JUNIPER NETWORKS | Engineering Simplicity

Next Gen Services Interfaces User Guide for Routing Devices

Next Gen Services Interfaces User Guide for Routing Devices

Published
2020-01-10

JUNOS

Juniper Networks, Inc.
1133 Innovation Way
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

Next Gen Services Interfaces User Guide for Routing Devices Next Gen Services Interfaces User Guide for Routing Devices
1.0

The information in this document is current as of the date on the title page.

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

END USER LICENSE AGREEMENT

The Juniper Networks product that is the subject of this technical documentation consists of (or is intended for use with) Juniper Networks software. Use of such software is subject to the terms and conditions of the End User License Agreement (“EULA”) posted at https://support.juniper.net/support/eula/. By downloading, installing or using such software, you agree to the terms and conditions of that EULA.

Table of Contents

11

Operational Commands

About the Documentation

IN THIS SECTION

Use this guide to configure Next Gen Services on MX240, MX480, and MX960 routers running the MX-SPC3 services card.

Documentation and Release Notes

To obtain the most current version of all Juniper Networks® technical documentation, see the product documentation page on the Juniper Networks website at https://www.juniper.net/documentation/.

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

Juniper Networks Books publishes books by Juniper Networks engineers and subject matter experts. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration. The current list can be viewed at https://www.juniper.net/books.

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

   ```
   system {
       scripts {
           commit {
               file ex-script.xsl;
           }
       }
   }
   interfaces {
       fxp0 {
           disable;
           unit 0 {
               family inet {
                   address 10.0.0.1/24;
               }
           }
       }
   }
   ```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

   ```
   [edit]
   user@host# load merge /var/tmp/ex-script.conf
   load complete
   ```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

   ```
   commit {
     file ex-script-snippet.xsl; }
   ```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

   ```
   [edit]
   user@host# edit system scripts
   [edit system scripts]
   ```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

   ```
   [edit system scripts]
   user@host# load merge relative /var/tmp/ex-script-snippet.conf
   load complete
   ```

For more information about the **load** command, see CLI Explorer.

Documentation Conventions

Table 1 on page xxvi defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Table 2 on page xxvi defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the **configure** command: user@host> **configure**
`Fixed-width text like this`	Represents output that appears on the terminal screen.	`user@host>` **show chassis alarms** `No alarms currently active`
Italic text like this	• Introduces or emphasizes important new terms. • Identifies guide names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS CLI User Guide* • RFC 1997, *BGP Communities Attribute*

Table 2: Text and Syntax Conventions *(continued)*

Convention	Description	Examples
Italic text like this	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# **set system domain-name** *domain-name*
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	• To configure a stub area, include the **stub** statement at the **[edit protocols ospf area area-id]** hierarchy level. • The console port is labeled **CONSOLE**.
< > (angle brackets)	Encloses optional keywords or variables.	**stub <default-metric *metric*>;**
| (pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	**broadcast | multicast** **(*string1* | *string2* | *string3*)**
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	**rsvp { # Required for dynamic MPLS only**
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	**community name members [*community-ids*]**

Indention and braces ({ })	Identifies a level in the configuration hierarchy.	[edit]
		routing-options {
		  static {
		  route default {
		  nexthop *address*;
		  retain;
		  }
		  }
		}

; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		

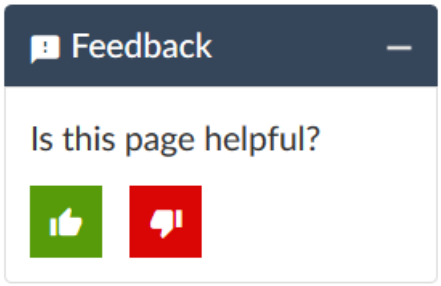
Table 2: Text and Syntax Conventions *(continued)*

Convention	Description	Examples
Bold text like this	Represents graphical user interface (GUI) items you click or select.	• In the Logical Interfaces box, select **All Interfaces**. • To cancel the configuration, click **Cancel**.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

Documentation Feedback

We encourage you to provide feedback so that we can improve our documentation. You can use either of the following methods:

- Online feedback system—Click TechLibrary Feedback, on the lower right of any page on the Juniper Networks TechLibrary site, and do one of the following:



  - Click the thumbs-up icon if the information on the page was helpful to you.
  - Click the thumbs-down icon if the information on the page was not helpful to you or if you have suggestions for improvement, and use the pop-up form to provide feedback.

- E-mail—Send your comments to techpubs-comments@juniper.net. Include the document or topic name, URL or page number, and software version (if applicable).

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active Juniper Care or Partner Support Services support contract, or are

covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at https://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf.
- Product warranties—For product warranty information, visit https://www.juniper.net/support/warranty/.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- Find CSC offerings: https://www.juniper.net/customers/support/
- Search for known bugs: https://prsearch.juniper.net/
- Find product documentation: https://www.juniper.net/documentation/
- Find solutions and answer questions using our Knowledge Base: https://kb.juniper.net/
- Download the latest versions of software and review release notes: https://www.juniper.net/customers/csc/software/
- Search technical bulletins for relevant hardware and software notifications: https://kb.juniper.net/InfoCenter/
- Join and participate in the Juniper Networks Community Forum: https://www.juniper.net/company/communities/
- Create a service request online: https://myjuniper.juniper.net

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: https://entitlementsearch.juniper.net/entitlementsearch/

Creating a Service Request with JTAC

You can create a service request with JTAC on the Web or by telephone.

- Visit https://myjuniper.juniper.net.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see https://support.juniper.net/support/requesting-support/.

1

PART

Overview

CHAPTER 1

Next Gen Services Overview

IN THIS CHAPTER

Next Gen Services Overview

IN THIS SECTION

This topic provides an overview of Next Gen Services and includes the following subjects:

Next Gen Services Features

Next Gen Services provide capabilities for manipulating traffic before it is delivered to its destination. Next Gen Services features run on the MX Series, and are based on a different software architecture than legacy MX Series services. You can run Next Gen Services on MX240, MX480 and MX960 routers. Some Next Gen Services features use different Junos CLI statements than the equivalent legacy service.

NOTE: The only services card that supports Next Gen Services services is the MX-SPC3. If you are running Next Gen Services services, the MX chassis can only use MX-SPC3 services cards. Next Gen Services use their own software architecture, which is not compatible with legacy services.

Table 3 on page 4 provides a summary of Next Gen Services.

Table 3: Next Gen Services Summary

Next Gen Services Supported by MX-SPC3 Services Card	
Carrier Grade NAT	6rd Softwires
	Deterministic NAT
	Dynamic Address-Only Source NAT
	Global System Logging
	IPv4 Connectivity Across IPv6-Only Network Using 464XLAT
	Network Address Port Translation
	Port Forwarding
	Static Source NAT
	Stateful NAT64
	Static Destination NAT
	Stateless Source Network Prefix Translation for IPv6
	Twice NAPT
	Twice Static NAT
	Class of Service
Stateful Firewall Services	
Intrusion Detection Services	

Table 3: Next Gen Services Summary *(continued)*

Next Gen Services Supported by MX-SPC3 Services Card	
Traffic Load Balancing	
DNS Request Filtering	
Aggregated Multiservices Interfaces	
Inter-chassis High Availability	NAT, Stateful Firewall, and IDS Flows

See Protocols and Applications Supported by MX-SPC3 Services Card for information about the protocols and applications that the MX-SPC3 supports.

Next Gen Services Documentation

You can run Next Gen Services on the MX240, MX480, and MX960 if you have the MX-SPC3 services card installed in the router. Refer to our TechLibrary for all MX router documentation. For Next Gen Services, refer to the following documentation:

- To get started, see the *Next Gen Services Interfaces Overview for Routing Devices*, which provides a configuration overview of what you need to configure to get started with Next Gen Services. It also includes the basic configuration statements and commands you'll use to perform these steps.
- To learn about and configure Next Gen Services, see *Next Gen Services Interfaces User Guide for Routing Devices*.
- For details on installing or replacing the MX-SPC3 card, see *MX Series 5G Universal Routing Platform Interface Module Reference*.
- To monitor flows and sample traffic — See the *Monitoring, Sampling, and Collection Services Interfaces Feature Guide*, which describes how to configure traffic flow monitoring, packet flow capture, traffic sampling for accounting or discard, port mirroring to an external device, and real-time performance monitoring.
- Broadband Subscriber Services Feature Guide

Enabling Next Gen Services

To run Next Gen Services, you must enable it on the MX Series router. This enables the operating system to run it's own operating system (OS) for Next Gen Services. The Next Gen Service OS does not support running MS-MPC or MS-DPCs services in the same chassis.

There are specific steps you'll need to take if you're migrating your services from legacy services cards to the MX-SPC3. The Next Gen Services CLI differs from these legacy services. For more information, see *Configuration Differences Between Adaptive Services on the MS-MPC and Next Gen Services on the MX-SPC3*.

Supported Services Card

The only services card that supports Next Gen Services services is the MX-SPC3. If you are running Next Gen Services services, the MX chassis can only use MX-SPC3 services cards.

You cannot run MS-MPC, MS-MIC or MS-DPC inline services in the same chassis with the MX-SPC3.

Compatibility with Other Services Cards

The MX-SPC3 services card is compatible end-to-end with the MX Series Switch Fabrics, Routing Engines and MS-MPC line cards as described in Table 4 on page 6.

Table 4: MX-SPC3 Services Card Compatibility with MX Series Switch Fabrics, Routing Engines and MPC Line Cards

Switch Fabric	Route Engine	MPC Line Cards
SCBE	RE-S-1800X4-16G-UPG-BB RE-S-1800X4-32G-UB	MPC2E-3D MPC2-3D-NG MPC3E and MPC3E-3D-NG MPC4E-3D MPC-3D-16XGE
SCBE2	RE-S-1800X4-16G-UPG-BB RE-S-1800X4-32G-UB RE-S-X6-64G-UB	MPC2E-3D MPC2-3D-NG MPC3E and MPC3E-3D-NG MPC4E-3D MPC5E and MPC5EQ MPC7E, MPC7EQ, and MPC-3D-16XGE MPC-3D-16XGE

Configuring Interfaces for Next Gen Services

All Next Gen Services are provided by the MX-SPC3 services card. The interfaces on the MX-SPC3 services card are referred to as a virtual multi service (vms) pic and when you configure an interface for a Next Gen Service, you specify the interface as follows:

```
user@host# set services service-set service-set-name interface-service service-interface
    vms-slot-number/pic-number/0.logical-unit-number
```

Aside from the CLI differences, you need to be aware of the basic hardware differences between the MS-MPC and the MX-SPC3. The MS-MPC contains four CPU complexes whereas the MX-SPC3, while more powerful, contains two CPU complexes. Each CPU complex represents a single integrated PIC, meaning that the MS-MPC has four integrated PICs whereas the MX-SPC3 has two integrated PICs.

Because the number of PICs directly affects the number of interfaces, you might need to add logical units to each interface on the MX-SPC3 to increase the number of interfaces to four. For example, if you currently use all four interfaces on the MS-MPC and you have a service set per interface, you can create two logical units per interface on the MX-SPC3 to bring the total number of interfaces to four, and then reassociate the four service sets to these four logical interfaces.

Methods for Applying Services to Traffic

When you configure Next Gen Services, you can apply those services with either of the following methods:

- Apply the configured services to traffic that flows through a particular interface on the MX router.
- Apply the configured services to traffic that is destined for a particular next hop.

RELATED DOCUMENTATION

Enabling and Disabling Next Gen Services

Configuration Differences Between Adaptive Services on the MS-MPC and Next Gen Services on the MX-SPC3

2

PART

Carrier Grade NAT (CGNAT

CHAPTER 2

6rd Softwires Overview and Configuration

IN THIS CHAPTER

6rd Softwires in Next Gen Services

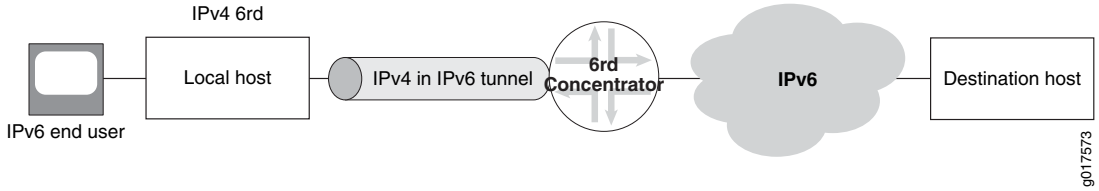
IN THIS SECTION

6rd Softwires in Next Gen Services Overview

Next Gen Services supports a 6rd softwire concentrator on the MX-SPC3 services card. 6rd softwires allow IPv6 end users to send traffic over an IPv4 network to reach an IPv6 network. IPv6 packets are encapsulated in IPv4 packets by a softwire initiator at the customer edge WAN, and tunneled to a 6rd softwire concentrator. A softwire is created when IPv4 packets containing IPv6 destination information are received at the softwire concentrator, which decapsulates IPv6 packets and forwards them for IPv6 routing.

6rd softwire flow is shown in Figure 1 on page 11.

Figure 1: 6rd Softwire Flow



In the reverse path, IPv6 packets are sent to the 6rd softwire concentrator, which encapsulates them in IPv4 packets corresponding to the proper softwire and sends them to the customer edge WAN.

IPv6 flows are also created for the encapsulated IPv6 payload, and are associated with the specific softwire that carried them in the first place. When the last IPv6 flow associated with a softwire ends, the softwire is deleted. This simplifies configuration and there is no need to create or manage tunnel interfaces.

For more information on 6rd softwires, see RFC 5969, *IPv6 Rapid Deployment on IPv4 Infrastructures (6rd) -- Protocol Specification*.

Benefits

- Rapid deployment of IPv6 service to subscribers on native IPv4 customer edge WANs.
- No need to create or manage tunnel interfaces.

Configuring Inline 6rd for Next Gen Services

IN THIS SECTION

Configuring a 6rd Softwire Concentrator

To configure a 6rd softwire concentrator:

1. Configure a 6rd softwire concentrator name and IP address.

```
user@host# set services softwires softwire-name v6rd-softwire-concentrator softwire-concentrator address
```

2. Specify that the softwire concentrator is for 6rd.

```
[edit services softwires softwire-name v6rd-softwire-concentrator]
user@host# set softwire-type v6rd
```

3. Configure the IPv4 address prefix for the customer edge network and the IPv6 address prefix for the 6rd domain.

```
[edit services softwires softwire-name v6rd-softwire-concentrator]
user@host# set ipv4-prefix ipv4-prefix v6rd-prefix v6rd-prefix
```

4. Configure the size, in bytes, of the maximum transmission unit for IPv6 packets encapsulated in IPv4. Compute this as the maximum expected IPv4 packet size plus 20.

```
[edit services softwires softwire-name v6rd-softwire-concentrator]
user@host# set mtu-v4 number-of-bytes
```

SEE ALSO

Configuring a 6rd Softwire Rule

To configure a 6rd softwire rule:

1. Specify the name of the rule set that the rule belongs to.

```
[edit services softwires]
user@host# set rule-set rule-set-name
```

2. Specify the direction of traffic to be tunneled.

```
[edit services softwires rule-set rule-set-name]
user@host# set match-direction (input | output)
```

3. Specify the name of the rule.

```
[edit services softwires rule-set rule-set-name]
user@host# set rule rule-name
```

4. Specify the 6rd softwire concentrator that the rule uses.

```
[edit services softwires rule-set rule-set-name rule rule-name]
user@host# set then v6rd v6rd-softwire-concentrator
```

Configuring Inline Services and an Inline Services Interface

Inline services run on MX line cards that can operate under Next Gen Services, for example MPC3 and MPC4 cards. This topic describes how to enable an inline service.

To enable inline services and an inline services interface:

1. Enable inline services for the FPC and PIC slot, and define the amount of bandwidth to dedicate to inline services.

   ```
   [edit chassis fpc slot-number pic number]
   user@host# set inline-services bandwidth (1g | 10g | 20g | 30g | 40g | 100g)
   ```

2. Configure the inline services logical interfaces. Inline interfaces use the following interface naming convention:

   ```
   si-slot/pic/port
   ```

   - If you are using an interface service set, configure one logical unit, and include units for IPv4 and IPv6:

     ```
     user@host# set interfaces si-slot-number/pic-number/0 unit unit-number family inet
     user@host# set interfaces si-slot-number/pic-number/0 unit unit-number family inet6
     ```

     For example:

     ```
     user@host# set interfaces si-0/0/0 unit 0 family inet
     user@host# set interfaces si-0/0/0 unit 0 family inet6
     ```

   - If you are using a next-hop service set, configure two logical units and define the inside and outside interfaces for IPv4 and IPv6:

     ```
     [edit interfaces si-slot-number/pic-number/0
     user@host# set unit inside-unit-number family inet
     user@host# set unit inside-unit-number family inet6
     user@host# set unit inside-unit-number service-domain inside
     user@host# set unit outside-unit-number family inet
     user@host# set unit outside-unit-number family inet6
     user@host# set unit outside-unit-number service-domain outside
     ```

     For example:

     ```
     user@host# set interfaces si-0/0/0 unit 1 family inet
     ```

```
user@host# set interfaces si-0/0/0 unit 1 family inet6
user@host# set interfaces si-0/0/0 unit 1 service-domain inside
user@host# set interfaces si-0/0/0 unit 2 family inet
user@host# set interfaces si-0/0/0 unit 2 family inet family inet6
user@host# set interfaces si-0/0/0 unit 2 service-domain outside
```

Configuring the IPv4-Facing and IPv6-Facing Interfaces for 6rd

To configure the IPv4-facing and IPv6-facing interfaces:

1. Configure the IPv4-facing interface:
   - To configure an interface to use with an interface-style service set, configure input and output service and specify the service set.

     ```
     user@host# set interfaces interface-name unit unit-number family inet service input service-set
       service-set-name
     user@host# set interfaces interface-name unit unit-number family inet service output service-set
       service-set-name
     user@host# set interfaces interface-name unit unit-number family inet address ip-address
     ```

   - To configure an interface to use with a next-hop style service set, omit the **service input** and **service output** references.

     ```
     user@host# set interfaces interface-name unit unit-number family inet
     user@host# set interfaces interface-name unit unit-number family inet address ip-address
     ```

2. Configure the IPv6-facing interface.

   ```
   user@host# set interface-name unit unit-number family inet6 address ipv6-address
   ```

Configuring the Service Set

To configure the service set for 6rd processing:

1. Define the service set.

   ```
   [edit services]
   user@host# edit service-set service-set-name
   ```

2. Configure either an interface service set, which requires a single service interface, or a next-hop service set, which requires an inside and outside service interface.
   - To configure an interface service set:

```
[edit services service-set service-set-name]
user@host# set interface-service service-interface vms-slot-number/pic-number/0.unit-number
```

- To configure a next-hop service set:

```
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface vms-slot-number/pic-number/0.inside-unit-number
   outside-service-interface vms-slot-number/pic-number/0.outside-unit-number
```

3. Specify the 6rd rule-set that contains the 6rd rule to be used with the service set.

```
[edit services service-set service-set-name]
user@host# set softwires-rule-set softwire-rule-set-name
```

CHAPTER 3

Deterministic NAT Overview and Configuration

IN THIS CHAPTER

Deterministic NAPT Overview for Next Gen Services

Under Next Gen Services with the MX-SPC3, you can configure both Deterministic NAPT44 and NAPT64 services. Next Gen Services deterministic NAPT services use an algorithm to allocate blocks of destination ports.

Next Gen Services deterministic NAPT44 service ensures that the original source IPv4 address and port always map to the same post-NAT IPv4 address and port range, and that the reverse mapping of a given translated external IPv4 address and port are always mapped to the same internal IPv4 address.

Next Gen Services deterministic NAPT64 service ensures that the original source IPv6 address and port always map to the same post-NAT IPv4 address and port range, and that the reverse mapping of a given translated external IPv4 address and port are always mapped to the same internal IPv6 address.

For detailed information on how to configure deterministic NAPT, see "Configuring Deterministic NAPT for Next Gen Services" on page 22.

Benefits of Deterministic NAPT

- Eliminates the need for address translation logging because an IP address is always mapped to the same external IP address and port range, and the reverse mapping of a given translated external IP address and port are always mapped to the same internal IP address.

Understanding Deterministic NAPT Algorithms

The effectiveness of your implementation of deterministic NAPT depends on your analysis of your subscriber requirements. The block size you provide indicates how many ports will be made available for each incoming subscriber address from the range in the **from** clause specified in the applicable NAT rule. The allocation

algorithm computes an offset value to determine the outgoing IP address and port. A reverse algorithm is used to derive the originating subscriber address.

> **NOTE:** In order to track subscribers without using logs, an ISP must use a reverse algorithm to derive a subscriber (source) addresses from a translated address.

The following variables are used in forward calculation (private subscriber IP address to public IP address) and reverse calculation (public IP address to private subscriber IP address):

- Pr_Prefix—Any pre-NAT IPv4 subscriber address.
- Pr_Port—Any pre-NAT protocol port.
- Block_Size—Number of ports configured to be available for each Pr_Prefix.

  If **block-size** is configured as zero, the method for computing the block size is computed as follows:

  block-size = int(64512/ceil[(Nr_Addr_PR_Prefix/Nr_Addr_PU_Prefix)])

  where 64512 is the maximum available port range per public IP address.
- Base_PR_Prefix—First usable pre-NAT IPv4 subscriber address in a **from** clause of the NAT rule.
- Base_PU_Prefix—First usable post-NAT IPv4 subscriber address configured in the NAT pool.
- Pu_Port_Range_Start—First usable post-NAT port. This is 1024.
- Pr_Offset—The offset of the pre-NAT IP address that is being translated from the first usable pre-NAT IPv4 subscriber address in a **from** clause of the NAT rule. PR_Offset = Pr_Prefix – Base_Pr_Prefix.
- PR_Port_Offset—Offset of the pre-NAT IP address multiplied by the block size. PR_Port_Offset = Pr_Offset * Block_Size.
- Pu_Prefix—Post-NAT address for a given Pr_Prefix.
- Pu_Start_Port—Post-NAT start port for a flow from a given Pr_Prefix
- Pu_Actual_Port—Post-NAT port seen on a reverse flow.
- Nr_Addr_PR_Prefix — Number of usable pre-NAT IPv4 subscriber addresses in a **from** clause of the NAT rule.
- Nr_Addr_PU_Prefix — Number of usable post-NAT IPv4 addresses configured in the NAT pool.
- Rounded_Port_Range_Per_IP — Number of ports available for each post-NAT IP address. Rounded_Port_Range_Per_IP = ceil[(Nr_Addr_PR_Prefix/Nr_Addr_PU_Prefix)] * Block_Size.

- Pu_Offset—Offset of the post-NAT IP address from the first usable post-NAT address. Pu_Offset = Pu_Prefix – Base_Pu_Prefix.
- Pu_Port_Offset— Offset of the post-NAT port from 1024 added to the product of the offset of the post-NAT IP address and the number of ports available for each post-NAT IP address. Pu_Port_Offset = (Pu_Offset * Rounded_Port_Range_Per_IP) + (Pu_Actual_Port – Pu_Port_Range_Start).

Algorithm Usage–Assume the following configurations:

```
services {
    nat {
        source {
            pool src-pool {
                address 203.0.113.0/16;
                port {
                    automatic {
                        random-allocation;
                    }
                    deterministic {
                        block-size 249;
                        host address 10.1.0.1/16;
                    }
                }
            }
            rule-set set1 {
                rule det-nat {
                    match-direction-input;
                    match {
                        source-address 10.1.0.0/16;
                    }
                    then {
                        source-nat {
                            pool src-pool;
                        }
                    }
                }
            }
        }
    }
}
```

Forward Translation

1. Pr_Offset = Pr_Prefix – Base_Pr_Prefix

2. Pr_Port_Offset = Pr_Offset * Block_Size

3. Rounded_Port_Range_Per_IP = ceil[(Nr_Addr_PR_Prefix/Nr_Addr_PU_Prefix)] * Block_Size

4. Pu_Prefix = Base_Public_Prefix + floor(Pr_Port_Offset / Rounded_Port_Range_Per_IP)

5. Pu_Start_Port = Pu_Port_Range_Start + (Pr_Port_Offset % Rounded_Port_Range_Per_IP)

Using the sample configuration and assuming a subscriber flow sourced from 10.1.1.250:5000:

1. Pr_Offset = 10.1.1.250 – 10.1.0.1 = 505

2. Pr_Port_Offset = 505 * 249 = 125,745

3. Rounded_Port_Range_Per_IP = ceil[(65, 533/254)] * 249 = 259 * 249 = 64,491

4. Pu_Prefix = 203.0.113.1 + floor(125,745 /64,491) = 203.0.113.1 +1 = 203.0.113.2

5. Pu_Start_Port = 1,024 + (125,745 % 64,491) = 62278
   - 10.1.1.250 is translated to 203.0.113.2.
   - The starting port is 62278. There are 249 ports available to the subscriber based on the configured block size. The available port range spans ports 62278 through 62526 (inclusive).
   - The specific flow 10.1.1.250:5000 randomly assigns any of the ports in its range because random allocation was specified.

Reverse Translation

1. Pu_Offset = Pu_Prefix – Base_Pu_Prefix

2. Pu_Port_Offset = (Pu_Offset * Rounded_Port_Range_Per_IP) + (Pu_Actual_Port – Pu_Port_Range_Start)

3. Subscriber_IP = Base_Pr_Prefix + floor(Pu_Port_Offset / Block_Size)

The reverse translation is determined as follows. Assume a flow returning to 203.0.113.2:62278.

1. Pu_Offset = 203.0.113.2 – 203.0.113.1 = 1

2. Pu_Port_Offset = (1 * 64,491) + (62,280 - 1024) = 125,747

3. Subscriber_IP = 10.1.0.1 + floor(125,747 / 249) = 10.1.0.1 + 505 = 10.1.1.250

> **NOTE:** In reverse translation, only the original private IP address can be derived, and not the original port in use. This is sufficiently granular for law enforcement requirements.

When you have configured deterministic NAPT, you can use the **show services nat deterministic-nat internal-host** and **show services nat deterministic-nat nat-port-block** commands to show forward and reverse mapping. However, mappings will change if you reconfigure your deterministic port block allocation block size or the **from** clause for your NAT rule. In order to provide historical information on mappings, we recommend that you write scripts that can show specific mappings for prior configurations.

Deterministic NAPT Restrictions

When you configure deterministic NAPT, be aware of the following:

- For IPv6 deterministic NAT64 host address configuration, we support the last 32-bit (4 byte) change of the IPv6 host prefix. This means we only can configure /96 prefix masks for IPv6 address, which supports a maximum address number of 2^{32} for one IPv6 prefix. The host address is specified at the **[services nat source pool p1 port deterministic host]** configuration hierarchy.
- Usually, the number of address in host-range should be more than the number of address in pool.
- > **BEST PRACTICE:** We don't recommend the host address number be configured to exceed the total port block resource number because some hosts may not receive a port block resource successfully.

- The minimum block size for deterministic NAT is 1. If you configure a smaller block size, the commit fails. If the block size is configured to 0, the block size will be automatically calculated based on host number and translated address number. If the calculated block size is less than 1, the commit fails.
- For Next Gen Services deterministic NAPT, you can configure a mix of IPv4 and IPv6 host addresses together in a NAT pool in either a host address or an address name list, However. the total host prefix number cannot exceed 1000.
- You cannot configure an address range or DNS name in a host address book name.
- The configured host address prefix and host address book name are merged together if its prefixes are overlapped. You can use the **show services nat source deterministic** operational command to show the merged prefixes.

- **BEST PRACTICE:** We recommend, you keep subscriber host addresses consistent with multiple rule's matching the source address prefix, if the same deterministic NAT pool is used across multiple rules; otherwise, traffic from hosts which are not configured in the NAT pool, even it matches the NAT rule, may not allocate the port successfully.

- For Next Gen Services NAPT services, the total number of host addresses configured must be greater than or equal to the deterministic NAT port blocks available.

RELATED DOCUMENTATION

Configuring Deterministic NAPT for Next Gen Services | 22

Configuring Deterministic NAPT for Next Gen Services

IN THIS SECTION

To configure deterministic NAPT on Next Gen Services, perform the following:

Configuring the NAT Pool for Deterministic NAPT for Next Gen Services

To configure the NAT pool for deterministic NAPT:

1. Create a pool.

```
user@host# edit services nat source pool nat-pool-name
```

2. Define the addresses or subnets to which source addresses are translated.

```
[edit services nat source pool nat-pool-name]
user@host# set address address-prefix
```

or

```
[edit services nat source pool nat-pool-name]
user@host# set address address-prefix to address address-prefix
```

3. Configure deterministic port block allocation for the pool.

```
[edit services nat source pool nat-pool-name port]
user@host# set deterministic
```

4. If you want the lowest and highest IPv4 addresses (the network and broadcast addresses) in the source address range of a NAT rule to be translated when the NAT pool is used, configure **include-boundary-address**.

```
[edit services nat source pool nat-pool-name port deterministic]
user@host# set include-boundary-addresses
```

5. Configure the port block size. The range is 1 to 64,512. The default block size is 256.

```
[edit services nat source pool nat-pool-name port deterministic]
user@host# set block-size block-size
```

6. Configure the first usable pre-NAT subscriber address, which is used in calculating the offset value for a pre-NAT address that is being translated. This offset is used to perform the deterministic NAT mapping.

```
[edit services nat source pool nat-pool-name port deterministic]
user@host# set host address host-addr
```

7. Configure the interval at which the syslog is generated for the deterministic NAT configuration.

```
[edit services nat source pool nat-pool-name port deterministic]
user@host# set deterministic-nat-configuration-log-interval seconds
```

8. To configure automatic port assignment for the pool, specify either random allocation or round-robin allocation.

   ```
   [edit services nat source pool nat-pool-name port]
   user@host# set automatic (random-allocation | round-robin)
   ```

   Random allocation randomly assigns a port from the range 1024 through 65535 for each port translation. Round robin allocation first assigns port 1024, and uses the next higher port for each successive port assignment. Round robin allocation is the default.

9. To disable round-robin port allocation for all NAT pools that do not specify an **automatic (random-allocation | round-robin)** setting, configure the global setting.

   ```
   [edit services nat source]
   user@host# set port-round-robin disable
   ```

SEE ALSO

Network Address Translation Configuration Overview

Configuring the NAT Rule for Deterministic NAPT44 for Next Gen Services

To configure the NAT rule for deterministic NAPT44:

1. Configure the NAT rule name.

   ```
   [edit services nat source]
   user@host# set rule-set rule-set-name rule rule-name
   ```

2. Specify the traffic direction to which the NAT rule set applies.

   ```
   [edit services nat source rule-set rule-set-name]
   user@host# set match-direction (in | out | in-out)
   ```

3. Specify the addresses that are translated by the source NAT rule.

   To specify one address or prefix value:

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address address
```

To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

```
[edit services address-book global]
user@host# set address address-name range-address lower-limit to upper-limit
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address-name address-name
```

To specify any unicast address:

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address any-unicast
```

4. Specify one or more application protocols to which the NAT rule applies. The number of applications listed in the rule must not exceed 3072.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match application [application-name]
```

5. Specify the NAT pool that contains the addresses for translated traffic.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set then source-nat pool nat-pool-name
```

Configuring the NAT Rule for Deterministic NAPT64 for Next Gen Services

To configure the NAT rule for deterministic NAPT64:

1. Configure the source NAT rule name.

```
[edit services nat source]
user@host# set rule-set rule-set-name rule rule-name
```

2. Specify the traffic direction to which the NAT rule set applies.

```
[edit services nat source rule-set rule-set-name]
```

```
user@host# set match-direction (in | out | in-out)
```

3. Specify the IPv6 prefix for the source addresses that are translated by the NAT rule.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address address
```

4. Specify one or more application protocols to which the NAT rule applies. The number of application terms must not exceed 3072.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match application [application-name]
```

5. Specify the NAT source pool that contains the addresses for translated source addresses.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set then source-nat pool nat-pool-name
```

Configuring the Service Set for Deterministic NAT for Next Gen Services

To configure the service set for deterministic NAPT:

1. Define the service set.

```
[edit services]
user@host# edit service-set service-set-name
```

2. Configure either an interface service, which requires a single service interface, or a next-hop service, which requires an inside and outside service interface.

```
[edit services service-set service-set-name]
user@host# set interface-service service-interface interface-name
```

or

```
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
  interface-name
```

3. Specify the NAT rule sets to be used with the service set.

```
[edit services service-set service-set-name]
user@host# set nat-rule-sets rule-set-name
```

Clearing the Don't Fragment Bit

If you configured deterministic NAPT64, specify that the don't fragment (DF) bit for IPv4 packet headers is cleared when the packet length is less than 1280 bytes.

```
[edit services nat natv6v4]
user@host# set clear-dont-fragment-bit
```

This prevents unnecessary creation of an IPv6 fragmentation header when translating IPv4 packets that are less than 1280 bytes.

RELATED DOCUMENTATION

Deterministic NAPT Overview for Next Gen Services | 17

CHAPTER 4

Dynamic Address-Only Source NAT Overview and Configuration

IN THIS CHAPTER

Dynamic Address-Only Source Translation Overview

With dynamic address-only translation, you can map a private IP source address to a public IP address. A public address is picked up dynamically from a source NAT pool, and the mapping from the original source address to the translated source address is maintained as long as there is at least one active flow that uses this mapping. The port is not mapped.

Benefits of Dynamic Address-Only Source Translation

- Allows hosts in the private network to connect with the external domain, while hiding the private network.
- Allows a few public IP addresses to be used by several private hosts

RELATED DOCUMENTATION

Configuring Dynamic Address-Only Source NAT for Next Gen Services | 30

Configuring Dynamic Address-Only Source NAT for Next Gen Services

IN THIS SECTION

Configuring the Source Pool for Dynamic Address-Only Source NAT

To configure the source pool for dynamic address-only source NAT:

1. Create a source pool.

   ```
   user@host# edit services nat source pool nat-pool-name
   ```

2. Define the addresses or subnets to which source addresses are translated.

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set address address-prefix
   ```

   or

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set address address-prefix to address address-prefix
   ```

3. Disable port translation.

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set port no-translation
   ```

4. Define the NAT pool utilization levels that trigger SNMP traps. The **raise-threshold** is the pool utilization percentage that triggers the trap, and the range is 50 through 100. The **clear-threshold** is the pool utilization percentage that clears the trap, and the range is 40 through 100. The utilization is based on the number of addresses that are used.

```
[edit services nat source pool nat-pool-name]
user@host# set pool-utilization-alarm raise-threshold value
user@host# set pool-utilization-alarm clear-threshold value
```

If you do not configure **pool-utilization-alarm**, traps are not created.

5. To allow the IP addresses of a NAT source pool or destination pool to overlap with IP addresses in pools used in other service sets, configure **allow-overlapping-pools**.

```
[edit services nat]
user@host# set allow-overlapping-pools
```

Configuring the NAT Source Rule for Dynamic Address-Only Source NAT

To configure the NAT source rule for dynamic address-only source NAT:

1. Configure the NAT rule name.

```
[edit services nat source]
user@host# set rule-set rule-set-name rule rule-name
```

2. Specify the traffic direction to which the NAT rule set applies.

```
[edit services nat source rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

3. Specify the addresses that are translated by the source NAT rule.

   To specify one address or prefix value:

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address address
```

   To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

```
[edit services address-book global]
user@host# set address address-name range-address lower-limit to upper-limit
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address-name address-name
```

To specify any unicast address:

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address any-unicast
```

4. Specify one or more application protocols to which the NAT rule applies. The number of applications listed in the rule must not exceed 3072.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match application [application-name]
```

5. Specify the NAT pool that contains the addresses for translated traffic.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set then source-nat pool nat-pool-name
```

6. Configure the address-pooling paired feature if you want to ensure assignment of the same external IP address for all sessions originating from the same internal host.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat mapping-type]
user@host# set address-pooling-paired
```

7. Specify the timeout period for **address-pooling-paired** mappings that use the NAT pool. The range is 120 through 86,400 seconds, and the default is 300. Mappings that are inactive for this amount of time are dropped.

```
[edit services nat source pool nat-pool-name]
user@host# set mapping-timeout mapping-timeout
```

If you do not configure **ei-mapping-timeout** for endpoint independent translations, then the **mapping-timeout** value is used for endpoint independent translations.

8. Configure the generation of a syslog when traffic matches the NAT rule conditions.

```
[edit services nat source rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

Configuring the Service Set for Dynamic Address-Only Source NAT

To configure the service set for dynamic address-only source NAT:

1. Define the service set.

```
[edit services]
user@host# edit service-set service-set-name
```

2. Configure either an interface service, which requires a single service interface, or a next-hop service, which requires an inside and outside service interface.

```
[edit services service-set service-set-name]
user@host# set interface-service service-interface interface-name
```

or

```
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
    interface-name
```

3. Specify the NAT rule sets to be used with the service set.

```
[edit services service-set service-set-name]
user@host# set nat-rule-sets rule-set-name
```

RELATED DOCUMENTATION

Dynamic Address-Only Source Translation Overview | 29

CHAPTER 5

Global System Logging Overview and Configuration

IN THIS CHAPTER

Understanding System Logging for Next Gen Services

IN THIS SECTION

You can log messages for the various services provided by the MX-SPC3 services card. This topic describes the system logging of the MX-SPC3 services card and how to configure it.

Next Gen Services System Logging

You can generate logs for the services that the MX-SPC3 services card provides, such as NAT and Stateful Firewall, sessions and so forth. You can send logs to either the local routing engine (RE) or one or more remote servers (each of these is identified as a stream). You can configure files to log system messages

and also assign attributes, such as severity levels, to messages. Reboot requests are recorded to the system log files, which you can view with the **show log** command.

Modes of Operation for Next Gen Services System Logging

You can save logs for Next Gen Services locally, which is called: event mode, or send the log messages to one or more external servers, called: stream mode.

In event mode, after the log message is recorded, the log is stored within a log file which is then stored in the database table of the local routing engine (RE) for further analysis.

When configured in stream mode, log messages are streamed to one or more remote devices. Each remote device is assigned a stream from which it receives logs.

Understanding Stream Mode

When configured in stream mode, Next Gen Services log messages are streamed to a remote device.

For stream mode log forwarding, you can configure which transport protocol is used between MX-SPC3 services card and the log server. You can use either UDP, TCP, or TLS as the transport protocol.

When the device is configured in stream mode, you can configure a maximum of eight system log hosts to stream to.

System Logging Configuration Overview

Configuring system logging for Next Gen Services involves several main steps and considerations:

- Global system logging — Next Gen Services system logging uses a global logging option that you need to enable in order to collect system log messages.

  To enable global system logging for Next Gen Services, set the **traceoptions** option under the **edit services rtlog** hierarchy.

- For Next Gen Services, UDP based syslogs are always set at the **service-set** level regardless of whether you are running event mode or stream mode.

  You must configure system logging for each service-set for which you want to collect logs.

Disabling Session Open Information in Syslogs

You can stop open session information from cluttering up your syslogs by disabling session open information from being collected:

```
user@host# set services service-set ss1 service-set-options disable-session-open-syslog
```

RELATED DOCUMENTATION

Enabling Global System Logging for Next Gen Services

To configure either event mode or stream mode system logging for Next Gen Services, you must first globally enable logging:

1. Enable system logging for Next Gen Services.

```
[edit]
user@host# edit services rtlogtraceoptions
```

2. Specify the groups from which to inherit configuration data.

```
[edit services rtlog traceoptions]
user@host# set apply-groups group-names
```

3. Specify which groups not to inherit configuration data from.

```
[edit services rtlog traceoptions]
user@host# set apply-groups-except group-names
```

4. Configure information about the files that contain trace logging information.

```
[edit services rtlog traceoptions]
user@host# set file filename
```

5. Define tracing operations for individual service-sets. To specify more than one tracing operation, include multiple flag statements.

```
[edit services rtlog traceoptions]
user@host# set flag flag, flag...
```

6. (Optional) If you prefer not to perform any system logging, you can disable it.

```
[edit services rtlog traceoptions]
user@host# set no-remote-trace
```

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

Configuring Local System Logging for Next Gen Services

To send Next Gen Services log messages to a file on the local router, you'll need to configure system logging for **event** mode. This procedure describes this configuration process.

You must enable global system logging for Next Gen Services in order to perform event mode system logging. See, "Enabling Global System Logging for Next Gen Services" on page 37.

> **NOTE:** For Next Gen Services, UDP based syslogs are always set at the **service-set** level. You must perform this procedure for each service-set for which you want to collect logs.

To configure event mode logging for Next Gen Services:

1. Specify the filename to send log messages to.

```
user@host# set system syslog file filename
```

2. Specify the name of the service-set for which you want to log messages.

```
user@host# edit services service-set service-set-name syslog
```

For example specify the service-set name to ss1.

```
user@host# edit services service-set ss1 syslog
```

3. Enable event mode system logging for the service-set.

```
[edit services service-set ss1 syslog]
user@host# set mode event
```

4. Specify the rate at which log messages are sent per second.

```
[edit services service-set ss1 syslog]
user@host# set event-rate 100
```

5. Specify a local tag name for the log messages.

```
[edit services service-set ss1 syslog]
user@host# set local-log-tag SYSLOG
```

6. Specify the categories for which you want to collect events.

```
[edit services service-set ss1 syslog]
user@host# set local-category category, category
```

For example, to collect logs for stateful firewall, sessions and NAT:

```
[edit services service-set ss1 syslog]
user@host# set local-category sfw, session, nat
```

RELATED DOCUMENTATION

- Enabling Global System Logging for Next Gen Services | 37
- Understanding System Logging for Next Gen Services | 35
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40

Configuring System Logging to One or More Remote Servers for Next Gen Services

To send system log messages about Next Gen Services to one or more remote servers, you can configure system logging for **stream** mode. This procedure describes the configuration process.

> **NOTE:** Next Gen Services system log messages are configured and collected at the **service-set** level.
>
> In this procedure, you'll configure a stream for the log messages between each service set and each remote server that you want to send log messages.
>
> Complete this procedure for each **service-set** and each remote server for which you want to collect logs and send logs.

You must enable global system logging for Next Gen Services in order to perform stream logging. See, "Enabling Global System Logging for Next Gen Services" on page 37.

To configure stream mode system logging for Next Gen Services:

1. Specify the names of the service-set for which you want to collect log messages.

   ```
   user@host# edit services service-set service-set-name syslog
   ```

   For example specify the service-set name to ss1.

   ```
   user@host# edit services service-set ss1 syslog
   ```

2. (Optional) Specify the syslog source address.

   ```
   [edit services service-set ss1 syslog]
   user@host# set source-address 50.0.0.10
   ```

   > **BEST PRACTICE:** The syslog source address can be any arbitrary IP address. It does not have to be an IP address that is assigned to the device. Rather, this IP address is used on the syslog collector to identify the syslog source. The best practice is to configure the source address as the IP address of the interface that the traffic is sent out on.

3. Specify a local tag name for the log messages.

```
[edit services service-set ss1 syslog]
user@host# set local-log-tag SYSLOG
```

4. Enable stream mode system logging for the service-set.

```
[edit services service-set ss1 syslog]
user@host# set modestream
```

5. Specify a name for the stream.

```
[edit services service-set ss1 syslog]
user@host# set stream stream-name
```

For example, let's call the stream: stream-aa

```
[edit services service-set ss1 syslog]
user@host# edit stream stream-aa
```

6. Specify the categories for which you want to collect events.

```
[edit services service-set ss1 syslog stream stream-aa]
user@host# set category
```

For example, to collect logs for stateful firewall, sessions and NAT:

```
[edit services service-set ss1 syslog stream stream-aa]
user@host# set category sfw, session, nat
```

7. Specify the file format for the log.

```
[edit services service-set ss1 syslog stream stream-aa]
user@host# set format sd-syslog
```

8. Specify the IP address of syslog server to receive log messages,

```
[edit services service-set ss1 syslog stream stream-aa]
```

```
user@host# set host address
```

9. Specify the level of severity for the stream.

```
[edit services service-set ss1 syslog stream stream-aa]
user@host# set severity severity-level
```

RELATED DOCUMENTATION

Understanding System Logging for Next Gen Services | 35

Enabling Global System Logging for Next Gen Services | 37

Configuring Local System Logging for Next Gen Services | 38

System Log Error Messages for Next Gen Services

IN THIS SECTION

This topic describes Next Gen Services MX-SPC3 services card system log error messages and provides a comparison of these messages with the MS-MPC services card.

Session Open Logs

Following are example session open logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card

JSERVICES_SESSION_OPEN application source-interface-name source-address source-port source-nat-information destination-address destination-port destination-nat-information protocol-name softwire-information;

MX-SPC3 Services Card

RT_FLOW_SESSION_CREATE_USF Prefix service-set-name source-interface-name source-address source-port destination-address destination-port service-name nat-source-address nat-source-port nat-destination-address nat-destination-port src-nat-rule-type src-nat-rule-name dst-nat-rule-type dst-nat-rule-name protocol-name policy-name application softwire-information;

Sample MX-SPC3 Output

A sample output is as follows:

<14>1 2018-06-26T17:23:06.269-07:00 booklet RT_FLOW - RT_FLOW_SESSION_CREATE_USF [junos@2636.1.1.1.2.25 prefix="SYSLOG-PREFIX" service-set-name="JNPR-NH-SSET3" source-address="50.0.0.10" source-port="1" destination-address="60.0.0.10" destination-port="21219" connection-tag="0" service-name="icmp" nat-source-address="100.0.0.1" nat-source-port="1024" nat-destination-address="60.0.0.10" nat-destination-port="21219" nat-connection-tag="0" src-nat-rule-type="source rule" src-nat-rule-name="SRC-NAT-RULE1" dst-nat-rule-type="N/A" dst-nat-rule-name="N/A" protocol-id="1" policy-name="p1" source-zone-name="JNPR-NH-SSET3-ZoneIn" destination-zone-name="JNPR-NH-SSET3-ZoneOut" session-id-32="160000001" username="N/A" roles="N/A" packet-incoming-interface="vms-2/0/0.100" application="UNKNOWN" nestedapplication="UNKNOWN" encrypted="UNKNOWN" application-category="N/A" application-sub-category="N/A" application-risk="-1"] Prefix PADDY3 svc-set-name JNPR-NH-SSET3: session created 50.0.0.10/1->60.0.0.10/21219 0x0 icmp 100.0.0.1/1024->60.0.0.10/21219 0x0 source rule SRC-NAT-RULE1 N/A N/A 1 p1 JNPR-NH-SSET3-ZoneIn JNPR-NH-SSET3-ZoneOut 160000001 N/A(N/A) vms-2/0/0.100 UNKNOWN UNKNOWN UNKNOWN N/A N/A -1

Session Open Logs With NAT

MS-MPC Services Card

SYSLOG_MSMPC{SS_TEST}JSERVICES_SESSION_OPEN: application:ike-esp-nat, xe-2/2/1.0 24.0.0.2:1234 [85.0.0.1:1024] -> 25.0.0.2:1234 (UDP)

MX-SPC3 Services Card

Aug 3 02:04:28 mobst480i RT_FLOW: RT_FLOW_SESSION_CREATE_USF: Tag svc-set-name sset1: session created 90.0.0.2/1->30.0.0.2/4323 0x0 icmp 50.0.0.3/1024->30.0.0.2/4323 0x0 source rule rule1 N/A N/A 1 p1 sset1-ZoneIn sset1-ZoneOut 160000015 N/A(N/A) vms-2/0/0.1 UNKNOWN UNKNOWN UNKNOWN N/A N/A -1 N/A

Session Open Logs Without NAT

MS-MPC Services Card

SYSLOG_MSMPC{SS_TEST}JSERVICES_SESSION_OPEN: application:ike-esp-nat, xe-2/2/1.0 24.0.0.2:1234 -> 25.0.0.2:1234 (UDP)

MX-SPC3 Services Card

RT_FLOW - RT_FLOW_SESSION_CREATE_USF [junos@2636.1.1.1.2.25 tag="SYSLOG_SFW" service-set-name="ss1" source-address="20.1.1.2" source-port="12000" destination-address="30.1.1.2" destination-port="22000" connection-tag="0" service-name="None" nat-source-address="20.1.1.2" nat-source-port="12000" nat-destination-address="30.1.1.2" nat-destination-port="22000" nat-connection-tag="0" src-nat-rule-type="N/A" src-nat-rule-name="N/A" dst-nat-rule-type="N/A" dst-nat-rule-name="N/A" protocol-id="6" policy-name="policy1" source-zone-name="ss1-ZoneIn" destination-zone-name="ss1-ZoneOut" session-id-32="190000004" username="N/A" roles="N/A" packet-incoming-interface="xe-5/3/2.0" application="UNKNOWN" nested-application="UNKNOWN" encrypted="UNKNOWN" application-category="N/A" application-sub-category="N/A" application-risk="-1" application-characteristics="N/A"] Tag SYSLOG_SFW svc-set-name ss1: session created 20.1.1.2/12000->30.1.1.2/22000 0x0 None 20.1.1.2/12000->30.1.1.2/22000 0x0 N/A N/A N/A N/A 6 policy1 ss1-ZoneIn ss1-ZoneOut 190000004 N/A(N/A) xe-5/3/2.0 UNKNOWN UNKNOWN UNKNOWN N/A N/A -1 N/A

Session Close Logs

Following are example session close logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card

JSERVICES_SESSION_CLOSE application source-interface-name source-address source-port source-nat-information destination-address destination-port destination-nat-information protocol-name softwire-information;

MX-SPC3 Services Card

RT_FLOW_SESSION_CLOSE_USF Prefix service-set-name source-interface-name source-address source-port destination-address destination-port service-name nat-source-address nat-source-port nat-destination-address nat-destination-port src-nat-rule-type src-nat-rule-name dst-nat-rule-type dst-nat-rule-name protocol-name policy-name; softwire-information;

Sample MX-SPC3 Output

A sample output follows:

<14>1 2018-06-27T09:24:00.058-07:00 booklet RT_FLOW - RT_FLOW_SESSION_CLOSE_USF [junos@2636.1.1.1.2.25 prefix="SYSLOG-PREFIX" service-set-name="JNPR-NH-SSET3" reason="idle Timeout" source-address="50.0.0.10" source-port="1" destination-address="60.0.0.10" destination-port="30170" connection-tag="0" service-name="icmp" nat-source-address="100.0.0.1" nat-source-port="1024" nat-destination-address="60.0.0.10" nat-destination-port="30170" nat-connection-tag="0" src-nat-rule-type="source rule" src-nat-rule-name="SRC-NAT-RULE1" dst-nat-rule-type="N/A" dst-nat-rule-name="N/A" protocol-id="1" policy-name="p1" source-zone-name="JNPR-NH-SSET3-ZoneIn" destination-zone-name="JNPR-NH-SSET3-ZoneOut" session-id-32="160000001" packets-from-client="1" bytes-from-client="84" packets-from-server="0" bytes-from-server="0" elapsed-time="4" application="UNKNOWN" nested-application="UNKNOWN" username="N/A" roles="N/A" packet-incoming-interface="vms-2/0/0.100" encrypted="UNKNOWN" application-category="N/A" application-sub-category="N/A" application-risk="-1"] Prefix PADDY-DEF svc-set-name JNPR-NH-SSET3: session closed idle Timeout: 50.0.0.10/1->60.0.0.10/30170 0x0 icmp 100.0.0.1/1024->60.0.0.10/30170 0x0 source rule SRC-NAT-RULE1 N/A N/A 1 p1 JNPR-NH-SSET3-ZoneIn JNPR-NH-SSET3-ZoneOut 160000001 1(84) 0(0) 4 UNKNOWN UNKNOWN N/A(N/A) vms-2/0/0.100 UNKNOWN N/A N/A -1

NAT Out of Address Logs

Following are example NAT Out of Address logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card

JSERVICES_NAT_OUTOF_ADDRESSES: nat-pool-name

MX-SPC3 Services Card:

Aug 10 10:06:13 champ RT_NAT: RT_SRC_NAT_OUTOF_ADDRESSES: nat-pool-name src_pool1 is out of addresses

NAT Out of Ports Logs

Following are example NAT Out of Ports logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card

{NPU-1-PFX1}[jservices-nat]: JSERVICES_NAT_OUTOF_PORTS: natpool NAT-POOL-NPU1-PFX3 is out of ports

MX-SPC3 Services Card

jul 31 03:08:30 esst480h RT_NAT: RT_SRC_NAT_OUTOF_PORTS: nat-pool-name nat_pool1 is out of ports

NAT Rule Match Logs

Following are example NAT rule match logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card

SYSLOG_MSMPC{SS_TEST}[jservices-nat]: JSERVICES_NAT_RULE_MATCH: proto 17 (UDP) application: any, xe-2/2/1.0:24.0.0.2:1234 -> 25.0.0.2:1234, Match NAT rule-set: (null), rule: NAT_RULE_TEST, term: t

MX-SPC3 Services Card

RT_NAT: RT_NAT_RULE_MATCH: protocol-id 17 protocol-name udp application Unknown interface-name ge-2/0/9.0 source-address 11.1.1.2 source-port 2000 destination-address 12.1.1.2 destination-port 5000 rule-set-name rule-set rule-name nat-rule

NAT Pool Release Logs

Following are example NAT Rule Match logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card

SYSLOG_MSMPC{SS_TEST}[jservices-nat]: JSERVICES_NAT_POOL_RELEASE: natpool release 85.0.0.1:1024[1]

MX-SPC3 Services Card

RT_NAT: RT_SRC_NAT_POOL_RELEASE: nat-pool-name nat-pool address 112.1.1.4 port 1024 count 1

NAT Port Block Allocation Logs

Following are example NAT port block allocation logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card-Example 1

SYSLOG_MSMPC{ss1}[jservices-nat]: JSERVICES_NAT_PORT_BLOCK_ALLOC: 11.1.1.2 -> 112.1.1.4:42494-42503 0x59412760

MX-SPC3 Services Card-Example 1

Aug 9 23:01:59 esst480r RT_NAT: RT_SRC_NAT_PBA_ALLOC: Subscriber 20.1.1.5 used/maximum [1/1] blocks, allocates port block [49774-49923] from 100.0.0.1 in source pool p1 lsys_id: 0

MS-MPC Services Card-Example 2

SYSLOG_MSMPC{ss1}[jservices-nat]: JSERVICES_NAT_PORT_BLOCK_RELEASE: 2001:2010:0:0:0:0:0:2 -> 161.161.16.1:56804-56813 0x597ef2c3

MX-SPC3 Services Card-Example 2

RT_NAT: RT_SRC_NAT_PBA_ALLOC: Subscriber 11.1.1.2 used/maximum [1/2] blocks, allocates port block [13934-13943] from 112.1.1.1 in source pool nat-pool lsys_id: 0

NAT Port Block Allocation Interim Logs

Following are example interim logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card

SYSLOG_MSMPC{ss1}[jservices-nat]: JSERVICES_NAT_PORT_BLOCK_ACTIVE: 11.1.1.2 -> 112.1.1.4:42494-42503 0x59412760

MX-SPC3 Services Card

RT_NAT: RT_SRC_NAT_PBA_INTERIM: Subscriber 50.0.0.3 used/maximum [1/1] blocks, allocates port block [5888-6015] from 202.0.0.1 in source pool JNPR-CGNAT-PUB-POOL lsys_id: 0

NAT Port Block Release Logs

Following are example NAT port block release logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card

JSERVICES_NAT_PORT_BLOCK_RELEASE source-address nat-source-address nat-source-port-range-start nat-source-port-range-end object-create-time;

MX-SPC3 Services Card

RT_NAT: RT_SRC_NAT_PBA_RELEASE: Subscriber 11.1.1.2 used/maximum [2/3] blocks, releases port block [3839-3843] from 112.1.2.1 in source pool nat-pool lsys_id: 0

Deterministic NAT Logs

MS-MPC Services Card

{ss1}[jservices-nat]: JSERVICES_DET_NAT_CONFIG: Determinstc NAT Config [2001:2010::-2001:2010::ff]:[161.161.16.1-161.161.16.254]:0:200:0:1024-65535

Stateful Firewall Rule Accept Logs

Following are example stateful firewall rule accept logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card

Sep 20 01:36:51 mobst480b (FPC Slot 5, PIC Slot 0) 2017-09-20 08:36:19: SYSLOG_MSMPC{SS_TEST}[jservices-sfw]: JSERVICES_SFW_RULE_ACCEPT: proto 17 (UDP) application:

any, interface: xe-2/2/1.0, 24.0.0.2:1234 -> 25.0.0.2:1234, Match SFW allow rule-set: (null), rule: SFW_RULE_TEST, term: t

MX-SPC3 Services Card

expo RT_FLOW: RT_FLOW_SESSION_POLICY_ACCEPT_USF: Tag SYSLOGMSG svc-set-name ss1:session created with policy accept 20.1.1.2/5->30.1.1.2/15100 0x0 icmp R11 1 sfw_policy1 ss1-ZoneIn ss1-ZoneOut 160000010 N/A(N/A) xe-5/3/2.0 UNKNOWN UNKNOWN UNKNOWN N/A N/A -1 N/A

Sample MX-SPC3 Output

Here's a sample output:

<14>1 2018-06-27T09:23:56.808-07:00 booklet RT_FLOW - RT_FLOW_SESSION_POLICY_ACCEPT_USF [junos@2636.1.1.1.2.25 prefix="PADDY-DEF" service-set-name="JNPR-NH-SSET3" source-address="50.0.0.10" source-port="1" destination-address="60.0.0.10" destination-port="30170" connection-tag="0" service-name="icmp" rule-name="Tobe implemented" rule-set-name="To be implemented" protocol-id="1" policy-name="p1" source-zone-name="JNPR-NH-SSET3-ZoneIn" destination-zone-name="JNPR-NH-SSET3-ZoneOut" session-id-32="160000001" username="N/A"roles="N/A" packet-incoming-interface="vms-2/0/0.100" application="UNKNOWN" nested-application="UNKNOWN"encrypted="UNKNOWN" application-category="N/A" application-sub-category="N/A" application-risk="-1"] Prefix PADDY-DEF svc-set-name JNPR-NH-SSET3: session created 50.0.0.10/1->60.0.0.10/30170 0x0 icmp To be implemented To be implemented 1 p1 JNPR-NH-SSET3-ZoneIn JNPR-NH-SSET3-ZoneOut 160000001 N/A(N/A) vms-2/0/0.100 UNKNOWN UNKNOWN UNKNOWN N/A N/A -1

Stateful Firewall Rule Reject Logs

Following are example stateful firewall rule reject logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card

Sep 20 01:42:02 mobst480b (FPC Slot 5, PIC Slot 0) 2017-09-20 08:41:31: SYSLOG_MSMPC{SS_TEST}[jservices-sfw]: JSERVICES_SFW_RULE_REJECT: proto 17 (UDP) application: any, 24.0.0.2:1234 -> 25.0.0.2:1234, Match SFW reject rule-set: (null), rule: SFW_RULE_TEST, term: t

MX-SPC3 Services Card

expo RT_FLOW: RT_FLOW_SESSION_RULE_REJECT_USF: Tag SYSLOGMSG svc-set-name ss1: session denied 20.1.1.2/5->30.1.1.2/15183 0x0 icmp R11 1(8) sfw_policy1 ss1-ZoneIn ss1-ZoneOut UNKNOWN UNKNOWN N/A(N/A) xe-5/3/2.0 No Rejected by policy 160000030 N/A N/A -1 N/A

Stateful Firewall Rule Discard Logs

Following are example stateful firewall rule discard logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card

Sep 20 01:43:57 mobst480b (FPC Slot 5, PIC Slot 0) 2017-09-20 08:43:26: SYSLOG_MSMPC{SS_TEST}[jservices-sfw]: JSERVICES_SFW_RULE_DISCARD: proto 17 (UDP) application: any, 24.0.0.2:1234 -> 25.0.0.2:1234, Match SFW drop rule-set: (null), rule: SFW_RULE_TEST, term: t

MX-SPC3 Services Card

RT_FLOW - RT_FLOW_SESSION_RULE_DISCARD_USF [junos@2636.1.1.1.2.25 tag="SYSLOG_SFW" service-set-name="ss1" source-address="20.1.1.2" source-port="10000" destination-address="30.1.1.2" destination-port="20000" connection-tag="0" service-name="None" rule-name="R1" rule-set-name="" protocol-id="17" icmp-type="0" policy-name="policy1" source-zone-name="ss1-ZoneIn" destination-zone-name="ss1-ZoneOut" application="UNKNOWN" nested-application="UNKNOWN" username="N/A" roles="N/A" packet-incoming-interface="xe-5/3/2.0" encrypted="No" reason="Denied by policy" session-id-32="190000014" application-category="N/A" application-sub-category="N/A" application-risk="-1" application-characteristics="N/A"] Tag SYSLOG_SFW svc-set-name ss1: session denied 20.1.1.2/10000->30.1.1.2/20000 0x0 None R1 17(0) policy1 ss1-ZoneIn ss1-ZoneOut UNKNOWN UNKNOWN N/A(N/A) xe-5/3/2.0 No Denied by policy 190000014 N/A N/A -1 N/A

Stateful Firewall Rule No Rule Drop Logs

Following are example stateful firewall rule no rule drop logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card

Sep 20 01:43:57 mobst480b (FPC Slot 5, PIC Slot 0) 2017-09-20 08:43:26: SYSLOG_MSMPC{SS_TEST}[jservices-sfw]: JSERVICES_SFW_NO_RULE_DROP: proto 17 (UDP) application: any, 24.0.0.2:1234 -> 25.0.0.2:1234

MX-SPC3 Services Card

RT_FLOW_SESSION_NO_RULE_DROP_USF Prefix service-set-name protocol-id protocol-name source-interface-name separator source-address source-port destination-address destination-port event-type;

Stateful Firewall No Policy Drop Logs

Following are example stateful firewall logs for MS-MPC services cards versus MX-SPC3 services processing card:

MS-MPC Services Card

JSERVICES_SFW_NO_POLICY source-address destination-address;

MX-SPC3 Services Card

RT_FLOW_SESSION_NO_POLICY_USF Prefix service-set-name source-address destination-address;

RELATED DOCUMENTATION

Understanding System Logging for Next Gen Services | 35
Enabling Global System Logging for Next Gen Services | 37
Configuring Local System Logging for Next Gen Services | 38

Configuring Syslog Events for NAT Rule Conditions with Next Gen Services

To configure syslog events to be generated when traffic matches NAT rule conditions for Next Gen Services NAT:

1. Configure the generation of a syslog when traffic matches the NAT rule conditions.

   ```
   [edit services nat source rule-set rule-set-name rule rule-name then]
   user@host# set syslog
   ```

   The following are logs collected:

   Out of addresses logs — If the allocation request fails to be handled as the public IP addresses in the No-PAT pool are used up, the out of addresses syslog is generated.

   Out of ports logs — If the allocation request fails to be handled as the public IPs and ports in the NAPT pool are used up, the out of ports syslog is generated.

   NAT Rule Match Logs — If the packet matches the NAT rule, the NAT rule match syslog is generated.

   Pool resource release logs — If the public IP and port succeeds to be released to the NAPT pool, the pool release syslog is generated.

RELATED DOCUMENTATION

Network Address Port Translation (NAPT) Overview | 61
Configuring Network Address Port Translation for Next Gen Services | 62

CHAPTER 6

IPv4 Connectivity Across IPv6-Only Network Using 464XLAT Overview and Configuration

IN THIS CHAPTER

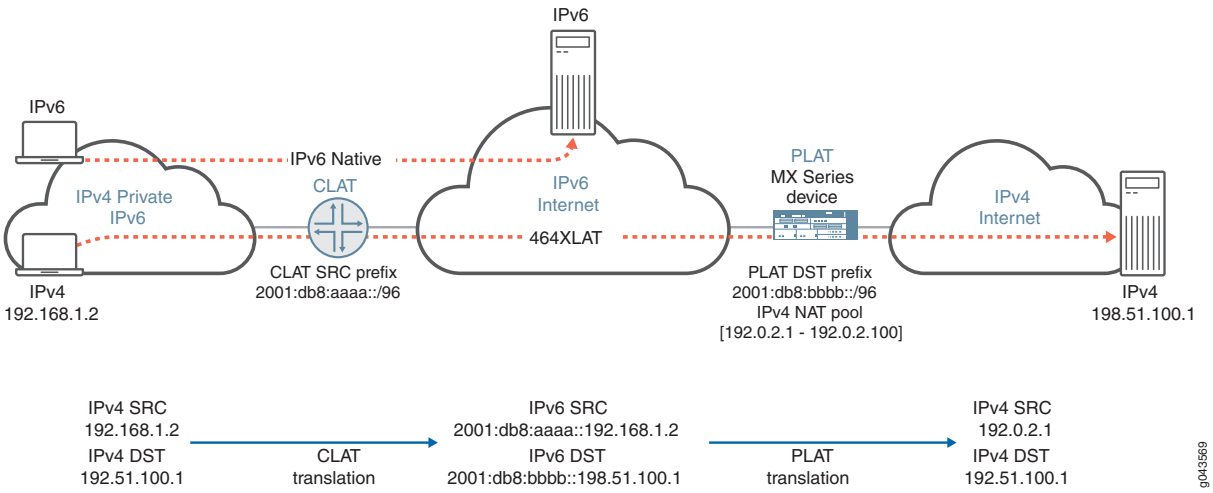
464XLAT Overview

You can configure the MX Series router as an 464XLAT Provider-Side Translator (PLAT). 464XLAT provides a simple and scalable technique for an IPv4 client with a private address to connect to an IPv4 host over an IPv6 network. 464XLAT only supports IPv4 in the client-server model, so it does not support IPv4 peer-to-peer communication or inbound IPv4 connections.

XLAT464 provides the advantages of not having to maintain an IPv4 network for this IPv4 traffic and not having to assign additional public IPv4 addresses.

A customer-side translator (CLAT), which is not a Juniper Networks product, translates the IPv4 packet to IPv6 by embedding the IPv4 source and destination addresses in IPv6 prefixes, and sends the packet over an IPv6 network to the PLAT. The PLAT translates the packet to IPv4, and sends the packet to the IPv4 host over an IPv4 network (see Figure 2 on page 52).

Figure 2: 464XLAT Wireline Flow

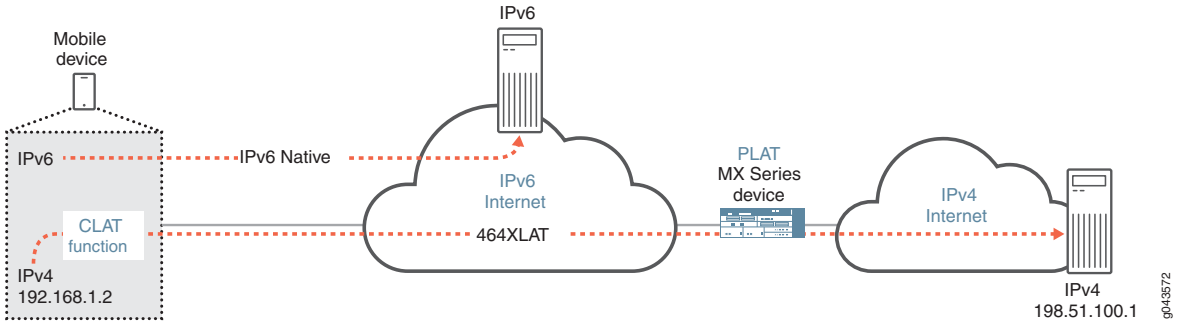


The CLAT uses a unique source IPv6 prefix for each end user, and translates the IPv4 source address to an IPv6 address by embedding it in the IPv6 /96prefix. In Figure 2 on page 52, the CLAT source IPv6 prefix is 2001:db8:aaaa::/96, and the IPv4 source address 192.168.1.2 is translated to 2001:db8:aaaa::192.168.1.2. The CLAT translates the IPv4 destination address to IPv6 by embedding it in the IPv6 prefix of the PLAT (MX Series router). In Figure 2 on page 52, the PLAT destination IPv6 prefix is 2001:db8:bbbb::/96, so the CLAT translates the IPv4 destination address 198.51.100.1 to 2001:db8:bbbb::198.51.100.

The PLAT translates the IPv6 source address to a public IPv4 address, and translates the IPv6 destination address to a public IPv4 address by removing the PLAT prefix.

The CLAT can reside on the end user mobile device in an IPv6-only mobile network, allowing mobile network providers to roll out IPv6 for their users *and* support IPv4-only applications on mobile devices (see Figure 3 on page 52).

Figure 3: 464XLAT Wireless Flow



464XLAT supports the following:

- Address pooling and endpoint independent mapping (see "Address Pooling and Endpoint Independent Mapping for Port Translation" on page 79).
- Secured port block allocation (see "Secured Port Block Allocation for Port Translation" on page 82

Benefits of 464XLAT

- No need to maintain an IPv4 transit network
- No need to assign additional public IPv4 addresses

RELATED DOCUMENTATION

IPv4 Addresses Embedded in IPv6 Addresses

Stateful NAT64 and XLAT464 embed IPv4 addresses in IPv6 addresses by using an IPv6 prefix that you specify. The prefix length you use determines how the IPv4 address is embedded.

IPv6 addresses with embedded IPv4 addresses are composed of a variable-length prefix, the embedded IPv4 address, and a variable-length suffix. Bits 64 to 71 are reserved and must be set to 0. The suffix follows the last bit of the embedded IPv4 address, and the suffix bits are ignored and should be set to 0.

The format for the IPv4-embedded IPv6 address depends on the prefix length, as shown in Table 5 on page 53.

Table 5: IPv6 Address With Embedded IPv4 Address

Prefix length	Prefix bits	IPv4 address bits	Reserved bits (must be set to 0)	Suffix bits
32	0-31	32 to 63	64 to 71	72 to 127
40	0 to 39	40 to 63 and 72 to 79	64 to 71	80 to 127
48	0 to 47	48 to 63 and 72 to 87	64 to 71	88 to 127
56	0 to 55	56 to 63 and 72 to 95	64 to 71	96 to 127
64	0 to 63	72 to 103	64 to 71	104 to 127

Table 5: IPv6 Address With Embedded IPv4 Address *(continued)*

Prefix length	Prefix bits	IPv4 address bits	Reserved bits (must be set to 0)	Suffix bits
96	0 to 95	96 to 127	64 to 71	No suffix bits

The following table shows an example of an IPv4 address embedded in an IPv6 address for various prefix lengths.

IPv6 Prefix	IPv4 Address	IPv4 Address Embedded in IPv6 Address
2001:db8::/32	192.0.2.33	2001:db8:c000:221::
2001:db8:100::/40	192.0.2.33	2001:db8:1c0:2:21::
2001:db8:122::/48	192.0.2.33	2001:db8:122:c000:2:2100::
2001:db8:122:300::/56	192.0.2.33	2001:db8:122:3c0:0:221::
2001:db8:122:344::/64	192.0.2.33	2001:db8:122:344:c0:2:2100::
2001:db8:122:344::/96	192.0.2.33	2001:db8:122:344::192.0.2.33

Configuring 464XLAT Provider-Side Translator for IPv4 Connectivity Across IPv6-Only Network for Next Gen Services

Configuring the Source Pool for 464XLAT

To configure the source pool for 464XLAT:

1. Create a source NAT pool that is used to translate source IPv6 addresses to source public IPv4 addresses on PLAT.

```
user@host# edit services nat source pool nat-pool-name
```

2. Define the addresses or subnets to which source addresses are translated.

```
[edit services nat source pool nat-pool-name]
user@host# set address address-prefix
```

3. If you want to allocate a block of ports for each subscriber to use, configure port-block allocation:
   a. Configure the number of ports in a block. The range is 1 through 64,512 and the default is 256.

```
[edit services nat source pool nat-pool-name port]
user@host# set block-allocation block-size block-size
```

   b. Configure the interval, in seconds, for which the block is active. After the timeout, a new block is allocated, even if ports are available in the active block. If you set the timeout to 0, port blocks are filled completely before a new port block is allocated, and the last port block remains active indefinitely. The range is 0 through 86,400, and the default is 120.

```
[edit services nat source pool nat-pool-name port block-allocation]
user@host# set active-block-timeout timeout-interval
```

   c. If you set the **active-block-timeout** to 0, you can configure the amount of time before the last active port block is released. The range is 120 through 864,000 seconds, and the default is 300.

```
[edit services nat source pool nat-pool-name port block-allocation]
user@host# set last-block-recycle-timeout timeout-interval
```

   d. Configure the maximum number of blocks that can be allocated to a user address. The range is 1 through 512, and the default is 8.

```
[edit services nat source pool nat-pool-name port block-allocation]
user@host# set maximum-blocks-per-host maximum-block-number
```

   e. Specify how often to send interim system logs for active port blocks and for inactive port blocks with live sessions. This increases the reliability of system logs, which are UDP-based and can get lost in the network. The range is 1800 through 86,400 seconds, and the default is 1800 (interim logs are disabled).

```
[edit services nat source pool nat-pool-name port block-allocation]
user@host# set interim-logging-interval timeout-interval
```

4. Specify the timeout period for endpoint independent translations that use the specified NAT pool. Mappings that are inactive for this amount of time are dropped. The range is 120 through 86,400 seconds. If you do not configure **ei-mapping-timeout**, then the **mapping-timeout** value is used for endpoint independent translations.

```
[edit services nat source pool nat-pool-name]
user@host# set ei-mapping-timeout ei-mapping-timeout
```

5. Specify the timeout period for address-pooling paired mappings that use the NAT pool. The range is 120 through 86,400 seconds, and the default is 300. Mappings that are inactive for this amount of time are dropped.

```
[edit services nat source pool nat-pool-name]
user@host# set mapping-timeout mapping-timeout
```

If you do not configure **ei-mapping-timeout** for endpoint independent translations, then the **mapping-timeout** value is used for endpoint independent translations.

Configuring the NAT Rules for 464XLAT

For 464XLAT, you must configure a source rule and a destination rule. To configure the NAT rules for 464XLAT:

1. Configure the source NAT rule name.

```
[edit services nat source]
user@host# set rule-set rule-set-name rule rule-name
```

2. Specify the traffic direction to which the NAT rule set applies.

```
[edit services nat source rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

3. Specify the CLAT IPv6 source prefix.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set then source-nat clat-prefix clat-prefix
```

4. Configure the IPv6 source address prefix to match. This is the IPv4 source address embedded in IPv6 by using the CLAT prefix.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address address
```

5. Specify the NAT source pool that the PLAT uses for converting the IPv6 source address to a public IPv4 address.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set then source-nat pool nat-pool-name
```

6. If you want to ensure that the same external address and port are assigned to all connections from a given host, configure endpoint-independent mapping:

   a. Configure the mapping type as endpoint independent.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set mapping-type endpoint-independent
```

   b. Specify prefix lists that contain the hosts that are allowed to establish inbound connections using the endpoint-independent mapping. (Prefix lists are configured at the **[edit policy-options]** hierarchy level.)

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set filtering-type endpoint-independent prefix-list [allowed-host] except [denied-host]
```

   c. Specify the maximum number of inbound flows allowed simultaneously on an endpoint-independent mapping.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set secure-nat-mapping eif-flow-limit number-of-flows
```

   d. Specify the direction in which active endpoint-independent mapping is refreshed. By default, mapping is refreshed for both inbound and outbound active flows.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set secure-nat-mapping mapping-refresh (inbound | inbound-outbound | outbound)
```

e. Configure the address-pooling paired feature if you want to ensure assignment of the same external IP address for all sessions originating from the same internal host.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat mapping-type]
user@host# set address-pooling-paired
```

f. Specify the timeout period for **address-pooling-paired** mappings that use the NAT pool. The range is 120 through 86,400 seconds, and the default is 300. Mappings that are inactive for this amount of time are dropped.

```
[edit services nat source pool nat-pool-name]
user@host# set mapping-timeout mapping-timeout
```

If you do not configure **ei-mapping-timeout** for endpoint independent translations, then the **mapping-timeout** value is used for endpoint independent translations.

g. Configure the generation of a syslog when traffic matches the NAT rule conditions.

```
[edit services nat source rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

7. Configure the destination NAT rule name.

```
[edit services nat destination]
user@host# set rule-set rule-set-name rule rule-name
```

8. Specify the traffic direction to which the destination NAT rule set applies.

```
[edit services nat destination rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

9. Configure the IPv6 source address prefix to match. Use the same value that you used for the NAT source rule.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
```

```
user@host# set match source-address address
```

10. Configure the PLAT destination IPv6 prefix.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set then destination-nat destination-prefix address
```

11. Configure the IPv6 destination address to match. This is the IPv4 destination address embedded in IPv6 by using the PLAT destination prefix.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address address
```

Configuring the Service Set for 464XLAT

To configure the service set for 464XLAT:

1. Define the service set.

```
[edit services]
user@host# edit service-set service-set-name
```

2. Configure either an interface service, which requires a single service interface, or a next-hop service, which requires an inside and outside service interface.

```
[edit services service-set service-set-name]
user@host# set interface-service service-interface interface-name
```

or

```
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
  interface-name
```

3. Specify the NAT rule sets to be used with the service set.

```
[edit services service-set service-set-name]
user@host# set nat-rule-sets rule-set-name
```

Clearing the Don’t Fragment Bit

Specify that the don’t fragment (DF) bit for IPv4 packet headers is cleared when the packet length is less than 1280 bytes.

```
[edit services nat natv6v4]
user@host# set clear-dont-fragment-bit
```

This prevents unnecessary creation of an IPv6 fragmentation header when translating IPv4 packets that are less than 1280 bytes.

CHAPTER 7

Network Address Port Translation Overview and Configuration

IN THIS CHAPTER

Network Address Port Translation (NAPT) Overview

IN THIS SECTION

NAPT translates a private source IP address to an external source address and port. Multiple private IP addresses can be mapped to the same external address because each private address is mapped to a different port of the external address.

With NAPT, you can configure up to 32 external address ranges, and map up to 65,536 private addresses to each external address.

NAPT supports the following:

- Round-robin port and address allocation (see “Round-Robin Port Allocation” on page 81).
- Address pooling and endpoint independent mapping (see “Address Pooling and Endpoint Independent Mapping for Port Translation” on page 79).
- Secured port block allocation (see “Secured Port Block Allocation for Port Translation” on page 82

Benefits of NAPT

- Allows hosts in the private network to connect with the external domain, while hiding the private network.
- Minimizes the number of public IP addresses that are allocated for NAT.

Configuring Network Address Port Translation for Next Gen Services

Configuring the Source Pool for NAPT

To configure the source pool for NAPT:

1. Create a source pool.

   ```
   user@host# edit services nat source pool nat-pool-name
   ```

2. Define the addresses or subnets to which source addresses are translated.

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set address address-prefix
   ```

   or

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set address address-prefix to address address-prefix
   ```

3. To configure automatic port assignment for the pool, specify either random allocation or round-robin allocation. Round-robin allocation is the default.

   ```
   [edit services nat source pool nat-pool-name port]
   user@host# set automatic (random-allocation | round-robin)
   ```

   Random allocation randomly assigns a port from the range 1024 through 65535 for each port translation. Round-robin allocation first assigns port 1024, and uses the next higher port for each successive port assignment.

4. To disable round-robin port allocation for all NAT pools that do not specify an **automatic (random-allocation | round-robin)** setting, configure the global setting.

```
[edit services nat source]
user@host# set port-round-robin disable
```

5. To configure a range of ports to assign to a pool, perform the following:

> **NOTE:** If you specify a range of ports to assign, the **automatic** statement is ignored.

   a. Specify the low and high values for the port. If you do not configure automatic port assignment, you must configure a range of ports.

```
[edit services nat source pool nat-pool-name port]
user@host# set range port-low to port-high
```

   b. Specify either random allocation or round-robin allocation. Round-robin allocation is the default.

```
[edit services nat source pool nat-pool-name port range]
user@host# set (random-allocation | round-robin)
```

6. Assign a port within the same range as the incoming port—either 0 through 1023 or 1024 through 65,535. This feature is not available if you configure port-block allocation.

```
[edit services nat source pool nat-pool-name port]
user@host# set preserve-range
```

7. Assign a port with the same parity (even or odd) as the incoming source port. This feature is not available if you configure port-block allocation.

```
[edit services nat source pool nat-pool-name port]
user@host# set preserve-parity
```

8. Configure a global default port range for NAT pools that use port translation. This port range is used when a NAT pool does not specify a port range and does not specify automatic port assignment. The global port range can be from 1024 through 65,535.

```
[edit services nat source]
user@host# set pool-default-port-range port-low to port-high
```

9. If you want to allocate a block of ports for each subscriber to use for NAPT, configure port-block allocation:

   a. Configure the number of ports in a block. The range is 1 through 64,512 and the default is 256.

   ```
   [edit services nat source pool nat-pool-name port]
   user@host# set block-allocation block-size block-size
   ```

   b. Configure the interval, in seconds, for which the block is active. After the timeout, a new block is allocated, even if ports are available in the active block. If you set the timeout to 0, port blocks are filled completely before a new port block is allocated, and the last port block remains active indefinitely. The range is 0 through 86,400, and the default is 120.

   ```
   [edit services nat source pool nat-pool-name port block-allocation]
   user@host# set active-block-timeout timeout-interval
   ```

   c. If you set the **active-block-timeout** to 0, you can configure the amount of time before the last active port block is released. The range is 120 through 864,000 seconds, and the default is 300.

   ```
   [edit services nat source pool nat-pool-name port block-allocation]
   user@host# set last-block-recycle-timeout timeout-interval
   ```

   d. Configure the maximum number of blocks that can be allocated to a user address. The range is 1 through 512, and the default is 8.

   ```
   [edit services nat source pool nat-pool-name port block-allocation]
   user@host# set maximum-blocks-per-host maximum-block-number
   ```

   e. Specify how often to send interim system logs for active port blocks and for inactive port blocks with live sessions. This increases the reliability of system logs, which are UDP-based and can get lost in the network. The range is 1800 through 86,400 seconds, and the default is 1800 (interim logs are disabled).

   ```
   [edit services nat source pool nat-pool-name port block-allocation]
   ```

```
user@host# set interim-logging-interval timeout-interval
```

10. Specify the timeout period for endpoint independent translations that use the specified NAT pool. Mappings that are inactive for this amount of time are dropped. The range is 120 through 86,400 seconds. If you do not configure **ei-mapping-timeout**, then the **mapping-timeout** value is used for endpoint independent translations.

```
[edit services nat source pool nat-pool-name]
user@host# set ei-mapping-timeout ei-mapping-timeout
```

11. Specify the timeout period for address-pooling paired mappings that use the NAT pool. The range is 120 through 86,400 seconds, and the default is 300. Mappings that are inactive for this amount of time are dropped.

```
[edit services nat source pool nat-pool-name]
user@host# set mapping-timeout mapping-timeout
```

If you do not configure **ei-mapping-timeout** for endpoint independent translations, then the **mapping-timeout** value is used for endpoint independent translations.

12. Define the NAT pool utilization levels that trigger SNMP traps. The **raise-threshold** is the pool utilization percentage that triggers the trap, and the range is 50 through 100. The **clear-threshold** is the pool utilization percentage that clears the trap, and the range is 40 through 100. For pools that use port-block allocation, the utilization is based on the number of ports that are used; for pools that do not use port-block allocation, the utilization is based on the number of addresses that are used.

```
[edit services nat source pool nat-pool-name]
user@host# set pool-utilization-alarm raise-threshold value
user@host# set pool-utilization-alarm clear-threshold value
```

If you do not configure **pool-utilization-alarm**, traps are not created.

13. To allow the IP addresses of a NAT pool to overlap with IP addresses in pools used in other service sets, configure **allow-overlapping-pools**. However, pools that configure port-block allocation must not overlap with other pools.

```
[edit services nat]
user@host# set allow-overlapping-pools
```

Configuring the NAT Source Rule for NAPT

To configure the NAT source rule for NAPT:

1. Configure the NAT rule name.

```
[edit services nat source]
user@host# edit rule-set rule-set-name rule rule-name
```

2. Specify the traffic direction to which the NAT rule set applies.

```
[edit services nat source rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

3. Specify the source addresses that are translated by the source NAT rule.

   To specify one address or prefix value:

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address address
```

   To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

```
[edit services address-book global]
user@host# set address address-name range-address lower-limit to upper-limit
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address-name address-name
```

   To specify any unicast address:

```
[edit services nat source rule-set rule-set-name rule rule-name rule rule-name]
user@host# set match source-address any-unicast
```

4. Specify one or more application protocols to which the NAT rule applies. The number of applications listed in the rule must not exceed 3072.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match application [application-name]
```

5. Specify the NAT pool that contains the addresses for translated traffic.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set then source-nat pool nat-pool-name
```

6. Configure the address-pooling paired feature if you want to ensure assignment of the same external IP address for all sessions originating from the same internal host.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat mapping-type]
user@host# set address-pooling
```

7. If you want to ensure that the same external address and port are assigned to all connections from a given host, configure endpoint-independent mapping:

   a. Configure the mapping type as endpoint independent.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set mapping-type endpoint-independent
```

   b. Specify prefix lists that contain the hosts that are allowed to establish inbound connections using the endpoint-independent mapping. (Prefix lists are configured at the **[edit policy-options]** hierarchy level.)

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set filtering-type endpoint-independent prefix-list [allowed-host] except [denied-host]
```

   c. Specify the maximum number of inbound flows allowed simultaneously on an endpoint-independent mapping.

```
[edit services nat source rule-set rule-set-name rule rule-name filtering-type then source-nat]
user@host# set secure-nat-mapping eif-flow-limit number-of-flows
```

   d. Specify the direction in which active endpoint-independent mapping is refreshed. By default, mapping is refreshed for both inbound and outbound active flows.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set secure-nat-mapping mapping-refresh (inbound | inbound-outbound | outbound)
```

8. Configure the generation of a syslog when traffic matches the NAT rule conditions.

```
[edit services nat source rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

Configuring the Service Set for NAPT

To configure the service set for NAPT:

1. Define the service set.

   ```
   [edit services]
   user@host# edit service-set service-set-name
   ```

2. Configure either an interface service, which requires a single service interface, or a next-hop service, which requires an inside and outside service interface.

   ```
   [edit services service-set service-set-name]
   user@host# set interface-service service-interface interface-name
   ```

   or

   ```
   [edit services service-set service-set-name]
   user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
     interface-name
   ```

3. Specify the NAT rule sets to be used with the service set.

   ```
   [edit services service-set service-set-name]
   user@host# set nat-rule-sets rule-set-name
   ```

RELATED DOCUMENTATION

Network Address Port Translation (NAPT) Overview | 61

Configuring Syslog Events for NAT Rule Conditions with Next Gen Services

To configure syslog events to be generated when traffic matches NAT rule conditions for Next Gen Services NAT:

1. Configure the generation of a syslog when traffic matches the NAT rule conditions.

   ```
   [edit services nat source rule-set rule-set-name rule rule-name then]
   user@host# set syslog
   ```

   The following are logs collected:

   Out of addresses logs — If the allocation request fails to be handled as the public IP addresses in the No-PAT pool are used up, the out of addresses syslog is generated.

   Out of ports logs — If the allocation request fails to be handled as the public IPs and ports in the NAPT pool are used up, the out of ports syslog is generated.

   NAT Rule Match Logs — If the packet matches the NAT rule, the NAT rule match syslog is generated.

   Pool resource release logs — If the public IP and port succeeds to be released to the NAPT pool, the pool release syslog is generated.

RELATED DOCUMENTATION

Network Address Port Translation (NAPT) Overview | 61

Configuring Network Address Port Translation for Next Gen Services | 62

CHAPTER 8

Port Forwarding Overview and Configuration

IN THIS CHAPTER

Port Forwarding for Next Gen Services

IN THIS SECTION

Port Forwarding Overview

Port forwarding allows the public destination address and port of a packet to be translated to an IP address and port in a private network. This translation is a static, one-to-one mapping.

Port forwarding allows a packet to reach a host within a masqueraded, typically private, network, based on the port number on which the packet was received from the originating host. An example of this type of destination is the host of a public HTTP server within a private network.

If you only need to change the destination port, you can also configure port forwarding without translating the destination address.

Port forwarding is supported for destination NAT and twice NAPT 44. Port forwarding works only with the FTP application-level gateway (ALG), and has no support for technologies that offer IPv6 services over IPv4 infrastructure, such as IPv6 rapid deployment (6rd) and dual-stack lite (DS-Lite).

Benefits

- Allows remote computers, such as public machines on the Internet, to connect to a non-standard port of a specific computer that is hidden within a private network.

Configuring Port Forwarding with Static Destination Address Translation for Next Gen Services

You can configure port forwarding with static destination address translation, which changes the destination address and port of a packet so it can reach the correct host and port within a masqueraded, typically private, network.

Configuring the Destination Pool for Destination Address Translation

To configure the destination pool for the static destination address translation:

1. Create a destination pool.

```
user@host# edit services nat destination pool nat-pool-name
```

2. Define the addresses or subnets to which destination addresses are translated.

```
[edit services nat destination pool nat-pool-name]
user@host# set address address-prefix
```

3. To allow the IP addresses of a NAT destination pool to overlap with IP addresses in pools used in other service sets, configure **allow-overlapping-pools**.

```
[edit services nat]
user@host# set allow-overlapping-pools
```

Configuring the Mappings for Port Forwarding

1. Configure the port forwarding map name.

```
[edit services nat destination]
user@host# set port-forwarding map-name
```

2. Specify the original destination port number that needs to be translated and the port number to which the original port is mapped. You can configure a maximum of 32 destination port mappings in a port forwarding map.

```
[edit services nat destination port-forwarding map-name]
user@host# set destined-port port-id translated-port port-id
```

In the following example, the destination port number that needs to be translated is 23 and the port to which traffic is mapped is 45.

```
[edit services nat destination port-forwarding map1]
user@host# set destined-port 32 translated-port 45
```

Configuring the NAT Rule for Port Forwarding with Destination Address Translation

To configure the NAT rule for port forwarding with destination address translation:

1. Configure the NAT rule name.

```
[edit services destination source]
user@host# set rule-set rule-set-name rule rule-name
```

2. Specify the traffic direction to which the NAT rule set applies.

```
[edit services nat destination rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

3. Specify the destination addresses that the NAT rule applies to.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address address
```

To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

```
[edit services address-book global]
user@host# set address address-name range-address lower-limit to upper-limit
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address-name address-name
```

To specify any unicast address:

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address any-unicast
```

4. Specify the destination port range that the NAT rule applies to.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-port low-port to high-port
```

5. Specify the NAT pool that contains the destination addresses for translated traffic.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set then destination-nat pool nat-pool-name
```

6. Specify the name of the mapping for port forwarding. You can only configure one mapping within a NAT rule term.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set then port-forwarding-mappings map-name
```

7. Configure the generation of a syslog when traffic matches the destination NAT rule match conditions.

```
[edit services nat destination rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

Configuring the Service Set for Port Forwarding with Destination Address Translation

To configure the service set for static destination NAT:

1. Define the service set.

```
[edit services]
user@host# edit service-set service-set-name
```

2. Configure either an interface service, which requires a single service interface, or a next-hop service, which requires an inside and outside service interface.

```
[edit services service-set service-set-name]
user@host# set interface-service service-interface interface-name
```

or

```
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
  interface-name
```

> **NOTE:** You cannot use an AMS interface in a port forwarding service set.

3. Specify the NAT rule sets to be used with the service set.

```
[edit services service-set service-set-name]
user@host# set nat-rule-sets rule-set-name
```

Configuring Port Forwarding without Static Destination Address Translation for Next Gen Services

You can configure port forwarding without static destination address translation, which changes the destination port of a packet so it can reach the correct port on the destination host.

Configuring the Mappings for Port Forwarding

1. Configure the port forwarding map name.

```
[edit services destination source]
user@host# set port-forwarding map-name
```

2. Specify the original destination port number that needs to be translated and the port number to which the original port is mapped. You can configure a maximum of 32 destination port mappings in a port forwarding map.

```
[edit services nat destination port-forwarding map-name]
user@host# set destined-port port-id translated-port port-id
```

   In the following example, the destination port number that needs to be translated is 23 and the port to which traffic is mapped is 45.

```
[edit services nat destination port-forwarding map1]
user@host# set destined-port 32 translated-port 45
```

Configuring the NAT Rule for Port Forwarding without Destination Address Translation

To configure the NAT rule for port forwarding without destination address translation:

1. Configure the NAT rule name.

```
[edit services destination source]
user@host# set rule-set rule-set-name rule rule-name
```

2. Specify the traffic direction to which the NAT rule set applies.

```
[edit services nat destination rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

3. Specify the destination addresses that the NAT rule applies to.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address address
```

   To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

```
[edit services address-book global]
user@host# set address address-name range-address lower-limit to upper-limit
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address-name address-name
```

To specify any unicast address:

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address any-unicast
```

4. Specify that there is no address translation for the rule.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set then destination-nat off
```

5. Specify the name of the mapping for port forwarding. You can only configure one mapping within a NAT rule term.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set then port-forwarding-mappings map-name
```

6. Configure the generation of a syslog when traffic matches the destination NAT rule match conditions.

```
[edit services nat destination rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

Configuring the Service Set for Port Forwarding without Destination Address Translation

To configure the service set for static destination NAT:

1. Define the service set.

```
[edit services]
user@host# edit service-set service-set-name
```

2. Configure either an interface service, which requires a single service interface, or a next-hop service, which requires an inside and outside service interface.

```
[edit services service-set service-set-name]
```

```
user@host# set interface-service service-interface interface-name
```

or

```
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
  interface-name
```

> **NOTE:** You cannot use an AMS interface in a port forwarding service set.

3. Specify the NAT rule sets to be used with the service set.

```
[edit services service-set service-set-name]
user@host# set nat-rule-sets rule-set-name
```

CHAPTER 9

Port Translation Features Overview and Configuration

IN THIS CHAPTER

Address Pooling and Endpoint Independent Mapping for Port Translation

IN THIS SECTION

Address Pooling

Address pooling, or address pooling paired (APP) ensures assignment of the same external IP address for all sessions originating from the same internal host. You can use this feature when assigning external IP addresses from a pool. This option does not affect port utilization.

Address pooling solves the problems of an application opening multiple connections. For example, when Session Initiation Protocol (SIP) client sends Real-Time Transport Protocol (RTP) and Real-Time Control Protocol (RTCP) packets, the SIP generally server requires that they come from the same IP address, even if they have been subject to NAT. If RTP and RTCP IP addresses are different, the receiving endpoint might drop packets. Any point-to-point (P2P) protocol that negotiates ports (assuming address stability) benefits from address pooling paired.

The following are use cases for address pooling:

- A site that offers instant messaging services requires that chat and their control sessions come from the same public source address. When the user signs on to chat, a control session authenticates the user.

A different session begins when the user starts a chat session. If the chat session originates from a source address that is different from the authentication session, the instant messaging server rejects the chat session, because it originates from an unauthorized address.

- Certain websites such as online banking sites require that all connections from a given host come from the same IP address.

> **NOTE:** When you deactivate a service set that contains address pooling paired (APP) for that service set, messages are displayed on the PIC console and the mappings are cleared for that service set. These messages are triggered when the deletion of a service-set commences and again generated when the deletion of the service set is completed. The following sample messages are displayed when deletion starts and ends:
>
> - **Nov 15 08:33:13.974 LOG: Critical] SVC-SET ss1 (iid 5) deactivate/delete: NAT Mappings and flows deletion initiated**
> - **Nov 15 08:33:14.674 LOG: Critical] SVC-SET ss1 (iid 5) deactivate/delete: NAT Mappings and flows deletion completed**
>
> In a scaled environment that contains a large number of APP in a service set, a heavy volume of messages is generated and this process takes some amount of time. We recommend that you wait until the console messages indicating the completion of deletion of the service set are completed before you reactivate the service-set again.

Endpoint Independent Mapping and Endpoint Independent Filtering

Endpoint independent mapping (EIM) ensures the assignment of the same external address *and* port for all connections from a given host if they use the same internal port. This means if they come from a different source port, you are free to assign a different external address.

EIM and APP differ as follows:

- APP ensures assigning the same external IP address.
- EIM provides a stable external IP address and port (for a period of time) to which external hosts can connect. Endpoint independent filtering (EIF) controls which external hosts can connect to an internal host.

NOTE: When you deactivate a service set that contains endpoint independent mapping (EIM) mapping for that service set, messages are displayed on the PIC console and the mappings are cleared for that service set. These messages are triggered when the deletion of a service set commences and again generated when the deletion of the service set is completed. The following sample messages are displayed when deletion starts and ends:

- Nov 15 08:33:13.974 LOG: Critical] SVC-SET ss1 (iid 5) deactivate/delete: NAT Mappings and flows deletion initiated
- Nov 15 08:33:14.674 LOG: Critical] SVC-SET ss1 (iid 5) deactivate/delete: NAT Mappings and flows deletion completed

In a scaled environment that contains a large number of EIM mappings in a service set, a heavy volume of messages is generated and this process takes some amount of time. We recommend that you wait until the console messages indicating the completion of deletion of the service set are completed before you reactivate the service-set again.

Round-Robin Port Allocation

Round-robin allocation is one method you can configure to allocate private addresses to external addresses and ports. Round-robin allocation assigns one port from each external address in a range before repeating the process for each address in the next range. After ports have been allocated for all addresses in the last range, the allocation process wraps around and allocates the next unused port for addresses in the first range. For example, if you have a NAT pool range of 100.0.0.1 through 100.0.0.12 and the first port is 3333:

- The first connection is allocated to the address:port 100.0.0.1:3333.
- The second connection is allocated to the address:port 100.0.0.2:3333.
- The third connection is allocated to the address:port 100.0.0.3:3333.
- The fourth connection is allocated to the address:port 100.0.0.4:3333.
- The fifth connection is allocated to the address:port 100.0.0.5:3333.
- The sixth connection is allocated to the address:port 100.0.0.6:3333.
- The seventh connection is allocated to the address:port 100.0.0.7:3333.
- The eighth connection is allocated to the address:port 100.0.0.8:3333.
- The ninth connection is allocated to the address:port 100.0.0.9:3333.
- The tenth connection is allocated to the address:port 100.0.0.10:3333.

- The eleventh connection is allocated to the address:port 100.0.0.11:3333.
- The twelfth connection is allocated to the address:port 100.0.0.12:3333.
- Wraparound occurs and the thirteenth connection is allocated to the address:port 100.0.0.1:3334.

Secured Port Block Allocation for Port Translation

You can configure secured port block allocation, which allocates blocks of ports to a subscriber for source NAT port translation. The most recently allocated block is the current active block. New requests for NAT ports for the subscriber are served from the active block. Ports are allocated randomly from the current active block.

Carriers track subscribers using the IP address (RADIUS or DHCP) log. If they use port translation without port block allocation, an IP address is shared by multiple subscribers, and the carrier must track the IP address and port, which are part of the NAT log. Because ports are used and reused at a very high rate, tracking subscribers using the log becomes difficult because of the large number of messages, which are difficult to archive and correlate. By using port block allocation, you can significantly reduce the number of logs, making it easier to track subscribers.

With port block allocation, we generate one syslog log per set of ports allocated for a subscriber. These logs are UDP based and can be lost in the network, particularly for long-running flows. You can configure an interim logging interval to re-send logs for active blocks that have traffic on at least one of the ports.

CHAPTER 10

Static Source NAT Overview and Configuration

IN THIS CHAPTER

Static Source NAT Overview

IN THIS SECTION

Static source NAT performs a one-to-one static mapping of the original private domain host source address to a public source address. A block of external addresses is set aside for this mapping, and source addresses are translated as hosts in a private domain originate sessions to the external domain. Static source NAT does not perform port mapping. For packets outbound from the private network, static source NAT translates source IP addresses and related fields such as IP, TCP, UDP, and ICMP header checksums. For inbound packets, static source NAT translates the destination IP address and the checksums.

Benefits

- Allows hosts in the private network to connect with the external domain, while hiding the private network.

Configuring Static Source NAT44 or NAT66 for Next Gen Services

Configuring the Source Pool for Static Source NAT44 or NAT66

To configure the source pool for static source NAT44 or NAT66:

1. Create a source pool.

   ```
   user@host# edit services nat source pool nat-pool-name
   ```

2. Define the addresses or subnets to which source addresses are translated.

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set address address-prefix
   ```

   or

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set address address-prefix to address address-prefix
   ```

3. Configure a one-to-one static shifting of a range of original source addresses to the range of addresses in the source pool by specifying the base address of the original source address range.

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set host-address-base ip-address
   ```

   For example, if the host address base is 198.51.100.30 and the NAT pool uses the range 203.0.113.10 to 203.0.113.20, then 198.51.100.30 translates to 203.0.113.10, 198.51.100.31 translates to 203.0.113.11, and so on.

4. To allow the IP addresses of a NAT source pool to overlap with IP addresses in pools used in other service sets, configure **allow-overlapping-pools**.

```
[edit services nat]
user@host# set allow-overlapping-pools
```

Configuring the NAT Rule for Static Source NAT44 or NAT66

To configure the NAT source rule for static source NAT44 or NAT66 :

1. Configure the NAT rule name.

```
[edit services nat source]
user@host# set rule-set rule-set-name rule rule-name
```

2. Specify the traffic direction to which the NAT rule set applies.

```
[edit services nat source rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

3. Specify the addresses that are translated by the source NAT rule.

   To specify one address or prefix value:

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address address
```

   To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

```
[edit services address-book global]
user@host# set address address-name range-address lower-limit to upper-limit
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address-name address-name
```

   To specify any unicast address:

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address any-unicast
```

4. Specify one or more application protocols to which the NAT rule applies. The number of applications listed in the rule must not exceed 3072.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match application [application-name]
```

5. Specify the NAT pool that contains the addresses for translated traffic.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set then source-nat pool nat-pool-name
```

6. Configure the address-pooling paired feature if you want to ensure assignment of the same external IP address for all sessions originating from the same internal host.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat mapping-type]
user@host# set address-pooling-paired
```

7. Specify the timeout period for **address-pooling-paired** mappings that use the NAT pool. The range is 120 through 86,400 seconds, and the default is 300. Mappings that are inactive for this amount of time are dropped.

```
[edit services nat source pool nat-pool-name]
user@host# set mapping-timeout mapping-timeout
```

If you do not configure **ei-mapping-timeout** for endpoint independent translations, then the **mapping-timeout** value is used for endpoint independent translations.

8. Configure the generation of a syslog when traffic matches the NAT rule conditions.

```
[edit services nat source rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

Configuring the Service Set for Static Source NAT44 or NAT66

To configure the service set for static source NAT44 or NAT66:

1. Define the service set.

```
[edit services]
```

```
user@host# edit service-set service-set-name
```

2. Configure either an interface service, which requires a single service interface, or a next-hop service, which requires an inside and outside service interface.

```
[edit services service-set service-set-name]
user@host# set interface-service service-interface interface-name
```

or

```
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
    interface-name
```

3. Specify the NAT rule sets to be used with the service set.

```
[edit services service-set service-set-name]
user@host# set nat-rule-sets rule-set-name
```

SEE ALSO

Static Source NAT Overview | 83

CHAPTER 11

Stateful NAT64 Overview and Configuration

IN THIS CHAPTER

Stateful NAT64 Overview

Stateful NAT64 translates IPv6 addresses to public IPv4 addresses, allowing IPv6-only clients to contact IPv4 servers using unicast UDP, TCP, or ICMP. Stateful NAT64 translates the destination IPv6 address to the embedded IPv4 address, and translates the source IPv6 address to a public IPv4 address and port from a block of IPv4 addresses that you set aside.

Stateful NAT64 supports the following:

- Round-robin port and address allocation (see "Round-Robin Port Allocation" on page 81).
- Address pooling and endpoint independent mapping (see "Address Pooling and Endpoint Independent Mapping for Port Translation" on page 79).
- Secured port block allocation (see "Secured Port Block Allocation for Port Translation" on page 82

Benefits of Stateful NAT64

Stateful NAT64 provides a way to:

- Let IPv6-only clients contact IPv4 servers using unicast UDP, TCP, or ICMP
- Move to an IPv6 network
- Deal with IPv4 address depletion

RELATED DOCUMENTATION

IPv4 Addresses Embedded in IPv6 Addresses

Stateful NAT64 and XLAT464 embed IPv4 addresses in IPv6 addresses by using an IPv6 prefix that you specify. The prefix length you use determines how the IPv4 address is embedded.

IPv6 addresses with embedded IPv4 addresses are composed of a variable-length prefix, the embedded IPv4 address, and a variable-length suffix. Bits 64 to 71 are reserved and must be set to 0. The suffix follows the last bit of the embedded IPv4 address, and the suffix bits are ignored and should be set to 0.

The format for the IPv4-embedded IPv6 address depends on the prefix length, as shown in Table 5 on page 53.

Table 6: IPv6 Address With Embedded IPv4 Address

Prefix length	Prefix bits	IPv4 address bits	Reserved bits (must be set to 0)	Suffix bits
32	0-31	32 to 63	64 to 71	72 to 127
40	0 to 39	40 to 63 and 72 to 79	64 to 71	80 to 127
48	0 to 47	48 to 63 and 72 to 87	64 to 71	88 to 127
56	0 to 55	56 to 63 and 72 to 95	64 to 71	96 to 127
64	0 to 63	72 to 103	64 to 71	104 to 127
96	0 to 95	96 to 127	64 to 71	No suffix bits

The following table shows an example of an IPv4 address embedded in an IPv6 address for various prefix lengths.

IPv6 Prefix	IPv4 Address	IPv4 Address Embedded in IPv6 Address
2001:db8::/32	192.0.2.33	2001:db8:c000:221::
2001:db8:100::/40	192.0.2.33	2001:db8:1c0:2:21::
2001:db8:122::/48	192.0.2.33	2001:db8:122:c000:2:2100::
2001:db8:122:300::/56	192.0.2.33	2001:db8:122:3c0:0:221::

IPv6 Prefix	IPv4 Address	IPv4 Address Embedded in IPv6 Address
2001:db8:122:344::/64	192.0.2.33	2001:db8:122:344:c0:2:2100::
2001:db8:122:344::/96	192.0.2.33	2001:db8:122:344::192.0.2.33

Configuring Stateful NAT64 for Next Gen Services

This section describes how to configure Stateful NAT64 for Next Gen Services.

Configuring the Source Pool for Stateful NAT64

To configure the source pool for Stateful NAT64:

1. Create a source pool.

   ```
   user@host# edit services nat source pool nat-pool-name
   ```

2. Define the addresses or subnets to which source addresses are translated.

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set address address-prefix
   ```

   or

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set address address-prefix to address address-prefix
   ```

   To disable round-robin port allocation for all NAT pools that do not specify an **automatic (random-allocation | round-robin)** setting, configure the global setting.

   ```
   [edit services nat source]
   user@host# set port-round-robin disable
   ```

3. To configure a range of ports to assign to a pool, perform the following:

   NOTE: If you specify a range of ports to assign, the **automatic** statement is ignored.

   a. Specify the low and high values for the port. If you do not configure automatic port assignment, you must configure a range of ports.

   ```
   [edit services nat source pool nat-pool-name port]
   user@host# set range port-low to port-high
   ```

   b. Specify either random allocation or round-robin allocation. Round-robin allocation is the default.

   ```
   [edit services nat source pool nat-pool-name port range]
   user@host# set (random-allocation | round-robin)
   ```

4. Assign a port within the same range as the incoming port—either 0 through 1023 or 1024 through 65,535. This feature is not available if you configure port-block allocation.

   ```
   [edit services nat source pool nat-pool-name port]
   user@host# set preserve-range
   ```

5. Assign a port with the same parity (even or odd) as the incoming port. This feature is not available if you configure port-block allocation.

   ```
   [edit services nat source pool nat-pool-name port]
   user@host# set preserve-parity
   ```

6. Configure a global default port range for NAT pools that use port translation. This port range is used when a NAT pool does not specify a port range and does not specify automatic port assignment. The global port range can be from 1024 through 65,535.

   ```
   [edit services nat source]
   user@host# set pool-default-port-range port-low to port-high
   ```

7. Configure the source pool without port translation.

   ```
   [edit services nat source pool nat-pool-name]
   ```

```
user@host# set address-pooling no-paired
```

8. Configure the maximum number of ports that can be allocated for each host. The range is 2 through 65,535.

```
[edit services nat source pool nat-pool-name]
user@host# set limit-ports-per-host number
```

9. If you want to allocate a block of ports for each subscriber to use, configure port-block allocation:

   a. Configure the number of ports in a block. The range is 1 through 64,512 and the default is 256.

```
[edit services nat source pool nat-pool-name port]
user@host# set block-allocation block-size block-size
```

   b. Configure the interval, in seconds, for which the block is active. After the timeout, a new block is allocated, even if ports are available in the active block. If you set the timeout to 0, port blocks are filled completely before a new port block is allocated, and the last port block remains active indefinitely. The range is 0 through 86,400, and the default is 120.

```
[edit services nat source pool nat-pool-name port block-allocation]
user@host# set active-block-timeout timeout-interval
```

   c. If you set the **active-block-timeout** to 0, you can configure the amount of time before the last active port block is released. The range is 120 through 864,000 seconds, and the default is 300.

```
[edit services nat source pool nat-pool-name port block-allocation]
user@host# set last-block-recycle-timeout timeout-interval
```

   d. Configure the maximum number of blocks that can be allocated to a user address. The range is 1 through 512, and the default is 8.

```
[edit services nat source pool nat-pool-name port block-allocation]
user@host# set maximum-blocks-per-host maximum-block-number
```

   e. Specify how often to send interim system logs for active port blocks and for inactive port blocks with live sessions. This increases the reliability of system logs, which are UDP-based and can get

lost in the network. The range is 1800 through 86,400 seconds, and the default is 0 (interim logs are disabled).

```
[edit services nat source pool nat-pool-name port block-allocation]
user@host# set interim-logging-interval timeout-interval
```

10. Specify the timeout period for endpoint independent translations that use the specified NAT pool. Mappings that are inactive for this amount of time are dropped. The range is 120 through 86,400 seconds. If you do not configure **ei-mapping-timeout**, then the **mapping-timeout** value is used for endpoint independent translations.

```
[edit services nat source pool nat-pool-name]
user@host# set ei-mapping-timeout ei-mapping-timeout
```

11. Specify the timeout period for address-pooling paired mappings that use the NAT pool. The range is 120 through 86,400 seconds, and the default is 300. Mappings that are inactive for this amount of time are dropped.

```
[edit services nat source pool nat-pool-name]
user@host# set mapping-timeout mapping-timeout
```

If you do not configure **ei-mapping-timeout** for endpoint independent translations, then the **mapping-timeout** value is used for endpoint independent translations.

12. To allow the IP addresses of a NAT source pool to overlap with IP addresses in pools used in other service sets, configure **allow-overlapping-pools**.

```
[edit services nat]
user@host# set allow-overlapping-pools
```

Configuring the NAT Rules for Stateful NAT64

For Stateful NAT64, you must configure a source rule and a destination rule. To configure the NAT rules for Stateful NAT64:

1. Configure the source NAT rule name.

```
[edit services nat source]
user@host# set rule-set rule-set-name rule rule-name
```

2. Specify the traffic direction to which the NAT rule set applies.

```
[edit services nat source rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

3. Specify the IPv6 source addresses that are translated by the NAT rule.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address address
```

4. Configure the matching destination address as 0.0.0.0/0.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match destination-address 0.0.0.0/0
```

5. Specify one or more application protocols to which the NAT rule applies. The number of applications listed in the rule must not exceed 3072.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match application [application-name]
```

6. Specify the NAT source pool that contains the addresses for translated source addresses.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set then source-nat pool nat-pool-name
```

7. Configure endpoint-independent mapping, which ensures that the same external address and port are assigned to all connections from a given host.

   a. Configure the mapping type as endpoint independent.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set mapping-type endpoint-independent
```

   b. Specify prefix lists that contain the hosts that are allowed to establish inbound connections using the endpoint-independent mapping. (Prefix lists are configured at the **[edit policy-options]** hierarchy level.)

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set filtering-type endpoint-independent prefix-list [allowed-host] except [denied-host]
```

c. Specify the maximum number of inbound flows allowed simultaneously on an endpoint-independent mapping.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set secure-nat-mapping eif-flow-limit number-of-flows
```

d. Specify the direction in which active endpoint-independent mapping is refreshed. By default, mapping is refreshed for both inbound and outbound active flows.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set secure-nat-mapping mapping-refresh (inbound | inbound-outbound | outbound)
```

8. Configure the destination NAT rule name.

```
[edit services nat destination]
user@host# set rule-set rule-set-name rule rule-name
```

9. Specify the traffic direction to which the destination NAT rule set applies.

```
[edit services nat destination rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

10. Specify the IPv6 prefix source addresses that are translated by the destination NAT rule. Use the same value that you used for the NAT source rule.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match source-address address
```

11. Specify the prefix that is used to embed the IPv4 destination address in the IPv6 destination address.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set then destination-nat destination-prefix destination-prefix
```

12. Configure the IPv6 destination address to match. This is the IPv4 destination address embedded in IPv6 by using the **destination-prefix**.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address address
```

13. Configure the generation of a syslog when traffic matches the NAT rule conditions.

```
[edit services nat (source | destination) rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

Configuring the Service Set for Stateful NAT64

To configure the service set for stateful NAT64:

1. Define the service set.

```
[edit services]
user@host# edit service-set service-set-name
```

2. Configure either an interface service, which requires a single service interface, or a next-hop service, which requires an inside and outside service interface.

```
[edit services service-set service-set-name]
user@host# set interface-service service-interface interface-name
```

or

```
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
    interface-name
```

3. Specify the NAT rule sets to be used with the service set.

```
[edit services service-set service-set-name]
user@host# set nat-rule-sets rule-set-name
```

Clearing the Don’t Fragment Bit

Specify that the don’t fragment (DF) bit for IPv4 packet headers is cleared when the packet length is less than 1280 bytes.

```
[edit services nat natv6v4]
user@host# set clear-dont-fragment-bit
```

This prevents unnecessary creation of an IPv6 fragmentation header when translating IPv4 packets that are less than 1280 bytes.

RELATED DOCUMENTATION

Stateful NAT64 Overview | 89

CHAPTER 12

Static Destination NAT Overview and Configuration

IN THIS CHAPTER

Static Destination NAT Overview

Static destination NAT translates the IPv4 destination address of an incoming packet to the IPv4 address of a private server. This redirects traffic destined to a virtual host (identified by the original destination IP address) to the real host (identified by the translated destination IP address).

Static destination NAT uses a one-to-one mapping between the original address and the translated address; the mapping is configured statically.

You can also statically translate the destination port by using port forwarding. See "Port Forwarding for Next Gen Services" on page 71.

Benefits of Static Destination NAT

- Allows external traffic to communicate with a private host without revealing the host's private IP address
- Does not require port mapping

RELATED DOCUMENTATION

Configuring Static Destination NAT for Next Gen Services | 100

Configuring Static Destination NAT for Next Gen Services

Configuring the Destination Pool for Static Destination NAT

To configure the destination pool for static destination NAT:

1. Create a destination pool.

```
user@host# edit services nat destination pool nat-pool-name
```

2. Define the addresses or subnets to which destination addresses are translated.

```
[edit services nat destination pool nat-pool-name]
user@host# set address address-prefix
```

3. To allow the IP addresses of a NAT destination pool to overlap with IP addresses in pools used in other service sets, configure **allow-overlapping-pools**.

```
[edit services nat]
user@host# set allow-overlapping-pools
```

Configuring the NAT Rule for Static Destination NAT

To configure the NAT rule for static destination NAT:

1. Configure the NAT rule name.

```
[edit services nat destination]
user@host# set rule-set rule-set-name rule rule-name
```

2. Specify the traffic direction to which the destination NAT rule set applies.

```
[edit services nat destination rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

3. Specify the source addresses of traffic that the NAT rule applies to.

   To specify one address or prefix value:

   ```
   [edit services nat destination rule-set rule-set-name rule rule-name]
   user@host# set match source-address address
   ```

   To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

   ```
   [edit services address-book global]
   user@host# set address address-name range-address lower-limit to upper-limit
   [edit services nat destination rule-set rule-set-name rule rule-name]
   user@host# set match source-address-name address-name
   ```

   To specify any unicast address:

   ```
   [edit services nat destination rule-set rule-set-name rule rule-name]
   user@host# set match source-address any-unicast
   ```

4. Specify the destination addresses that the NAT rule applies to.

   ```
   [edit services nat destination rule-set rule-set-name rule rule-name]
   user@host# set match destination-address address
   ```

   To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

   ```
   [edit services address-book global]
   user@host# set address address-name range-address lower-limit to upper-limit
   [edit services nat destination rule-set rule-set-name rule rule-name]
   user@host# set match destination-address-name address-name
   ```

   To specify any unicast address:

   ```
   [edit services nat destination rule-set rule-set-name rule rule-name]
   user@host# set match destination-address any-unicast
   ```

5. Specify one or more application protocols to which the destination NAT rule applies. The number of applications listed in the rule must not exceed 3072.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match application [application-name]
```

6. Specify the NAT pool that contains the destination addresses for translated traffic.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set then destination-nat pool nat-pool-name
```

7. Configure the generation of a syslog when traffic matches the destination NAT rule match conditions.

```
[edit services nat destination rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

Configuring the Service Set for Static Destination NAT

To configure the service set for static destination NAT:

1. Define the service set.

```
[edit services]
user@host# edit service-set service-set-name
```

2. Configure either an interface service, which requires a single service interface, or a next-hop service, which requires an inside and outside service interface.

```
[edit services service-set service-set-name]
user@host# set interface-service service-interface interface-name
```

or

```
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
    interface-name
```

3. Specify the NAT rule sets to be used with the service set.

```
[edit services service-set service-set-name]
user@host# set nat-rule-sets rule-set-name
```

RELATED DOCUMENTATION

Static Destination NAT Overview | 99

CHAPTER 13

Stateless Source Network Prefix Translation for IPv6 Overview and Configuration

IN THIS CHAPTER

Stateless Source Network Prefix Translation for IPv6

IN THIS SECTION

Stateless Source Network Prefix Translation for IPv6 for IPv6

IN THIS SECTION

When an IPv6 packet is going from an internal network to the external network, Stateless Source Network Prefix Translation for IPv6 (NPTv6) maps the IPv6 prefix of the source address to an IPv6 prefix of an external network. When an IPv6 packet is coming from the external network to the internal network, NPTv6 maps the IPv6 prefix of the destination address to the IPv6 prefix of the internal network.

NPTv6 uses an algorithm to translate the addresses, and does not need to maintain the state for each node or each flow in the translator. NPTv6 also removes the need to recompute the transport layer checksum.

Benefits of Stateless Source Network Prefix Translation

- For edge networks, you do not need to renumber the IPv6 addresses used inside the local network for interfaces, access lists, and system logging messages if:
  - The global prefixes used by the edge network are changed.
  - The IPv6 addresses are used inside the edge network or within other upstream networks (such as multihomed devices) when a site adds, drops, or changes upstream networks.
- IPv6 addresses used by the edge network do not need ingress filtering in upstream networks and do not need their customer-specific prefixes advertised to upstream networks.
- Connections that traverse the translation function are not disrupted by a reset or brief outage of an NPTv6 translator.

Configuring NPTv6 for Next Gen Services

Configuring the Source Pool

To configure the source pool for NPTv6:

1. Create a source pool.

```
user@host# edit services nat source pool nat-pool-name
```

2. Define the IPv6 prefix to which the IPv6 source address prefix is translated.

```
[edit services nat source pool nat-pool-name]
user@host# set address address-prefix
```

Configuring the NAT Rule

To configure the NAT source rule for NPTv6:

1. Configure the NAT rule name.

```
[edit]
user@host# edit services nat source rule-set rule-set-name rule rule-name
```

2. Specify the traffic direction to which the NAT rule set applies.

```
[edit services nat source rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

3. Specify the IPv6 prefix of source addresses that are translated by the source NAT rule.

   To specify one address or prefix value:

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address address
```

4. Configure the address-pooling paired feature if you want to ensure assignment of the same external IP address for all sessions originating from the same internal host.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat mapping-type]
user@host# set address-pooling-paired
```

5. Specify the timeout period for **address-pooling-paired** mappings that use the NAT pool. The range is 120 through 86,400 seconds, and the default is 300. Mappings that are inactive for this amount of time are dropped.

```
[edit services nat source pool nat-pool-name]
user@host# set mapping-timeout mapping-timeout
```

   If you do not configure **ei-mapping-timeout** for endpoint independent translations, then the **mapping-timeout** value is used for endpoint independent translations.

6. Specify the NAT pool that contains the IPv6 prefix for translated traffic.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set then source-nat pool nat-pool-name
```

7. Configure the generation of a syslog when traffic matches the NAT rule conditions.

```
[edit services nat source rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

Configuring the Service Set

To configure the service set for NPTv6:

1. Define the service set.

```
[edit services]
user@host# edit service-set service-set-name
```

2. Configure either an interface service set, which requires a single service interface, or a next-hop service set, which requires an inside and outside service interface.

   - To configure an interface service set:

```
[edit services service-set service-set-name]
user@host# set interface-service service-interface vms-slot-number/pic-number/0.logical-unit-number
```

   - To configure a next-hop service set:

```
[edit services service-set service-set-name]
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface vms-slot-number/pic-number/0.logical-unit-number
    outside-service-interface vms-slot-number/pic-number/0.logical-unit-number
```

3. Specify the NAT rule sets to be used with the service set.

```
[edit services service-set service-set-name]
user@host# set nat-rule-sets rule-set-name
```

4. Specify that ICMP error messages are sent if NPTv6 address translation fails.

```
[edit services service-set service-set-name nat-options nptv6]
user@host# set icmpv6-error-messages
```

CHAPTER 14

Twice NAPT Overview and Configuration

IN THIS CHAPTER

Twice NAPT Overview

Twice NAPT translates both the source and destination IP addresses.

The private source address is translated by dynamically assigning a public address from a pool and a port number. Multiple private IP addresses can be mapped to the same external address because each private address is mapped to a different port of the external address.

The destination address is translated to the IPv4 address of a private server. This redirects traffic destined to a virtual host (identified by the original destination IP address) to the real host (identified by the translated destination IP address). The destination addresses is translated with a one-to-one static mapping to an address in a pool. Port mapping is not performed for the destination address.

You can also statically translate the destination port by using port forwarding. See “Port Forwarding for Next Gen Services” on page 71.

Benefits

- Allows hosts in the private network to connect with the external domain, while hiding the private network.
- Minimizes the number of public IP addresses that are allocated for NAT.
- Allows external traffic to communicate with a private host without revealing the host’s private IP address

Configuring Twice NAPT for Next Gen Services

IN THIS SECTION

Configuring the Source and Destination Pools for Twice NAPT

To configure the source and destination pools for twice NAPT:

1. Create a source pool.

   ```
   user@host# edit services nat source pool nat-pool-name
   ```

2. Define the addresses or subnets to which source addresses are translated.

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set address address-prefix
   ```

   or

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set address address-prefix to address address-prefix
   ```

3. To configure automatic port assignment, specify either random allocation or round-robin allocation.

   ```
   [edit services nat source pool nat-pool-name port]
   user@host# set automatic (random-allocation | round-robin)
   ```

   Random allocation randomly assigns a port from the range 1024 through 65535 for each port translation. Round robin allocation first assigns port 1024, and uses the next higher port for each successive port assignment. Round robin allocation is the default.

4. To disable round-robin port allocation for all NAT pools that do not specify an **automatic (random-allocation | round-robin)** setting, configure the global setting.

```
[edit services nat source]
user@host# set port-round-robin disable
```

5. To configure a range of ports to assign to a pool, perform the following:

> **NOTE:** If you specify a range of ports to assign, the **automatic** statement is ignored.

   a. Specify the low and high values for the port. If you do not configure automatic port assignment, you must configure a range of ports.

```
[edit services nat source pool nat-pool-name port]
user@host# set range port-low to port-high
```

   b. Specify either random allocation or round-robin allocation. Round-robin allocation is the default.

```
[edit services nat source pool nat-pool-name port range]
user@host# set (random-allocation | round-robin)
```

6. Assign a port within the same range as the incoming port—either 0 through 1023 or 1024 through 65,535. This feature is not available if you configure port-block allocation.

```
[edit services nat source pool nat-pool-name port]
user@host# set preserve-range
```

7. Assign a port with the same parity (even or odd) as the incoming port. This feature is not available if you configure port-block allocation.

```
[edit services nat source pool nat-pool-name port]
user@host# set preserve-parity
```

8. Configure a global default port range for NAT pools that use port translation. This port range is used when a NAT pool does not specify a port range and does not specify automatic port assignment. The global port range can be from 1024 through 65,535.

```
[edit services nat source]
user@host# set pool-default-port-range port-low to port-high
```

9. If you want to allocate a block of ports for each subscriber to use for NAPT, configure port-block allocation:

   a. Configure the number of ports in a block. The range is 1 through 64,512 and the default is 256.

   ```
   [edit services nat source pool nat-pool-name port]
   user@host# set block-allocation block-size block-size
   ```

   b. Configure the interval, in seconds, for which the block is active. After the timeout, a new block is allocated, even if ports are available in the active block. If you set the timeout to 0, port blocks are filled completely before a new port block is allocated, and the last port block remains active indefinitely. The range is 0 through 86,400, and the default is 120.

   ```
   [edit services nat source pool nat-pool-name port block-allocation]
   user@host# set active-block-timeout timeout-interval
   ```

   c. If you set the **active-block-timeout** to 0, you can configure the amount of time before the last active port block is released. The range is 120 through 864,000 seconds, and the default is 300.

   ```
   [edit services nat source pool nat-pool-name port block-allocation]
   user@host# set last-block-recycle-timeout timeout-interval
   ```

   d. Configure the maximum number of blocks that can be allocated to a user address. The range is 1 through 512, and the default is 8.

   ```
   [edit services nat source pool nat-pool-name port block-allocation]
   user@host# set maximum-blocks-per-host maximum-block-number
   ```

   e. Specify how often to send interim system logs for active port blocks and for inactive port blocks with live sessions. This increases the reliability of system logs, which are UDP-based and can get lost in the network. The range is 1800 through 86,400 seconds, and the default is 0 (interim logs are disabled).

   ```
   [edit services nat source pool nat-pool-name port block-allocation]
   ```

```
user@host# set interim-logging-interval timeout-interval
```

10. Specify the timeout period for endpoint independent translations that use the specified NAT pool. Mappings that are inactive for this amount of time are dropped. The range is 120 through 86,400 seconds. If you do not configure **ei-mapping-timeout**, then the **mapping-timeout** value is used for endpoint independent translations.

```
[edit services nat source pool nat-pool-name]
user@host# set ei-mapping-timeout ei-mapping-timeout
```

11. Specify the timeout period for address-pooling paired mappings that use the NAT pool. The range is 120 through 86,400 seconds, and the default is 300. Mappings that are inactive for this amount of time are dropped.

```
[edit services nat source pool nat-pool-name]
user@host# set mapping-timeout mapping-timeout
```

If you do not configure **ei-mapping-timeout** for endpoint independent translations, then the **mapping-timeout** value is used for endpoint independent translations.

12. Define the NAT pool utilization levels that trigger SNMP traps. The **raise-threshold** is the pool utilization percentage that triggers the trap, and the range is 50 through 100. The **clear-threshold** is the pool utilization percentage that clears the trap, and the range is 40 through 100. For pools that use port-block allocation, the utilization is based on the number of ports that are used; for pools that do not use port-block allocation, the utilization is based on the number of addresses that are used.

```
[edit services nat source pool nat-pool-name]
user@host# set pool-utilization-alarm raise-threshold value
user@host# set pool-utilization-alarm clear-threshold value
```

If you do not configure **pool-utilization-alarm**, traps are not created.

13. Create a destination pool. Do not use the same name that you used for the source pool.

```
user@host# edit services nat destination pool nat-pool-name
```

14. Define the addresses or subnets to which destination addresses are translated.

```
[edit services nat destination pool nat-pool-name]
```

```
user@host# set address address-prefix
```

15. To allow the IP addresses of a NAT source pool or destination pool to overlap with IP addresses in pools used in other service sets, configure **allow-overlapping-pools**. However, pools that configure port-block allocation must not overlap with other pools.

```
[edit services nat]
user@host# set allow-overlapping-pools
```

Configuring the NAT Rules for Twice NAPT

To configure the source and destination NAT rules for twice NAPT:

1. Configure the source NAT rule name.

```
[edit services nat source]
user@host# set rule-set rule-set-name rule rule-name
```

2. Specify the traffic direction to which the NAT rule set applies.

```
[edit services nat source rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

3. Specify the addresses that are translated by the source NAT rule.

   To specify one address or prefix value:

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address address
```

   To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

```
[edit services address-book global]
user@host# set address address-name range-address lower-limit to upper-limit
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address-name address-name
```

   To specify any unicast address:

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address any-unicast
```

4. Specify one or more application protocols to which the NAT rule applies. The number of applications listed in the rule must not exceed 3072.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match application [application-name]
```

5. Specify the NAT pool that contains the addresses for translated traffic.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set then source-nat pool nat-pool-name
```

6. If you want to ensure that the same external address and port are assigned to all connections from a given host, configure endpoint-independent mapping:

   a. Configure the mapping type as endpoint independent.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set mapping-type endpoint-independent
```

   b. Specify prefix lists that contain the hosts that are allowed to establish inbound connections using the endpoint-independent mapping. (Prefix lists are configured at the **[edit policy-options]** hierarchy level.)

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set filtering-type endpoint-independent prefix-list [allowed-host] except [denied-host]
```

   c. Specify the maximum number of inbound flows allowed simultaneously on an endpoint-independent mapping.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set secure-nat-mapping eif-flow-limit number-of-flows
```

   d. Specify the direction in which active endpoint-independent mapping is refreshed. By default, mapping is refreshed for both inbound and outbound active flows.

```
[edit services nat source rule-set rule-set-name rule rule-name then source-nat]
user@host# set secure-nat-mapping mapping-refresh (inbound | inbound-outbound | outbound)
```

7. Configure the generation of a syslog when traffic matches the NAT rule conditions.

```
[edit services nat source rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

8. Configure the destination NAT rule name.

```
[edit services nat destination]
user@host# set rule-set rule-set-name rule rule-name
```

9. Specify the traffic direction to which the destination NAT rule set applies.

```
[edit services nat destination rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

10. Specify the destination addresses of traffic that the destination NAT rule applies to.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address address
```

To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

```
[edit services address-book global]
user@host# set address address-name range-address lower-limit to upper-limit
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address-name address-name
```

To specify any unicast address:

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address any-unicast
```

11. Specify one or more application protocols to which the destination NAT rule applies. The number of applications listed in the rule must not exceed 3072.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match application [application-name]
```

12. Specify the destination NAT pool that contains the destination addresses for translated traffic.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set then destination-nat pool nat-pool-name
```

13. Configure the generation of a syslog when traffic matches the destination NAT rule match conditions.

```
[edit services nat destination rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

Configuring the Service Set for Twice NAPT

To configure the service set for twice NAPT:

1. Define the service set.

```
[edit services]
user@host# edit service-set service-set-name
```

2. Configure either an interface service, which requires a single service interface, or a next-hop service, which requires an inside and outside service interface.

```
[edit services service-set service-set-name]
user@host# set interface-service service-interface interface-name
```

or

```
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
    interface-name
```

3. Specify the NAT rule sets to be used with the service set. Include the source NAT rule set and the destination NAT rule set.

```
[edit services service-set service-set-name]
```

```
user@host# set nat-rule-sets rule-set-name
```

CHAPTER 15

Twice NAT Overview and Configuration

IN THIS CHAPTER

Twice Static NAT Overview

IN THIS SECTION

Twice static NAT translates both the source and destination IP addresses. An addresses is translated with a one-to-one static mapping to an address in a pool. Port mapping is not performed.

The original private domain host source address is translated to a public source address.

The destination address is translated to the IPv4 address of a private server. This redirects traffic destined to a virtual host (identified by the original destination IP address) to the real host (identified by the translated destination IP address).

Benefits

- Allows hosts in the private network to connect with the external domain, while hiding the private network.
- Hides a private network
- Allows external traffic to communicate with a private host without revealing the host's private IP address
- Does not require port mapping

Configuring Twice Static NAT44 for Next Gen Services

IN THIS SECTION

Configuring the Source and Destination Pools for Twice Static NAT44

To configure the source and destination pools for twice static NAT44:

1. Create a source pool.

   ```
   user@host# edit services nat source pool nat-pool-name
   ```

2. Define the addresses or subnets to which source addresses are translated.

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set address address-prefix
   ```

   or

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set address address-prefix to address address-prefix
   ```

3. Configure a one-to-one static shifting of a range of original source addresses to the range of addresses in the source pool by specifying the base address of the original source address range.

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set host-address-base ip-address
   ```

   For example, if the host address base is 198.51.100.30 and the NAT pool uses the range 203.0.113.10 to 203.0.113.20, then 198.51.100.30 translates to 203.0.113.10, 198.51.100.31 translates to 203.0.113.11, and so on.

4. Create a destination pool. Do not use the same name that you used for the source pool.

```
user@host# edit services nat destination pool nat-pool-name
```

5. Define the addresses or subnets to which destination addresses are translated.

```
[edit services nat destination pool nat-pool-name]
user@host# set address address-prefix
```

6. To allow the IP addresses of a NAT pool to overlap with IP addresses in pools used in other service sets, configure **allow-overlapping-pools**.

```
[edit services nat]
user@host# set allow-overlapping-pools
```

Configuring the NAT Rules for Twice Static NAT44

To configure the source and destination NAT rules for twice static NAT44:

1. Configure the source NAT rule name.

```
[edit services nat source]
user@host# set rule-set rule-set-name rule rule-name
```

2. Specify the traffic direction to which the NAT rule set applies.

```
[edit services nat source rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

3. Specify the addresses that are translated by the source NAT rule.

   To specify one address or prefix value:

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address address
```

   To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

```
[edit services address-book global]
```

```
user@host# set address address-name range-address lower-limit to upper-limit
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address-name address-name
```

To specify any unicast address:

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match source-address any-unicast
```

4. Specify one or more application protocols to which the source NAT rule applies. The number of applications listed in the rule must not exceed 3072.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match application [application-name]
```

5. Specify the source NAT pool that contains the addresses for translated traffic.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set then source-nat pool nat-pool-name
```

6. Configure the generation of a syslog when traffic matches the NAT rule conditions.

```
[edit services nat source rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

7. Configure the destination NAT rule name.

```
[edit services nat destination]
user@host# set rule-set rule-set-name rule rule-name
```

8. Specify the traffic direction to which the destination NAT rule set applies.

```
[edit services nat destination rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

9. Specify the destination addresses of traffic that the destination NAT rule applies to.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address address
```

To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

```
[edit services address-book global]
user@host# set address address-name range-address lower-limit to upper-limit
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address-name address-name
```

To specify any unicast address:

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address any-unicast
```

10. Specify one or more application protocols to which the destination NAT rule applies. The number of applications listed in the rule must not exceed 3072.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match application [application-name]
```

11. Specify the destination NAT pool that contains the destination addresses for translated traffic.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set then destination-nat pool nat-pool-name
```

12. Configure the generation of a syslog when traffic matches the destination NAT rule match conditions.

```
[edit services nat destination rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

Configuring the Service Set for Twice Static NAT44

To configure the service set for twice static NAT44:

1. Define the service set.

```
[edit services]
```

```
user@host# edit service-set service-set-name
```

2. Configure either an interface service, which requires a single service interface, or a next-hop service, which requires an inside and outside service interface.

```
[edit services service-set service-set-name]
user@host# set interface-service service-interface interface-name
```

or

```
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
    interface-name
```

3. Specify the NAT rule sets to be used with the service set. Include the source NAT rule set and the destination NAT rule set.

```
[edit services service-set service-set-name]
user@host# set nat-rule-sets rule-set-name
```

Twice Dynamic NAT Overview

Twice dynamic NAT translates both the source and destination IP addresses. Port mapping is not performed.

The private source address is translated by dynamically assigning a public address from a pool, and the mapping from the original source address to the translated source address is maintained as long as there is at least one active flow that uses this mapping.

The destination address is translated to the IPv4 address of a private server. This redirects traffic destined to a virtual host (identified by the original destination IP address) to the real host (identified by the translated destination IP address). The destination addresses is translated with a one-to-one static mapping to an address in a pool.

Benefits

- Allows hosts in the private network to connect with the external domain, while hiding the private network.
- Allows a few public IP addresses to be used by several private hosts

- Allows external traffic to communicate with a private host without revealing the host's private IP address
- Does not require port mapping

Configuring Twice Dynamic NAT for Next Gen Services

IN THIS SECTION

Configuring the Source and Destination Pools for Twice Dynamic NAT

To configure the source and destination pools for twice dynamic NAT:

1. Create a source pool.

```
user@host# edit services nat source pool nat-pool-name
```

2. Define the addresses or subnets to which source addresses are translated.

```
[edit services nat source pool nat-pool-name]
user@host# set address address-prefix
```

or

```
[edit services nat source pool nat-pool-name]
user@host# set address address-prefix to address address-prefix
```

3. Disable port translation.

```
[edit services nat destination pool nat-pool-name]
user@host# set port no-translation
```

4. Define the NAT pool utilization levels that trigger SNMP traps. The **raise-threshold** is the pool utilization percentage that triggers the trap, and the range is 50 through 100. The **clear-threshold** is the pool utilization percentage that clears the trap, and the range is 40 through 100. The utilization is based on the number of addresses that are used.

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set pool-utilization-alarm raise-threshold value
   user@host# set pool-utilization-alarm clear-threshold value
   ```

   If you do not configure **pool-utilization-alarm**, traps are not created.

5. Create a destination pool. Do not use the same name that you used for the source pool.

   ```
   user@host# edit services nat destination pool nat-pool-name
   ```

6. Define the addresses or subnets to which destination addresses are translated.

   ```
   [edit services nat destination pool nat-pool-name]
   user@host# set address address-prefix
   ```

7. To allow the IP addresses of a NAT source pool or destination pool to overlap with IP addresses in pools used in other service sets, configure **allow-overlapping-pools**.

   ```
   [edit services nat]
   user@host# set allow-overlapping-pools
   ```

Configuring the NAT Rules for Twice Dynamic NAT

To configure the source and destination NAT rules for twice dynamic NAT:

1. Configure the source NAT rule name.

   ```
   [edit services nat source]
   user@host# set rule-set rule-set-name rule rule-name
   ```

2. Specify the traffic direction to which the NAT rule set applies.

   ```
   [edit services nat source rule-set rule-set-name]
   user@host# set match-direction (in | out | in-out)
   ```

3. Specify the addresses that are translated by the source NAT rule.

   To specify one address or prefix value:

   ```
   [edit services nat source rule-set rule-set-name rule rule-name]
   user@host# set match source-address address
   ```

   To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

   ```
   [edit services address-book global]
   user@host# set address address-name range-address lower-limit to upper-limit
   [edit services nat source rule-set rule-set-name rule rule-name]
   user@host# set match source-address-name address-name
   ```

   To specify any unicast address:

   ```
   [edit services nat source rule-set rule-set-name rule rule-name]
   user@host# set match source-address any-unicast
   ```

4. Specify one or more application protocols to which the source NAT rule applies. The number of applications listed in the rule must not exceed 3072.

   ```
   [edit services nat source rule-set rule-set-name rule rule-name]
   user@host# set match application [application-name]
   ```

5. Configure the address-pooling paired feature if you want to ensure assignment of the same external IP address for all sessions originating from the same internal host.

   ```
   [edit services nat source rule-set rule-set-name rule rule-name then source-nat mapping-type]
   user@host# set address-pooling-paired
   ```

6. Specify the timeout period for **address-pooling-paired** mappings that use the NAT pool. The range is 120 through 86,400 seconds, and the default is 300. Mappings that are inactive for this amount of time are dropped.

   ```
   [edit services nat source pool nat-pool-name]
   user@host# set mapping-timeout mapping-timeout
   ```

   If you do not configure **ei-mapping-timeout** for endpoint independent translations, then the **mapping-timeout** value is used for endpoint independent translations.

7. Specify the source NAT pool that contains the addresses for translated traffic.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set then source-nat pool nat-pool-name
```

8. Configure the generation of a syslog when traffic matches the NAT rule conditions.

```
[edit services nat source rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

9. Configure the destination NAT rule name.

```
[edit services nat destination]
user@host# set rule-set rule-set-name rule rule-name
```

10. Specify the traffic direction to which the destination NAT rule set applies.

```
[edit services nat destination rule-set rule-set-name]
user@host# set match-direction (in | out | in-out)
```

11. Specify the destination addresses of traffic that the destination NAT rule applies to.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address address
```

To specify a range of addresses, configure an address book global address with the desired address range, and assign the global address to the NAT rule:

```
[edit services address-book global]
user@host# set address address-name range-address lower-limit to upper-limit
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address-name address-name
```

To specify any unicast address:

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set match destination-address any-unicast
```

12. Specify one or more application protocols to which the destination NAT rule applies. The number of applications listed in the rule must not exceed 3072.

```
[edit services nat source rule-set rule-set-name rule rule-name]
user@host# set match application [application-name]
```

13. Specify the destination NAT pool that contains the destination addresses for translated traffic.

```
[edit services nat destination rule-set rule-set-name rule rule-name]
user@host# set then destination-nat pool nat-pool-name
```

14. Configure the generation of a syslog when traffic matches the destination NAT rule match conditions.

```
[edit services nat destination rule-set rule-set-name rule rule-name then]
user@host# set syslog
```

Configuring the Service Set for Twice Dynamic NAT

To configure the service set for twice dynamic NAT:

1. Define the service set.

```
[edit services]
user@host# edit service-set service-set-name
```

2. Configure either an interface service, which requires a single service interface, or a next-hop service, which requires an inside and outside service interface.

```
[edit services service-set service-set-name]
user@host# set interface-service service-interface interface-name
```

or

```
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
    interface-name
```

3. Specify the NAT rule sets to be used with the service set. Include the source NAT rule set and the destination NAT rule set.

```
[edit services service-set service-set-name]
user@host# set nat-rule-sets rule-set-name
```

CHAPTER 16

Class of Service Overview and Configuration

IN THIS CHAPTER

Class of Service for Services PICs (Next Gen Services)

IN THIS SECTION

Class of Service Overview for Services PICs (Next Gen Services)

You can configure CoS Differentiated Services (DiffServ) code point (DSCP) marking and forwarding-class assignment for packets transiting a services PIC while being processed by a service set.

Configure services CoS rules, which identify the matching conditions for packet source and destination addresses and for packet applications, and the actions to take on those packets. You must apply CoS rules to a service set before the rules can be applied to traffic. Only stateful firewall and NAT rules can be used with CoS rules in a service set.

You can also configure specific CoS actions for FTP and for SIP traffic by creating an application profile. The application profile can then be referenced in the CoS rule actions.

The services CoS rules do not support scheduling. You must configure scheduling at the **[edit class-of-service]** hierarchy level on the output interface or fabric.

NOTE: When configuring Next Gen Services with the MX-SPC3 services card, the **service set** must include at least one stateful firewall (SFW) rule or NAT rule, or services CoS does not work. Only stateful firewall and NAT rules can be used with CoS rules in a **service set**. CoS works without NAT and SFW rules also.

Benefits

CoS for traffic on a services PIC lets you classify traffic flows based on stateful firewall and NAT configurations.

SEE ALSO

Configuring CoS for Traffic Processed by a Services PIC (Next Gen Services) | 132

Configuring CoS for Traffic Processed by a Services PIC (Next Gen Services)

IN THIS SECTION

Configuring CoS Rules

1. Configure a name for the CoS rule.

```
user@host# edit services cos rule rule-name
```

2. Specify the traffic flow direction for the CoS rule.

```
[edit services cos rule rule-name]
user@host# set match-direction (input | input-output | output)
```

If this CoS rule is applied to an interface-type service set, the direction is determined by whether a packet is entering or leaving the interface on which the service set is applied. If this CoS rule is applied to a next-hop service set, the direction is input if the inside interface is used to route the packet, and the direction is output if the outside interface is used to route the package.

If you configure **input-output**, the rule is applied to sessions initiated from either direction.

3. Configure a name for a CoS rule policy.

```
[edit services cos rule rule-name]
user@host# set policy policy-name
```

You can configure multiple policies for a CoS rule. Each policy identifies the matching conditions for packet source and destination addresses and for packet applications, and the CoS actions to take on those packets. Once a policy in the rule matches a packet, that policy is applied and no other policies in the rule are processed.

4. Specify one or more port-based applications that match the policy.

```
[edit services cos rule rule-name policy policy-name]
user@host# set match application [application-names]
```

5. Specify the destination address that matches the policy.

```
[edit services cos rule rule-name policy policy-name]
user@host# set match destination-address address
```

6. Specify a range of destination addresses that match the policy.

```
[edit services cos rule rule-name policy policy-name]
user@host# set match destination-address-range low minimum-value high maximum-value
```

7. Specify the destination port number that matches the policy.

```
[edit services cos rule rule-name policy policy-name]
user@host# set match destination-port port-number
```

8. Specify the source address that matches the policy.

```
[edit services cos rule rule-name policy policy-name]
user@host# set match source-address address
```

9. Specify a range of source addresses that match the policy.

```
[edit services cos rule rule-name policy policy-name]
user@host# set match source-address-range low minimum-value high maximum-value
```

10. Specify a prefix list of source address prefixes that match the policy.

```
[edit services cos rule rule-name policy policy-name]
user@host# set match source-prefix-list list-name
```

You configure a prefix list by using the **prefix-list** statement at the **[edit policy-options]** hierarchy level.

11. Specify the application profile that defines the CoS policy actions for FTP and SIP traffic.

```
[edit services cos rule rule-name policy policy-name]
user@host# set then application-profile profile-name
```

12. Specify the DSCP value to apply to the packet.

```
[edit services cos rule rule-name policy policy-name]
user@host# set then dscp (alias | bits)
```

The DSCP can be either a code point alias or a DSCP bit value.

13. Specify the forwarding class name to apply to the packet.

```
[edit services cos rule rule-name policy policy-name]
user@host# set then forwarding-class class-name
```

The choices are:

- assured-forwarding
- best-effort
- expedited-forwarding
- network-control
- user-defined classifiers.

You can define classifiers under [edit class-of-service classifiers dscp] hierarchy.

14. Configure system logging for the CoS rule policy.

15. Specify the treatment of flows in the reverse direction of the matching direction. Perform only one of the following:

    - Configure unique values for the reverse direction:

      ```
      [edit services cos rule rule-name policy policy-name]
      user@host# set then reverse application-profile profile-name
      user@host# set then reverse dscp (alias | bits)
      user@host# set then reverse forwarding-class class-name
      ```

    - Apply the CoS rule policy actions to flows in the reverse direction as well as to flows in the matching direction.

      ```
      [edit services cos rule rule-name policy policy-name]
      user@host# set then reflexive
      ```

    - Store the DSCP and forwarding class of a packet that is received in the match direction of the rule and then apply that DSCP and forwarding class to packets that are received in the reverse direction of the same session.

      ```
      [edit services cos rule rule-name policy policy-name]
      user@host# set then revert
      ```

Configuring Application Profiles for CoS Rules

Configure CoS actions for FTP and SIP traffic. The application profile can then be used in CoS rule actions.

1. Configure a name for the application profile.

   ```
   user@host# edit services cos application-profile profile-name
   ```

2. Specify the DSCP value to apply to the FTP or SIP (voice or video) packets.

   For FTP traffic:

   ```
   [edit services cos application-profile profile-name]
   user@host# set ftp data dscp (alias | bits)
   ```

For SIP voice or video traffic:

```
[edit services cos application-profile profile-name]
user@host# set sip video | voice dscp dscp
```

The DSCP can be either a code point alias or a DSCP bit value.

3. Specify the forwarding class to apply to FTP or SIP packets.

   For FTP traffic:

   ```
   [edit services cos application-profile profile-name]
   user@host# set ftp data forwarding-class class-name
   ```

   For SIP voice or video traffic:

   ```
   [edit services cos application-profile profile-name]
   user@host# set sip video | voice forwarding-class forwarding-class dscp
   ```

   The choices are:

   - assured-forwarding
   - best-effort
   - expedited-forwarding
   - network-control

Configuring CoS Rule Sets

A CoS rule set lets you specify a set of services CoS rules. You can then assign the rule set to a service set, which processes the rules in the order they appear. Once a rule matches the packet, the router performs the corresponding action, and no further rules in the rule set are applied.

1. Configure a name for the CoS rule set.

   ```
   user@host# edit services cos rule-set rule-set-name
   ```

2. Specify the CoS rules that belong to the rule set.

   ```
   [edit services cos rule-set rule-set-name]
   user@host# set rule [rule-name]
   ```

Configuring the Service Set for CoS

You must apply CoS rules to a service set before the rules can be applied to traffic. Only stateful firewall and NAT rules can be used with CoS rules in a service set.

To configure a service set with CoS rules:

1. Define the service set.

   ```
   [edit services]
   user@host# edit service-set service-set-name
   ```

2. Configure either an interface service set, which requires a single service interface, or a next-hop service set, which requires an inside and outside service interface.

   ```
   [edit services service-set service-set-name]
   user@host# set interface-service service-interface interface-name
   ```

   or

   ```
   [edit services service-set service-set-name]
   user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
     interface-name
   ```

3. Specify the CoS rules to be used with the service set. You can either specify individual rules or rule sets.

   To apply individual CoS rules:

   ```
   [edit services service-set service-set-name]
   user@host# set cos-rules [cos-rule-name]
   ```

   To apply CoS rule sets:

   ```
   [edit services service-set service-set-name]
   user@host# set cos-rule-sets [cos-rule-set-name]
   ```

   The service set processes the CoS rules or rule sets in the order in which they appear in the service set configuration.

4. (Optional) Assign at least one stateful firewall rule or NAT rule to the service set.

5. (Optional) Configure the service set to create a CoS session even if a packet is first received in the reverse direction of the matching direction of the CoS rule. The CoS rule values are then applied as soon as a packet in the correct match direction is received.

```
[edit services service-set service-set-name]
user@host# set cos-options match-rules-on-reverse-flow
```

SEE ALSO

Class of Service Overview for Services PICs (Next Gen Services) | 131

3

PART

Stateful Firewall Services

CHAPTER 17

Stateful Firewall Services Overview and Configuration

IN THIS CHAPTER

Stateful Firewall Overview for Next Gen Services

Services PICs employ a type of firewall called a stateful firewall. Contrasted with a stateless firewall, which inspects packets in isolation, a stateful firewall provides an extra layer of security by using state information derived from past communications and other applications to make dynamic control decisions for new communication attempts.

Stateful firewalls group relevant flows into conversations, and decide whether the conversation is allowed to be established. If a conversation is allowed, all flows within the conversation are permitted, including flows that are created during the life cycle of the conversation.

Benefits

By Inspecting the application protocol data of a flow, the stateful firewall intelligently enforces security policies and permits only the minimally required packet traffic.

Flows and Conversations

A typical Transmission Control Protocol (TCP) or User Datagram Protocol (UDP) conversation consists of two flows: the initiation flow and the responder flow. However, some conversations, such as an FTP conversation, might consist of two control flows and many data flows.

A flow is identified by the following five properties:

- Source address
- Source port
- Destination address

- Destination port
- Protocol

Stateful Firewall Rules

Stateful firewall rules govern whether the conversation is allowed to be established. A rule consists of matching conditions and actions to take.

Matching conditions include direction, source address, destination address, and application protocol or service. In addition to the specific values you configure, you can assign the value **any**, **any-ipv4**, **any-ipv6**, or you can use an **address-book** under **services** to define address lists and ranges for use within stateful firewall rules. Finally, you can specify matches that result in the rule *not* being applied.

Actions in a stateful firewall rule include allowing the traffic or dropping the traffic.

Stateful firewall rules are directional. For each new conversation, the router software determines whether the initiation flow direction matches the rule direction.

Stateful firewall rules are ordered. The software checks the rules in the order in which you include them in the configuration. The first time the software finds a matching rule for a flow, the router implements the action specified by that rule, and ignores subsequent rules.

The stateful firewall rules are configured in relation to an interface. By default, the stateful firewall allows all sessions initiated from the hosts behind the interface to pass through the router.

Configuring Stateful Firewalls for Next Gen Services

IN THIS SECTION

To configure stateful firewalls, you configure stateful firewall rules, and apply those rules to a service set. You can also configure stateful firewall rule sets, which contain a set of stateful firewall rules.

Configuring Stateful Firewall Rules for Next Gen Services

A stateful firewall rule specifies which traffic is processed and what action to apply to the traffic.

To configure a stateful firewall rule:

1. Configure a name for the stateful firewall rule.

   ```
   user@host# edit services policies stateful-firewall-rule rule-name
   ```

2. Specify the traffic flow direction to which the stateful firewall rule applies.

   ```
   [edit services policies stateful-firewall-rule rule-name]
   user@host# set match-direction (input | input-output | output)
   ```

   If you configure **input-output**, the rule is applied to sessions initiated from either direction.

   If this stateful firewall rule is applied to an interface-type service set, the direction is determined by whether a packet is entering or leaving the interface on which the service set is applied. If this stateful firewall rule is applied to a next-hop service set, the direction is input if the inside interface is used to route the packet, and the direction is output if the outside interface is used to route the package.

3. Configure a name for a policy.

   ```
   [edit services policies stateful-firewall-rule rule-name]
   user@host# set policy policy-name
   ```

   You can configure multiple policies for a stateful firewall rule. Each policy identifies the matching conditions for a flow, and whether or not to allow the flow. Once a policy in the rule matches a packet, that policy is applied and no other policies in the rule are processed.

4. Specify the destination address of the flows to which the policy applies.

   ```
   [edit services policies stateful-firewall-rule rule-name policy policy-name]
   user@host# set match destination-address (address | any | any-ipv4 | any-ipv6)
   ```

   Alternatively, you can specify an **address-book** under the **services** configuration hierarchy to use in this step.

   The destination address can be IPv4 or IPv6.

5. Specify the destination address of the flows to which the policy does not apply.

```
[edit services policies stateful-firewall-rule rule-name policy policy-name]
user@host# set match destination-address-excluded address
```

   The destination address can be IPv4 or IPv6.

6. Specify the source address of the flows to which the policy applies.

```
[edit services policies stateful-firewall-rule rule-name policy policy-name]
user@host# set match source-address (address | any | any-ipv4 | any-ipv6)
```

   Alternatively, you can specify an **address-book** under the **services** configuration hierarchy to use in this step.

   The source address can be IPv4 or IPv6.

7. Specify the source address of the flows to which the policy does not apply.

```
[edit services policies stateful-firewall-rule rule-name policy policy-name]
user@host# set match source-address-excluded address
```

   The source address can be IPv4 or IPv6.

8. Specify one or more application protocols to which the policy applies.

```
[edit services policies stateful-firewall-rule rule-name policy policy-name]
user@host# set match application [application-name]
```

   Use an application protocol definition you have configured at the **[edit applications]** hierarchy level.

9. Specify an action that the policy takes.

```
[edit services policies stateful-firewall-rule rule-name policy policy-name]
user@host# set then (count | deny | reject | permit)
```

   where:

   count— Enables a count, in bytes or kilobytes, of all network traffic the policy allows to pass.

   deny— Drop the packets.

   permit— Accept the packets and send them to their destination.

reject—Drop the packets. For TCP traffic, send a TCP reset (RST) segment to the source host. For UDP traffic, send an ICMP **destination unreachable, port unreachable** message (type 3, code 3) to the source host.

Configuring Stateful Firewall Rule Sets for Next Gen Services

A stateful firewall rule set lets you specify a set of stateful firewall rules, which are processed in the order in which they appear in the rule set configuration. Once a stateful firewall rule in the rule set matches a packet, that rule is applied and no other rules in the rule set are processed˙.

To configure a stateful firewall rule set:

1. Configure a name for the stateful firewall rule set.

```
user@host# edit services policies stateful-firewall-rule-set rule-set-name
```

2. Specify the stateful firewall rules that belong to the rule set.

```
[edit services policies stateful-firewall-rule-set rule-set-name]
user@host# set stateful-firewall-rule [rule-name]
```

Configuring the Service Set for Stateful Firewalls for Next Gen Services

Stateful firewall rules must be assigned to a service set before they can be applied to traffic.

To configure a service set to apply stateful firewall rules:

1. Define the service set.

```
[edit services]
user@host# edit service-set service-set-name
```

2. Configure either an interface service set, which requires a single service interface, or a next-hop service set, which requires an inside and outside service interface.

```
[edit services service-set service-set-name]
user@host# set interface-service service-interface interface-name
```

or

```
[edit services service-set service-set-name]
user@host# set next-hop-service inside-service-interface interface-name outside-service-interface
    interface-name
```

3. Specify the stateful firewall rules to be used with the service set. You can specify either individual rules or rule sets but not both.

   To apply individual stateful firewall rules:

   ```
   [edit services service-set service-set-name]
   user@host# set stateful-firewall-rules [rule-name]
   ```

   To apply stateful firewall rule sets:

   ```
   [edit services service-set service-set-name]
   user@host# set stateful-firewall-rule-sets [rule-set-name]
   ```

   The service set processes the stateful firewall rules or rule sets in the order in which they appear in the service set configuration.

PART 4

Intrusion Detection Services

CHAPTER 18

IDS Screens for Network Attack Protection Overview and Configuration

IN THIS CHAPTER

Understanding IDS Screens for Network Attack Protection

IN THIS SECTION

Intrusion Detection Services

Intrusion detection services (IDS) screens give you a way to identify and drop traffic that is part of a network attack.

In an IDS screen, you can specify:

- The limits on the number of sessions that originate from individual sources or that terminate at individual destinations
- The types of suspicious packets

You can also choose to log an alarm when an IDS screen identifies a packet, rather than drop the packet.

In addition to IDS screens, you can use firewall filters and policers to stop illegal TCP flags and other bad flag combinations, and to specify general rate limiting (see the *Routing Policies, Firewall Filters, and Traffic Policers User Guide*). IDS screens add a more granular level of filtering.

Use firewall filters and stateful firewall filters to filter out traffic that does not need to be processed by an IDS screen.

Benefits

Provides protection against several types of network attacks.

Session Limits

You can use IDS screens to set session limits for traffic from an individual source or to an individual destination. This protects against network probing and flooding attacks. Traffic that exceeds the session limits is dropped. You can specify session limits either for traffic with a particular IP protocol, such as ICMP, or for traffic in general.

You decide whether the limits apply to individual addresses or to an aggregation of traffic from individual subnets of a particular prefix length. For example, if you aggregate limits for IPv4 subnets with a prefix length of 24, traffic from 192.0.2.2 and 192.0.2.3 is counted against the limits for the 192.0.2.0/24 subnet.

Some common network probing and flooding attacks that session limits protect against include:

ICMP Address Sweep—The attacker sends ICMP request probes (pings) to multiple targets. If a target machine replies, the attacker receives the IP address of the target.

ICMP Flood—The attacker floods a target machine by sending a large number of ICMP packets from one or more source IP addresses. The target machine uses up its resources as it attempts to process those ICMP packets, and then it can no longer process valid traffic.

TCP Port Scan—The attacker sends TCP SYN packets from one source to multiple destination ports of the target machine. If the target replies with a SYN-ACK from one or more destination ports, the attacker learns which ports are open on the target.

TCP SYN Flood—The attacker floods a target machine by sending a large number of TCP SYN packets from one or more source IP addresses. The attacker might use real source IP addresses, which results in a completed TCP connection, or might use fake source IP addresses, resulting in the TCP connection not being completed. The target creates states for all the completed and incomplete TCP connections. The target uses up its resources as it attempts to manage the connection states, and then it can no longer process valid traffic.

UDP Flood—The attacker floods a target machine by sending a large number of UDP packets from one or more source IP addresses. The target machine uses up its resources as it attempts to process those UDP packets, and then it can no longer process valid traffic.

Session limits for traffic from a source or to a destination include:

- maximum number of concurrent sessions
- maximum number of packets per second
- maximum number of connections per second

IDS screens also install a dynamic filter on the PFEs of line cards for suspicious activity when the following conditions occur:

- Either the packets per second or the number of connections per second for an individual source or destination address exceeds four times the session limit in the IDS screen. (Dynamic filters are not created from IDS screens that use subnet aggregation.)
- The services card CPU utilization percentage exceeds a configured value (default value is 90 percent).

The dynamic filter drops the suspicious traffic at the PFE, without the traffic being processed by the IDS screen. When the packet or connection rate no longer exceeds four times the limit in the IDS screen, the dynamic filter is removed.

Suspicious Packet Patterns

You can use IDS screens to identify and drop traffic with a suspicious packet pattern. This protects against attackers that craft unusual packets to launch denial-of-service attacks.

Suspicious packet patterns and attacks that you can specify in an IDS screen are:

ICMP fragmentation attack—The attacker sends the target ICMP packets that are IP fragments. These are considered suspicious packets because ICMP packets are usually short. When the target receives these packets, the results can range from processing packets incorrectly to crashing the entire system.

Malformed ICMPv6 packets—Malformed ICMPv6 packets can cause damage to the device and network. Examples of malformed IPv6 packets are packets that are too big (message type 2), that have the next header set to routing (43), or that have a routing header set to hop-by hop.

ICMP large packet attack—The attacker sends the target ICMP frames with an IP length greater than 1024 bytes. These are considered suspicious packets because most ICMP messages are small.

Ping of death attack—The attacker sends the target ICMP ping packets whose IP datagram length (ip_len) exceeds the maximum legal length (65,535 bytes) for IP packets, and the packet is fragmented. When the target attempts to reassemble the IP packets, a buffer overflow might occur, resulting in a system crashing, freezing, and restarting.

Bad option attack—The attacker sends the target packets with incorrectly formatted IPv4 options or IPv6 extension headers. This can cause unpredictable issues, depending on the IP stack implementation of routers and the target.

Fragmented IP packets—IP fragments might contain an attacker's attempt to exploit the vulnerabilities in the packet reassembly code of specific IP stack implementations. When the target receives these packets, the results can range from processing the packets incorrectly to crashing the entire system.

IPv6 extension headers—Attackers can maliciously use extension headers for denial-of-service attacks or to bypass filters.

IPv4 options—Attackers can maliciously use IPv4 options for denial-of-service attacks.

IP teardrop attack—The attacker sends the target fragmented IP packets that overlap. The target machine uses up its resources as it attempts to reassemble the packets, and then it can no longer process valid traffic.

IP unknown protocol attack—The attacker sends the target packets with protocol numbers greater than 137 for IPv4 and 139 for IPv6. An unknown protocol might be malicious.

TCP FIN No ACK attack—The attacker sends the target TCP packets that have the FIN bit set but have the ACK bit unset. This can allow the attacker to identify the operating system of the target or to identify open ports on the target.

Land attack—The attacker sends the target spoofed SYN packets that contain the target's IP address as both the destination and the source IP address. The target uses up its resources as it repeatedly replies to itself. In another variation of the land attack, the SYN packets also contain the same source and destination ports.

TCP SYN ACK ACK attack—The attacker initiates Telnet or FTP connections with the target without completing the connections. The target's session table can fill up, resulting in the device rejecting legitimate connection requests.

TCP SYN FIN attack—The attacker sends the target TCP packets that have both the SYN and the FIN bits set. This can cause unpredictable behavior on the target, depending on its TCP stack implementation.

SYN fragment attack—The attacker sends the target SYN packet fragments. The target caches SYN fragments, waiting for the remaining fragments to arrive so it can reassemble them and complete the connection. A flood of SYN fragments eventually fills the host's memory buffer, preventing valid traffic connections.

TCP no flag attack—The attacker sends the target TCP packets containing no flags. This can cause unpredictable behavior on the target, depending on its TCP stack implementation.

TCP WinNuke attack—The attacker sends a TCP segment with the urgent (URG) flag set and destined for port 139 of a target running Windows. This might cause the target machine to crash.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services

IN THIS SECTION

Configuring the IDS Screen Name, Direction, and Alarm Option

Configure the IDS screen name, traffic direction, and optional alarm.

1. Specify a name for the IDS screen.

```
[edit services screen]
user@host# set ids-option screen-name
```

2. Specify whether the IDS screen is applied to input traffic, output traffic, or both.

```
[edit services screen ids-option screen-name]
user@host# set match-direction (input | input-output |output)
```

3. If you want the IDS screen to log an alarm when packets exceed the session limit, rather than drop packets, configure **alarm-without-drop**.

```
[edit services screen ids-option screen-name]
user@host# set alarm-without-drop
```

Configuring Session Limits in the IDS Screen

You can use IDS screens to set session limits for traffic from individual addresses or subnets and to individual addresses or subnets. This protects against network probing and flooding attacks. Table 7 on page 154 shows the session limit options that protect against some common network probing and flooding attacks.

Table 7: IDS Screen Options for Network Attacks Type

Network Attack Type	**[edit services screen ids-options *screen-name* limit-sessions]** Options to Set

ICMP Address Sweep	by-source by-protocol icmp {
	maximum-sessions *number*;
	packet-rate *number*;
	session-rate *number*;
	}

ICMP Flood	by-destination by-protocol icmp {
	maximum-sessions *number*;
	packet-rate *number*;
	session-rate *number*;
	}

TCP Port Scan	(by-destination | by-source) by-protocol tcp {
	maximum-sessions *number*;
	packet-rate *number*;
	}

TCP SYN Flood	(by-destination | by-source) by-protocol tcp {
	maximum-sessions *number*;
	packet-rate *number*;
	session-rate *number*;
	}

UDP Flood	by-destination by-protocol udp {
	maximum-sessions *number*;
	packet-rate *number*;
	session-rate *number*;
	}

To configure the session limits in an IDS screen:

1. If you want to apply session limits to an aggregation of all sessions to individual destination subnets or from individual source subnets rather than individual addresses, configure aggregation.
   a. To apply session limits to an aggregation of all sessions from within an individual IPv4 subnet, specify the subnet prefix length. The range is from 1 through 32.

```
[edit services screen ids-option screen-name aggregations]
user@host# set source-prefix-mask prefix-value
```

For example, the following statement configures an IPv4 prefix length of 24, and sessions from 192.0.2.2 and 192.0.2.3 are counted as sessions from the 192.0.2.0/24/24 subnet.

```
[edit services screen ids-option screen1 aggregations]
user@host# set source-prefix-mask 24
```

b. To apply session limits to an aggregation of all sessions from within an individual IPv6 subnet, specify the subnet prefix length. The range is from 1 through 128.

```
[edit services screen ids-option screen-name aggregations]
user@host# set source-prefix-ipv6-mask prefix-value
```

For example, the following statement configures an IPv6 prefix length of 64, and sessions from 2001:db8:1234:72a2::2 and 2001:db8:1234:72a2::3 are counted as sessions from the 2001:db8:1234:72a2::/64 subnet.

```
[edit services screen ids-option screen1 aggregations]
user@host# set source-prefix-ipv6-mask 64
```

c. To apply session limits to an aggregation of all sessions to an individual IPv4 subnet, specify the subnet prefix length. The range is from 1 through 32.

```
[edit services screen ids-option screen-name aggregations]
user@host# set destination-prefix-mask prefix-value
```

d. To apply session limits to an aggregation of all sessions to an individual IPv6 subnet, specify the subnet prefix length. The range is from 1 through 128.

```
[edit services screen ids-option screen-name aggregations]
user@host# set destination-prefix-ipv6-mask prefix-value
```

2. If you want to apply session limits from a source for a particular IP protocol:

   a. Configure the maximum number of concurrent sessions allowed from an individual source IP address or subnet for a particular IP protocol.

```
[edit services screen ids-option screen-name limit-session by-source ]
user@host# set by-protocol (icmp | tcp | udp) maximum-sessions number
```

b. Configure the maximum number of packets per second allowed from an individual source IP address or subnet for a particular protocol.

```
[edit services screen ids-option screen-name limit-session by-source ]
user@host# set by-protocol (icmp | tcp | udp) packet-rate number
```

c. Configure the maximum number of connections per second allowed from an individual source IP address or subnet for a particular protocol.

```
[edit services screen ids-option screen-name limit-session by-source ]
user@host# set by-protocol (icmp | tcp | udp) session-rate number
```

3. If you want to apply session limits to a destination for a particular IP protocol:

a. Configure the maximum number of concurrent sessions allowed to an individual destination IP address or subnet for a particular IP protocol.

```
[edit services screen ids-option screen-name limit-session by-destination]
user@host# set by-protocol (icmp | tcp | udp) maximum-sessions number
```

b. Configure the maximum number of packets per second allowed to an individual destination IP address or subnet for a particular protocol.

```
[edit services screen ids-option screen-name limit-session by-destination ]
user@host# set by-protocol (icmp | tcp | udp) packet-rate number
```

c. Configure the maximum number of connections per second allowed to an individual destination IP address or subnet for a particular protocol.

```
[edit services screen ids-option screen-name limit-session by-destination ]
user@host# set by-protocol (icmp | tcp | udp) session-rate number
```

4. If you want to apply session limits from a source regardless of the IP protocol:

a. Configure the maximum number of concurrent sessions allowed from an individual source IP address or subnet.

```
[edit services screen ids-option screen-name limit-session by-source ]
user@host# set maximum-sessions number
```

b. Configure the maximum number of packets per second allowed from an individual source IP address or subnet

```
[edit services screen ids-option screen-name limit-session by-source ]
user@host# set packets-rate number
```

c. Configure the maximum number of connections per second allowed from an individual source IP address or subnet.

```
[edit services screen ids-option screen-name limit-session by-source ]
user@host# set session-rate number
```

5. If you want to apply session limits to a destination regardless of the IP protocol:

a. Configure the maximum number of concurrent sessions allowed to an individual destination IP address or subnet.

```
[edit services screen ids-option screen-name limit-session by-destination ]
user@host# set maximum-sessions number
```

b. Configure the maximum number of packets per second allowed to an individual destination IP address or subnet

```
[edit services screen ids-option screen-name limit-session by-destination ]
user@host# set packets-rate number
```

c. Configure the maximum number of connections per second allowed to an individual destination IP address or subnet.

```
[edit services screen ids-option screen-name limit-session by-destination]
user@host# set session-rate number
```

6. Specify the services card CPU utilization percentage that triggers the installation of a dynamic filter on the PFEs of the line cards for suspicious traffic. The default value is 90.

```
[edit services screen]
user@host# set cpu-throttle percentage percent
```

In addition to the CPU utilization percentage threshold, the packet rate or connection rate for an individual source or destination address must exceed four times the session limit in the IDS screen before the dynamic filter is installed. Dynamic filters are not created from IDS screens that use subnet aggregation.

The dynamic filter drops the suspicious traffic at the PFE, without the traffic being processed by the IDS screen. When the packet or connection rate no longer exceeds four times the limit in the IDS screen, the dynamic filter is removed.

Configuring Suspicious Packet Pattern Detection in the IDS Screen

You can use IDS screens to identify and drop suspicious packets. This protects against attackers that craft unusual packets to launch denial-of-service attacks.

To configure suspicious pattern detection:

1. To protect against ICMP fragmentation attacks, identify and drop ICMP packets that are IP fragments.

   ```
   [edit services screen ids-option screen-name icmp]
   user@host# set fragment
   ```

2. To identify and drop malformed ICMPv6 packets, configure **icmpv6-malformed**.

   ```
   [edit services screen ids-option screen-name icmp]
   user@host# set icmpv6-malformed
   ```

3. To protect against ICMP large packet attacks, identify and drop ICMP packets that are larger than 1024 bytes.

   ```
   [edit services screen ids-option screen-name icmp]
   user@host# set large
   ```

4. To protect against ping of death attacks, identify and drop oversized and irregular ICMP packets.

   ```
   [edit services screen ids-option screen-name icmp]
   user@host# set ping-death
   ```

5. To protect against bad option attacks, identify and drop packets with incorrectly formatted IPv4 options or IPv6 extension headers.

```
[edit services screen ids-option screen-name ip]
user@host# set bad-option
```

6. To identify and drop fragmented IP packets, configure **block-frag**.

```
[edit services screen ids-option screen-name ip]
user@host# set block-frag
```

7. To drop IPv6 packets with particular extension header values, specify the values.

```
[edit services screen ids-option screen-name ip]
user@host# set ipv6-extension-header header
```

The following header values can be configured:

ah-header—Authentication Header extension header

esp-header—Encapsulating Security Payload extension header

fragment-header—Fragment Header extension header

hop-by-hop-header—Hop-by-Hop option with the specified option:

CALIPSO-option—Common Architecture Label IPv6 Security Option

jumbo-payload-option—IPv6 jumbo payload option

quick-start-option—IPv6 quick start option

router-alert-option—IPv6 router alert option

RPL-option—Routing Protocol for Low-Power and Lossy Networks option

SFM-DPD-option—Simplified Muliticast Forwarding IPv6 Duplicate Packet Detection option

user-defined-option-type *type-low* to *type-high*—A range of header types

Range: 1 through 255.

mobility-header—Mobility Header extension header.

routing-header—Routing Header extension header.

8. To drop IPv4 packets with particular IPv4 option values, specify the values.

```
[edit services screen ids-option screen-name ip]
user@host# set option
```

The following IPv4 option values can be configured:

loose-source-route-option— IP option of 3 (Loose Source Routing)

record-route-option— IP option of 7 (Record Route)

security-option— IP option of 2 (Security)

source-route-option—IP option of 3 (Loose Source Routing) or the IP option of 9 (Strict Source Routing)

stream-option—IP option of 8 (Stream ID)

strict-source-route-option—IP option of 9 (Strict Source Routing)

timestamp-option—IP option of 4 (Internet timestamp)

9. To protect against IP teardrop attacks, identify and drop fragmented IP packets that overlap.

```
[edit services screen ids-option screen-name ip]
user@host# set tear-drop
```

10. To protect against IP unknown protocol attacks, identify and drop IP frames with protocol numbers greater than 137 for IPv4 and 139 for IPv6.

```
[edit services screen ids-option screen-name ip]
user@host# set unknown-protocol
```

11. To protect against TCP FIN No ACK Attacks, identify and drop any packet with the FIN flag set and without the ACK flag set.

```
[edit services screen ids-option screen-name tcp]
user@host# set fin-no-ack
```

12. To protect against land attacks, identify and drop SYN packets that have the same source and destination address or port.

```
[edit services screen ids-option screen-name tcp]
user@host# set land
```

13. To protect against TCP SYN ACK ACK attacks, configure the maximum number of connections from an IP address that can be opened without being completed.

```
[edit services screen ids-option screen-name tcp]
user@host# set syn-ack-ack-proxy number
```

14. To protect against TCP SYN FIN attacks, identify and drop packets that have both the SYN and FIN flags set.

```
[edit services screen ids-option screen-name tcp]
user@host# set syn-fin
```

15. To protect against SYN fragment attacks, identify and drop SYN packet fragments.

```
[edit services screen ids-option screen-name tcp]
user@host# set syn-frag
```

16. To protect against TCP no flag attacks, identify and drop TCP packets that have no flag fields set.

```
[edit services screen ids-option screen-name tcp]
user@host# set tcp-no-flag
```

17. To protect against TCP WinNuke attacks, identify and drop TCP segments that are destined for port 139 and have the urgent (URG) flag set.

```
[edit services screen ids-option screen-name tcp]
user@host# set winnuke
```

Configuring the Service Set for IDS

Configure a service set to apply the IDS screen.

1. Assign the IDS screen to a service set.

```
[edit services]
user@host# set service-set service-set-name ids-option screen-name
```

If the service set is associated with an AMS interface, then the session limits you configure are applicable to each member interface.

2. Limit the packets that the IDS screen processes by configuring a stateful firewall rule . The stateful firewall rule can identify either the traffic that should undergo IDS processing or the traffic that should skip IDS processing:

   - To allow IDS processing on the traffic that matches the stateful firewall rule, include **accept** at the **[edit services stateful-firewall rule *rule-name* term *term-name* then]** hierarchy level.
   - To skip IDS processing on the traffic that matches the stateful firewall rule, include **accept skip-ids** at the **[edit services stateful-firewall rule *rule-name* term *term-name* then]** hierarchy level.

3. Assign the stateful firewall rule to the service set.

   ```
   [edit services]
   user@host# set service-set service-set-name stateful-firewall-rules rule-name
   ```

4. To protect against header anomaly attacks, configure a header integrity check for the service set.

   ```
   [edit services]
   user@host# set service-set service-set-name service-set-options header-integrity-check enable-all
   ```

RELATED DOCUMENTATION

Understanding IDS Screens for Network Attack Protection | 149

5

PART

Traffic Load Balancing

CHAPTER 19

Traffic Load Balancing Overview and Configuration

IN THIS CHAPTER

Traffic Load Balancer Overview

IN THIS SECTION

Traffic Load Balancer Application Description

Traffic Load Balancer (TLB) is supported on MX Series routers with Multiservices Modular Port Concentrator (MS-MPC) and Modular Port Concentrator (MPC) line cards, as well as the Services Processing Card (MX-SPC3) when running Next Gen Services on MX Series routers (MX480 and MX960). TLB enables you to distribute traffic among multiple servers.

TLB employs an MS-MPC-based control plane and a data plane using the MX Series router forwarding engine.

TLB uses an enhanced version of equal-cost multipath (ECMP). Enhanced ECMP facilitates the distribution of flows across groups of servers. Enhancements to native ECMP ensure that when servers fail, only flows associated with those servers are impacted, minimizing the overall network churn on services and sessions.

TLB provides application-based health monitoring for up to 255 servers per group, providing Intelligent traffic steering based on health checking of server availability information. You can configure an aggregated multiservices (AMS) interface to provide one-to-one redundancy for MS-MPCs or Next Gen Services MX-SPC3 services card used for server health monitoring.

TLB applies its flow distribution processing to ingress traffic.

TLB supports multiple virtual routing instances to provide improved support for large scale load balancing requirements.

TLB supports static virtual-IP-address-to-real-IP-address translation, and static destination port translation during load balancing.

Traffic Load Balancer Modes of Operation

IN THIS SECTION

Traffic Load Balancer provides three modes of operation for the distribution of outgoing traffic and for handling the processing of return traffic.

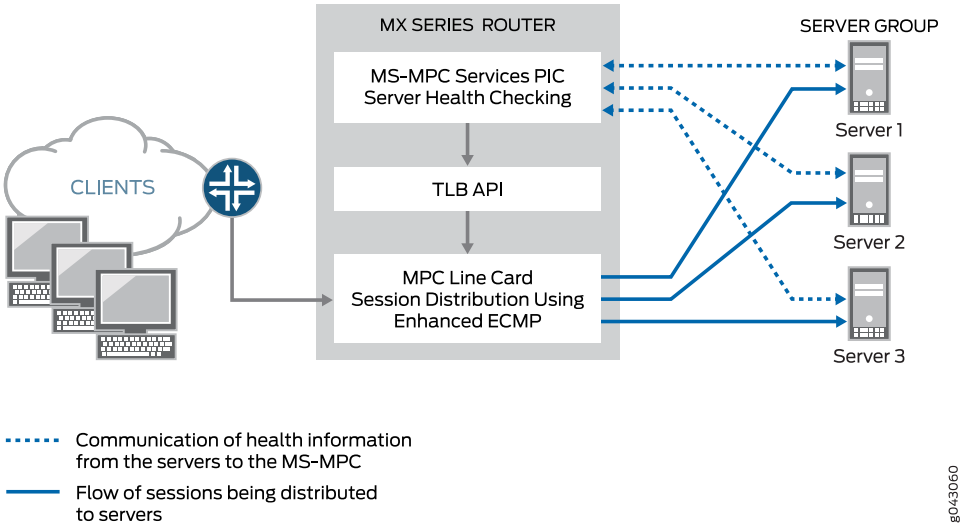
Transparent Mode Layer 2 Direct Server Return

When you use transparent mode Layer 2 direct server return (DSR):

- The PFE processes data.
- Load balancing works by changing the Layer 2 MAC of packets.
- An MS-MPC performs the network-monitoring probes.
- Real servers must be directly (Layer 2) reachable from the MX Series router.
- TLB installs a route and all the traffic over that route is load-balanced.
- TLB never modifies Layer 3 and higher level headers.

Figure 4 on page 167 shows the TLB topology for transparent mode Layer 2 DSR.

Figure 4: TLB Topology for Transparent Mode



Translated Mode

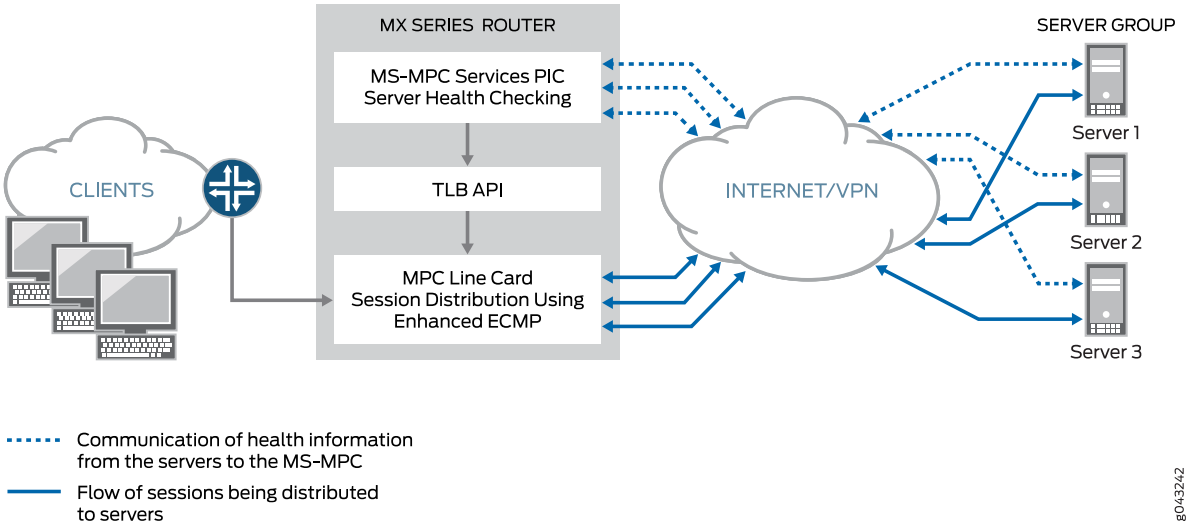
Translated mode provides greater flexibility than transparent mode Layer 2 DSR. When you choose translated mode:

- An MS-MPC performs the network-monitoring probes.
- The PFE performs stateless load balancing:
  - Data traffic directed to a virtual IP address undergoes translation of the virtual IP address to a real server IP address and translates the virtual port to a server listening port. Return traffic undergoes the reverse translation.
  - Client to virtual IP traffic is translated; the traffic is routed to reach its destination.
  - Server-to-client traffic is captured using implicit filters and directed to an appropriate load-balancing next hop for reverse processing. After translation, traffic is routed back to the client.
  - Two load balancing methods are available: random and hash. The random method is only for UDP traffic and provides quavms-random distribution. While not literally random, this mode provides fair distribution of traffic to an available set of servers. The hash method provides a hash key based on any combination of the source IP address, destination IP address, and protocol.

> **NOTE:** Translated mode processing is only available for IPv4-to-IPv4 and IPv6-to-IPv6 traffic.

Figure 5 on page 168 shows the TLB topology for translated mode.

Figure 5: TLB Topology for Translated Mode



Transparent Mode Layer 3 Direct Server Return

Transparent mode Layer 3 DSR load balancing distributes sessions to servers that can be a Layer 3 hop away. Traffic is returned directly to the client from the real-server.

Traffic Load Balancer Functions

TLB provides the following functions:

- TLB always distributes the *requests* for any flow. When you specify DSR mode, the response returns directly to the source. When you specify translated mode, reverse traffic is steered through implicit filters on server-facing interfaces.
- TLB supports hash-based load balancing or random load balancing.
- TLB enables you to configure servers offline to prevent a performance impact that might be caused by a rehashing for all existing flows. You can add a server in the administrative down state and use it later for traffic distribution by disabling the administrative down state. Configuring servers offline helps prevent traffic impact to other servers.
- When health checking determines a server to be down, only the affected flows are rehashed.
- When a previously down server is returned to service, all flows belonging to that server based on hashing return to it, impacting performance for the returned flows. For this reason, you can disable the automatic rejoining of a server to an active group. You can return servers to service by issuing the **request services traffic-load-balance real-service rejoin** operational command.

> **NOTE:** NAT is not applied to the distributed flows.

- Health check monitoring application runs on an MS-MPC/NPU. This network processor unit (NPU) is not used for handling data traffic.
- TLB supports static virtual-IP-adddress-to-real-IP-address translation, and static destination port translation during load balancing.
- TLB provides multiple VRF support.

RELATED DOCUMENTATION

Interchassis High-Availability

Understanding AMS Interfaces

Traffic Load Balancer Application Components

Servers and Server Groups

TLB enables configuration of groups of up to 255 servers (referred to in configuration statements as *real services*) for use as alternate destinations for stateless session distribution. All servers used in server groups must be individually configured before assignment to groups. Load balancing uses hashing or randomization for session distribution. Users can add and delete servers to and from the TLB server distribution table and can also change the administrative status of a server.

> **NOTE:** TLB uses the session distribution next-hop API to update the server distribution table and retrieve statistics. *Applications do not have direct control on the server distribution table management. They can only influence changes indirectly through the add and delete services of the TLB API.*

Server Health Monitoring — Single Health Check and Dual Health Check

TLB supports TCP, HTTP, SSL Hello, and custom health check probes to monitor the health of servers in a group. You can use a single probe type for a server group, or a dual health check configuration that includes two probe types. The configurable health monitoring function resides on either an MX-SPC3 or an MS-MPC. By default, probe requests are sent every 5 seconds. Also by default, a real server is declared down only after five consecutive probe failures and declared up only after five consecutive probe successes.

Use a custom health check probe to specify the following:

- Expected string in the probe response
- String that is sent with the probe
- Server status to assign when the probe times out (up or down)

- Server status to assign when the expected response to the probe is received (up or down)
- Protocol — UDP or TCP

TLB provides *application stickiness*, meaning that server failures or changes do not affect traffic flows to other active servers. Changing a server's administrative state from up to down does not impact any active flows to remaining servers in the server distribution table. Adding a server or deleting a server from a group has some traffic impact for a length of time that depends on your configuration of the interval and retry parameters in the monitoring profile.

TLB provides two levels of server health monitoring:

- Single Health Check—One probe type is attached to a server group by means of the **network-monitoring-profile** configuration statement.
- TLB Dual Health Check (TLB-DHC)—Two probe types are associated with a server group by means of the **network-monitoring-profile** configuration statement. A server's status is declared based on the result of two health check probes. Users can configure up to two health check profiles per server group. If a server group is configured for dual health check, a real-service is declared to be UP only when both health-check probes are simultaneously UP; otherwise, a real-service is declared to be DOWN.

> **NOTE:**
> The following restrictions apply to AMS interfaces used for server health monitoring:
>
> - An AMS interface configured under a TLB instance uses its configured member interfaces exclusively for health checking of configured multiple real servers.
> - The member interfaces use unit 0 for single VRF cases, but can use units other than 1 for multiple VRF cases.
> - TLB uses the IP address that is configured for AMS member interfaces as the source IP address for health checks.
> - The member interfaces must be in the same routing instance as the interface used to reach real servers. This is mandatory for TLB server health-check procedures.

Virtual Services

The virtual service provides a virtual IP address (VIP) that is associated with the group of servers to which traffic is directed as determined by hash-based or random session distribution and server health monitoring. In the case of Layer2 DSR and Layer3 DSR, the special address 0.0.0.0 causes all traffic flowing to the forwarding instance to be load balanced.

The virtual service configuration includes:

- Mode—indicating how traffic is handled (translated or transparent).
- The group of servers to which sessions are distributed.

- The load balancing method.
- Routing instance and route metric.

> **BEST PRACTICE:** Although you can assign a virtual address of 0.0.0.0 in order to use default routing, we recommend using a virtual address that can be assigned to a routing instance set up specifically for TLB.

Traffic Load Balancer Configuration Limits

Traffic Load Balancer configuration limits are described in Table 8 on page 171.

Table 8: TLB Configuration Limits

Configuration Component	Configuration Limit
Maximum number of instances.	Starting in Junos OS Release 16.1R6 and Junos OS Release 18.2R1, the TLB application supports 2000 TLB instances for virtual services that use the direct-server-return or the translated mode. In earlier releases, the maximum number of instances is 32. If multiple virtual services are using the same server group, then all of those virtual services must use the same load balancing method to support 2000 TLB instances. For virtual services that use the layer2-direct-server-return mode, TLB supports only 32 TLB instances. To perform the same function as the layer2-direct-server-return mode and have support for 2000 TLB instances, you can use the direct-server-return mode and use a service filter with the skip action.
Maximum number of servers per group	255
Maximum number of virtual services per services PIC	32
Maximum number of health checks per services PIC in a 5-second interval	For MS-MPC services cards: 2000 For Next Gen Services mode and the MX-SPC3 services cards: 1250
Maximum number of groups per virtual service	1

Table 8: TLB Configuration Limits *(continued)*

Configuration Component	Configuration Limit
Maximum number of virtual IP addresses per virtual service	1
Supported health checking protocols	ICMP, TCP, HTTP, SSL, Custom **NOTE:** ICMP health checking is supported only on MS-MPC services cards.

Release History Table

Release	Description
16.1R6	Starting in Junos OS Release 16.1R6 and Junos OS Release 18.2R1, the TLB application supports 2000 TLB instances for virtual services that use the direct-server-return or the translated mode.

RELATED DOCUMENTATION

Configuring TLB | **172**

Configuring TLB

IN THIS SECTION

The following topics describe how to configure TLB. To create a complete application, you must also define interfaces and routing information. You can optionally define firewall filters and policy options in order to differentiate TLB traffic.

Loading the TLB Service Package

Load the TLB service package on each service PIC on which you want to run TLB.

> **NOTE:** For Next Gen Services and the MX-SPC3 services card, you do not need to load this package.

To load the TLB service package on a service PIC:

- Load the **jservices-traffic-dird** package.

```
[edit chassis fpc slot-number pic pic-number adaptive-services service-package extension-provider]
user@host# set package jservices-traffic-dird
```

For example:

```
[edit chassis fpc 3 pic 0 adaptive-services service-package extension-provider]
user@host# set package jservices-traffic-dird
```

Configuring a TLB Instance Name

To configure a name for the TLB instance:

- At the **[edit services traffic-load-balance]** hierarchy level, identify the TLB instance name.

```
[edit services traffic-load-balance]
user@host# set instance instance-name
```

For example:

```
[edit services traffic-load-balance]
user@host# set instance tlb-instance1
```

Configuring Interface and Routing Information

To configure interface and routing information:

1. At the **[edit services traffic-load-balance instance *instance-name*]** hierarchy level, identify the service interface associated with this instance.

   ```
   user@host# [edit services traffic-load-balance instance instance-name]
   user@host# set interface interface-name
   ```

   For example, on an MS-MPC:

   ```
   [edit services traffic-load-balance instance tlb-instance1]
   user@host# set interface ms-1/0/0
   ```

   For example, for Next Gen Services on an MX-SPC3:

   ```
   [edit services traffic-load-balance instance tlb-instance1]
   user@host# set interface vms-1/0/0
   ```

2. Enable the routing of health-check packet responses from real servers to the service interface that you identified in Step 1.

   ```
   [edit interfaces]
   user@host# set interface-name unit 0 ip-address-owner service-plane
   ```

   For example, on an MS-MPC:

   ```
   [edit interfaces]
   user@host# set ms-1/0/0 unit 0 ip-address-owner service-plane
   ```

   For example, on an MX-SPC3:

   ```
   [edit interfaces]
   user@host# set vms-1/0/0 unit 0 ip-address-owner service-plane
   ```

3. Specify the client interface for which an implicit filter is defined to direct traffic in the forward direction. This is required only for translated mode.

   ```
   user@host# [edit services traffic-load-balance instance instance-name]
   user@host# set client-interface interface-name
   ```

For example:

```
[edit services traffic-load-balance instance tlb-instance1]
user@host# set client-interface ge-5/2/0.0
```

4. Specify the virtual routing instance used to route data traffic in the forward direction to servers. This is required for SLT and Layer 3 DSR; it is optional for Layer 2 DSR.

```
user@host# [edit services traffic-load-balance instance instance-name]
user@host# set server-vrf server-vrf
```

For example:

```
[edit services traffic-load-balance instance tlb-instance1]
user@host# set server-vrf server-vrf
```

5. Specify the server interface for which implicit filters are defined to direct return traffic to the client.

> **NOTE:** Implicit filters for return traffic are not used for DSR.

```
user@host# [edit services traffic-load-balance instance instance-name]
user@host# set server-interface server-interface
```

For example:

```
[edit services traffic-load-balance instance tlb-instance1]
user@host# set server-interface ge-5/2/1.0
```

6. (Optional) Specify the filter used to bypass health checking for return traffic.

```
user@host# [edit services traffic-load-balance instance instance-name]
user@host# set server-inet-bypass-filter server-inet-bypass-filter
```

For example:

```
[edit services traffic-load-balance instance tlb-instance1]
user@host# set server-inet-bypass-filter tlb-ipv4-bypass
```

7. Specify the virtual routing instance in which you want the data in the reverse direction to be routed to the clients.

```
user@host# [edit services traffic-load-balance instance instance-name]
user@host# set client-vrf client-vrf
```

For example:

```
[edit services traffic-load-balance instance tlb-instance1]
user@host# set client-vrf client-vrf
```

> **NOTE:** Virtual routing instances for routing data in the reverse direction are not used with DSR.

Configuring Servers

To configure servers for the TLB instance:

- Configure a logical name and IP address for each server to be made available for next-hop distribution.

```
[edit services traffic-load-balance instance instance-name]
user@host# set real-service real-service-name address server-ip-address
```

For example:

```
[edit services traffic-load-balance instance tlb-instance1]
user@host# set real-service rs138 address 172.26.99.138
user@host# set real-service rs139 address 172.26.99.139
user@host# set real-service rs140 address 172.26.99.140
```

Configuring Network Monitoring Profiles

A network monitoring profile configures a health check probe, which you assign to a server group to which session traffic is distributed.

To configure a network monitoring profile:

1. Configure the type of probe to use for health monitoring — **icmp**, **tcp**, **http**, **ssl-hello**, or **custom**.

   > **NOTE:** **icmp** probes are supported only on MS-MPC cards.
   >
   > Next Gen Services and the MX-SPC3 do not support ICMP probes in this release.

   - For an ICMP probe:

     ```
     [edit services network-monitoring profile profile-name]
     user@host.com# set icmp
     ```

   - For a TCP probe:

     ```
     [edit services network-monitoring profile profile-name]
     user@host.com# set tcp port tcp-port-number
     ```

   - For an HTTP probe:

     ```
     [edit services network-monitoring profile profile-name]
     user@host.com# set http host hostname url url port http-port-number method (get | option)
     ```

   - For an SSL probe:

     ```
     [edit services network-monitoring profile profile-name]
     user@host.com# set ssl-hello port port ssl-version
     ```

   - For a custom probe:

     ```
     [edit services network-monitoring profile profile-name]
     user@host.com# set custom cmd priority default-real-service-status (down | up) expect (ascii | binary)
       receive-string port port real-service-action (down | up) send (ascii | binary) send-string
     ```

2. Configure the interval for probe attempts, in seconds (1 through 180).

   ```
   [edit services network-monitoring profile profile-name]
   ```

```
user@host.com# set probe-interval interval
```

For example:

```
[edit services network-monitoring profile profile1-icmp]
user@host.com# set probe-interval 2
```

3. Configure the number of failure retries, after which the real server is tagged as down.

```
[edit services network-monitoring profile profile-name]
user@host.com# set failure-retries number-of-retries
```

For example:

```
[edit services network-monitoring profile profile1-icmp]
user@host.com# set failure-retries 3
```

4. Configure the number of recovery retries, which is the number of successful probe attempts after which the server is declared up.

```
[edit services network-monitoring profile profile-name]
user@host.com# set recovery-retries number-of-retries
```

For example:

```
[edit services network-monitoring profile profile1-icmp]
user@host.com# set recovery-retries 1
```

Configuring Server Groups

Server groups consist of servers to which traffic is distributed by means of stateless, hash-based session distribution and server health monitoring.

To configure a server group:

1. Specify the names of one or more configured real servers.

```
[edit services traffic-load-balance instance instance-name groups group-name]
user@host.com# set real-services real-service-name, ...
```

For example:

```
[edit services traffic-load-balance instance tlb-instance1 groups tlb-group1]
user@host.com# set real-services [ rs138 rs139 rs140 ]
```

2. Configure the routing instance for the group when you do not want to use the default instance, **inet.0**.

```
[edit services traffic-load-balance instance instance-name groups group-name]
user@host.com# set routing-instance routing-instance-name
```

For example:

```
[edit services traffic-load-balance instance tlb-instance1 groups tlb-group1]
user@host.com# set routing-instance tlb-routing-instance1
```

3. (Optional) Disable the default option that allows a server to rejoin the group automatically when it comes up.

```
[edit services traffic-load-balance instance instance-name group group-name]
user@host.com# set real-service-rejoin-options no-auto-rejoin
```

4. (Optional) Configure the logical unit of the instance's service interface to use for health checking.
   a. Specify the logical unit.

```
[edit services traffic-load-balance instance instance-name group group-name]
user@host.com# set health-check-interface-subunit health-check-interface-subunit
```

   b. Enable the routing of health-check packet responses from real servers to the interface.

```
[edit interfaces]
user@host.com# set interface-name unit subunit ip-address-owner service-plane
```

For example:

```
[edit services traffic-load-balance instance tlb-instance1 group tlb-group1]
user@host.com# set health-check-interface-subunit 30
[edit interfaces]
user@host.com# set ms-1/0/0 unit 30 ip-address-owner service-plane
```

5. Configure one or two network monitoring profiles to be used to monitor the health of servers in this group.

```
[edit services traffic-load-balance instance instance-name groups group-name]
user@host.com# set network-monitoring-profile profile-name1 profile-name2
```

For example:

```
[edit services traffic-load-balance instance tlb-instance1 groups tlb-group1]
user@host.com# set network-monitoring-profile profile1-icmp profile2-http
```

Configuring Virtual Services

A virtual service provides an address that is associated with a the group of servers to which traffic is directed as determined by hash-based or random session distribution and server health monitoring. You may optionally specify filters and routing instances to steer traffic for TLB.

To configure a virtual service:

1. At the **[edit services traffic-load-balance instance *instance-name*]** hierarchy level, specify a non-zero address for the virtual service.

```
[edit services traffic-load-balance instance instance-name virtual-service virtual-service-name]
user@host# set address virtual-ip–address
```

For example:

```
[edit services traffic-load-balance instance tlb-instance1 virtual-service virtual-service1]
user@host# set address 192.0.2.11
```

2. Specify the server group used for this virtual service.

```
[edit services traffic-load-balance instance instance-name virtual-service virtual-service-name]
user@host# set group group-name
```

For example:

```
[edit services traffic-load-balance instance tlb-instance1 virtual-service virtual-service1]
user@host# set group tlb-group1
```

3. (Optional) Specify a routing instance for the virtual service. If you do not specify a routing instance, the default routing instance is used.

   ```
   [edit services traffic-load-balance instance instance-name virtual-service virtual-service-name]
   user@host# set routing-instance routing-instance
   ```

   For example:

   ```
   [edit services traffic-load-balance instance tlb-instance1 virtual-service virtual-service1]
   user@host# set routing-instance msp-tproxy-server-vrf31
   ```

4. Specify the processing mode for the virtual service.

   ```
   [edit services traffic-load-balance instance instance-name virtual-service virtual-service-name]
   user@host# set mode (layer2-direct-server-return | direct-server-return | translated)
   ```

   For example:

   ```
   [edit services traffic-load-balance instance tlb-instance1 virtual-service virtual-service1]
   user@host# set mode translated
   ```

5. (Optional) For a translated mode virtual service, enable the addition of the IP addresses for all the real servers in the group under the virtual service to the server-side filters. Doing this allows you to configure two virtual services with the same listening port and protocol on the same interface and VRF.

   ```
   [edit services traffic-load-balance instance instance-name virtual-service virtual-service-name]
   user@host# set include-real-server-ips-in-server-filter
   ```

6. (Optional) Specify a routing metric for the virtual service.

   ```
   [edit services traffic-load-balance instance instance-name virtual-service virtual-service-name]
   user@host# set routing-metric routing-metric
   ```

   For example:

   ```
   [edit services traffic-load-balance instance tlb-instance1 virtual-service virtual-service1]
   user@host# set routing-metric 128
   ```

7. Specify the method used for load balancing. You can specify a hash method that provides a hash key based on any combination of the source IP address, destination IP address, and protocol, or you can specify **random**.

```
[edit services traffic-load-balance instance tlb-instance1 virtual-service virtual-service1]
user@host# set load-balancing-method (hash hash-key (source-ip | destination-ip | proto) | random)
```

For example:

```
[edit services traffic-load-balance instance tlb-instance1 virtual-service virtual-service1]
user@host# set load-balancing-method hash hash-key source-ip
```

or

```
[edit services traffic-load-balance instance tlb-instance1 virtual-service virtual-service1]
user@host# set load-balancing-method random
```

> **NOTE:** If you switch between the hash method and the random method for a virtual service, the statistics for the virtual service are lost.

8. For a translated mode virtual service, specify a service for translation, including a virtual-port, server-listening-port, and protocol.

```
[edit services traffic-load-balance instance instance-name virtual-service virtual-service-name]
user@host# set service service-name virtual-port virtual-port server-listening-port server-listening-port protocol
   (udp | tcp)
```

For example:

```
[edit services traffic-load-balance instance tlb-instance1 virtual-service virtual-service1]
user@host# set service fast-track-service virtual-port 1111 server-listening-port 22 protocol tcp
```

9. Commit the configuration.

```
[edit services traffic-load-balance instance instance-name virtual-service virtual-service-name]
user@host# commit
```

NOTE: In the absence of a client-interface configuration under the TLB instance, the implicit client filter (for VIP) is attached to the client-vrf configured under the TLB instance. In this case, the routing-instance under a translate mode virtual service cannot be the same as the client-vrf configured under the TLB instance. if it is, the commit fails.

Configuring Tracing for the Health Check Monitoring Function

To configure tracing options for the health check monitoring function:

1. Specify that you want to configure tracing options for the health check monitoring function.

```
[edit services network-monitoring]
user@host# edit traceoptions
```

2. (Optional) Configure the name of the file used for the trace output.

```
[edit services network-monitoring traceoptions]
user@host# set file file-name
```

3. (Optional) Disable remote tracing capabilities.

```
[edit services network-monitoring traceoptions]
user@host# set no-remote-trace
```

4. (Optional) Configure flags to filter the operations to be logged.

```
[edit services network-monitoring traceoptions]
user@host# set flag flag
```

Table 9 on page 183 describes the flags that you can include.

Table 9: Trace Flags

Flag	Support on MS-MPC and MX-SPC3 Cards	Description
all	MS-MPC and MX-SPC3	Trace all operations.
all-real-services	MX-SPC3	Trace all real services.

Table 9: Trace Flags *(continued)*

Flag	Support on MS-MPC and MX-SPC3 Cards	Description
config	MS-MPC and MX-SPC3	Trace traffic load balancer configuration events.
connect	MS-MPC and MX-SPC3	Trace traffic load balancer ipc events.
database	MS-MPC and MX-SPC3	Trace database events.
file-descriptor-queue	MS-MPC	Trace file descriptor queue events.
inter-thread	MS-MPC	Trace inter-thread communication events.
filter	MS-MPC and MX-SPC3	Trace traffic load balancer filter programming events.
health	MS-MPC and MX-SPC3	Trace traffic load balancer health events.
messages	MS-MPC and MX-SPC3	Trace normal events.
normal	MS-MPC and MX-SPC3	Trace normal events.
operational-commands	MS-MPC and MX-SPC3	Trace traffic load balancer show events.
parse	MS-MPC and MX-SPC3	Trace traffic load balancer parse events.
probe	MS-MPC and MX-SPC3	Trace probe events.
probe-infra	MS-MPC and MX-SPC3	Trace probe infra events.
route	MS-MPC and MX-SPC3	Trace traffic load balancer route events.
snmp	MS-MPC and MX-SPC3	Trace traffic load balancer SNMP events.
statistics	MS-MPC and MX-SPC3	Trace traffic load balancer statistics events.
system	MS-MPC and MX-SPC3	Trace traffic load balancer system events.

5. (Optional) Configure the level of tracing.

```
[edit services network-monitoring traceoptions]
user@host# set level (all |error | info | notice | verbose | warning)
```

6. (Optional) Configure tracing for a particular real server within a particular server group.

```
[edit services network-monitoring traceoptions]
user@host# set monitor monitor-object-name group-name group-name real-services-name real-service-name
```

7. (Optional) Starting in Junos OS Release 16.1R6 and 18.2R1, configure tracing for a particular virtual service and instance.

```
[edit services traffic-load-balance traceoptions]
user@host# set monitor monitor-object-name instance-name instance-name virtual-svc-name
   virtual-service-name
```

Release History Table

Release	Description
16.1R6	Starting in Junos OS Release 16.1R6 and 18.2R1, configure tracing for a particular virtual service and instance.

RELATED DOCUMENTATION

Traffic Load Balancer Overview | 165

PART 6

DNS Request Filtering

CHAPTER 20

DNS Request Filtering Overview and Configuration

IN THIS CHAPTER

DNS Request Filtering for Blacklisted Website Domains

IN THIS SECTION

Overview of DNS Request Filtering

IN THIS SECTION

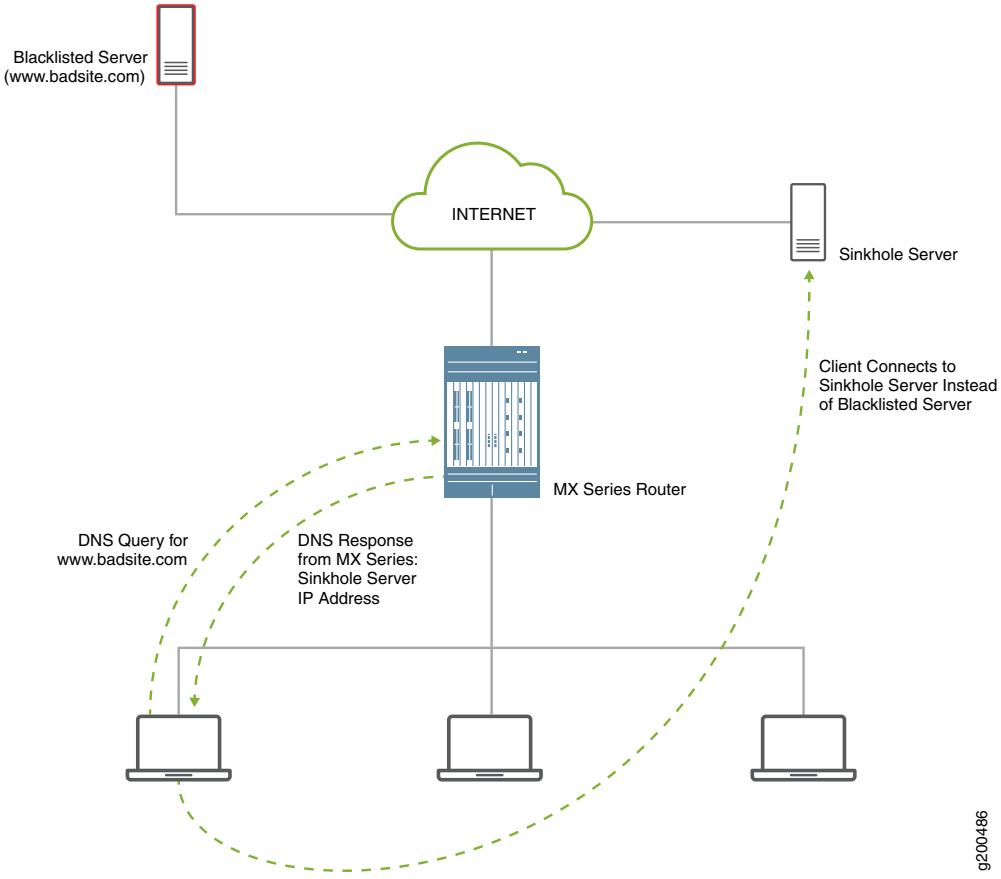
Starting in Junos OS Release 18.3R1, you can configure DNS filtering to identify DNS requests for blacklisted website domains. Starting in Junos OS Release 19.3R2, you can configure DNS filtering if you are running Next Gen Services with the MX-SPC3 services card. Next Gen Services are supported on MX240, MX480 and MX960 routers. For DNS request types A, AAAA, MX, CNAME, TXT, SRV, and ANY, you configure the action to take for a DNS request for a blacklisted domain. You can either:

- Block access to the website by sending a DNS response that contains the IP address or fully qualified domain name (FQDN) of a DNS sinkhole server. This ensures that when the client attempts to send traffic to the blacklisted domain, the traffic instead goes to the sinkhole server (see Figure 6 on page 190).
- Log the request and allow access.

For other DNS request types for a blacklisted domain, the request is logged and access is allowed.

The actions that the sinkhole server takes are not controlled by the DNS request filtering feature; you are responsible for configuring the sinkhole server actions. For example, the sinkhole server could send a message to the requestor that the domain is not reachable and prevent access to the blacklisted domain.

Figure 6: DNS Request for Blacklisted Domain



Benefits

DNS filtering redirects DNS requests for blacklisted website domains to sinkhole servers, while preventing anyone operating the system from seeing the list of blacklisted domains. This is because the blacklisted domain names are in an encrypted format.

Blacklisted Domain Filter Database File

DNS request filtering requires a blacklisted domain filter database .txt file, which identifies each blacklisted domain name, the action to take on a DNS request for the blacklisted domain, and the IP address or fully qualified domain name (FQDN) of a DNS sinkhole server.

DNS Filter Profile

You configure a DNS filter profile to specify which blacklisted domain filter database file to use. You can also specify the interfaces on which DNS request filtering is performed, limit the filtering to requests for specific DNS servers, and limit the filtering to requests from specific source IP address prefixes.

How to Configure DNS Request Filtering

IN THIS SECTION

To filter DNS requests for blacklisted website domains, perform the following:

How to Configure a Domain Filter Database

Create one or more domain filter database files that include an entry for each blacklisted domain. Each entry specifies what to do with a DNS request for a blacklisted website domain.

To configure a domain filter database file:

1. Create the name for the file. The database file name can have a maximum length of 64 characters and must have a **.txt** extension.

2. Add a file header with a format such as **20170314_01:domain,sinkhole_ip,v6_sinkhole,sinkhole_fqdn,id,action**.

3. Add an entry in the file for each blacklisted domain. You can include a maximum of 10,000 domain entries. Each entry in the database file has the following items:

   hashed-domain-name,IPv4 sinkhole address, IPv6 sinkhole address, sinkhole FQDN, ID, action

   where:

- **hashed-domain-name** is a hashed value of the blacklisted domain name (64 hexadecimal characters). The hash method and hash key that you use to produce the hashed domain value are needed when you configure DNS filtering with the Junos OS CLI.
- **IPv4 sinkhole address** is the address of the DNS sinkhole server for IPv4 DNS requests.
- **IPv6 sinkhole address** is the address of the DNS sinkhole server for IPv6 DNS requests.
- **sinkhole FQDN** is the fully qualified domain name of the DNS sinkhole server.
- **ID** is a 32-bit number that uniquely associates the entry with the hashed domain name.
- **action** is the action to apply to a DNS request that matches the blacklisted domain name. If you enter **replace**, the MX Series router sends the client a DNS response with the IP address or FQDN of the DNS sinkhole server. If you enter **report**, the DNS request is logged and then sent to the DNS server.

4. In the last line of the file, include the file hash, which you calculate by using the same key and hash method that you used to produce the hashed domain names.

5. Save the database files on the Routing Engine in the **/var/db/url-filterd** directory.

6. Validate the domain filter database file.

```
user@host> request services web-filter validate dns-filter-file-name filename hash-key key-string hash-method
  hash-method-name
```

7. If you make any changes to the database file, apply the changes.

```
user@host> request services web-filter update dns-filter-database filename
```

How to Configure a DNS Filter Profile

A DNS filter profile includes general settings for filtering DNS requests for blacklisted website domains, and includes up to 32 templates. The template settings apply to DNS requests on specific uplink and downlink logical interfaces or routing instances, or to DNS requests from specific source IP address prefixes, and override the corresponding settings at the DNS profile level. You can configure up to eight DNS filter profiles.

To configure a DNS filter profile:

1. Configure the name for a DNS filter profile:

```
[edit]
user@host# edit services web-filter profile profile-name
```

   The maximum number of profiles is 8.

2. Configure the interval for logging per-client statistics for DNS filtering. The range is 0 through 60 minutes and the default is 5 minutes.

   ```
   [edit services web-filter profile profile-name]
   user@host# set global-dns-stats-log-timer minutes
   ```

3. Configure general DNS filtering settings for the profile. These values are used if a DNS request does not match a specific template.

   a. Specify the name of the domain filter database to use when filtering DNS requests.

      ```
      [edit services web-filter profile profile-name dns-filter]
      user@host# set database-file filename
      ```

   b. (Optional) To limit DNS filtering to DNS requests that are destined for specific DNS servers, specify up to three IP addresses (IPv4 or IPv6).

      ```
      [edit services web-filter profile profile-name dns-filter]
      user@host# set dns-server [ ip-address ]
      ```

   c. Specify the format for the hash key.

      ```
      [edit services web-filter profile profile-name dns-filter]
      user@host# set hash-key ascii-text
      ```

   d. Specify the hash key that you used to create the hashed domain name in the domain filter database file.

      ```
      [edit services web-filter profile profile-name dns-filter]
      user@host# set hash-key key-string
      ```

   e. Specify the hash method that was used to create the hashed domain name in the domain filter database file.

      ```
      [edit services web-filter profile profile-name dns-filter]
      user@host# set hash-method hash-method-name
      ```

      The only supported hash method is **hmac-sha2-256**.

f. Configure the interval for logging statistics for DNS requests and for sinkhole actions performed for each customer IP address. The range is 1 through 60 minutes and the default is 5 minutes.

```
[edit services web-filter profile profile-name dns-filter]
user@host# set statistics-log-timer minutes
```

g. Configure the time to live while sending the DNS response after taking the DNS sinkhole action. The range is 0 through 86,400 seconds and the default is 1800.

```
[edit services web-filter profile profile-name dns-filter]
user@host# set dns-resp-ttl seconds
```

h. Configure the level of subdomains that are searched for a match. The range is 0 through 10. A value of 0 indicates that subdomains are not searched.

```
[edit services web-filter profile profile-name dns-filter]
user@host# set wildcarding-level level
```

For example, if you set the **wildcarding-level** to 4 and the database file includes an entry for **example.com**, the following comparisons are made for a DNS request that arrives with the domain **198.51.100.0.example.com**:

- **198.51.100.0.example.com**: no match
- **51.100.0.example.com**: no match for one level down
- **100.0.example.com**: no match for two levels down
- **0.example.com**: no match for three levels down
- **example.com**: match for four levels down

4. Configure a template. You can configure a maximum of 8 templates in a profile. Each template identifies filter settings for DNS requests on specific uplink and downlink logical interfaces or routing instances, or for DNS requests from specific source IP address prefixes.

a. Configure the name for the template.

```
[edit services web-filter profile profile-name]
user@host# set dns-filter-template template-name
```

b. (Optional) Specify the client-facing logical interfaces (uplink) to which the DNS filtering is applied.

```
[edit services web-filter profile profile-name dns-filter-template template-name]
```

```
user@host# set client-interfaces client-interface-name
```

c. (Optional) Specify the server-facing logical interfaces (downlink) to which the DNS filtering is applied.

```
[edit services web-filter profile profile-name dns-filter-template template-name]
user@host# set server-interfaces server-interface-name
```

d. (Optional) Specify the routing instance for the client-facing logical interface to which the DNS filtering is applied.

```
[edit services web-filter profile profile-name dns-filter-template template-name]
user@host# set client-routing-instance client-routing-instance-name
```

e. (Optional) Specify the routing instance for the server-facing logical interface to which DNS filtering is applied.

```
[edit services web-filter profile profile-name dns-filter-template template-name]
user@host# set server-routing-instance server-routing-instance-name
```

> **NOTE:** If you configure the client and server interfaces or the client and server routing instances, implicit filters are installed on the interfaces or routing instances to direct DNS traffic to the services PIC for DNS filtering. If you configure neither the client and server interfaces nor the routing instances, you must provide a way to direct DNS traffic to the services PIC (for example, via routes).

f. Specify the name of the domain filter database to use when filtering DNS requests.

```
[edit services web-filter profile profile-name dns-filter-template template-name dns-filter]
user@host# set database-file filename
```

g. (Optional) To limit DNS filtering to DNS requests that are destined for specific DNS servers, specify up to three IP addresses (IPv4 or IPv6).

```
[edit services web-filter profile profile-name dns-filter-template template-name dns-filter]
user@host# set dns-server ip-address
```

h. Specify the hash method that was used to create the hashed domain name in the domain filter database file.

```
[edit services web-filter profile profile-name dns-filter-template template-name dns-filter]
user@host# set hash-method hash-method-name
```

The only supported hash method is **hmac-sha2-256**.

i. Specify the hash key that was used to create the hashed domain name in the domain filter database file.

```
[edit services web-filter profile profile-name dns-filter-template template-name dns-filter]
user@host# set hash-key key-string
```

j. Configure the interval for logging statistics for DNS requests and for sinkhole actions performed for each customer IP address. The range is 1 through 60 minutes and the default is 5 minutes.

```
[edit services web-filter profile profile-name dns-filter-template template-name dns-filter]
user@host# set statistics-log-timer minutes
```

k. Configure the time to live while sending the DNS response after taking the DNS sinkhole action. The range is 0 through 86,400 seconds and the default is 1800.

```
[edit services web-filter profile profile-name dns-filter-template template-name dns-filter]
user@host# set dns-resp-ttl seconds
```

l. Configure the level of subdomains that are searched for a match. The range is 0 through 10. A value of 0 indicates that subdomains are not searched.

```
[edit services web-filter profile profile-name dns-filter-template template-name dns-filter]
user@host# set wildcarding-level level
```

For example, if you set the **wildcarding-level** to 4 and the database file includes an entry for **example.com**, the following comparisons are made for a DNS request that arrives with the domain **198.51.100.0.example.com**:

- **198.51.100.0.example.com**: no match
- **51.100.0.example.com**: no match for one level down
- **100.0.example.com**: no match for two levels down

- **0.example.com**: no match for three levels down
- **example.com**: match for four levels down

m. (Optional) Specify the response error code for SRV and TXT query types.

```
[edit services web-filter profile profile-name dns-filter-template template-name dns-filter]
user@host# set txt-resp-err-code (Noerror | Refused)
user@host# set srv-resp-err-code (Noerror | Refused)
```

n. Configure a term for the template. You can configure a maximum of 64 terms in a template.

```
[edit services web-filter profile profile-name dns-filter-template template-name]
user@host# set term term-name
```

o. (Optional) Specify the source IP address prefixes of DNS requests you want to filter. You can configure a maximum of 64 prefixes in a term.

```
[edit services web-filter profile profile-name dns-filter-template template-name term term-name]
user@host# set from src-ip-prefix source-prefix
```

p. Specify that the sinkhole action identified in the domain filter database is performed on blacklisted DNS requests.

```
[edit services web-filter profile profile-name dns-filter-template template-name term term-name]
user@host# set then dns-sinkhole
```

How to Configure a Service Set for DNS Filtering

- Associate the DNS filter profile with a next-hop service set and enable logging for DNS filtering. The service interface can be an ms- or vms- interface Next Gen Services with MX-SPC3 services card), or it can be an aggregated multiservices (AMS) interface.

```
[edit services service-set service-set-name]
user@host# set web-filter-profile profile-name
user@host# set syslog host hostname class urlf-logs
user@host# set next-hop-service inside-service-interface interface-name.unit-number
user@host# set next-hop-service outside-service-interface interface-name.unit-number
```

Release History Table

Release	Description
19.3R2	Starting in Junos OS Release 19.3R2, you can configure DNS filtering if you are running Next Gen Services with the MX-SPC3 services card. Next Gen Services are supported on MX240, MX480 and MX960 routers.

DNS Request Filtering System Logging Error Messages

IN THIS SECTION

The message format for system logs related to DNS request filtering differs slightly for the Next Gen Services MX-SPC3 services card versus early services cards. This topic describes the differences in the DNS request filtering related system log messages and provides a description of all fields in these messages.

System Logging for DNS Request Filtering Overview

Next Gen Services DNS request filtering system logging generates these events:

1. DNS match events (DNS_SR_MATCH_EVENT)
   a. A single syslog is generated for each DNS match to the list of filtered domains.
2. Per-term statistics (DNS_SR_CUSTOMER_STATS)
   a. Each term in the template represents a customer, enabling you to collect per-customer statistics.
   b. You can configure the interval in which you want to collect statistics in each template.

3. You can report an event each time a DNS blacklist file is added or updated (DNS_SR_FILE_UPDATE_NOTICE)
4. You can collect per-PIC Summary report statistics (DNS_SR_REPORT_STATS)
   a. Statistics are generated every 5 minutes. This interval value is not configurable.
   b. These stats are generated per-PIC basis.

> **NOTE:** To enable these logs you must configure a syslog for each **service-set** for which you've configured dns-filtering.
>
> All system log messages for Next Gen Services are configured at the **service-set** level using the following statement:
>
> ```
> user@host# edit services service-set service-set-name syslog
> ```
>
> To collect DNS request filtering system log messages, include **urlf** in the **local-category** statement:
>
> ```
> [edit services service-set ss1 syslog]
> user@host# set local-category urlf
> ```

5. You can collect per-client IP statistics (DNS_SR_CLIENT_IP_STATS)
   a. This statistics are generated per-profile.
   b. The interval for collecting these statistics is configurable per-profile.

DNS Match-Event Syslog Format

> **NOTE:** System system log messages for Next Gen Services DNS request filtering doesn't include the FPC slot/PIC slot and UTC time.

Table 10 on page 199 describes the fields contained in DNS request filtering match events.

Table 10: DNS-Match-Event Syslog Format

Field Name	Description	Example
Time Stamp	Time when log entry was generated	Oct 27 10:04:19

Table 10: DNS-Match-Event Syslog Format *(continued)*

Field Name	Description	Example
Router Name	Host name of the router generating the record	Jnpr-router-01
Log Handle	Log handle to identify the log category	junos-url-filter
Match	Indicates a DNS match was detected.	JSERVICES_URLF_MATCH_EVENT: DNS_SR_MATCH_EVENT
Tag	Log-prefix configured	Tag=<value>
svc-set-name	Service-set name	svc-set-name=<value>
ID	ID assigned to the domain name (Size of ID is assumed to be a 32-bit number)	ID=12345
IP_Src	Source IP	IP_Src=10.1.5.72
IP_Dst	Destination IP (DNS resolver)	IP_Dst=10.1.1.10
Src_Prt	Source Port	Src_Prt=37344
Dst_Prt	Destination Port	Dst_Prt=53
Sinkhole_IP	IP of sinkhole server from Domain Name Input List	Sinkhole_IP=10.1.50.64
Sinkhole_IPv6	IP of IPv6 sinkhole server from Domain Name Input List	Sinkhole_IPv6=8001:1002: 1003:1004:1005:1006:1007:1008
Sinkhole_fqdn	Sinkhole FQDN	Sinkhole_fqdn=NA
Count	Counter for match events to accommodate identical event records	Count=54
Replaced	Designates replacement of response domain (i.e. sinkholing)	Replaced=Y

Table 10: DNS-Match-Event Syslog Format *(continued)*

Field Name	Description	Example
Reason_Mask	Reason for action (if Replaced=N) [See table below for bit position enumeration]	Reason_Mask=0x0
QType	Query Type of the DNS request (A, AAAA, MX, CNAME, SRV, TXT)	QType=A
Profile	Profile Name [The Web filter profile name as configured]	Profile=profile_01
Template	Template Name [The DNS filter template name as configured]	Template=template_01
Term	Term Name [The DNS filter term name as configured]	Term=term_01
Time	UNIX timestamp	Time=Wed Dec 20 12:25:24 2017

Here's an example of MX-SPC3 DNS filtering syslog format:

Feb 20 17:06:36 ce-bras-mx480-o junos-url-filter: JSERVICES_URLF_MATCH_EVENT: DNS_SR_MATCH_EVENT, Tag=tag, svc-set-name= s1, ID=1235, IP_SRC=2.2.2.3, IP_DST=101.10.10.100, SRC_PRT=34342, DST_PRT=53, Sinkhole_IP=1.1.1.1, Sinkhole_IPv6=NA, Sinkhole_fqdn=NA, Count=9, Replaced=Y, Reason_Mask=0x0, QType=A, Profile=webf-prof-1, Template=dnsf-temp-1, Term=dnsf-term-1, Time=Tue Jan 23 13:45:52 2018

Here's an example of MS-MPC DNS filtering syslog format:

Jan 23 13:45:52 cliq (FPC Slot 1, PIC Slot 1) 2018-01-23 21:45:52: {s1}[jservices-urlf]: JSERVICES_URLF_MATCH_EVENT: DNS_SR_MATCH_EVENT ID=1235, IP_SRC=2.2.2.3, IP_DST=101.10.10.100, SRC_PRT=34342, DST_PRT=53, Sinkhole_IP=1.1.1.1, Sinkhole_IPv6=NA, Sinkhole_fqdn=NA, Count=9, Replaced=Y, Reason_Mask=0x0, QType=A, Profile=webf-prof-1, Template=dnsf-temp-1, Term=dnsf-term-1, Time=Tue Jan 23 13:45:52 2018

Reason Mask Values & Interpretations for DNS Filtering

Table 11 on page 202 describes the reason mask value fields and interpretations for MX Next Gen Services DNS filtering.

Table 11: Reason Mask Values & Interpretations for DNS Filtering

Bit Position	Hex Value	Interpretation	Add
	0x0	Replaced	
0	0x1	Reason Other	*Exar* pack
1	0x2	Not a supported DNS request type	*Exar*
2	0x4	Indicator action set to “Report-Only”	This new putt Proc
3	0x8	Replace A/AAAA record error	
4	0x10	Replacement information not available	The mar sinkh is no

Here’s an example of MX Next Gen Services syslog format for DNS filtering showing the reason mask and interpretation:

Feb 20 17:06:36 ce-bras-mx480-o junos-url-filter: JSERVICES_URLF_MATCH_EVENT: DNS_SR_MATCH_EVENT, Tag=tag, svc-set-name= s1, ID=1235, IP_SRC=2.2.2.3, IP_DST=101.10.10.100, SRC_PRT=34342, DST_PRT=53, Sinkhole_IP=1.1.1.1, Sinkhole_IPv6=NA, Sinkhole_fqdn=NA, Count=9, Replaced=Y, Reason_Mask=0x0, QType=A, Profile=webf-prof-1, Template=dnsf-temp-1, Term=dnsf-term-1, Time=Tue Jan 23 13:45:52 2018

Here’s an example of MS-MPC DNS filtering syslog format:

Jan 23 13:45:52 cliq (FPC Slot 1, PIC Slot 1) 2018-01-23 21:45:52: {s1}[jservices-urlf]: JSERVICES_URLF_MATCH_EVENT: DNS_SR_MATCH_EVENT ID=1235, IP_SRC=2.2.2.3, IP_DST=101.10.10.100, SRC_PRT=34342, DST_PRT=53, Sinkhole_IP=1.1.1.1, Sinkhole_IPv6=NA,

Sinkhole_fqdn=NA, Count=9, Replaced=Y, Reason_Mask=0x0, QType=A, Profile=webf-prof-1, Template=dnsf-temp-1, Term=dnsf-term-1, Time=Tue Jan 23 13:45:52 2018

Per-Term Statistics Syslog Format

Table 12 on page 203 describes the fields for MX Next Gen Services DNS filtering per-term statistics syslog format.

Table 12: Per-Term Statistics Syslog Format

Field Name	Description	Example
Time Stamp	Time when log entry was generated	Oct 27 10:04:17
Router Name	Host name of the router generating the record	Jnpr-router-01
Log Handle	Log handle to identify the log category	junos-url-filter
Match	A term(customer) statistics record	JSERVICES_URLF_CUSTOMER_STATS: DNS_SR_CUSTOMER_STATS
Tag	Log-prefix configured	Tag=<value>
svc-set-name	Service-set name	svc-set-name=<value>
Profile	Profile Name [The Web filter profile name as configured]	Profile=profile_01
Template	Template Name [The DNS filter template name as configured]	Template=template_01
Term	Term Name [The DNS filter term name as configured]	Term=term_01
Packets_Processed	Total DNS Requests Processed	Requests_Processed=200
DNS_UDP_Packets_Processed	DNS UDP Requests Processed	DNS_UDP_Requests_Processed=98

Table 12: Per-Term Statistics Syslog Format *(continued)*

Field Name	Description	Example
DNS_TCP_Packets_Processed	DNS TCP Requests Processed	DNS_TCP_Requests_Processed=35
DNS_UDP_Requests_sinkholed	DNS UDP Requests sink-holed	DNS_UDP_Requests_Sinkholed =50
DNS_TCP_Requests_sinkholed	DNS TCP Requests sink-holed	DNS_TCP_Requests_Sinkholed =50
DNS_UDP_Requests_reported	DNS UDP Requests reported	DNS_UDP_Requests_Reported =50
DNS_TCP_Requests_reported	DNS TCP Requests reported	DNS_TCP_Requests_Reported =50
Time	UNIX timestamp	Time=Wed Dec 20 12:25:24 2017
Count	Counter to accommodate identical event records	Count=10

Here's an example of MX-SPC3 DNS filtering syslog format for per-term statistics:

Feb 25 14:25:45 curve junos-url-filter: JSERVICES_URLF_CUSTOMER_STATS: DNS_SR_CUSTOMER_STATS, Tag , svc-set-name s1, Profile=DNS_CUSTOMER-A, Template=DNS_CUSTOMER-A, Term=DNS_CUSTOMER-A, Requests_Processed=0, DNS_UDP_Requests_Processed=0, DNS_TCP_Requests_Processed=0, DNS_UDP_Requests_Sinkholed=0, DNS_TCP_Requests_Sinkholed=0, DNS_UDP_Requests_Reported=0, DNS_TCP_Requests_Reported=0, Time=Mon Feb 25 14:25:45 2019, Count=13

Here's an example of MS-MPC DNS filtering syslog format:

Mar 8 12:16:05 iphone3gs (FPC Slot 5, PIC Slot 0) 2019-03-08 20:16:04: {ATT-Zone5}[jservices-urlf]: JSERVICES_URLF_CUSTOMER_STATS: DNS_SR_CUSTOMER_STATS, Profile=ATT-Profile-5-Zone5, Template=ATT-Profile-5-Zone5-Area1, Term=ATT-Profile-5-Zone5-Area1-Customer3, Requests_Processed=0, DNS_UDP_Requests_Processed=0, DNS_TCP_Requests_Processed=0, DNS_UDP_Requests_Sinkholed=0, DNS_TCP_Requests_Sinkholed=0, DNS_UDP_Requests_Reported=0, DNS_TCP_Requests_Reported=0, Time=Fri Mar 08 12:16:05 2019, Count=111

DNS Filtering Blacklist File Add/Change Syslog Format

Table 13 on page 205 describes the fields for MX Next Gen Services DNS filtering blacklist file additions and updates syslog format.

Table 13: Blacklist File Add/Change Syslog Format

Field Name	Description	Example
Time Stamp	Time when log entry was generated	Oct 27 10:04:17
Router Name	Host name of the router generating the record	Jnpr-router-01
Log Handle	Log handle to identify the log category	junos-url-filter
Match	The domain blacklist file updated for the template. .	JSERVICES_URLF_FILE_UPDATE_NOTICE: DNS_SR_FILE_UPDATE_NOTICE
Tag	Log-prefix configured	Tag=<value>
svc-set-name	Service-set name	svc-set-name=<value>
File Name	Name of the file	File_Name=shdb.txt
File Version	Version of the file	File_Version=20170314_01
Updated	File Update Time	Domain_Filter_File_Updated=Fri Oct 27 10:56:42 2017
Profile	Profile Name [The Web filter profile name as configured]	Profile=profile_01
Template	Template Name [The DNS filter template name as configured]	Template=template_01
Domains	Number of Domains in the file	Domains=12
Report-Only-Domains	Number of Report-Only domains in the file	Report_Only_Domains=3

Here's an example of the syslog format for MX-SPC3 DNS filtering blacklist add/change file updates:

Feb 25 14:36:47 curve junos-url-filter: JSERVICES_URLF_FILE_UPDATE_NOTICE: DNS_SR_FILE_UPDATE_NOTICE, Tag=, svc-set-name=s1, File_Name=test_dns_sink.txt,

File_Version=20180911 01, Domain_Filter_File_Updated=Mon Feb 25 14:36:47 2019 Profile=DNS_CUSTOMER-A, Template=DNS_CUSTOMER-A, Domains=18, Report_Only_Domains=0

Here's an example of the syslog format for DNS filtering blacklist file changes with the MS-MPC services card:

Jan 23 13:34:34 cliq (FPC Slot 1, PIC Slot 1) 2018-01-23 21:34:33: {s1}[jservices-urlf]: JSERVICES_URLF_FILE_UPDATE_NOTICE: DNS_SR_FILE_UPDATE_NOTICE, File_Name=dnsf1_hashed.txt, File_Version=20170314_01, Domain_Filter_File_Updated=Tue Jan 23 13:34:34 2018 Profile=webf-prof-1, Template=dnsf-temp-1, Domains=4, Report_Only_Domains=1

DNS Filtering Summary Report Statistics Syslog Format

Summary report statistics syslog format Stats will be reported in syslog with the following format:

Here's an example summary report syslog message for MX-SPC3 Next Gen Services DNS filtering:

Feb 25 11:50:39 curve junos-url-filter: JSERVICES_URLF_REPORT_STATS: DNS_SR_REPORT_STATS, Tag=, svc-set-name=s1, TCP_DNS_Packets=0, TCP_DNS_Non_Segmented=0, TCP_DNS_Segmented=0, Count=1

Here's an example summary report syslog message for MS-MPC services card DNS filtering:

Mar 8 12:20:41 iphone3gs (FPC Slot 5, PIC Slot 1) 2019-03-08 20:20:40: {ATT-Zone1}[jservices-urlf]: JSERVICES_URLF_REPORT_STATS: DNS_SR_REPORT_STATS, TCP_DNS_Packets=0, TCP_DNS_Non_Segmented=0, TCP_DNS_Segmented=0, Count=169

DNS Filtering Per-Client-IP Statistics Syslog Format

Table 14 on page 206 describes the syslog fields for MX-SPC3 DNS filtering per-client-IP statistics that is reported per-PIC, per-profile for all known client IP addresses known to the system.

Table 14: Per-Client-IP Statistics Syslog Format

Field Name	Description	Example
Time Stamp	Time when log entry was generated	Oct 27 10:04:17
Router Name	Host name of the router generating the record	Jnpr-router-01
Log Handle	Log handle to identify the log category	junos-url-filter
Match	Log for per-Client IP stats	JSERVICES_URLF_CLIENT_IP_STATS: DNS_SR_CLIENT_IP_STATS

Table 14: Per-Client-IP Statistics Syslog Format *(continued)*

Field Name	Description	Example
Tag	Log-prefix configured	Tag=<value>
svc-set-name	Service-set name	svc-set-name=<value>
Client-IP	IP address of the client	Client-IP=1.1.1.1
Profile	Profile Name [The Web filter profile name as configured]	Profile=profile_01
Template	Template Name [The DNS filter template name as configured]	Template=template_01
Term	Term Name [The DNS filter term name as configured]	Term=term_01
A_Req	DNS A-Record Requests Processed	A_Req=10
AAAA_Req	DNS AAAA-Record Requests Processed	AAAA_Req=10
MX_Req	DNS MX-Record Requests Processed	MX_Req=4
CNAME_Req	DNS CNAME-Record Requests Processed	CNAME_Req=4
SRV_Req	DNS SRV-Record Requests Processed	SRV_Req=4
TXT_Req	DNS TXT-Record Requests Processed	TXT_Req=4
ANY_Req	DNS ANY-Record Requests Processed	ANY_Req=4
A_Req_SH	DNS A-Record Requests sink-holed	A_Req_SH =5
AAAA_Req_SH	DNS AAAA-Record Requests sink-holed	AAAA_Req_SH=5

Table 14: Per-Client-IP Statistics Syslog Format *(continued)*

Field Name	Description	Example
MX_Req_SH	DNS MX-Record Requests Sink-holed	MX_Req_SH=4
CNAME_Req_SH	DNS CNAME-Record Requests Sink-holed	CNAME_Req_SH=4
SRV_Req_SH	DNS SRV-Record Requests Sink-holed	SRV_Req_SH=4
TXT_Req_SH	DNS TXT-Record Requests Sink-holed	TXT_Req_SH=4
ANY_Req_SH	DNS ANY-Record Requests Sink-holed	ANY_Req_SH=4
Req_Rep	DNS Requests reported	Req_Rep=5

Here's an example per-client-IP-statitics for MX-SPC3 DNS filtering:

Feb 25 11:50:39 curve junos-url-filter: JSERVICES_URLF_CLIENT_IP_STATS: DNS_SR_CLIENT_IP_STATS, Tag=tag, svc-set-name=s1, Client-IP=2.2.2.3, Profile=webf-prof-1, Template=dnsf-temp-1, Term=dnsf-term-1, A_Req=0, AAAA_Req=0, MX_Req=0, CNAME_Req=0, SRV_Req=0, TXT_Req=0, ANY_Req=2, A_Req_SH=0, AAAA_Req_SH=0, MX_Req_SH=0, CNAME_Req_SH=0, SRV_Req_SH=0, TXT_Req_SH=0, ANY_Req_SH=0, Req_Rep=2

Here's an example syslog message for DNS filtering client-IP statistics on MS-MPC services cards:

Mar 7 17:58:54 iphone3gs (FPC Slot 5, PIC Slot 3) 2019-03-08 01:58:54: {dns}[jservices-urlf]: JSERVICES_URLF_CLIENT_IP_STATS: DNS_SR_CLIENT_IP_STATS, Client-IP=2004:db0:2228:8001::1, Profile=dns-profile1, Template=dns1, Term=3, A_Req=19, AAAA_Req=19, MX_Req=0, CNAME_Req=0, SRV_Req=0, TXT_Req=0, ANY_Req=0, A_Req_SH=19, AAAA_Req_SH=19, MX_Req_SH=0, CNAME_Req_SH=0, SRV_Req_SH=0, TXT_Req_SH=0, ANY_Req_SH=0, Req_Rep=0

RELATED DOCUMENTATION

PART 7

Aggregated Multiservices Interfaces

CHAPTER 21

Enabling Load Balancing and High Availability Using Multiservices Interfaces

IN THIS CHAPTER

Understanding Aggregated Multiservices Interfaces for Next Gen Services

IN THIS SECTION

This topic provides an overview of using the Aggregated Multiservices Interfaces feature with the MX-SPC3 services card for Next Gen Services. It contains the following sections:

Aggregated Multiservices Interface

In Junos OS, you can combine multiple services interfaces to create a bundle of services interfaces that can function as a single interface. Such a bundle of interfaces is known as an *aggregated multiservices interface* (AMS), and is denoted as ams*N* in the configuration, where *N* is a unique number that identifies an AMS interface (for example, ams0). Starting in Junos OS Release 19.3R2, AMS interfaces are supported on the Next Gen Services MX-SPC3 services card.

NOTE: MX240, MX480, MX960 routers support Next Gen Services using the MX-SPC3 services card. When running Next Gen Services, you cannot run other legacy MX line card services in the same chassis, for example, you cannot run the MS-MPC card inline services.

AMS configuration provides higher scalability, improved performance, and better failover and load-balancing options.

An AMS configuration enables service sets to support multiple services PICs by associating an AMS bundle with a service set. For Next Gen Services, the MX-SPC3 services card supports up to two PICs and you can have a maximum of eight MX-SPC3 services cards in your chassis. This enables a Next Gen Services AMS bundle to have up to 16 services PICs as member interfaces and you can distribute services among the member interfaces.

Member interfaces are identified as mams in the configuration. The chassisd process in routers that support AMS configuration creates a mams entry for every multiservices interface on the router.

When you configure services options at the ams interface level, the options apply to all member interfaces (mams) for the ams interface.

The options also apply to service sets configured on services interfaces corresponding to the ams interface's member interfaces. All settings are per PIC. For example, session-limit applies per member and not at an aggregate level.

NOTE: You cannot configure services options at both the ams (aggregate) and member-interface level. If services options are configured on **vms-x/y/z**, they also apply to service sets on **mams-x/y/z**.

When you want services options settings to apply uniformly to all members, configure services options at the ams interface level. If you need different settings for individual members, configure services options at the member interface level.

NOTE: If you modify a NAT pool that is being used by a service set assigned to an AMS interface, you must deactivate and activate the service set before the NAT pool changes take effect.

Traffic distribution over the member interfaces of an AMS interface can occur in either a round-robin fashion or hash-based. You can configure the following hash key values to regulate the traffic distribution: **source-ip**, **destination-ip** , and **protocol**. For services that require traffic symmetry, you must configure symmetrical hashing. Symmetrical hashing configuration ensures that both forward and reverse traffic is routed through the same member interface.

If the service set is applied on the Gigabit Ethernet or 10-Gigabit Ethernet interface (interface-style service set) that functions as the NAT inside interface, then the hash keys used for load balancing might be configured in such a way that the ingress key is set as destination IP address and the egress key is set as source IP address. Because the source IP address undergoes NAT processing, it is not available for hashing the traffic in the reverse direction. Therefore, load balancing does not happen on the same IP address and forward and reverse traffic does not map to the same PIC. With the hash keys reversed, load balancing occurs correctly.

With next-hop services, for forward traffic, the ingress key on the inside interface load -balances traffic, and for reverse traffic, the ingress key on the outside interface load -balances traffic or per-member next hops steer reverse traffic. With interface-style services, the ingress key load-balances forward traffic and the egress key load-balances forward traffic or per-member next hops steer reverse traffic. Forward traffic is traffic entering from the inner side of a service set and reverse traffic is traffic entering from the outer side of a service set. The forward key is the hash key used for the forward direction of traffic and the reverse key is the hash key used for the reverse direction of traffic (depends on whether it relates to interface services or next-hop services style.)

With stateful firewalls, you can configure the following combinations of forward and reverse keys for load balancing. In the following combinations presented for hash keys, FOR-KEY refers to the forward key, REV-KEY denotes the reverse key, SIP signifies source IP address, DIP signifies destination IP address, and PROTO refers to protocol such as IP.

- FOR-KEY: SIP, REV-KEY: DIP
- FOR-KEY: SIP,PROTO REV-KEY: DIP, PROTO
- FOR-KEY: DIP, REV-KEY: SIP
- FOR-KEY: DIP,PROTO REV-KEY: SIP, PROTO
- FOR-KEY: SIP,DIP REV-KEY: SIP, DIP
- FOR-KEY: SIP,DIP,PROTO REV-KEY: SIP, DIP,PROTO

With static NAT configured as basic NAT44 or destination NAT44, and with stateful firewall configured or not, if the forward direction of traffic must undergo NAT processing, configure the hash keys as follows:

- FOR-KEY: DIP, REV-KEY: SIP
- FOR-KEY: DIP,PROTO REV-KEY: SIP, PROTO

If the reverse direction of traffic must undergo NAT processing, configure the hash keys as follows:

- FOR-KEY: SIP, REV-KEY: DIP
- FOR-KEY: SIP,PROTO REV-KEY: DIP, PROTO

With dynamic NAT configured, and with stateful firewall configured or not, only the forward direction traffic can undergo NAT. The forward hash key can be any combination of SIP, DIP, and protocol, and the reverse hash key is ignored.

NOTE: The Junos OS AMS configuration supports IPv4 and IPv6 traffic.

IPv6 Traffic on AMS Interfaces Overview

You can use AMS interfaces for IPv6 traffic. To configure IPv6 support for an AMS interface, include the **family inet6** statement at the **[edit interfaces *ams-interface-name* unit 1]** hierarchy level. When **family inet** and **family inet6** are set for an AMS interface subunit, the **hash-keys** is configured at service-set level for interface style and at IFL level for next-hop style.

When a member interface of an AMS bundle fails, traffic destined to the failed member is redistributed among the remaining active members. The traffic (flows or sessions) traversing through the existing active members is unaffected. If M members are currently active, the expected result is that only about 1/M fraction of the traffic (flows/sessions) is impacted because that amount of traffic is shifted from the failed member to remain active members. When the failed member interface comes back online, only a fraction of the traffic is redistributed to the new member. If N members are currently active, the expected result is that only about 1/(N+1) fraction of the traffic (flows/sessions) is impacted because that amount of traffic moves to the new restored member. The 1/M and 1/(N+1) values assume that the flows are uniformly distributed among members, because a packet-hash is used to load-balance and because traffic usually contains a typical random combination of IP addresses (or any other fields that are used as load-balancing keys).

Similar to IPv4 traffic, for IPv6 packets, an AMS bundle must contain members of only one services PIC type.

The number of flows distributed, in an ideal environment, can be 1/N in a best-case scenario when the Nth member goes up or down. However, this assumption considers that the hash keys load-balance the real or dynamic traffic. For example, consider a real-world deployment where member A is serving only one flow, whereas member B is serving 10 flows. If member B goes down, then the number of flows disrupted is 10/11. The NAT pool-split behavior is designed to utilize the benefits of the rehash-minimization feature. The splitting of a NAT pool is performed for dynamic NAT scenarios (dynamic NAT, NAT64, and NAPT44).

If the original and redistributed flows are defined as follows:

- Member-original-flows—The traffic mapped to a member when all members are up.
- Member-redistributed-flows—The additional traffic mapped to a member when some other member fails. These traffic flows might need to be rebalanced when member interfaces come up and go down.

With the preceding definitions of the original and redistributed flows for member interfaces, the following observations apply:

- The member-original-flows of a member stay intact as long as that member is up. Such flows are not impacted when other members move between the up and down states.
- The member-redistributed-flows of a member can change when other members go up or down. This change of flows occurs because these additional flows need to be rebalanced among all active members. Therefore, the member-redistributed-flow can vary a lot based on other members going down or up. Although it might seem that when a member goes down, the flows on active-members are preserved, and that when a member goes up, flows on active-members are not preserved in an effective way, this behavior is only because of static or hash-based rebalancing of traffic among active members.

The rehash-minimization feature handles the operational changes in a member interface status only (such as member offline or member Junos OS reset). It does not handle changes in configuration. For example, addition or deletion, or activation and deactivation, of member interfaces at the **[edit interfaces ams*N* load-balancing-options member-interface mams-a/b/0]** hierarchy level requires the member PICs to be bounced. Twice NAT or hairpinning is not supported, similar to IPv4 support for AMS interfaces.

Member Failure Options and High Availability Settings

Because multiple service interfaces are configured as part of an AMS bundle, AMS configuration also provides for failover and high availability support. You can either configure one of the member interfaces as a backup interface that becomes active when any one of the other member interfaces goes down, or configure the AMS in such a way that when one of the member interfaces goes down, the traffic assigned to that interface is shared across the active interfaces.

The **member-failure-options** configuration statement enables you to configure how to handle traffic when a member interface fails. One option is to redistribute the traffic immediately among the other member interfaces. However, redistribution of traffic involves recalculating the hash tags, and might cause some disruption in traffic on all the member interfaces.

The other option is to configure the AMS to drop all traffic that is assigned to the failed member interface. With this you can optionally configure an interval, **rejoin-timeout**, for the AMS to wait for the failed interface to come back online after which the AMS can redistribute the traffic among other member interfaces. If the failed member interface comes back online before the configured wait time, traffic continues unaffected on all member interfaces, including the interface that has come back online and resumed the operations.

You can also control the rejoining of the failed interface when it comes back online. If you do not include the **enable-rejoin** statement in the **member-failure-options** configuration, the failed interface cannot rejoin the AMS when it comes back online. In such cases, you can manually rejoin that to the AMS by executing the **request interfaces revert *interface-name*** operational mode command.

The **rejoin-timeout** and **enable-rejoin** statements enable you to minimize traffic disruptions when member interfaces flap.

> **NOTE:** When **member-failure-options** are not configured, the default behavior is to drop member traffic with a rejoin timeout of 120 seconds.

The **high-availability-options** configuration enables you to designate one of the member interfaces as a backup interface. The backup interface does not participate in routing operations as long as it remains a backup interface. When a member interface fails, the backup interface handles the traffic assigned to the failed interface. When the failed interface comes back online, it becomes the new backup interface.

In a many-to-one configuration (N:1), a single backup interface supports all other member interfaces in the group. If any of the member interfaces fails, the backup interface takes over. In this stateless configuration, data is not synchronized between the backup interface and the other member interfaces.

When both **member-failure-options** and **high-availability-options** are configured for an AMS, the **high-availability-options** configuration takes precedence over the **member-failure-options** configuration. If a second failure occurs before the failed interface comes back online to be the new backup, the **member-failure-options** configuration takes effect.

Warm Standby Redundancy

Starting in Junos OS Release 19.3R2, the N:1 warm standby option is supported on the MX-SPC3 if you are running Next Gen Services. Each warm standby AMS interface contains two members; one member is the service interface you want to protect, called the primary interface, and one member is the secondary (backup) interface. The primary interface is the active interface and the backup interface does not handle any traffic unless the primary interface fails.

To configure warm standby on an AMS interface, you use the **redundancy-options** statement. You cannot use the **load-balancing-options** statement in a warm standby AMS interface.

To switch from the primary interface to the secondary interface, issue the **request interface switchover ams*N*** command.

To revert to the primary interface from the secondary interface, issue the **request interface revert ams*N*** command.

Release History Table

Release	Description
19.3R2	Starting in Junos OS Release 19.3R2, AMS interfaces are supported on the Next Gen Services MX-SPC3 services card.
19.3R2	Starting in Junos OS Release 19.3R2, the N:1 warm standby option is supported on the MX-SPC3 if you are running Next Gen Services.

Configuring Aggregated Multiservices Interfaces

The aggregated multiservices (AMS) interface configuration in Junos OS enables you to combine services interfaces from multiple PICs to create a bundle of interfaces that can function as a single interface. You identify the PIC that you want to act as the backup.

1. Create an aggregated multiservices interface and add member interfaces. Starting in Junos OS Release 19.3R2, an MX-SPC3 Next Gen Services AMS interface can have up to 16 member interfaces with a maximum of 8 MX-SPC3 services cards with up to 2 PICs on each card. Starting with Junos OS Release 16.2, an MS-MPC AMS interface can have up to 36 member interfaces. In Junos OS Release 16.1 and earlier, an AMS interface can have a maximum of 24 member interfaces.

   NOTE: The member interface format is **mams-*a*/*b*/0**, where *a* is the Flexible PIC Concentrator (FPC) slot number and *b* is the PIC slot number.

   ```
   [edit interfaces]
   user@host# set interface-name load-balancing-options member-interface mams-a/b/0
   user@host# set interface-name load-balancing-options member-interface mams-a/b/0
   ```

   For example on an MS-MPC, which can have up to four PICs:

   ```
   [edit interfaces]
   user@host# set ams1 load-balancing-options member-interface mams-1/1/0
   user@host# set ams1 load-balancing-options member-interface mams-1/2/0
   ```

   For example on an MX-SPC3, which can have up to two PICs:

   ```
   [edit interfaces]
   user@host# set ams1 load-balancing-options member-interface mams-1/0/0
   user@host# set ams1 load-balancing-options member-interface mams-1/1/0
   ```

2. Configure logical units for the AMS interface.

   ```
   [edit interfaces]
   user@host# set interface-name unit logical-unit-number family family
   user@host# set interface-name unit logical-unit-number family family
   ```

   For example:

```
[edit interfaces]
user@host# set ams1 unit 1 family inet
user@host# set ams1 unit 2 family inet6
```

3. Configure member failure options.

```
[edit interfaces interface-name]
user@host# set load-balancing-options member-failure-options drop-member-traffic rejoin-timeout seconds
user@host# set load-balancing-options member-failure-options drop-member-traffic enable-rejoin
```

For example:

```
[edit interfaces ams1]
user@host# set load-balancing-options member-failure-options drop-member-traffic rejoin-timeout 1000
user@host# set load-balancing-options member-failure-options drop-member-traffic enable-rejoin
```

4. Configure the preferred backup.

```
[edit interfaces interface-name]
user@host# set load-balancing-options high-availability-options many-to-one preferred-backup
  preferred-backup
```

For example:

```
[edit interfaces ams1]
user@host# set load-balancing-options high-availability-options many-to-one preferred-backup mams-1/2/0
```

5. **NOTE:** This step is not applicable to the Next Gen Services MX-SPC3 services card in the MX240, MX480 or MX960 chassis.

If the AMS interface has more than 24 member interfaces, set the service PIC boot timeout value to 240 or 300 seconds for every services PIC on the MX Series router. We recommend that you use a value of 240.

NOTE: Starting with Junos OS Release 16.2, an AMS interface can have up to 36 member interfaces. In Junos OS Release 16.1 and earlier, an AMS interface could have a maximum of 24 member interfaces.

```
[edit interfaces interface-name multiservice-options]
user@host# set pic-boot-timeout (240 | 300);
```

For example:

```
[edit interfaces sp-1/1/0 multiservice-options]
user@host# set pic-boot-timeout 240
```

Release History Table

Release	Description
19.3R2	Starting in Junos OS Release 19.3R2, an MX-SPC3 Next Gen Services AMS interface can have up to 16 member interfaces with a maximum of 8 MX-SPC3 services cards with up to 2 PICs on each card.
16.2	Starting with Junos OS Release 16.2, an MS-MPC AMS interface can have up to 36 member interfaces.

RELATED DOCUMENTATION

Understanding Aggregated Multiservices Interfaces for Next Gen Services | 211

Configuring Load Balancing on AMS Infrastructure

Configuring load balancing requires an aggregated multiservices (AMS) system. AMS involves grouping several services PICs together. An AMS configuration eliminates the need for separate routers within a system. The primary benefit of having an AMS configuration is the ability to support load balancing of traffic across multiple services PICs.

AMS is supported on the MS-MPC and MS-MIC. Starting in Junos OS Release 19.3R2, AMS interfaces are also supported on the MX-SPC3 if you are running Next Gen Services.

High availability (HA) is supported on AMS infrastructure on all MX Series 5G Universal Routing Platforms. AMS has several benefits:

- Support for configuring behavior if a services PIC that is part of the AMS configuration fails
- Support for specifying hash keys for each service set in either direction
- Support for adding routes to individual PICs within the AMS system

Configuring AMS Infrastructure

AMS supports load balancing across multiple service sets. All ingress or egress traffic for a service set can be load balanced across different services PICs. To enable load balancing, you have to configure an aggregate interface with existing services interfaces.

To configure failure behavior in AMS, include the **member-failure-options** statement:

```
[edit interfaces ams1]
load-balancing-options {
    member-failure-options {
        drop-member-traffic {
            rejoin-timeout rejoin-timeout;
        }
        redistribute-all-traffic {
            enable-rejoin;
        }
    }
}
```

If a PIC fails, you can configure the traffic to the failed PIC to be redistributed by using the **redistribute-all-traffic** statement at the **[edit interfaces *interface-name* load-balancing-options member-failure-options]** hierarchy level. If the **drop-member-traffic** statement is used, all traffic to the failed PIC is dropped. Both options are mutually exclusive.

> **NOTE:** If **member-failure-options** is not explicitly configured, the default behavior is to drop member traffic with a rejoin timeout of 120 seconds.

Only mams- interfaces (services interfaces that are part of AMS) can be aggregated. After an AMS interface has been configured, you cannot configure the individual constituent mams- interfaces. A mams- interface cannot be used as an ams interface (this is not applicable to Next Gen Services MX-SPC3). AMS supports IPv4 (**family inet**) and IPv6 (**family inet6**). You cannot configure addresses on an AMS interface. Network Address Translation (NAT) is the only application that runs on AMS infrastructure at this time.

NOTE: You cannot configure unit 0 on an AMS interface.

To support multiple applications and different types of translation, AMS infrastructure supports configuring hashing for each service set. You can configure the hash keys separately for ingress and egress. The default configuration uses source IP, destination IP, and the protocol for hashing; incoming-interface for ingress and outgoing-interface for egress are also available.

NOTE: When using AMS in a load-balanced setup for the NAT solution, the number of NAT IP addresses must be greater than or equal to the number of active mams-interfaces you have added to the AMS bundle.

Configuring High Availability

In an AMS system configured with high availability, a designated services PIC acts as a backup for other active PICs that are part of the AMS system in a many-to-one (N:1) backup configuration. In a N:1 backup configuration, one PIC is available as backup for all other active PICs. If any of the active PICs fail, the backup PIC takes over for the failed PIC. In an N:1 (stateless) backup configuration, traffic states and data structures are not synchronized between the active PICs and the backup PIC.

An AMS system also supports a one-to-one (1:1) configuration. In the case of 1:1 backup, a backup interface is paired with a single active interface. If the active interface fails, the backup interface takes over. In a 1:1 (stateful) configuration, traffic states and data structures are synchronized between the active PICs and the backup PIC. Stateful synchronization is required for high availability of IPsec connections. For IPsec connections, AMS supports 1:1 configuration only.

NOTE: AMS 1:1 high availability is not supported for Next Gen Services in this release.

High availability for load balancing is configured by adding the **high-availability-options** statement at the **[edit interfaces *interface-name* load-balancing-options]** hierarchy level.

To configure N:1 high availability, include the **high-availability-options** statement with the **many-to-one** option:

```
[edit interfaces ams1]
load-balancing-options {
    high-availability-options {
```

```
        many-to-one {
            preferred-backup preferred-backup;
        }
    }
}
```

Starting in Junos OS Release 16.1, you can configure stateful 1:1 high availability on an MS-MPC. To configure stateful 1:1 high availability, at the **[edit interfaces *interface-name* load-balancing-options]** hierarchy level, include the **high-availability-options** statement with the **one-to-one** option:

NOTE: The Next Gen Services MX-SPC3 services card does not support AMS 1:1 high availability.

```
[edit interfaces ams1]
load-balancing-options {
    high-availability-options {
        one-to-one {
            preferred-backup preferred-backup;
        }
    }
}
```

Load Balancing Network Address Translation Flows

Network Address Translation (NAT) has been programmed as a plug-in and is a function of load balancing and high availability. The plug-in runs on AMS infrastructure. All flows for translation are automatically distributed to different services PICs that are part of the AMS infrastructure. In case of failure of an active services PIC, the configured backup PIC takes over the NAT pool resources of the failed PIC. The hashing method selected depends on the type of NAT. Using NAT on AMS infrastructure has a few limitations:

- NAT flows to failed PICs cannot be restored.
- There is no support for IPv6 flows.

  IPv6 address pools are not supported with AMS, however NAT64 is supported with AMS, so that IPv6 flows enters AMS.

  NAT64 is supported for Next Gen Services on the MX-SPC3 services card, there is no support of NAT66. IPv6 flows for different NAT services are supported except where the translation is required to be IPv6 to IPv6 or IPv4 to IPv6.
- Twice NAT is not supported for load balancing on MS-MPC cards.

Twice NAT is supported for load balancing on the Next Gen Services MX-SPC3 services card.

- Deterministic NAT uses warm-standby AMS configuration and can distribute the load using multiple AMS bundles in warm-standby mode.

Release History Table

Release	Description
19.3R2	Starting in Junos OS Release 19.3R2, AMS interfaces are also supported on the MX-SPC3 if you are running Next Gen Services.
16.1	Starting in Junos OS Release 16.1, you can configure stateful 1:1 high availability on an MS-MPC.

Configuring Warm Standby for Services Interfaces

You can configure an N:1 warm standby option for MS-MPCs, MS-MICs, and MX-SPC3s by creating multiple aggregated multiservices (AMS) interfaces, each of which contains the service interface you want to backup and the service interface that acts as the backup. The same backup service interface can be used in all these AMS interfaces. Starting in Junos OS Release 19.3R2, the N:1 warm standby option is also supported on the MX-SPC3 if you are running Next Gen Services.

To configure warm standby for services interfaces:

1. Create an AMS interface.

   ```
   [edit interfaces]
   user@host# set amsN
   ```

   The variable *N* is a unique number, such as 0 or 1.

2. Specify the primary service interface that you want to backup.

   ```
   [edit interfaces amsN]
   user@host# set redundancy-options primary mams-a/b/0
   ```

   The variable *a* is the FPC slot number and *b* is the PIC slot number for the primary service interface.

3. Specify the secondary service interface, which backs up the primary interface.

```
[edit interfaces amsN]
user@host# set redundancy-options secondary mams-a/b/0
```

The variable *a* is the FPC slot number and *b* is the PIC slot number for the secondary service interface.

4. Repeat Steps 1 through 3 to create an AMS interface for each service interface that you want to backup. You can use the same secondary service interface in each AMS interface.

Release History Table

Release	Description
19.3R2	Starting in Junos OS Release 19.3R2, the N:1 warm standby option is also supported on the MX-SPC3 if you are running Next Gen Services.

RELATED DOCUMENTATION

Understanding Aggregated Multiservices Interfaces

8

PART

Inter-Chassis Services PIC High Availability

CHAPTER 22

Inter-Chassis Services PIC High Availability Overview and Configuration

IN THIS CHAPTER

Inter-chassis High Availability Overview for NAT, Stateful Firewall, and IDS Flows for Next Gen Services

Carrier-grade NAT, stateful firewall, and IDS flows can be configured with a dual-chassis, redundant data path. Although intra-chassis high availability can be used in an MX Series device by employing the AMS interfaces, this method only deals locally with services PIC failures. If for any reason traffic is switched to a backup router due to some other failure in the router, the session state from the services PIC is lost unless you configure synchronization of the services session states with a services PIC on the backup router.

Inter-chassis high availability provides this synchronization, and controls switchovers between the services PICs in the redundancy pair. Inter-chassis high availability is a primary-secondary model, not an active-active cluster. Only one services PIC in a redundancy pair, the current master, receives traffic to be serviced.

To configure interchassis high availability for NAT, stateful firewall, and IDS, you configure:

1. Stateful synchronization, which replicates the session state from the master services PICs on the master to the backup services PIC on the other chassis. For more information, see “Inter-Chassis Stateful Synchronization for Long Lived NAT, Stateful Firewall, and IDS Flows for Next Gen Services” on page 228.
2. Inter-chassis services redundancy, which controls mastership switchovers in the services PIC redundancy pair, based on monitored events. Most operators would not want to employ stateful synchronization without also implementing services redundancy. For more information, see “Inter-Chassis Services Redundancy Overview for Next Gen Services” on page 235

Benefits

Interchassis high availability provides automatic switchovers from a services PIC on one chassis to a services PIC on another chassis, while providing uninterrupted services for customer traffic.

Inter-Chassis Stateful Synchronization for Long Lived NAT, Stateful Firewall, and IDS Flows for Next Gen Services

IN THIS SECTION

Inter-Chassis Stateful Synchronization Overview

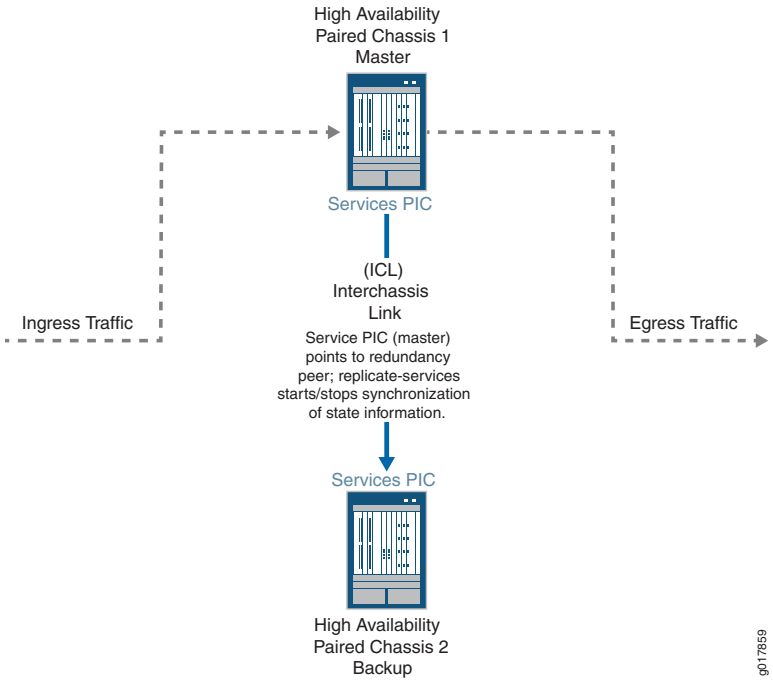
Stateful synchronization replicates the state of long-lived NAT, stateful firewall, and IDS sessions on the master services PIC and sends it to the backup services PIC, which is on a different MX Series chassis. By default, long lived sessions are defined as having been active on the services PIC for at least 180 seconds, though you can configure this to a higher value.

The following restrictions apply:

- NAPT44 is the only translation type supported.
- Replicating state information for the port block allocation (PBA), endpoint-independent mapping (EIM), or endpoint-independent filters (EIF) features is not supported.
- When configuring a service set for NAT, stateful firewall, or IDS that belongs to a stateful synchronization setup, you must use a next-hop service set, and the NAT, stateful firewall, and IDS configurations for the service set must be identical on both MX Series chassis.

Figure 7 on page 229 shows the stateful synchronization topology.

Figure 7: Stateful Sync Topology



Benefits

Interchassis stateful synchronization of the services session state allows uninterrupted services when a switchover occurs from a services PIC on one chassis to a services PIC on another chassis.

SEE ALSO

Configuring Inter-Chassis Stateful Synchronization for Long- Lived NAT, Stateful Firewall, and IDS Flows for Next Gen Services | **229**

Configuring Inter-Chassis Stateful Synchronization for Long- Lived NAT, Stateful Firewall, and IDS Flows for Next Gen Services

IN THIS SECTION

Configuring Inter-Chassis Stateful Synchronization for Next Gen Services with non-AMS Interface

To configure stateful synchronization inter-chassis high availability for NAT, stateful firewall, and IDS flows for Next Gen Services when the services interfaces are not AMS, perform the following configuration steps on each chassis of the high availability pair.

1. Specify the IP address of the vms- interface. This address is used by the TCP channel between the HA pairs.

   ```
   [edit interfaces interface-name redundancy-options]
   user@host# set redundancy-local data-address address
   ```

   For example:

   ```
   [edit interfaces vms-1/0/0 redundancy-options]
   user@host# set redundancy-local data-address 192.0.2.2
   ```

   When you configure the other chassis, this is the address you use for the **redundancy-peer ipaddress**.

2. Specify the IP address of the remote services interface. This address is used by the TCP channel between the HA pairs.

   ```
   [edit interfaces interface-name redundancy-options]
   user@host# set redundancy-peer ipaddress address
   ```

   For example:

   ```
   [edit interfaces vms-1/0/0 redundancy-options]
   user@host# set redundancy-peer ipaddress 192.0.2.1
   ```

   When you configure the other chassis, this is the address you use for the **redundancy-local data-address**.

3. Configure the length of time that the flow remains active for replication, in seconds.

   ```
   [edit interfaces interface-name redundancy-options]
   user@host# set replication-threshold seconds
   ```

   For example:

   ```
   [edit interfaces vms-1/0/0 redundancy-options]
   user@host# set replication-threshold 60
   ```

4. Configure a unit other than 0, and assign it the IP address of the local services interface that you configured with the **redundancy-local data-address** option.

   ```
   [edit interfaces interface-name]
   user@host# set unit logical-unit-number family (inet | inet6) address address
   ```

   For example:

   ```
   [edit interfaces vms-1/0/0]
   user@host# set unit 10 family inet address 192.0.2.2/32
   ```

5. For ease of management, we recommend you create a special routing instance with **instance-type vrf** to host the HA synchronization traffic between the MX Series high availability pair. Then specify the name of the special routing instance to apply to the HA synchronization traffic between the high availability pair.

   ```
   [edit interfaces interface-name redundancy-options]
   user@host# set routing-instance instance-name
   ```

6. Configure the inside and outside interface units, which are used by the next-hop service set. Use different unit numbers for the inside and outside units, and do not use 0 or the unit number used in Step 4.

   ```
   [edit]
   user@host# set interfaces interface-name unit logical-unit-number family (inet | inet6)
   user@host# set interfaces interface-name unit logical-unit-number service-domain inside
   user@host# set interfaces interface-name unit logical-unit-number family (inet | inet6)
   user@host# set interfaces interface-name unit logical-unit-number service-domain outside
   ```

   For example:

   ```
   [edit]
   user@host# set interfaces vms-1/0/0 unit 100 family inet
   user@host# set interfaces vms-1/0/0 unit 100 family inet6
   user@host# set interfaces vms-1/0/0 unit 100 service-domain inside
   user@host# set interfaces vms-1/0/0 unit 1000 family inet
   user@host# set interfaces vms-1/0/0 unit 1000 family inet6
   user@host# set interfaces vms-1/0/0 unit 1000 service-domain outside
   ```

7. Configure the next-hop service set that contains the NAT rules, stateful firewall rules, or IDS screens. The service set must be configured identically on each chassis of the high availability pair. The NAT rules, stateful firewall rules, and IDS screens must also be configured identically on each chassis.

   For example:

   ```
   user@host#set service-set internal-nat next-hop-service inside-service-interface vms-1/0/0.100
   user@host#set service-set internal-nat next-hop-service outside-service-interface vms-1/0/0.1000
   user@host#set service-set internal-nat next-hop-service nat-rules internal-nat1
   ```

8. Repeat these steps for the other chassis of the high availability pair.

SEE ALSO

Configuring Inter-Chassis Stateful Synchronization for Next Gen Services with AMS Interface | 232

Configuring Inter-Chassis Stateful Synchronization for Next Gen Services with AMS Interface

To configure stateful synchronization inter-chassis high availability for NAT, stateful firewall, and IDS flows for Next Gen Services for an AMS services interface, perform the following configuration steps on each chassis of the high availability pair.

1. Configure a services vms- interface for every member of the AMS interface:

   a. Specify the IP address of the vms- interface. This address is used by the TCP channel between the HA pairs.

      ```
      [edit interfaces interface-name redundancy-options]
      user@host# set redundancy-local data-address address
      ```

      For example:

      ```
      [edit interfaces vms-1/0/0 redundancy-options]
      user@host# set redundancy-local data-address 192.0.2.2
      ```

      When you configure the other chassis, this is the address you use for the **redundancy-peer ipaddress**.

   b. Specify the IP address of the remote services interface. This address is used by the TCP channel between the HA pairs.

      ```
      [edit interfaces interface-name redundancy-options]
      user@host# set redundancy-peer ipaddress address
      ```

For example:

```
[edit interfaces vms-1/0/0 redundancy-options]
user@host# set redundancy-peer ipaddress 192.0.2.1
```

When you configure the other chassis, this is the address you use for the **redundancy-local data-address**.

c. Configure the length of time that the flow remains active for replication, in seconds.

```
[edit interfaces interface-name redundancy-options]
user@host# set replication-threshold seconds
```

For example:

```
[edit interfaces vms-1/0/0 redundancy-options]
user@host# set replication-threshold 60
```

d. Configure a unit other than 0, and assign it the IP address of the local services interface that you configured with the **redundancy-local data-address** option.

```
[edit interfaces interface-name]
user@host# set unit logical-unit-number family inet address address
```

For example:

```
[edit interfaces vms-1/0/0]
user@host# set unit 10 family inet address 192.0.2.2/32
```

e. For ease of management, we recommend you create a special routing instance with **instance-type vrf** to host the HA synchronization traffic between the MX Series high availability pair. Then specify the name of the special routing instance to apply to the HA synchronization traffic between the high availability pair.

```
[edit interfaces interface-name redundancy-options]
user@host# set routing-instance instance-name
```

2. Create the AMS interface and add the member interfaces you configured in Step 1.

```
[edit interfaces]
```

```
user@host# set interface-name load-balancing-options [member-interface mams-a/b/0]
```

where the *interface-name* is ams*N*, and *a* is the FPC slot number and *b* is the PIC slot number for each member interface.

For example:

```
[edit interfaces]
user@host# set ams0 load-balancing-options member-interface mams-1/0/0
user@host# set ams0 load-balancing-options member-interface mams-1/1/0
```

3. Configure the inside interface for the AMS interface, which is used by the next-hop service set:

   a. Configure the family for the inside interface. Do not use 0 for the unit number.

   ```
   [edit]
   user@host# set interfaces interface-name unit logical-unit-number service-domain inside
   user@host# set interfaces interface-name unit logical-unit-number family (inet | inet6)
   ```

   For example:

   ```
   [edit]
   user@host# set interfaces ams0 unit 100 service-domain inside
   user@host# set interfaces ams0 unit 100 family inet
   user@host# set interfaces ams0 unit 100 family inet6
   ```

   b. Configure the hash key to regulate distribution for the inside interface.

   ```
   [edit set interfaces interface-name unit logical-unit-number]
   user@host# load-balancing-options hash-keys ingress-key [source-ip destination-ip]
   ```

4. Configure the outside interface for the AMS interface, which is used by the next-hop service set. Do not use 0 or the same unit number that you used for the inside interface.

   a. Configure the family for the outside interface.

   ```
   [edit]
   user@host# set interfaces interface-name unit logical-unit-number service-domain outside
   user@host# set interfaces interface-name unit logical-unit-number family (inet | inet6)
   ```

   For example:

```
[edit]
user@host# set interfaces ams0 unit 1000 service-domain outside
user@host# set interfaces ams0 unit 1000 family inet
user@host# set interfaces ams0 unit 1000 family inet6
```

b. Configure the hash key to regulate distribution for the outside interface.

```
[edit set interfaces interface-name unit logical-unit-number]
user@host# load-balancing-options hash-keys ingress-key [source-ip destination-ip]
```

5. Configure the next-hop service set that contains the NAT rules, stateful firewall rules, or IDS screens. The service set must be configured identically on each chassis of the high availability pair. The NAT rules, stateful firewall rule, and IDS screens must also be configured identically on each chassis.

   For example:

```
user@host#set service-set internal-nat next-hop-service inside-service-interface ams0.100
user@host#set service-set internal-nat next-hop-service outside-service-interface ams0.1000
user@host#set service-set internal-nat next-hop-service nat-rules internal-nat1
```

6. Repeat these steps for the other chassis of the high availability pair.

SEE ALSO

Configuring Inter-Chassis Stateful Synchronization for Next Gen Services with non-AMS Interface | 230

Inter-Chassis Services Redundancy Overview for Next Gen Services

IN THIS SECTION

Introduction to Inter-Chassis Services Redundancy

Interchassis redundancy for services is controlled by the services redundancy daemon (SRD). The SRD lets you specify events that trigger a switchover between the master and standby services PICs, which are on two different MX Series chassis. The SRD monitors conditions, and performs a switchover when an event occurs. Inter-chassis services redundancy is a primary-secondary model, not an active-active cluster. Only one services PIC in a redundancy pair, the current master, receives traffic to be serviced.

You can configure redundancy based on the following monitored events:

- Link down events.
- FPC and PIC reboots.
- Routing protocol daemon (rpd) aborts and restarts.
- Peer gateway events, including requests to acquire or release mastership, or to broadcast warnings.

Benefits

Inter-chassis services redundancy provides automatic switchovers from a services PIC on one chassis to a services PIC on another chassis when a monitored event occurs.

Services Redundancy Components

The following configurable components control services redundancy processing:

- **Redundancy Event**—A monitored critical event that triggers the redundancy peers to acquire or release mastership or to create a warning, and to add or delete signal routes.

  One monitored interface can be part of only one redundancy event, but one redundancy event can have multiple monitored interfaces.

- **Redundancy Policy**—A policy that defines the set of actions taken when a redundancy event occurs. Available actions include acquisition or release of mastership, creation of a warning, and addition or deletion of signal routes. You can configure a maximum of 256 redundancy policies. A redundancy policy can have a maximum of 256 interface-down events.

  One redundancy event can be part of only one redundancy policy, but one redundancy policy can have multiple redundancy events. For example, redundancy policy RP1 can include redundancy events RE1 and RE2. Redundancy events RE1 and RE2 cannot be included in redundancy policies other than RP1.

- **Redundancy Set**—A collection of one or more redundancy policies that is assigned to one or more service sets on each MX Series chassis of the redundant pair, and the redundancy group that is associated with the redundancy set. At a given time, a particular redundancy set can be active on only one gateway, but not all redundancy sets have to be active on the same gateway. For example, redundancy set A can be

active on gateway 1 while redundancy set B is active on gateway 2. You can configure a maximum of 128 redundancy sets.

One service set can be assigned only one redundancy set, but multiple service sets can be assigned the same redundancy set.

One redundancy policy can be part of only one redundancy set, but one redundancy set can have multiple redundancy policies. For example, redundancy set RS1 can include redundancy policies RP1 and RP2. Redundancy policies RP1 and RP2 cannot be included in redundancy sets other than RS1. A redundancy set can have a maximum of 16 redundancy policies.

- **Redundancy Group**—The redundancy group identifies the associated ICCP redundancy group. A one-to-one relationship exists between a redundancy set and a redundancy group. One redundancy set can be part of only one redundancy group. You can configure a maximum of 16 redundancy groups. A maximum of 16 redundancy sets can be associated with the same redundancy group.
- **Signal routes**—Static routes that are added or deleted by services redundancy processing, based on mastership state changes.
- **Routing Policies**—Policies that advertise routes based on the existence or non-existence of signal routes.
- **VRRP (Virtual Router Redundancy Protocol) route tracking**—Tracks whether a reachable signal route exists in the routing table of the routing instance in the configuration. Based on the reachability of the tracked route, VRRP route tracking dynamically changes the priority of the VRRP group.

Services Redundancy Operation

Services redundancy operates as follows:

1. The services redundancy daemon runs on the Routing Engine. It continuously monitors configured redundancy events.
2. When a redundancy event is detected, the services redundancy daemon:
   a. Adds or removes signal routes specified in the redundancy policy.
   b. Switches services to the standby.
   c. Updates stateful synchronization roles as needed.
3. Resulting route changes cause:
   a. The routing policy connected to this route to advertise routes differently.
   b. VRRP to change advertised priorities.

To summarize the switchover process:

1. A critical event occurs.
2. The services redundancy daemon adds or removes a signal route.

3. A routing policy advertises routes differently. VRRP changes advertised priorities.
4. Services switch over to the standby.
5. Stateful synchronization is updated accordingly.

> **NOTE:** The order of routing priorities must match the order of services mastership.

If a redundancy policy action is release-mastership and the redundancy peer's state is wait, the mastership-release fails. If a redundancy policy action is release-mastership-force, the mastership release succeeds even if the redundancy peer's state is warned.

Similarly, if a redundancy policy action on the standby is acquire-mastership and the local state is wait, the mastership-release fails. If a redundancy policy action is acquire-mastership-force, the mastership release succeeds even if the standby state is wait.

You can also use a manual command to trigger a redundancy policy that releases or acquires mastership.

If gateway 1, the chassis that is configured with the lower IP address, is the master chassis and you deactivate the services redundancy daemon on it, a switchover to gateway 2 occurs . If gateway 2, the chassis that is configured with the higher IP address, is the master chassis and you deactivate the services redundancy daemon on it, a switchover does not occur.

RELATED DOCUMENTATION

Configuring Inter-Chassis Services Redundancy for Next Gen Services | 238

Configuring Inter-Chassis Services Redundancy for Next Gen Services

IN THIS SECTION

This topic describes how to configure interchassis-services redundancy for Next Gen Services. This topic contains a procedure for configuring non-stop services redundancy (automatic switchovers in both

directions) and a procedure for one-way redundancy (automatic switchovers only from the original master to the original standby).

You can also use a manual request command to release or acquire mastership:

```
request services redundancy-set redundancy-set trigger redundancy-event event-name <force>
```

The command automatically triggers the specified redundancy event. You must create a configuration that assigns the redundancy event to a redundancy policy that either releases or acquires mastership. You must also assign the redundancy policy to the redundancy set used in the command.

Configuring Non-Stop Services Redundancy for Next Gen Services Service Set

Non-stop services redundancy gives you automatic services switchovers between the MX Series routers when a critical event occurs. Automatic switchovers from gateway1 to gateway2 and from gateway2 to gateway1 take place without manual intervention.

To configure non-stop services redundancy for a service set, perform the following steps on both gateway1 and gateway2:

1. Configure one or more redundancy events to monitor the conditions that trigger a services switchover to the peer gateway.

   a. Configure a name for the redundancy event.

   ```
   [edit services]
   user@host# set event-options redundancy-event event-name
   ```

   For example:

   ```
   [edit services]
   user@host# set event-options redundancy-event RELS_MSHIP_CRIT_EV
   ```

   b. Specify any interfaces that trigger a services switchover when the interface goes down.

   ```
   [edit services event-options redundancy-event event-name]
   user@host# set monitor link-down [interface-name]
   ```

   c. Specify that a process routing daemon restart request triggers a services switchover.

   ```
   [edit services event-options redundancy-event event-name]
   user@host# set monitor process routing restart
   ```

d. Specify that a process routing daemon abort request triggers a services switchover.

```
[edit services event-options redundancy-event event-name]
user@host# set monitor process routing abort
```

e. Specify that a request from the peer to acquire ownership triggers a services switchover.

```
[edit services event-options redundancy-event event-name]
user@host# set monitor peer mastership-acquire
```

2. Configure a redundancy policy that releases mastership and deletes a static route when the redundancy event conditions are met.

a. Configure a name for the policy.

```
user@host# edit policy-options redundancy-policy policy-name
```

For example:

```
user@host# edit policy-options redundancy-policy RLS_MSHIP_POL
```

b. Specify the redundancy events that release mastership.

```
[edit policy-options redundancy-policy policy-name]
user@host# set redundancy-events [event-list]
```

For example:

```
[edit policy-options redundancy-policy RLS_MSHIP_POL
user@host# set redundancy-events RELS_MSHIP_CRIT_EV
```

If you want to be able to run the **request services redundancy-set *redundancy-set* trigger redundancy-event *event-name* <force>** to manually release mastership, include that *event-name* in the redundancy policy. The redundancy event itself does not need to be configured, because it is triggered by the request command.

For example:

```
[edit policy-options redundancy-policy RLS_MSHIP_POL
user@host# set redundancy-events [RELS_MSHIP_CRIT_EV RELS_MSHIP_MANUAL_EV]
```

c. Release mastership.

```
[edit policy-options redundancy-policy policy-name]
user@host# set then release-mastership
```

d. Delete the static route.

```
[edit policy-options redundancy-policy policy-name]
user@host# set then delete-static-route destination (receive | next-hop next-hop) routing-instance
  routing-instance
```

3. Configure a redundancy event to identify when the peer gateway releases mastership.

```
[edit services]
user@host# set event-options redundancy-event event-name monitor peer release-mastership
```

For example:

```
[edit services]
user@host# set event-options redundancy-event PEER_RELS_MSHIP_EV monitor peer release-mastership
```

4. Configure a redundancy policy that acquires mastership from the peer gateway and adds a static route.

a. Configure a name for the policy.

```
user@host# edit policy-options redundancy-policy policy-name
```

For example:

```
user@host# edit policy-options redundancy-policy ACQU_MSHIP_POL
```

b. Specify the redundancy events that acquire mastership.

```
[edit policy-options redundancy-policy policy-name]
user@host# set redundancy-events [event-list]
```

For example:

```
[edit policy-options redundancy-policy ACQU_MSHIP_POL]
user@host# set redundancy-events PEER_RELS_MSHIP_EV
```

If you want to be able to run the **request services redundancy-set *redundancy-set* trigger redundancy-event *event-name* <force>** to manually acquire mastership, include that *event-name* in the redundancy policy. The redundancy event itself does not need to be configured, because it is triggered by the request command.

For example:

```
[edit policy-options redundancy-policy ACQU_MSHIP_POL]
user@host# set redundancy-events [PEER_RELS_MSHIP_EV ACQU_MSHIP_MANUAL_EV]
```

c. Acquire mastership.

```
[edit policy-options redundancy-policy policy-name]
user@host# set then acquire-mastership
```

d. Add a static route.

```
[edit policy-options redundancy-policy policy-name]
user@host# set then add-static-route destination (receive | next-hop next-hop) routing-instance
  routing-instance
```

5. Configure the redundancy set.

a. Configure a name for the redundancy set.

```
[edit services]
user@host# set redundancy-set redundancy-set
```

For example:

```
[edit services]
user@host# set redundancy-set 1
```

b. Specify the redundancy group ID for the redundancy set.

```
[edit services redundancy-set redundancy-set]
user@host# set redundancy-group redundancy-group
```

For example:

```
[edit services redundancy-set 1]
user@host# set redundancy-group 1
```

The redundancy group ID is the same redundancy group ID configured for the ICCP daemon (iccpd) through the existing ICCP configuration hierarchy. For example,

```
iccp {
 local-ip-addr 1.1.1.1;
 peer 2.2.2.2 {
  redundancy-group-id-list 1;
  liveness-detection {
   minimum-interval 1000;
  }
 }
}
```

c. Specify the redundancy policy that releases mastership and the redundancy policy that acquires mastership.

```
[edit services redundancy-set redundancy-set]
user@host# set redundancy-policy [redundancy-policy-list]
```

For example:

```
[edit services redundancy-set 1]
user@host# set redundancy-policy [ACQU_MSHIP_POL RLS_MSHIP_POL]
```

d. Configure the frequency of health check probes of the redundancy set, in seconds.

```
[edit services redundancy-set redundancy-set]
user@host# set healthcheck-timer-interval healthcheck-timer-interval
```

The default is 30 seconds.

e. Configure the maximum wait time for a help check response, in seconds.

```
[edit services redundancy-set redundancy-set]
user@host# set hold-time hold-time
```

The range is 0 through 3600 seconds.

f. Configure the frequency of srd hello messages, in seconds.

```
[edit services redundancy-set redundancy-set]
user@host# set keepalive keepalive
```

The range is 1 through 60 seconds.

6. Configure routing policies.

a. Identify signal routes that requires redundancy-related routing changes. Specify the signal route and the routing table that is used.

```
[edit policy-options condition condition-name}
user@host# set if-route-exists signal-route table routing-table
```

For example:

```
[edit policy-options condition switchover-route-exists]
user@host# set if-route-exists 10.45.45.0/24 table bgp1_table
```

b. To change the local-preference for the signal route, enter it in a policy statement.

```
[edit policy-options policy-statement policy-name]
user@host# set term term from protocol [protocol variables] prefix-list prefix-list condition condition-name
    then local-preference preference-value accept
```

c. To change as-path-prepend values for the signal route, enter them in the policy statement.

```
[edit policy-options policy-statement policy-name]
user@host# set term term from prefix-list prefix-list condition condition-name then as-path-prepend
    [as-prepend-values] next-hop self accept
```

7. Configure redundancy for the service set by assigning the redundancy set to the service set.

```
[edit]
user@host# set services service-set service-set-name redundancy-set-id redundancy-set
```

8. Repeat these steps on the peer gateway.

SEE ALSO

Configuring One-Way Services Redundancy for Next Gen Services Service Set | 245

Configuring One-Way Services Redundancy for Next Gen Services Service Set

One-way services redundancy gives you automatic services switchovers from gateway1, the original master gateway, to gateway2, the original standby gateway. An automatic switchover from gateway 2 to gateway1 does not happen. To switchover from gateway2 to gateway1, you must perform a manual switchover.

1. On gateway1, the initial master, configure one or more redundancy events to monitor the conditions that trigger a services switchover to gateway2, the standby gateway.

   a. Configure a name for the redundancy event.

   ```
   [edit services]
   user@gateway1# set event-options redundancy-event event-name
   ```

   For example:

   ```
   [edit services]
   user@gateway1# set event-options redundancy-event RELS_MSHIP_CRIT_EV
   ```

   b. Specify any interfaces that trigger a services switchover when the interface goes down.

   ```
   [edit services event-options redundancy-event event-name]
   user@gateway1# set monitor link-down [interface-name]
   ```

   c. Specify that a process routing daemon restart request triggers a services switchover.

   ```
   [edit services event-options redundancy-event event-name]
   user@gateway1# set monitor process routing restart
   ```

   d. Specify that a process routing daemon abort request triggers a services switchover.

   ```
   [edit services event-options redundancy-event event-name]
   user@gateway1# set monitor process routing abort
   ```

2. On gateway1, configure a redundancy policy that releases mastership and deletes a static route when the redundancy event conditions are met.

   a. Configure a name for the policy.

```
user@gateway1# edit policy-options redundancy-policy policy-name
```

For example:

```
user@gateway1# edit policy-options redundancy-policy RLS_MSHIP_POL
```

b. Specify the redundancy events that release mastership.

```
[edit policy-options redundancy-policy policy-name]
user@gateway1# set redundancy-events [event-list]
```

For example:

```
[edit policy-options redundancy-policy RLS_MSHIP_POL]
user@gateway1# set redundancy-events RELS_MSHIP_CRIT_EV
```

If you want to be able to run the **request services redundancy-set *redundancy-set* trigger redundancy-event *event-name* <force>** to manually release mastership, include that *event-name* in the redundancy policy. The redundancy event itself does not need to be configured, because it is triggered by the request command.

For example:

```
[edit policy-options redundancy-policy RLS_MSHIP_POL]
user@gateway1# set redundancy-events [RELS_MSHIP_CRIT_EV RELS_MSHIP_MANUAL_EV]
```

c. Release mastership.

```
[edit policy-options redundancy-policy policy-name]
user@gateway1# set then release-mastership force
```

d. Delete the static route.

```
[edit policy-options redundancy-policy policy-name]
```

```
user@gateway1# set then delete-static-route destination (receive | next-hop next-hop) routing-instance
  routing-instance
```

3. On gateway1, configure a redundancy policy that acquires mastership from gateway2 when you perform a manual request on gateway1 (**request services redundancy-set *redundancy-set* trigger redundancy-event *event-name* <force>**) .

   a. Configure a name for the policy.

   ```
   user@gateway1# edit policy-options redundancy-policy policy-name
   ```

   For example:

   ```
   user@gateway1# edit policy-options redundancy-policy ACQU_MSHIP_POL
   ```

   b. Specify the name of the redundancy event that the manual request uses.

   ```
   [edit policy-options redundancy-policy policy-name]
   user@gateway1# set redundancy-events event-name
   ```

   For example:

   ```
   [edit policy-options redundancy-policy ACQU_MSHIP_POL]
   user@gateway1# set redundancy-events ACQU_MSHIP_MANUAL_EV
   ```

   The redundancy event itself does not need to be configured, because it is triggered by the request command.

   c. Acquire mastership.

   ```
   [edit policy-options redundancy-policy policy-name]
   user@host# set then acquire-mastership
   ```

4. On gateway1, configure the redundancy set.

   a. Configure a name for the redundancy set.

   ```
   [edit services]
   user@gateway1# set redundancy-set redundancy-set
   ```

   For example:

```
[edit services]
user@gateway1# set redundancy-set 1
```

b. Specify the redundancy group ID for the redundancy set.

```
[edit services redundancy-set redundancy-set]
user@gateway1# set redundancy-group redundancy-group
```

For example:

```
[edit services redundancy-set 1]
user@gateway1# set redundancy-group 1
```

The redundancy group ID is the same redundancy group ID configured for the ICCP daemon (iccpd) through the existing ICCP configuration hierarchy. For example,

```
iccp {
 local-ip-addr 1.1.1.1;
 peer 2.2.2.2 {
  redundancy-group-id-list 1;
  liveness-detection {
   minimum-interval 1000;
  }
 }
}
```

c. Specify the redundancy policy that releases mastership and the redundancy policy that acquires mastership.

```
[edit services redundancy-set redundancy-set]
user@gateway1# set redundancy-policy [redundancy-policy-list]
```

For example:

```
[edit services redundancy-set 1]
user@gateway1# set redundancy-policy [ ACQU_MSHIP_POL RLS_MSHIP_POL]
```

d. Configure the frequency of health check probes of the redundancy set, in seconds.

```
[edit services redundancy-set redundancy-set]
```

```
user@gateway1# set healthcheck-timer-interval healthcheck-timer-interval
```

The default is 30 seconds.

e. Configure the maximum wait time for a help check response, in seconds.

```
[edit services redundancy-set redundancy-set]
user@gateway1# set hold-time hold-time
```

The range is 0 through 3600 seconds.

f. Configure the frequency of srd hello messages, in seconds.

```
[edit services redundancy-set redundancy-set]
user@gateway1# set keepalive keepalive
```

The range is 1 through 60 seconds.

5. On gateway1, configure routing policies.

a. Identify signal routes that requires redundancy-related routing changes. Specify the signal route and the routing table that is used.

```
[edit policy-options condition condition-name}
user@gateway1# set if-route-exists signal-route table routing-table
```

For example:

```
[edit policy-options condition switchover-route-exists]
user@gateway1# set if-route-exists 10.45.45.0/24 table bgp1_table
```

b. To change the local-preference for the signal route, enter it in a policy statement.

```
[edit policy-options policy-statement policy-name]
user@gateway1# set term term from protocol [protocol variables] prefix-list prefix-list condition
   condition-name then local-preference preference-value accept
```

c. To change as-path-prepend values for the signal route, enter them in the policy statement.

```
[edit policy-options policy-statement policy-name]
```

```
user@gateway1# set term term from prefix-list prefix-list condition condition-name then as-path-prepend
    [as-prepend-values] next-hop self accept
```

6. On gateway1, configure redundancy for the service set by assigning the redundancy set to the service set.

```
[edit]
user@gateway1# set services service-set service-set-name redundancy-set-id redundancy-set
```

7. On gateway2, the initial standby, configure a redundancy event to identify when the peer gateway releases mastership.

```
[edit services]
user@gateway2# set event-options redundancy-event event-name monitor peer release-mastership
```

   For example:

```
[edit services]
user@gateway2# set event-options redundancy-event PEER_RELS_MSHIP_EV monitor peer
    release-mastership
```

8. On gateway2, configure a redundancy policy that acquires mastership from the peer gateway and adds a static route.

   a. Configure a name for the policy.

```
user@gateway2# edit policy-options redundancy-policy policy-name
```

      For example:

```
user@gateway2# edit policy-options redundancy-policy ACQU_MSHIP_POL
```

   b. Specify the configured redundancy event for the peer gateway mastership release event.

```
[edit policy-options redundancy-policy policy-name]
user@gateway2# set redundancy-events event-name
```

      For example:

```
[edit policy-options redundancy-policy ACQU_MSHIP_POL]
user@gateway2# set redundancy-events PEER_RELS_MSHIP_EV
```

c. Acquire mastership.

```
[edit policy-options redundancy-policy policy-name]
user@gateway2# set then acquire-mastership
```

d. Add a static route.

```
[edit policy-options redundancy-policy policy-name]
user@gateway2# set then add-static-route destination (receive | next-hop next-hop) routing-instance
  routing-instance
```

9. On gateway2, configure a redundancy event to identify when the peer gateway requests mastership.

```
[edit services]
user@gateway2# set event-options redundancy-event event-name monitor peer mastership-acquire
```

For example:

```
[edit services]
user@gateway2# set event-options redundancy-event PEER_MSHIP_ACQU_EV monitor peer
  mastership-acquire
```

10. On gateway2, configure a redundancy policy that releases mastership and deletes a static route when gateway1 requests mastership.

a. Configure a name for the policy.

```
user@gateway2# edit policy-options redundancy-policy policy-name
```

For example:

```
user@gateway2# edit policy-options redundancy-policy RELS-MSHIP_POL
```

b. Specify the configured redundancy event that identifies when the peer gateway requests mastership.

```
[edit policy-options redundancy-policy policy-name]
user@gateway2# set redundancy-events event-name
```

For example:

```
[edit policy-options redundancy-policy RELS-MSHIP_POL]
user@gateway2# set redundancy-events PEER_MSHIP_ACQU_EV
```

c. Release mastership.

```
[edit policy-options redundancy-policy policy-name]
user@gateway2# set then release-mastership force
```

d. Delete the static route.

```
[edit policy-options redundancy-policy policy-name]
user@gateway2# set then delete-static-route destination (receive | next-hop next-hop) routing-instance
  routing-instance
```

11. On gateway2, configure one or more redundancy events to monitor the conditions that trigger a warning.

a. Configure a name for the redundancy event.

```
[edit services]
user@gateway2# set event-options redundancy-event event-name
```

For example:

```
[edit services]
user@gateway2# set event-options redundancy-event WARN_EV
```

b. Specify any interfaces that trigger a warning when the interface goes down.

```
[edit services event-options redundancy-event event-name]
user@gateway2# set monitor link-down [interface-name]
```

c. Specify that a process routing daemon restart request triggers a warning.

```
[edit services event-options redundancy-event event-name]
user@gateway2# set monitor process routing restart
```

d. Specify that a process routing daemon abort request triggers a warning.

```
[edit services event-options redundancy-event event-name]
user@gateway2# set monitor process routing abort
```

12. On gateway2, configure a redundancy policy that broadcasts a warning.

a. Configure a name for the policy.

```
user@gateway2# edit policy-options redundancy-policy policy-name
```

For example:

```
user@gateway2# edit policy-options redundancy-policy WARN_POL
```

b. Specify the configured redundancy events that trigger a warning.

```
[edit policy-options redundancy-policy policy-name]
user@gateway2# set redundancy-events [event-list]
```

For example:

```
[edit policy-options redundancy-policy WARN_POL]
user@gateway2# set redundancy-events WARN_EV
```

c. Broadcast the warning.

```
[edit policy-options redundancy-policy policy-name]
user@gateway2# set then broadcast-warning
```

13. On gateway2, configure the redundancy set.

a. Configure a name for the redundancy set.

```
[edit services]
user@gateway2# set redundancy-set redundancy-set
```

For example:

```
[edit services]
user@gateway2# set redundancy-set 1
```

b. Specify the redundancy group ID for the redundancy set.

```
[edit services redundancy-set redundancy-set]
user@gateway2# set redundancy-group redundancy-group
```

For example:

```
[edit services redundancy-set 1]
user@gateway2# set redundancy-group 1
```

The redundancy group ID is the same redundancy group ID configured for the ICCP daemon (iccpd) through the existing ICCP configuration hierarchy. For example,

```
iccp {
 local-ip-addr 1.1.1.1;
 peer 2.2.2.2 {
  redundancy-group-id-list 1;
  liveness-detection {
   minimum-interval 1000;
  }
 }
}
```

c. Specify the redundancy policy that releases mastership, the redundancy policy that acquires mastership, and the redundancy policy that triggers a warning.

```
[edit services redundancy-set redundancy-set]
user@gateway2# set redundancy-policy [redundancy-policy-list]
```

For example:

```
[edit services redundancy-set 1]
user@gateway2# set redundancy-policy [ ACQU_MSHIP_POL RLS_MSHIP_POL WARN_POL]
```

d. Configure the frequency of health check probes of the redundancy set, in seconds.

```
[edit services redundancy-set redundancy-set]
user@gateway2# set healthcheck-timer-interval healthcheck-timer-interval
```

The default is 30 seconds.

e. Configure the maximum wait time for a help check response, in seconds.

```
[edit services redundancy-set redundancy-set]
user@gateway2# set hold-time hold-time
```

The range is 0 through 3600 seconds.

f. Configure the frequency of srd hello messages, in seconds.

```
[edit services redundancy-set redundancy-set]
user@gateway2# set keepalive keepalive
```

The range is 1 through 60 seconds.

14. On gateway2, configure routing policies.

a. Identify signal routes that requires redundancy-related routing changes. Specify the signal route and the routing table that is used.

```
[edit policy-options condition condition-name}
user@gateway2# set if-route-exists signal-route table routing-table
```

For example:

```
[edit policy-options condition switchover-route-exists]
user@gateway2# set if-route-exists 10.45.45.0/24 table bgp1_table
```

b. To change the local-preference for the signal route, enter it in a policy statement.

```
[edit policy-options policy-statement policy-name]
user@gateway2# set term term from protocol [protocol variables] prefix-list prefix-list condition
   condition-name then local-preference preference-value accept
```

c. To change as-path-prepend values for the signal route, enter them in the policy statement.

```
[edit policy-options policy-statement policy-name]
user@gateway2# set term term from prefix-list prefix-list condition condition-name then as-path-prepend
    [as-prepend-values] next-hop self accept
```

15. On gateway2, configure redundancy for the service set by assigning the redundancy set to the service set.

```
[edit]
user@gateway2# set services service-set service-set-name redundancy-set-id redundancy-set
```

SEE ALSO

Configuring Non-Stop Services Redundancy for Next Gen Services Service Set | 239

9

PART

Application Layer Gateways

CHAPTER 23

Enabling Traffic to Pass Securely Using Application Layer Gateways

IN THIS CHAPTER

Next Gen Services Application Layer Gateways

IN THIS SECTION

This topic describes the Application Layer Gateways (ALGs) supported by Junos OS for Next Gen Services. ALG support includes managing pinholes and parent-child relationships for the supported ALGs.

RTSP

The Real-Time Streaming Protocol (RTSP) controls the delivery of data with real-time properties such as audio and video. The streams controlled by RTSP can use RTP, but it is not required. Media can be transmitted on the same RTSP control stream. This is an HTTP-like text-based protocol, but client and server maintain session information. A session is established using the SETUP message and terminated

using the TEARDOWN message. The transport (the media protocol, address, and port numbers) is negotiated in the setup and the setup-response.

Support for stateful firewall and NAT services requires that you configure the RTSP ALG for TCP port 554.

The ALG monitors the control connection, opens flows dynamically for media (RTP/RTSP) streams, and performs NAT address and port rewrites.

SIP

The Session Initiation Protocol (SIP) is an application layer protocol that can establish, maintain, and terminate media sessions. It is a widely used voice over IP (VoIP) signaling protocol. The SIP ALG monitors SIP traffic and dynamically creates and manages pinholes on the signaling and media paths. The ALG only allows packets with the correct permissions. The SIP ALG also performs the following functions:

- Manages parent-child session relationships.
- Enforces security policies.
- Manages pinholes for VoIP traffic.

The SIP ALG supports the following features:

- Stateful firewall
- Static source NAT
- Dynamic address only source NAT
- Network Address Port Translation (NAPT)

> **NOTE:** SIP sessions are limited to 12 hours (720 minutes) for NAT processing on the MS-MIC and MS-MPC interface cards. SIP sessions on the MS-DPC have no time limit.

Configuring SIP

The Session Initiation Protocol (SIP) is a generalized protocol for communication between endpoints involved in Internet services such as telephony, fax, video conferencing, instant messaging, and file exchange.

The Junos OS provides ALG services in accordance with the standard described in RFC 3261, *SIP: Session Initiation Protocol*. SIP flows under the Junos OS are as described in RFC 3665, *Session Initiation Protocol (SIP) Basic Call Flow Examples*.

> **NOTE:** Before implementing the Junos OS SIP ALG, you should be familiar with certain limitations, discussed in "Junos OS SIP ALG Limitations" on page 268
>
> The use of NAT in conjunction with the SIP ALG results in changes in SIP header fields due to address translation. For an explanation of these translations, refer to "SIP ALG Interaction with Network Address Translation" on page 262.

To implement SIP on adaptive services interfaces, you configure the **application-protocol** statement at the **[edit applications application *application-name*]** hierarchy level with the value **sip**. In addition, there are two other statements you can configure to modify how SIP is implemented:

- You can enable the router to accept any incoming SIP calls for the endpoint devices that are behind the NAT firewall. When a device behind the firewall registers with the proxy that is outside the firewall, the AS or Multiservices PIC maintains the registration state. When the **learn-sip-register** statement is enabled, the router can use this information to accept inbound calls. If this statement is not configured, no inbound calls are accepted; only the devices behind the firewall can call devices outside the firewall.

  To configure SIP registration, include the **learn-sip-register** statement at the **[edit applications application *application-name*]** hierarchy level:

  ```
  [edit applications application application-name]
  learn-sip-register;
  ```

  > **NOTE:** The **learn-sip-register** statement is not applicable to the Next Gen Services MX-SPC3.

  You can also manually inspect the SIP register by issuing the **show services stateful-firewall sip-register** command; for more information, see the *Junos OS System Basics and Services Command Reference*. The **show services stateful-firewall sip-register** command is not supported for Next Gen Services.

- You can specify a timeout period for the duration of SIP calls that are placed on hold. When a call is put on hold, there is no activity and flows might time out after the configured **inactivity-timeout** period expires, resulting in call state teardown. To avoid this, when a call is put on hold, the flow timer is reset to the **sip-call-hold-timeout** cycle to preserve the call state and flows for longer than the **inactivity-timeout** period.

  > **NOTE:** The **sip-call-hold-timeout** statement is not applicable to the Next Gen Services MX-SPC3.

To configure a timeout period, include the **sip-call-hold-timeout** statement at the **[edit applications application *application-name*]** hierarchy level:

```
[edit applications application application-name]
sip-call-hold-timeout seconds;
```

The default value is 7200 seconds and the range is from 0 through 36,000 seconds (10 hours).

SIP ALG Interaction with Network Address Translation

IN THIS SECTION

The Network Address Translation (NAT) protocol enables multiple hosts in a private subnet to share a single public IP address to access the Internet. For outgoing traffic, NAT replaces the private IP address of the host in the private subnet with the public IP address. For incoming traffic, the public IP address is converted back into the private address, and the message is routed to the appropriate host in the private subnet.

Using NAT with the Session Initiation Protocol (SIP) service is more complicated because SIP messages contain IP addresses in the SIP headers as well as in the SIP body. When using NAT with the SIP service, the SIP headers contain information about the caller and the receiver, and the device translates this information to hide it from the outside network. The SIP body contains the Session Description Protocol (SDP) information, which includes IP addresses and port numbers for transmission of the media. The device translates SDP information for allocating resources to send and receive the media.

How IP addresses and port numbers in SIP messages are replaced depends on the direction of the message. For an outgoing message, the private IP address and port number of the client are replaced with the public

IP address and port number of the Juniper Networks firewall. For an incoming message, the public address of the firewall is replaced with the private address of the client.

When an INVITE message is sent out across the firewall, the SIP Application Layer Gateway (ALG) collects information from the message header into a call table, which it uses to forward subsequent messages to the correct endpoint. When a new message arrives, for example an ACK or 200 OK, the ALG compares the “From:, To:, and Call-ID:” fields against the call table to identify the call context of the message. If a new INVITE message arrives that matches the existing call, the ALG processes it as a REINVITE.

When a message containing SDP information arrives, the ALG allocates ports and creates a NAT mapping between them and the ports in the SDP. Because the SDP requires sequential ports for the Real-Time Transport Protocol (RTP) and Real-Time Control Protocol (RTCP) channels, the ALG provides consecutive even-odd ports. If it is unable to find a pair of ports, it discards the SIP message.

This topic contains the following sections:

Outgoing Calls

When a SIP call is initiated with a SIP request message from the internal to the external network, NAT replaces the IP addresses and port numbers in the SDP and binds the IP addresses and port numbers to the Juniper Networks firewall. Via, Contact, Route, and Record-Route SIP header fields, if present, are also bound to the firewall IP address. The ALG stores these mappings for use in retransmissions and for SIP response messages.

The SIP ALG then opens pinholes in the firewall to allow media through the device on the dynamically assigned ports negotiated based on information in the SDP and the Via, Contact, and Record-Route header fields. The pinholes also allow incoming packets to reach the Contact, Via, and Record-Route IP addresses and ports. When processing return traffic, the ALG inserts the original Contact, Via, Route, and Record-Route SIP fields back into packets.

Incoming Calls

Incoming calls are initiated from the public network to public static NAT addresses or to interface IP addresses on the device. Static NATs are statically configured IP addresses that point to internal hosts; interface IP addresses are dynamically recorded by the ALG as it monitors REGISTER messages sent by internal hosts to the SIP registrar. When the device receives an incoming SIP packet, it sets up a session and forwards the payload of the packet to the SIP ALG.

The ALG examines the SIP request message (initially an INVITE) and, based on information in the SDP, opens gates for outgoing media. When a 200 OK response message arrives, the SIP ALG performs NAT on the IP addresses and ports and opens pinholes in the outbound direction. (The opened gates have a short time-to-live, and they time out if a 200 OK response message is not received quickly.)

When a 200 OK response arrives, the SIP proxy examines the SDP information and reads the IP addresses and port numbers for each media session. The SIP ALG on the device performs NAT on the addresses and port numbers, opens pinholes for outbound traffic, and refreshes the timeout for gates in the inbound direction.

When the ACK arrives for the 200 OK, it also passes through the SIP ALG. If the message contains SDP information, the SIP ALG ensures that the IP addresses and port numbers are not changed from the previous INVITE—if they are, the ALG deletes old pinholes and creates new pinholes to allow media to pass through. The ALG also monitors the Via, Contact, and Record-Route SIP fields and opens new pinholes if it determines that these fields have changed.

Forwarded Calls

A forwarded call is when, for example, user A outside the network calls user B inside the network, and user B forwards the call to user C outside the network. The SIP ALG processes the INVITE from user A as a normal incoming call. But when the ALG examines the forwarded call from B to C outside the network and notices that B and C are reached using the same interface, it does not open pinholes in the firewall, because media will flow directly between user A and user C.

Call Termination

The BYE message terminates a call. When the device receives a BYE message, it translates the header fields just as it does for any other message. But because a BYE message must be acknowledged by the receiver with a 200 OK, the ALG delays call teardown for five seconds to allow time for transmission of the 200 OK.

Call Re-INVITE Messages

Re-INVITE messages add new media sessions to a call and remove existing media sessions. When new media sessions are added to a call, new pinholes are opened in the firewall and new address bindings are created. The process is identical to the original call setup. When one or more media sessions are removed from a call, pinholes are closed and bindings released just as with a BYE message.

Call Session Timers

The SIP ALG uses the Session-Expires value to time out a session if a Re-INVITE or UPDATE message is not received. The ALG gets the Session-Expires value, if present, from the 200 OK response to the INVITE and uses this value for signaling timeout. If the ALG receives another INVITE before the session times out, it resets all timeout values to this new INVITE or to default values, and the process is repeated.

As a precautionary measure, the SIP ALG uses hard timeout values to set the maximum amount of time a call can exist. This ensures that the device is protected should one of the following events occur:

- End systems crash during a call and a BYE message is not received.
- Malicious users never send a BYE in an attempt to attack a SIP ALG.
- Poor implementations of SIP proxy fail to process Record-Route and never send a BYE message.
- Network failures prevent a BYE message from being received.

Call Cancellation

Either party can cancel a call by sending a CANCEL message. Upon receiving a CANCEL message, the SIP ALG closes pinholes through the firewall—if any have been opened—and releases address bindings. Before releasing the resources, the ALG delays the control channel age-out for approximately five seconds to

allow time for the final 200 OK to pass through. The call is terminated when the five second timeout expires, regardless of whether a 487 or non-200 response arrives.

Forking

Forking enables a SIP proxy to send a single INVITE message to multiple destinations simultaneously. When the multiple 200 OK response messages arrive for the single call, the SIP ALG parses but updates call information with the first 200 OK messages it receives.

SIP Messages

The SIP message format consists of a SIP header section and the SIP body. In request messages, the first line of the header section is the request line, which includes the method type, request-URI, and protocol version. In response messages, the first line is the status line, which contains a status code. SIP headers contain IP addresses and port numbers used for signaling. The SIP body, separated from the header section by a blank line, is reserved for session description information, which is optional. Junos OS currently supports the SDP only. The SIP body contains IP addresses and port numbers used to transport the media.

SIP Headers

In the following sample SIP request message, NAT replaces the IP addresses in the header fields to hide them from the outside network.

```
INVITE bob@10.150.20.5 SIP/2.0
Via: SIP/2.0/UDP 10.150.20.3:5434
From: alice@10.150.20.3
To: bob@10.150.20.5
Call-ID: a12abcde@10.150.20.3
Contact: alice@10.150.20.3:5434
Route: <sip:netscreen@10.150.20.3:5060>
Record-Route: <sip:netscreen@10.150.20.3:5060>
```

How IP address translation is performed depends on the type and direction of the message. A message can be any of the following:

- Inbound request
- Outbound response
- Outbound request
- Inbound response

Table 15 on page 266 shows how NAT is performed in each of these cases. Note that for several of the header fields the ALG determine more than just whether the messages comes from inside or outside the network. It must also determine what client initiated the call, and whether the message is a request or response.

Table 15: Requesting Messages with NAT Table

Inbound Request (from public to private)	To:	Replace domain with local address
	From:	None
	Call-ID:	None
	Via:	None
	Request-URI:	Replace ALG address with local address
	Contact:	None
	Record-Route:	None
	Route:	None
Outbound Response (from private to public)	To:	Replace ALG address with local address
	From:	None
	Call-ID:	None
	Via:	None
	Request-URI:	N/A
	Contact:	Replace local address with ALG address
	Record-Route:	Replace local address with ALG address
	Route:	None

Table 15: Requesting Messages with NAT Table *(continued)*

Outbound Request (from private to public)	To:	None
	From:	Replace local address with ALG address
	Call-ID:	None
	Via:	Replace local address with ALG address
	Request-URI:	None
	Contact:	Replace local address with ALG address
	Record-Route:	Replace local address with ALG address
	Route:	Replace ALG address with local address
Outbound Response (from public to private)	To:	None
	From:	Replace ALG address with local address
	Call-ID:	None
	Via:	Replace ALG address with local address
	Request-URI:	N/A
	Contact:	None
	Record-Route:	Replace ALG address with local address
	Route:	Replace ALG address with local address

SIP Body

The SDP information in the SIP body includes IP addresses the ALG uses to create channels for the media stream. Translation of the SDP section also allocates resources, that is, port numbers to send and receive the media.

The following excerpt from a sample SDP section shows the fields that are translated for resource allocation.

```
o=user 2344234 55234434 IN IP4 10.150.20.3
c=IN IP4 10.150.20.3
m=audio 43249 RTP/AVP 0
```

SIP messages can contain more than one media stream. The concept is similar to attaching multiple files to an e-mail message. For example, an INVITE message sent from a SIP client to a SIP server might have the following fields:

```
c=IN IP4 10.123.33.4
m=audio 33445 RTP/AVP 0
c=IN IP4 10.123.33.4
m=audio 33447 RTP/AVP 0
c=IN IP4 10.123.33.4
m=audio 33449 RTP/AVP 0
```

Junos OS supports up to 6 SDP channels negotiated for each direction, for a total of 12 channels per call.

Junos OS SIP ALG Limitations

The following limitations apply to configuration of the SIP ALG:

- Only the methods described in RFC 3261 are supported.
- Only SIP version 2 is supported.
- TCP is not supported as a transport mechanism for signaling messages for MS-MPCs but is supported for Next Gen Services.
- *Do not configure the SIP ALG when using STUN.* if clients use STUN/TURN to detect the firewall or NAT devices between the caller and responder or proxy, the client attempts to best-guess the NAT device behavior and act accordingly to place the call.
- On MS-MPCs, do not use the endpoint-independent mapping NAT pool option in conjunction with the SIP ALG. Errors will result. This does not apply to Next Gen Services.
- IPv6 signaling data is not supported for MS-MPCs but is supported for Next Gen Services.
- Authentication is not supported.
- Encrypted messages are not supported.
- SIP fragmentation is not supported for MS-MPCs but is supported for Next Gen Services.
- The maximum UDP packet size containing a SIP message is assumed to be 9 KB. SIP messages larger than this are not supported.
- The maximum number of media channels in a SIP message is assumed to be six.
- Fully qualified domain names (FQDNs) are not supported in critical fields.
- QoS is not supported. SIP supports DSCP rewrites.
- High availability is not supported, except for warm standby.
- A timeout setting of never is not supported on SIP or NAT.
- Multicast (forking proxy) is not supported.

RELATED DOCUMENTATION

ALG Descriptions

ALGs Available for Junos OS Address Aware NAT

Configuring Application Sets

You can group the applications you have defined into a named object by including the **application-set** statement at the **[edit applications]** hierarchy level with an **application** statement for each application:

```
[edit applications]
   application-set application-set-name {
   application application;
}
```

For an example of a typical application set, see "Examples: Configuring Application Protocols" on page 284.

RELATED DOCUMENTATION

ALG Descriptions

Configuring Application Properties

Examples: Configuring Application Protocols | **284**

Verifying the Output of ALG Sessions | **285**

Configuring Application Properties for Next Gen Services

IN THIS SECTION

To configure application properties, include the **application** statement at the **[edit applications]** hierarchy level:

```
[edit applications]
application application-name {
    application-protocol protocol-name;
    child-inactivity-timeout seconds;
    destination-port port-number;
    gate-timeout seconds;
    icmp-code value;
    icmp-type value;
    inactivity-timeout value;
    protocol type;
    rpc-program-number number;
    snmp-command command;
    source-port port-number;
    ttl-threshold value;
    uuid hex-value;
}
```

You can group application objects by configuring the **application-set** statement; for more information, see "Configuring Application Sets" on page 269.

This section includes the following tasks for configuring applications:

Configuring an Application Protocol

The **application-protocol** statement allows you to specify which of the supported application protocols (ALGs) to configure and include in an application set for service processing. To configure application protocols, include the **application-protocol** statement at the **[edit applications application *application-name*]** hierarchy level:

```
[edit applications application application-name]
application-protocol protocol-name;
```

Table 16 on page 270 shows the list of supported protocols for Next Gen Services. For more information about specific protocols, see *ALG Descriptions*.

Table 16: Application Protocols Supported by Services Interfaces

Protocol Name	CLI Value	Comments
Real-Time Streaming Protocol (RTSP)	**rtsp**	Requires the **protocol** statement to have the value **tcp** or to be unspecified. Requires a **destination-port** value.

Table 16: Application Protocols Supported by Services Interfaces *(continued)*

Protocol Name	CLI Value	Comments
Session Initiation Protocol	**sip**	–

> **NOTE:** You can configure application-level gateways (ALGs) for ICMP and trace route under stateful firewall, NAT, or CoS rules when twice NAT is configured in the same service set. These ALGs cannot be applied to flows created by the Packet Gateway Controller Protocol (PGCP). Twice NAT does not support any other ALGs. NAT applies only the IP address and TCP or UDP headers, but not the payload.
>
> For more information about configuring twice NAT, see *Junos Address Aware Network Addressing Overview*.

RELATED DOCUMENTATION

ALGs Available for Junos OS Address Aware NAT

Configuring the Network Protocol

The **protocol** statement allows you to specify which of the supported network protocols to match in an application definition. To configure network protocols, include the **protocol** statement at the **[edit applications application *application-name*]** hierarchy level:

```
[edit applications application application-name]
protocol type;
```

You specify the protocol type as a numeric value; for the more commonly used protocols, text names are also supported in the command-line interface (CLI). Table 17 on page 271shows the list of the supported protocols.

Table 17: Network Protocols Supported by Next Gen Services

Network Protocol Type	CLI Value	Comments
Generic routing encapsulation (GR)	**gre**	–
ICMP	**icmp**	Requires an **application-protocol** value of **icmp**.

Table 17: Network Protocols Supported by Next Gen Services *(continued)*

Network Protocol Type	CLI Value	Comments
ICMPv6	**icmp6**	Requires an **application-protocol** value of **icmp**.
Internet Group Management Protocol (IGMP)	**igmp**	–
TCP	**tcp**	Requires a **destination-port** or **source-port** value unless you specify **application-protocol rcp** or **dce-rcp**.
UDP	**udp**	Requires a **destination-port** or **source-port** value unless you specify **application-protocol rcp** or **dce-rcp**.

For a complete list of possible numeric values, see RFC 1700, *Assigned Numbers (for the Internet Protocol Suite)*.

NOTE: IP version 6 (IPv6) is not supported as a network protocol in application definitions.

By default, the twice NAT feature can affect IP, TCP, and UDP headers embedded in the payload of ICMP error messages. You can include the **protocol tcp** and **protocol udp** statements with the application statement for twice NAT configurations. For more information about configuring twice NAT, see *Junos Address Aware Network Addressing Overview*.

Configuring the ICMP Code and Type

The ICMP code and type provide additional specification, in conjunction with the network protocol, for packet matching in an application definition. To configure ICMP settings, include the **icmp-code** and **icmp-type** statements at the **[edit applications application *application-name*]** hierarchy level:

```
[edit applications application application-name]
icmp-code value;
icmp-type value;
```

You can include only one ICMP code and type value. The **application-protocol** statement must have the value **icmp**. Table 18 on page 273 shows the list of supported ICMP values.

Table 18: ICMP Codes and Types Supported by Services Interfaces

CLI Statement	Description
icmp-code	This value or keyword provides more specific information than **icmp-type**. Because the value's meaning depends upon the associated **icmp-type** value, you must specify **icmp-type** along with **icmp-code**. For more information, see the *Routing Policies, Firewall Filters, and Traffic Policers User Guide*. In place of the numeric value, you can specify one of the following text synonyms (the field values are also listed). The keywords are grouped by the ICMP type with which they are associated: parameter-problem: **ip-header-bad** (0), **required-option-missing** (1) redirect: **redirect-for-host** (1), **redirect-for-network** (0), **redirect-for-tos-and-host** (3), **redirect-for-tos-and-net** (2) time-exceeded: **ttl-eq-zero-during-reassembly** (1), **ttl-eq-zero-during-transit** (0) unreachable: **communication-prohibited-by-filtering** (13), **destination-host-prohibited** (10), **destination-host-unknown** (7), **destination-network-prohibited** (9), **destination-network-unknown** (6), **fragmentation-needed** (4), **host-precedence-violation** (14), **host-unreachable** (1), **host-unreachable-for-TOS** (12), **network-unreachable** (0), **network-unreachable-for-TOS** (11), **port-unreachable** (3), **precedence-cutoff-in-effect** (15), **protocol-unreachable** (2), **source-host-isolated** (8), **source-route-failed** (5)
icmp-type	Normally, you specify this match in conjunction with the **protocol** match statement to determine which protocol is being used on the port. For more information, see the *Routing Policies, Firewall Filters, and Traffic Policers User Guide*. In place of the numeric value, you can specify one of the following text synonyms (the field values are also listed): **echo-reply** (0), **echo-request** (8), **info-reply** (16), **info-request** (15), **mask-request** (17), **mask-reply** (18), **parameter-problem** (12), **redirect** (5), **router-advertisement** (9), **router-solicit** (10), **source-quench** (4), **time-exceeded** (11), **timestamp** (13), **timestamp-reply** (14), or **unreachable** (3).

NOTE: If you configure an interface with an input firewall filter that includes a reject action and with a service set that includes stateful firewall rules, the router executes the input firewall filter before the stateful firewall rules are run on the packet. As a result, when the Packet Forwarding Engine sends an ICMP error message out through the interface, the stateful firewall rules might drop the packet because it was not seen in the input direction.

Possible workarounds are to include a forwarding-table filter to perform the reject action, because this type of filter is executed after the stateful firewall in the input direction, or to include an output service filter to prevent the locally generated ICMP packets from going to the stateful firewall service.

Configuring Source and Destination Ports

The TCP or UDP source and destination port provide additional specification, in conjunction with the network protocol, for packet matching in an application definition. To configure ports, include the **destination-port** and **source-port** statements at the **[edit applications application *application-name*]** hierarchy level:

```
[edit applications application application-name]
destination-port value;
source-port value;
```

You must define one source or destination port. Normally, you specify this match in conjunction with the **protocol** match statement to determine which protocol is being used on the port.

You can specify either a numeric value or one of the text synonyms listed in Table 19 on page 274.

Table 19: Port Names Supported by Next Gen Services

Port Name	Corresponding Port Number
snmp	**161**
snmptrap	**162**

For more information about matching criteria, see the *Routing Policies, Firewall Filters, and Traffic Policers User Guide*.

Configuring the Inactivity Timeout Period

You can specify a timeout period for application inactivity. If the software has not detected any activity during the duration, the flow becomes invalid when the timer expires. To configure a timeout period, include the **inactivity-timeout** statement at the **[edit applications application *application-name*]** hierarchy level:

```
[edit applications application application-name]
inactivity-timeout seconds;
```

The default value is 14,400 seconds. The value you configure for an application overrides any global value configured at the **[edit interfaces *interface-name* service-options]** hierarchy level; for more information, see *Configuring Default Timeout Settings for Services Interfaces*.

Configuring SIP

The Session Initiation Protocol (SIP) is a generalized protocol for communication between endpoints involved in Internet services such as telephony, fax, video conferencing, instant messaging, and file exchange.

The Junos OS provides ALG services in accordance with the standard described in RFC 3261, *SIP: Session Initiation Protocol*. SIP flows under the Junos OS are as described in RFC 3665, *Session Initiation Protocol (SIP) Basic Call Flow Examples*.

> **NOTE:** Before implementing the Junos OS SIP ALG, you should be familiar with certain limitations, discussed in "Junos OS SIP ALG Limitations" on page 268
>
> The use of NAT in conjunction with the SIP ALG results in changes in SIP header fields due to address translation. For an explanation of these translations, refer to "SIP ALG Interaction with Network Address Translation" on page 262.

To implement SIP on adaptive services interfaces, you configure the **application-protocol** statement at the **[edit applications application *application-name*]** hierarchy level with the value **sip**. In addition, there are two other statements you can configure to modify how SIP is implemented:

- You can enable the router to accept any incoming SIP calls for the endpoint devices that are behind the NAT firewall. When a device behind the firewall registers with the proxy that is outside the firewall, the AS or Multiservices PIC maintains the registration state. When the **learn-sip-register** statement is enabled, the router can use this information to accept inbound calls. If this statement is not configured, no inbound calls are accepted; only the devices behind the firewall can call devices outside the firewall.

  To configure SIP registration, include the **learn-sip-register** statement at the **[edit applications application *application-name*]** hierarchy level:

```
[edit applications application application-name]
learn-sip-register;
```

> **NOTE:** The **learn-sip-register** statement is not applicable to the Next Gen Services MX-SPC3.

You can also manually inspect the SIP register by issuing the **show services stateful-firewall sip-register** command; for more information, see the *Junos OS System Basics and Services Command Reference*. The **show services stateful-firewall sip-register** command is not supported for Next Gen Services.

- You can specify a timeout period for the duration of SIP calls that are placed on hold. When a call is put on hold, there is no activity and flows might time out after the configured **inactivity-timeout** period expires, resulting in call state teardown. To avoid this, when a call is put on hold, the flow timer is reset to the **sip-call-hold-timeout** cycle to preserve the call state and flows for longer than the **inactivity-timeout** period.

  > **NOTE:** The **sip-call-hold-timeout** statement is not applicable to the Next Gen Services MX-SPC3.

  To configure a timeout period, include the **sip-call-hold-timeout** statement at the **[edit applications application *application-name*]** hierarchy level:

  ```
  [edit applications application application-name]
  sip-call-hold-timeout seconds;
  ```

  The default value is 7200 seconds and the range is from 0 through 36,000 seconds (10 hours).

SIP ALG Interaction with Network Address Translation

IN THIS SECTION

The Network Address Translation (NAT) protocol enables multiple hosts in a private subnet to share a single public IP address to access the Internet. For outgoing traffic, NAT replaces the private IP address of the host in the private subnet with the public IP address. For incoming traffic, the public IP address is converted back into the private address, and the message is routed to the appropriate host in the private subnet.

Using NAT with the Session Initiation Protocol (SIP) service is more complicated because SIP messages contain IP addresses in the SIP headers as well as in the SIP body. When using NAT with the SIP service, the SIP headers contain information about the caller and the receiver, and the device translates this information to hide it from the outside network. The SIP body contains the Session Description Protocol (SDP) information, which includes IP addresses and port numbers for transmission of the media. The device translates SDP information for allocating resources to send and receive the media.

How IP addresses and port numbers in SIP messages are replaced depends on the direction of the message. For an outgoing message, the private IP address and port number of the client are replaced with the public IP address and port number of the Juniper Networks firewall. For an incoming message, the public address of the firewall is replaced with the private address of the client.

When an INVITE message is sent out across the firewall, the SIP Application Layer Gateway (ALG) collects information from the message header into a call table, which it uses to forward subsequent messages to the correct endpoint. When a new message arrives, for example an ACK or 200 OK, the ALG compares the “From:, To:, and Call-ID:” fields against the call table to identify the call context of the message. If a new INVITE message arrives that matches the existing call, the ALG processes it as a REINVITE.

When a message containing SDP information arrives, the ALG allocates ports and creates a NAT mapping between them and the ports in the SDP. Because the SDP requires sequential ports for the Real-Time Transport Protocol (RTP) and Real-Time Control Protocol (RTCP) channels, the ALG provides consecutive even-odd ports. If it is unable to find a pair of ports, it discards the SIP message.

This topic contains the following sections:

Outgoing Calls

When a SIP call is initiated with a SIP request message from the internal to the external network, NAT replaces the IP addresses and port numbers in the SDP and binds the IP addresses and port numbers to the Juniper Networks firewall. Via, Contact, Route, and Record-Route SIP header fields, if present, are also bound to the firewall IP address. The ALG stores these mappings for use in retransmissions and for SIP response messages.

The SIP ALG then opens pinholes in the firewall to allow media through the device on the dynamically assigned ports negotiated based on information in the SDP and the Via, Contact, and Record-Route header fields. The pinholes also allow incoming packets to reach the Contact, Via, and Record-Route IP addresses and ports. When processing return traffic, the ALG inserts the original Contact, Via, Route, and Record-Route SIP fields back into packets.

Incoming Calls

Incoming calls are initiated from the public network to public static NAT addresses or to interface IP addresses on the device. Static NATs are statically configured IP addresses that point to internal hosts; interface IP addresses are dynamically recorded by the ALG as it monitors REGISTER messages sent by internal hosts to the SIP registrar. When the device receives an incoming SIP packet, it sets up a session and forwards the payload of the packet to the SIP ALG.

The ALG examines the SIP request message (initially an INVITE) and, based on information in the SDP, opens gates for outgoing media. When a 200 OK response message arrives, the SIP ALG performs NAT on the IP addresses and ports and opens pinholes in the outbound direction. (The opened gates have a short time-to-live, and they time out if a 200 OK response message is not received quickly.)

When a 200 OK response arrives, the SIP proxy examines the SDP information and reads the IP addresses and port numbers for each media session. The SIP ALG on the device performs NAT on the addresses and port numbers, opens pinholes for outbound traffic, and refreshes the timeout for gates in the inbound direction.

When the ACK arrives for the 200 OK, it also passes through the SIP ALG. If the message contains SDP information, the SIP ALG ensures that the IP addresses and port numbers are not changed from the previous INVITE—if they are, the ALG deletes old pinholes and creates new pinholes to allow media to pass through. The ALG also monitors the Via, Contact, and Record-Route SIP fields and opens new pinholes if it determines that these fields have changed.

Forwarded Calls

A forwarded call is when, for example, user A outside the network calls user B inside the network, and user B forwards the call to user C outside the network. The SIP ALG processes the INVITE from user A as a normal incoming call. But when the ALG examines the forwarded call from B to C outside the network and notices that B and C are reached using the same interface, it does not open pinholes in the firewall, because media will flow directly between user A and user C.

Call Termination

The BYE message terminates a call. When the device receives a BYE message, it translates the header fields just as it does for any other message. But because a BYE message must be acknowledged by the receiver with a 200 OK, the ALG delays call teardown for five seconds to allow time for transmission of the 200 OK.

Call Re-INVITE Messages

Re-INVITE messages add new media sessions to a call and remove existing media sessions. When new media sessions are added to a call, new pinholes are opened in the firewall and new address bindings are

created. The process is identical to the original call setup. When one or more media sessions are removed from a call, pinholes are closed and bindings released just as with a BYE message.

Call Session Timers

The SIP ALG uses the Session-Expires value to time out a session if a Re-INVITE or UPDATE message is not received. The ALG gets the Session-Expires value, if present, from the 200 OK response to the INVITE and uses this value for signaling timeout. If the ALG receives another INVITE before the session times out, it resets all timeout values to this new INVITE or to default values, and the process is repeated.

As a precautionary measure, the SIP ALG uses hard timeout values to set the maximum amount of time a call can exist. This ensures that the device is protected should one of the following events occur:

- End systems crash during a call and a BYE message is not received.
- Malicious users never send a BYE in an attempt to attack a SIP ALG.
- Poor implementations of SIP proxy fail to process Record-Route and never send a BYE message.
- Network failures prevent a BYE message from being received.

Call Cancellation

Either party can cancel a call by sending a CANCEL message. Upon receiving a CANCEL message, the SIP ALG closes pinholes through the firewall—if any have been opened—and releases address bindings. Before releasing the resources, the ALG delays the control channel age-out for approximately five seconds to allow time for the final 200 OK to pass through. The call is terminated when the five second timeout expires, regardless of whether a 487 or non-200 response arrives.

Forking

Forking enables a SIP proxy to send a single INVITE message to multiple destinations simultaneously. When the multiple 200 OK response messages arrive for the single call, the SIP ALG parses but updates call information with the first 200 OK messages it receives.

SIP Messages

The SIP message format consists of a SIP header section and the SIP body. In request messages, the first line of the header section is the request line, which includes the method type, request-URI, and protocol version. In response messages, the first line is the status line, which contains a status code. SIP headers contain IP addresses and port numbers used for signaling. The SIP body, separated from the header section by a blank line, is reserved for session description information, which is optional. Junos OS currently supports the SDP only. The SIP body contains IP addresses and port numbers used to transport the media.

SIP Headers

In the following sample SIP request message, NAT replaces the IP addresses in the header fields to hide them from the outside network.

```
INVITE bob@10.150.20.5 SIP/2.0
Via: SIP/2.0/UDP 10.150.20.3:5434
```

From: alice@**10.150.20.3**
To: bob@**10.150.20.5**
Call-ID: a12abcde@**10.150.20.3**
Contact: alice@**10.150.20.3**:5434
Route: <sip:netscreen@**10.150.20.3**:5060>
Record-Route: <sip:netscreen@**10.150.20.3**:5060>

How IP address translation is performed depends on the type and direction of the message. A message can be any of the following:

- Inbound request
- Outbound response
- Outbound request
- Inbound response

Table 15 on page 266 shows how NAT is performed in each of these cases. Note that for several of the header fields the ALG determine more than just whether the messages comes from inside or outside the network. It must also determine what client initiated the call, and whether the message is a request or response.

Table 20: Requesting Messages with NAT Table

Inbound Request (from public to private)	To:	Replace domain with local address
	From:	None
	Call-ID:	None
	Via:	None
	Request-URI:	Replace ALG address with local address
	Contact:	None
	Record-Route:	None
	Route:	None

Table 20: Requesting Messages with NAT Table *(continued)*

Outbound Response (from private to public)	To:	Replace ALG address with local address
	From:	None
	Call-ID:	None
	Via:	None
	Request-URI:	N/A
	Contact:	Replace local address with ALG address
	Record-Route:	Replace local address with ALG address
	Route:	None
Outbound Request (from private to public)	To:	None
	From:	Replace local address with ALG address
	Call-ID:	None
	Via:	Replace local address with ALG address
	Request-URI:	None
	Contact:	Replace local address with ALG address
	Record-Route:	Replace local address with ALG address
	Route:	Replace ALG address with local address

Table 20: Requesting Messages with NAT Table *(continued)*

Outbound Response (from public to private)	To:	None
	From:	Replace ALG address with local address
	Call-ID:	None
	Via:	Replace ALG address with local address
	Request-URI:	N/A
	Contact:	None
	Record-Route:	Replace ALG address with local address
	Route:	Replace ALG address with local address

SIP Body

The SDP information in the SIP body includes IP addresses the ALG uses to create channels for the media stream. Translation of the SDP section also allocates resources, that is, port numbers to send and receive the media.

The following excerpt from a sample SDP section shows the fields that are translated for resource allocation.

```
o=user 2344234 55234434 IN IP4 10.150.20.3
c=IN IP4 10.150.20.3
m=audio 43249 RTP/AVP 0
```

SIP messages can contain more than one media stream. The concept is similar to attaching multiple files to an e-mail message. For example, an INVITE message sent from a SIP client to a SIP server might have the following fields:

```
c=IN IP4 10.123.33.4
m=audio 33445 RTP/AVP 0
c=IN IP4 10.123.33.4
m=audio 33447 RTP/AVP 0
c=IN IP4 10.123.33.4
m=audio 33449 RTP/AVP 0
```

Junos OS supports up to 6 SDP channels negotiated for each direction, for a total of 12 channels per call.

Junos OS SIP ALG Limitations

The following limitations apply to configuration of the SIP ALG:

- Only the methods described in RFC 3261 are supported.
- Only SIP version 2 is supported.
- TCP is not supported as a transport mechanism for signaling messages for MS-MPCs but is supported for Next Gen Services.
- *Do not configure the SIP ALG when using STUN.* if clients use STUN/TURN to detect the firewall or NAT devices between the caller and responder or proxy, the client attempts to best-guess the NAT device behavior and act accordingly to place the call.
- On MS-MPCs, do not use the endpoint-independent mapping NAT pool option in conjunction with the SIP ALG. Errors will result. This does not apply to Next Gen Services.
- IPv6 signaling data is not supported for MS-MPCs but is supported for Next Gen Services.
- Authentication is not supported.
- Encrypted messages are not supported.
- SIP fragmentation is not supported for MS-MPCs but is supported for Next Gen Services.
- The maximum UDP packet size containing a SIP message is assumed to be 9 KB. SIP messages larger than this are not supported.
- The maximum number of media channels in a SIP message is assumed to be six.
- Fully qualified domain names (FQDNs) are not supported in critical fields.
- QoS is not supported. SIP supports DSCP rewrites.
- High availability is not supported, except for warm standby.
- A timeout setting of never is not supported on SIP or NAT.
- Multicast (forking proxy) is not supported.

Configuring an SNMP Command for Packet Matching

You can specify an SNMP command setting for packet matching. To configure SNMP, include the **snmp-command** statement at the **[edit applications application *application-name*]** hierarchy level:

```
[edit applications application application-name]
snmp-command value;
```

The supported values are **get**, **get-next**, **set**, and **trap**. You can configure only one value for matching. The **application-protocol** statement at the **[edit applications application *application-name*]** hierarchy level must have the value **snmp**.

Examples: Configuring Application Protocols

The following example shows an application protocol definition describing a special FTP application running on port 78:

```
[edit applications]
application my-ftp-app {
    application-protocol ftp;
    protocol tcp;
    destination-port 78;
    timeout 100; # inactivity timeout for FTP service
}
```

The following example shows a special ICMP protocol (**application-protocol icmp**) of type 8 (ICMP echo):

```
[edit applications]
application icmp-app {
    application-protocol icmp;
    protocol icmp;
    icmp-type icmp-echo;
}
```

The following example shows a possible application set:

```
[edit applications]
application-set basic {
    http;
    ftp;
    telnet;
    nfs;
    icmp;
}
```

The software includes a predefined set of well-known application protocols. The set includes applications for which the TCP and UDP destination ports are already recognized by stateless firewall filters.

RELATED DOCUMENTATION

ALG Descriptions

Configuring Application Sets | **269**

Configuring Application Properties

Verifying the Output of ALG Sessions

IN THIS SECTION

This section contains examples of successful output from ALG sessions and information on system log configuration. You can compare the results of your sessions to check whether the configurations are functioning correctly.

FTP Example

IN THIS SECTION

This example analyzes the output during an active FTP session. It consists of four different flows; two are control flows and two are data flows. The example consists of the following parts:

Sample Output

For MS-MPCs, the following is a complete sample output from the **show services stateful-firewall conversations application-protocol ftp** operational mode command:

`user@host>`**show services stateful-firewall conversations application-protocol ftp**

```
Interface: ms-1/3/0, Service set: CLBJI1-AAF001
Conversation: ALG protocol: ftp
  Number of initiators: 2, Number of responders: 2
Flow        State    Dir       Frm count
TCP           1.1.79.2:14083 ->        2.2.2.2:21    Watch    I             13
    NAT source        1.1.79.2:14083   ->   194.250.1.237:50118
TCP           1.1.79.2:14104 ->        2.2.2.2:20    Forward  I              3
    NAT source        1.1.79.2:14104   ->   194.250.1.237:50119
TCP            2.2.2.2:21    ->  194.250.1.237:50118 Watch    O             12
    NAT dest     194.250.1.237:50118   ->        1.1.79.2:14083
TCP            2.2.2.2:20    ->  194.250.1.237:50119 Forward  O              5
    NAT dest     194.250.1.237:50119   ->        1.1.79.2:14104
```

For Net Gen Services on the MX-SPC3 services card, the following is a complete sample output from the **show services sessions application-protocol ftp** operational mode command:

`user@host>`**show services sessions application-protocol ftp**

For each flow, the first line shows flow information, including protocol (TCP), source address, source port, destination address, destination port, flow state, direction, and frame count.

- The state of a flow can be **Watch**, **Forward**, or **Drop**:
  - A **Watch** flow state indicates that the control flow is monitored by the ALG for information in the payload. NAT processing is performed on the header and payload as needed.
  - A **Forward** flow forwards the packets without monitoring the payload. NAT is performed on the header as needed.
  - A **Drop** flow drops any packet that matches the 5 tuple.
- The frame count (**Frm count**) shows the number of packets that were processed on that flow.

The second line shows the NAT information.

- **source** indicates source NAT.
- **dest** indicates destination NAT.

- The first address and port in the NAT line are the original address and port being translated for that flow.
- The second address and port in the NAT line are the translated address and port for that flow.

FTP System Log Messages

System log messages are generated during an FTP session. For more information about system logs, see "System Log Messages" on page 292.

The following system log messages are generated during creation of the FTP control flow:

- Rule Accept system log:

```
Oct 27 11:42:54 (FPC Slot 1, PIC Slot 1) {ss_ftp}[FWNAT]: ASP_SFW_RULE_ACCEPT: proto 6 (TCP) application:
  ftp, fe-3/3/3.0:1.1.1.2:4450 -> 2.2.2.2:21, Match SFW accept rule-set:, rule: ftp, term: 1
```

- Create Accept Flow system log:

```
Oct 27 11:42:54 (FPC Slot 1, PIC Slot 1) {ss_ftp}[FWNAT]: ASP_SFW_CREATE_ACCEPT_FLOW: proto 6 (TCP)
  application: ftp, fe-3/3/3.0:1.1.1.2:4450 -> 2.2.2.2:21, creating forward or watch flow
```

- System log for data flow creation:

```
Oct 27 11:43:30 (FPC Slot 1, PIC Slot 1) {ss_ftp}[FWNAT]: ASP_SFW_FTP_ACTIVE_ACCEPT: proto 6 (TCP)
  application: ftp, so-2/1/2.0:2.2.2.2:20 -> 1.1.1.2:50726, Creating FTP active mode forward flow
```

Analysis

Control Flows

The control flows are established after the three-way handshake is complete.

- Control flow from FTP client to FTP server. TCP destination port is 21.

```
TCP           1.1.79.2:14083 ->        2.2.2.2:21    Watch    I              13
    NAT source        1.1.79.2:14083   ->   194.250.1.237:50118
```

- Control flow from FTP server to FTP client. TCP source port is 21.

```
TCP            2.2.2.2:21    ->  194.250.1.237:50118 Watch    O              12
    NAT dest     194.250.1.237:50118   ->        1.1.79.2:14083
```

Data Flows

A data port of 20 is negotiated for data transfer during the course of the FTP control protocol. These two flows are data flows between the FTP client and the FTP server:

```
TCP           1.1.79.2:14104 ->        2.2.2.2:20    Forward  I              3
    NAT source        1.1.79.2:14104   ->   194.250.1.237:50119
TCP            2.2.2.2:20    ->  194.250.1.237:50119 Forward  O              5
    NAT dest     194.250.1.237:50119   ->        1.1.79.2:14104
```

Troubleshooting Questions

1. How do I know if the FTP ALG is active?
   - The ALG protocol field in the conversation should display **ftp**.
   - There should be a valid frame count (**Frm count**) in the control flows.
   - A valid frame count in the data flows indicates that data transfer has taken place.
2. What do I need to check if the FTP connection is established but data transfer does not take place?
   - Most probably, the control connection is up, but the data connection is down.
   - Check the conversations output to determine whether both the control and data flows are present.
3. How do I interpret each flow? What does each flow mean?
   - FTP control flow initiator flow—Flow with destination port 21
   - FTP control flow responder flow—Flow with source port ;21
   - FTP data flow initiator flow—Flow with destination port 20
   - FTP data flow responder flow—Flow with source port 20

RTSP ALG Example

IN THIS SECTION

The following is an example of an RTSP conversation. The application uses the RTSP protocol for control connection. Once the connection is set up, the media is sent using UDP protocol (RTP).

This example consists of the following:

Sample Output for MS-MPCs

Here is the output from the **show services stateful-firewall conversations** operational mode command:

```
user@host# show services stateful-firewall conversations
```

```
Interface: ms-3/2/0, Service set: svc_set
Conversation: ALG protocol: rtsp
  Number of initiators: 5, Number of responders: 5
Flow           State         Dir       Frm count
TCP            1.1.1.3:58795 ->        2.2.2.2:554   Watch    I      7
UDP            1.1.1.3:1028  ->        2.2.2.2:1028  Forward  I      0
UDP            1.1.1.3:1029  ->        2.2.2.2:1029  Forward  I      0
UDP            1.1.1.3:1030  ->        2.2.2.2:1030  Forward  I      0
UDP            1.1.1.3:1031  ->        2.2.2.2:1031  Forward  I      0
TCP            2.2.2.2:554   ->        1.1.1.3:58795 Watch    O      5
UDP            2.2.2.2:1028  ->        1.1.1.3:1028  Forward  O      6
UDP            2.2.2.2:1029  ->        1.1.1.3:1029  Forward  O      0
UDP            2.2.2.2:1030  ->        1.1.1.3:1030  Forward  O      3
UDP            2.2.2.2:1031  ->        1.1.1.3:1031  Forward  O      0
```

Sample Output for MX-SPC3 Services Card

Here is the output from the **show services sessions** operational mode command:

```
user@host# show services sessions
```

```
Session ID: 3, Service-set: ss1_interface_style1, Policy name: R11/7, Timeout:
 28, Valid
  In: 20.1.1.2/48102 --> 30.1.1.2/22;tcp, Conn Tag: 0x0, If: vms-0/2/0.16387,
 Pkts: 69, Bytes: 6205,
  Out: 30.1.1.2/22 --> 44.0.0.3/29071;tcp, Conn Tag: 0x0, If: vms-0/2/0.0,
Pkts: 58, Bytes: 8089,
Total sessions: 1
```

Analysis

An RTSP conversation should consist of TCP flows corresponding to the RTSP control connection. There should be two flows, one in each direction, from client to server and from server to client:

```
TCP            1.1.1.3:58795 ->        2.2.2.2:554   Watch    I              7
TCP            2.2.2.2:554   ->        1.1.1.3:58795 Watch    O              5
```

- The RTSP control connection for the initiator flow is sent from destination port 554.
- The RTSP control connection for the responder flow is sent from source port 554.

The UDP flows correspond to RTP media sent over the RTSP connection.

Troubleshooting Questions

1. Media does not work when the RTSP ALG is configured. What do I do?
   - Check RTSP conversations to see whether both TCP and UDP flows exist.
   - The ALG protocol should be displayed as **rtsp**.

     NOTE: The state of the flow is displayed as **Watch**, because the ALG processing is taking place and the client is essentially "watching" or processing payload corresponding to the application. For FTP and RTSP ALG flows, the control connections are always **Watch** flows.

2. How do I check for ALG errors?
   - You can check for errors by issuing the following command. Each ALG has a separate field for ALG packet errors.

     `user@host#` **show services stateful-firewall statistics extensive**

```
Interface: ms-3/2/0
  Service set: svc_set
    New flows:
      Accepts: 1347, Discards: 0, Rejects: 0
    Existing flows:
      Accepts: 144187, Discards: 0, Rejects: 0
    Drops:
      IP option: 0, TCP SYN defense: 0
      NAT ports exhausted: 0
    Errors:
      IP: 0, TCP: 276
      UDP: 0, ICMP: 0
```

```
  Non-IP packets: 0, ALG: 0
IP errors:
  IP packet length inconsistencies: 0
  Minimum IP header length check failures: 0
  Reassembled packet exceeds maximum IP length: 0
  Illegal source address: 0
  Illegal destination address: 0
  TTL zero errors: 0, Illegal IP protocol number (0 or 255): 0
  Land attack: 0
  Non-IPv4 packets: 0, Bad checksum: 0
  Illegal IP fragment length: 0
  IP fragment overlap: 0
  IP fragment reassembly timeout: 0
  Unknown: 0
TCP errors:
  TCP header length inconsistencies: 0
  Source or destination port number is zero: 0
  Illegal sequence number and flags combinations: 0
  SYN attack (multiple SYN messages seen for the same flow): 276
  First packet not a SYN message: 0
  TCP port scan (TCP handshake, RST seen from server for SYN): 0
  Bad SYN cookie response: 0
UDP errors:
  IP data length less than minimum UDP header length (8 bytes): 0
  Source or destination port number is zero: 0
  UDP port scan (ICMP error seen for UDP flow): 0
ICMP errors:
  IP data length less than minimum ICMP header length (8 bytes): 0
  ICMP error length inconsistencies: 0
  Duplicate ping sequence number: 0
  Mismatched ping sequence number: 0
ALG errors:
  BOOTP: 0, DCE-RPC: 0, DCE-RPC portmap: 0
  DNS: 0, Exec: 0, FTP: 0
  ICMP: 0
  Login: 0, NetBIOS: 0, NetShow: 0
  RPC: 0, RPC portmap: 0
  RTSP: 0, Shell: 0
  SNMP: 0, SQLNet: 0, TFTP: 0
  Traceroute: 0
```

System Log Messages

IN THIS SECTION

Enabling system log generation and checking the system log are also helpful for ALG flow analysis. This section contains the following:

System Log Configuration

You can configure the enabling of system log messages at a number of different levels in the Junos OS CLI. As shown in the following sample configurations, the choice of level depends on how specific you want the event logging to be and what options you want to include. For details on the configuration options, see the *Junos OS Administration Library* (system level) or the *Junos OS Services Interfaces Library for Routing Devices* (all other levels).

1. At the topmost global level:

```
user@host# show system syslog
file messages {
    any any;
}
```

2. At the service set level:

```
user@host# show services service-set svc_set
syslog {
    host local {
        services any;
    }
}
stateful-firewall-rules allow_rtsp;
interface-service {
    service-interface ms-3/2/0;
}
```

3. At the service rule level:

```
user@host# show services stateful-firewall rule allow_rtsp
```

```
match-direction input-output;
term 0 {
    from {
        applications junos-rtsp;
    }
    then {
        accept;
        syslog;
    }
}
```

System Log Output

System log messages are generated during flow creation, as shown in the following examples:

The following system log message indicates that the ASP matched an accept rule:

```
Oct 25 16:11:37 (FPC Slot 3, PIC Slot 2) {svc_set}[FWNAT]: ASP_SFW_RULE_ACCEPT: proto 6 (TCP) application:
    rtsp, ge-2/0/1.0:1.1.1.2:35595 -> 2.2.2.2:554, Match SFW accept rule-set: , rule: allow_rtsp, term: 0
```

For a complete listing of system log messages, see the System Log Explorer.

RELATED DOCUMENTATION

ALG Descriptions

Configuring Application Sets | 269

Configuring Application Properties

Examples: Configuring Application Protocols | 284

10
PART

Configuration Statements

CHAPTER 24

Configuration Statements

IN THIS CHAPTER

address (Address Book Next Gen Services)

Syntax

```
address address-name range-address lower-limit to upper-limit
```

Hierarchy Level

```
[edit services address-book global]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure a range of addresses that can be referenced in the **match** stanza of a NAT rule.

Options

lower-limit—The lower end of the address range.

upper-limit—The upper end of the address range.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

address (NAT Pool Next Gen Services)

Syntax

address *address-prefix* | address *address-prefix* to address *address-prefix*;

Hierarchy Level

[edit services nat destination pool *nat-pool-name*],
[edit services nat source pool *nat-pool-name*]

Release Information
Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description
Define the addresses or subnets to which source addresses or destination addresses are translated. You can configure a single address, an address range, a single subnet, or a subnet range.

Options
address *address-prefix*—A single address or subnet.

address *address-prefix* to address *address-prefix*—An address range or a subnet range.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

address-pooling (Source NAT Next Gen Services)

Syntax

```
address-pooling {
    no-paired;
}
```

Hierarchy Level

```
[edit services nat source pool pool-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Allow address-pooling no-paired for a source pool without port translation

Options

no-paired— Allow address-pooling no-paired for a source pool without port translation.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

aggregations (IDS Screen Next Gen Services)

Syntax

```
aggregations {
    destination-prefix-ipv6-mask prefix-length;
    destination-prefix-mask prefix-length;
    source-prefix-ipv6-mask prefix-length;
    source-prefix-mask prefix-length;
}
```

Hierarchy Level

```
[edit services screen ids-option screen-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure intrusion detection service session limits for individual destination subnets or source subnets rather than individual addresses. This applies session limits to an aggregation of all sessions from or to an individual subnet of the specified length.

For example, if you configure a value of 24 for **destination-prefix-mask**, then sessions to 10.1.1.2 and 10.1.1.3 are counted as sessions to the 10.1.1/24 subnet.

Options

destination-prefix-ipv6-mask *prefix-length*—Prefix length for destination IPv6 address subnets.

Range: 0 through 128

destination-prefix-mask *prefix-length*—Prefix length for destination IPv4 address subnets.

Range: 0 through 32

source-prefix-ipv6-mask *prefix-length*—Prefix length for source IPv6 address subnets.

Range: 0 through 128

source-prefix-mask *prefix-length*—Prefix length for source IPv4 address subnets.

Range: 0 through 32

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

alarm-without-drop (IDS Screen Next Gen Services)

Syntax

```
alarm-without-drop;
```

Hierarchy Level

```
[edit services screen ids-option screen-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure the IDS screen to log an alarm for an offending packet, but not drop the packet. The screen skips the rest of the screen checks. The packet is not counted as a dropped packet.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

allow-overlapping-pools (NAT Next Gen Services)

Syntax

```
allow-overlapping-pools;
```

Hierarchy Level

```
[edit services nat]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify that NAT source or destination pools can have IP addresses that overlap with IP addresses in pools used in other service sets. However, pools that configure port-block allocation must not overlap with other pools.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

application (NAT Next Gen Services)

Syntax

```
application [application-name]
```

Hierarchy Level

```
[edit services nat destination rule-set rule-set rule rule-name match],
[edit services nat source rule-set rule-set rule rule-name match]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify one or more application protocols to which the NAT rule applies. The number of applications must not exceed 3072.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

application-profile (Services CoS Next Gen Services)

Syntax

```
application-profile name {
    ftp {
        data {
            dscp dscp;
            forwarding-class forwarding-class;
        }
    }
    sip {
        video {
            dscp dscp;
            forwarding-class forwarding-class;
        }
        voice {
            dscp dscp;
            forwarding-class forwarding-class;
        }
    }
}
```

Hierarchy Level

```
[edit services cos]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure CoS actions for FTP and SIP traffic. The application profile can then be used in CoS rule actions. This enables you to apply a certain DSCP, or forwarding-class to a set of L7 flows.

Options

profile-name—Name of the application profile.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Class of Service for Services PICs (Next Gen Services) | 131

application-protocol

Syntax

```
application-protocol protocol-name;
```

Hierarchy Level

```
[edit applications application application-name]
```

Release Information

Statement introduced before Junos OS Release 7.4.
login options introduced in Junos OS Release 7.4.
ip option introduced in Junos OS Release 8.2.
ike-esp-nat option introduced in Junos OS Release 17.1.
ras option introduced in Junos OS Release 17.1.

Description

Identify the application protocol name. Application protocols are also called application layer gateways (ALGs).

Options

protocol-name—Name of the protocol. The following protocols are supported:

bootp—Bootstrap protocol

dce-rpc—DCE RPC

dce-rpc-portmap—DCE RPC portmap

dns—Domain Name Service

exec—Remote Execution Protocol

ftp—File Transfer Protocol

h323—H.323

icmp—ICMP

iiop—Internet Inter-ORB Protocol

ike-esp-nat—IKE ALG

ip—IP

login—Login

netbios—NetBIOS

netshow—NetShow

pptp—Point-to-Point Tunneling Protocol

ras—Gatekeeper RAS for H323

realaudio—RealAudio

rpc—RPC

rpc-portmap—RPC portmap

rtsp—Real Time Streaming Protocol

shell—Shell

sip—Session Initiation Protocol

snmp—SNMP

sqlnet—SQLNet

talk–Talk Program

tftp–Trivial File Transfer Protocol

traceroute—Traceroute

winframe—WinFrame

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

ALG Descriptions

Configuring Application Sets | **269**

Configuring Application Properties

Examples: Configuring Application Protocols | **284**

Verifying the Output of ALG Sessions | **285**

application-set

Syntax

```
application-set application-set-name {
    application application-name;
}
```

Hierarchy Level

```
[edit applications]
```

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Configure one or more applications to include in an application set.

Options

application-set-name—Identifier of an application set.

Required Privilege Level

system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

ALG Descriptions

Configuring Application Sets | **269**

Configuring Application Properties

Examples: Configuring Application Protocols | **284**

Verifying the Output of ALG Sessions | **285**

applications (Services ALGs)

Syntax

```
applications { ... }
```

Hierarchy Level

```
[edit]
```

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Define the applications used in services.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

ALG Descriptions

Configuring Application Sets | **269**

Configuring Application Properties

Examples: Configuring Application Protocols | **284**

Verifying the Output of ALG Sessions | **285**

automatic (Source NAT Next Gen Services)

Syntax

```
automatic (random-allocation | round-robin);
```

Hierarchy Level

```
[edit services nat source pool nat-pool-name port]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure automatic port assignment for source NAT with port translation, except for deterministic NAT. Automatic port assignment uses the port range 1024 through 65535. Specify either random allocation or round-robin allocation. Random allocation randomly assigns a port from the range 1024 through 65535 for each port translation. Round robin allocation first assigns port 1024, and uses the next higher port for each successive port assignment. Round robin allocation is the default.

Options

random-allocation—Randomly assigns a port from the range 1024 through 65535 for each port translation.

round-robin—First assigns port 1024, and uses the next higher port for each successive port assignment. Round robin allocation is the default.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

bad-option (IDS Screen Next Gen Services)

Syntax

```
bad-option;
```

Hierarchy Level

```
[edit services screen ids-option screen-name ip]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop any packet with incorrectly formatted IPv4 options or IPv6 extension headers. Incorrectly formatted IPv4 options or IPv6 extension headers can cause unpredictable issues, depending on the IP stack implementation of routers and the target.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

block-allocation (Source NAT Next Gen Services)

Syntax

```
block-allocation {
    active-block-timeout timeout-interval;
    block-size block-size;
    interim-logging-interval timeout-interval;
    last-block-recycle-timeout timeout-interval;
    maximum-blocks-per-host maximum-block-number
}
```

Hierarchy Level

```
[edit services nat source pool nat-pool-name port]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Allocate a block of ports for each subscriber to use for source NAT with port translation, except for deterministic NAT. New requests for NAT ports for the subscriber are served from the active block. With port block allocation, we generate one syslog log per set of ports allocated for a subscriber. This reduces the number of logs, making it easier to track subscribers.

Options

active-block-timeout *timeout-interval*—The interval, in seconds, for which the block is active. After the timeout, a new block is allocated, even if ports are available in the active block. If you set the timeout to 0, port blocks are filled completely before a new port block is allocated, and the last port block remains active indefinitely.

Range: 0 through 86,400

Default: 120

block-size *block-size*—Number of ports in a block.

Range: 1 through 64,512

Default: 256

interim-logging-interval *timeout-interval*—The interval, in seconds, at which to send interim system logs for active port blocks and for inactive port blocks with live sessions. This increases the reliability of system logs, which are UDP-based and can get lost in the network.

Range: 1800 through 86,400

Default: 0 (interim logs are disabled)

last-block-recycle-timeout ***timeout-interval***—If you set the **active-block-timeout** to 0, you can configure the amount of time in seconds before the last active port block is released.

Range: 120 through 864,000

Default: 300

maximum-blocks-per-host ***maximum-block-number***—The maximum number of blocks that can be allocated to a subscriber address.

Range: 1 through 512

Default: 8

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

block-frag (IDS Screen Next Gen Services)

Syntax

```
block-frag;
```

Hierarchy Level

```
[edit services screen ids-option screen-name ip]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop fragmented IP packets. IP fragments might contain an attacker's attempt to exploit the vulnerabilities in the packet reassembly code of specific IP stack implementations. When the target receives these packets, the results can range from processing the packets incorrectly to crashing the entire system.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

by-destination (IDS Screen Next Gen Services)

Syntax

```
by-destination {
    by-protocol {
        icmp {
            maximum-sessions number;
            packets-rate number;
            session-rate number;
        }
        tcp {
            maximum-sessions number;
            packet-rate number;
            session-rate number;
        }
        udp {
            maximum-sessions number;
            packet-rate number;
            session-rate number;
        }
    }
    maximum-sessions number;
    packet-rate number;
    session-rate number;
    ;
}
```

Hierarchy Level

```
[edit services screen ids-option screen-name limit-session]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure session limits for individual destination addresses or for individual destination subnets. This protects against network probing attacks and network flooding attacks. You can specify limits for specific protocols (ICMP, TCP, and UDP), or specify limits independent of a protocol. When a session limit is exceeded for a destination, packets to the destination are dropped until the session limit is no longer exceeded.

To specify limits for destination subnets rather than individual addresses, include the **aggregations** statement at the **[edit services screen ids-option *screen-name*]** hierarchy level.

Options

maximum-sessions *number*—Specify the maximum number of concurrent sessions allowed for an individual destination address or subnet.

packet-rate *number*—Specify the maximum number of packets per second allowed for an individual destination address or subnet.

session-rate *number*—Specify the maximum number of connections per second allowed for an individual destination address or subnet.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

bypass-traffic-on-exceeding-flow-limits

Syntax

```
bypass-traffic-on-exceeding-flow-limits;
```

Hierarchy Level

```
[editservices service-set service-set-name service-set-options]
```

Release Information

Statement introduced in Junos OS Release 10.1.
Statement introduced in Junos OS Release 19.3R2 on MX240, MX480 and MX960 routers using the MX-SPC3 services card..

Description

bypass-traffic-on-exceeding-flow-limitsbypass-traffic-on-exceeding-flow-limitsbypass-traffic-on-exceeding-flow-limits

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Service Sets to be Applied to Services Interfaces

by-protocol (IDS Screen Next Gen Services)

Syntax

```
by-protocol {
    icmp {
        maximum-sessions number;
        packet-rate number;
        session-rate number;
    }
    tcp {
        maximum-sessions number;
        packet-rate number;
        session-rate number;
    }
    udp {
        maximum-sessions number;
        packet-rate number;
        session-rate number;
    }
}
```

Hierarchy Level

```
[edit services screen ids-option screen-name limit-session by-destination],
[edit services screen ids-option screen-name limit-session by-source]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure session limits for individual destination or source addresses, or for individual destination or source subnets, for the specified protocol. This protects against network probing attacks and network flooding attacks. When a session limit is exceeded for a source or destination for the protocol, packets from the source or to the destination are dropped until the session limit is no longer exceeded.

To specify limits for destination or source subnets rather than individual addresses, include the **aggregations** statement at the **[edit services screen ids-option *screen-name*]** hierarchy level.

Options

icmp—Apply session limits to ICMP packets.

maximum-sessions *number*—Specify the maximum number of concurrent ICMP sessions allowed for individual destination or source addresses, or for individual destination or source subnets.

packet-rate *number*—Specify the maximum number of ICMP packets per second allowed for individual destination or source addresses, or for individual destination or source subnets.

session-rate *number*—Specify the maximum number of ICMP connections per second allowed for individual destination or source addresses, or for individual destination or source subnets.

tcp—Apply session limits to TCP packets.

maximum-sessions *number*—Specify the maximum number of concurrent TCP sessions allowed for individual destination or source addresses, or for individual destination or source subnets.

packet-rate *number*—Specify the maximum number of TCP packets per second allowed for individual destination or source addresses, or for individual destination or source subnets.

session-rate *number*—Specify the maximum number of TCP connections per second allowed for individual destination or source addresses, or for individual destination or source subnets.

udp—Apply session limits to UDP packets.

maximum-sessions *number*—Specify the maximum number of concurrent UDP sessions allowed for individual destination or source addresses, or for individual destination or source subnets.

packet-rate *number*—Specify the maximum number of UDP packets per second allowed for individual destination or source addresses, or for individual destination or source subnets.

session-rate *number*—Specify the maximum number of UDP connections per second allowed for individual destination or source addresses, or for individual destination or source subnets.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

by-source (IDS Screen Next Gen Services)

Syntax

```
by-source {
   by-protocol {
      icmp {
         maximum-sessions number;
         packet-rate number;
         session-rate number;
      }
      tcp {
         maximum-sessions number;
         packet-rate number;
         session-rate number;
      }
      udp {
         maximum-sessions number;
         packet-rate number;
         session-rate number;
      }
   }
   maximum-sessions number;
   packet-rate number;
   session-rate number;
   ;
}
```

Hierarchy Level

```
[edit services screen ids-option screen-name limit-session]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure session limits for individual source addresses or for individual source subnets. This protects against network probing attacks and network flooding attacks. You can specify limits for specific protocols (ICMP, TCP, and UDP), or specify limits independent of a protocol. When a session limit is exceeded for a source, packets from the source are dropped until the session limit is no longer exceeded.

To specify limits for source subnets rather than individual addresses, include the **aggregations** statement at the **[edit services screen ids-option *screen-name*]** hierarchy level.

Options

maximum-sessions *number*—Specify the maximum number of concurrent sessions allowed for an individual source address or subnet.

packet-rate *number*—Specify the maximum number of packets per second allowed for an individual source address or subnet.

session-rate *number*—Specify the maximum number of connections per second allowed for an individual source address or subnet.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

category (System Logging)

Syntax

```
category category, category....category;
```

Hierarchy Level

```
[edit services service-set service-set-name syslog stream]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services on the MX-SPC3 services card.

Description

Specify the categories for which you want to collect logs.

Options

all—All events are logged

content-security—Content security events are logged

fw-auth—Fw-auth events are logged

screen —Screen events are logged

alg—ALG events are logged

nat—NAT events are logged

flow—Flow events are logged

sctp—Sctp events are logged

gtp—Gtp events are logged

ipsec—Ipsec events are logged

idp—Idp events are logged

rtlog—Rtlog events are logged

pst-ds-lite—Pst-ds-lite events are logged

appqos—Appqos events are logged

secintel—Secintel events are logged

aamw—AAMW events are logged

sfw—Stateful Firewall events are logged

session —Session open and close events are logged

session-open—Session open events are logged

session-close—Session close events are logged

urlf—DNS request filtering events are logged

ha—Stateful High-Availability open and close events are logged

ha-open—Stateful High-Availability open events are logged

ha-close—Stateful High-Availability close events are logged

pcp—PCP logs

Required Privilege Level
system—To view this statement in the configuration.

child-inactivity-timeout

Syntax

```
child-inactivity-timeout seconds;
```

Hierarchy Level

```
[edit applications application ike-esp-nat]
```

Release Information

Statement introduced in Junos OS Release 17.1 on MX Series.

Description

For an IKE ALG application, configure the ESP session (IPsec data traffic) idle timeout. If no IPsec data traffic is passed on the ESP session in this time, the session is deleted.

The IKE ALG enables the passing of IKEv1 and IPsec packets through NAPT-44 and NAT64 rules between IPsec peers that are not NAT-T compliant.

Options

seconds—Number of seconds.

Default: 800 seconds

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

ALG Descriptions

Configuring Application Sets | **269**

Configuring Application Properties

clat-prefix (Source NAT Next Gen Services)

Syntax

```
clat-prefix clat-prefix;
```

Hierarchy Level

```
[edit services nat source rule-set rule-set rule rule-name then source-nat]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the customer-side translator (CLAT) IPv6 source prefix, which is used for 464XLAT.

464XLAT lets an IPv4 client with a private IP address connect to an IPv4 host over an IPv6 network. The CLAT translates IPv4 source addresses to IPv6 by embedding the IPv4 source address in this IPv6 source prefix. The CLAT then sends the packets over an IPv6 network to the MX Series router, which acts as a provider-side translator (PLAT). The MX translates the embedded IPv4 private IP address to a public IPv4 address.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

clear-dont-fragment-bit (NAT Next Gen Services)

Syntax

```
set clear-dont-fragment-bit;
```

Hierarchy Level

```
[edit services nat natv6v4]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify that the don't fragment (DF) bit for IPv4 packet headers is cleared when the packet length is less than 1280 bytes. Use this statement when configuring stateful NAT64, deterministic NAPT64, and 464XLAT. This prevents unnecessary creation of an IPv6 fragmentation header when translating IPv4 packets that are less than 1280 bytes.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

close-timeout

Syntax

```
close-timeout seconds;
```

Hierarchy Level

```
[edit interfaces interface-name services-options]
[edit services service-set service-set-name service-set-options tcp-session
```

Release Information

Statement introduced in Junos OS Release 12.3.
Support for Next Gen Services added in Junos OS Release 19.3R2 on MX Series MX240, MX480 and MX960 using MX-SPC3 services card.

Description

Configure the timeout period for Transmission Control Protocol (TCP) session tear-down.

Options

seconds—Timeout period.

Default: 1 second

Range: 2 through 300 seconds

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Default Timeout Settings for Services Interfaces

cos-rule-sets (Service Set Next Gen Services)

Syntax

```
cos-rule-sets [cos-rule-set-name];
```

Hierarchy Level

```
[edit services service-set service-set-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the services CoS rule set to apply to the service set. The service set processes the rules in the order they appear in the rule set.

The service set that the CoS rule set is assigned to must include at least one stateful firewall rule or NAT rule, or CoS does not work. Only stateful firewall and NAT rules can be used with CoS rules in a service set.

Options

cos-rule-set-name—Name of the services CoS rule set.

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Class of Service for Services PICs (Next Gen Services) | 131

cos-rules (Service Set Next Gen Services)

Syntax

```
cos-rules [cos-rule-name];
```

Hierarchy Level

```
[edit services service-set service-set-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the CoS rules to apply to the service set. You can configure multiple rules.

The service set that the CoS rule is assigned to must include at least one stateful firewall rule or NAT rule, or CoS does not work. Only stateful firewall and NAT rules can be used with CoS rules in a service set.

Options

cos-rule-name—CoS rule name.

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Class of Service for Services PICs (Next Gen Services) | 131

cpu-load-threshold

Syntax

```
cpu-load-threshold percentage;
```

Hierarchy Level

```
[edit interfaces interface-name services-options session-limit]
```

Release Information

Statement introduced in Release 13.2.
Support added in Junos OS Release 19.3R2for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Regulate the usage of CPU resources on services cards. When the CPU usage exceeds the configured value (percentage of the total available CPU resources), the system reduces the rate of new sessions so that the existing sessions are not affected by low CPU availability. The CPU utilization is constantly monitored, and if the CPU usage remains above the configured **cpu-load-threshold** value for a continuous period of 5 seconds, Junos OS reduces the session rate value configured at **edit interfaces *interface-name* services-options session-limit rate** by 10%. This is repeated until the CPU utilization comes down to the configured limit.

Options

percentage—Percentage of total available CPU resources.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

cpu-throttle (Next Gen Services)

Syntax

```
cpu-throttle {
    percentage percent;
}
```

Hierarchy Level

```
[edit services screen]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the services card CPU utilization percentage that triggers the installation of a dynamic filter on the PFEs of the line cards for suspicious activity. The dynamic filter drops the suspicious traffic.

In addition to this threshold, at least one of the following conditions is required to trigger the installation of a dynamic filter:

- The packet rate from an individual source address or to an individual destination address must exceed four times the configured **packet-rate** at the **[edit services screen ids-option *screen-name* limit-session by-source]** or **[edit services screen ids-option *screen-name* limit-session by-destination]** hierarchy level.
- The connection rate from an individual source address or to an individual destination address must exceed four times the configured **session-rate** at the **[edit services screen ids-option *screen-name* limit-session by-source]** or **[edit services screen ids-option *screen-name* limit-session by-destination]** hierarchy level.

Dynamic filters are not created from IDS screens that use subnet aggregation.

The dynamic filter drops the suspicious traffic at the PFE, without the traffic being processed by the IDS screen. When the packet or connection rate no longer exceeds four times the limit in the IDS screen, the dynamic filter is removed.

Options

percentage *percent*—The CPU utilization percentage.

Range: 1 through 100

Default: 90

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

- Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

data (FTP)

Syntax

```
data {
    dscp (alias | bits);
    forwarding-class class-name;
}
```

Hierarchy Level

[edit services cos application-profile *profile-name* ftp]

Release Information
Statement introduced in Junos OS Release 9.3.

Description
Set the appropriate **dscp** and **forwarding-class** value for FTP data.

Default
By default, the system will not alter the DSCP or forwarding class for FTP data traffic.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

- *Configuring CoS Rules on Services PICs*
- video (Application Profile) | 533
- voice (Application Profile) | 538

description (Security Policies Next Gen Services)

Syntax

```
description description;
```

Hierarchy Level

```
[edit security ike policy policy-name],
[edit security ike proposal proposal-name],
[edit security ipsec policy policy-name],
[edit security ipsec proposal proposal-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Enter descriptive text for an IKE policy, an IPsec policy, an IKE proposal, or an IPsec proposal.

Options

description—Descriptive text.

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

destination-address (NAT Next Gen Services)

Syntax

```
destination-address (address | any | any-ipv4 | any-ipv6);
```

Hierarchy Level

```
[edit services nat destination rule-set rule-set rule rule-name match],
[edit services nat source rule-set rule-set rule rule-name match]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the destination address that the packet must match for the NAT rule to take effect.

Options

address—A specific address that must be matched.

any—Any unicast destination address results in a match.

any-ipv4—Any IPv4 destination address results in a match.

any-ipv6—Any IPv6 destination address results in a match.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

destination-address-name (NAT Next Gen Services)

Syntax

```
destination-address-name address-name;
```

Hierarchy Level

```
[edit services nat destination rule-set rule-set rule rule-name match],
[edit services nat source rule-set rule-set rule rule-name match]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the name of the range of destination addresses that the packet must match for the NAT rule to take effect. The range of addresses is configured with the **address** statement at the **[edit services address-book global]** hierarchy level.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

destination-prefix (Destination NAT Next Gen Services)

Syntax

```
destination-prefix destination-prefix;
```

Hierarchy Level

```
[edit services nat destination rule-set rule-set rule rule-name then destination-nat]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the IPv6 prefix that is used to embed an IPv4 destination address in an IPv6 address. The **destination-prefix** statement is used in Stateful NAT64 and 464XLAT translations.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

deterministic (Source NAT Next Gen Services)

Syntax

```
deterministic {
    block-size block-size;
    host {
        address address;
    }
    include-boundary-addresses;
}
```

Hierarchy Level

```
[edit services nat source pool nat-pool-name port]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure deterministic NAT to ensure that the original internal source IPv4 or IPv6 address and port always map to the same post-NAT IPv4 address and block of ports. In addition, the reverse mapping of a given translated external IPv4 address and port are always mapped to the same internal IP address.

This eliminates the need for address translation logging.

Options

block-size *block-size*—The number of ports in the port block.

Range: 1 to 64,512

Default: 256

host address *address*—The first usable pre-NAT subscriber address, which is used to perform the deterministic NAT mapping.

include-boundary-addresses—Include the translation of the lowest and highest IPv4 addresses (the network and broadcast addresses) in the source address range of a NAT rule. This does not apply to IPv6 source addresses.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Deterministic NAPT for Next Gen Services | 22

deterministic-nat-configuration-log-interval (Source NAT Next Gen Services)

Syntax

```
deterministic-nat-configuration-log-interval seconds;
```

Hierarchy Level

```
[edit services nat source pool nat-pool-name port]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure the interval at which the syslog is generated for the deterministic NAT configuration.

Options

deterministic-nat-configuration-log-interval *seconds*—Number of seconds in the interval.

Range: 1800 through 86400

Default: 1800

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Deterministic NAPT for Next Gen Services | 22

dns-filter

Syntax

```
dns-filter {
    database-file filename;
    dns-resp-ttl seconds;
    dns-server [ ip-address ];
    hash-key key-string;
    hash-method hash-method-name;
    statistics-log-timer minutes;
    wildcarding-level level;
}
```

Hierarchy Level

```
[edit services web-filter profile profile-name],
[edit services web-filter profile profile-name dns-filter-template template-name]
```

Release Information

Statement introduced in Junos OS Release 18.3R1 on MX Series.
Support added for Next Gen Services on MX Series routers MX240, MX480 and MX960 with MX-SPC3 services cards in Junos OS Release 19.3R2.

Description

Configure the settings for filtering DNS requests for blacklisted website domains. Filtering can result in either:

- Blocking access to the site by sending the client a DNS response that includes an IP address or domain name of a sinkhole server instead of the blacklisted domain.
- Logging the DNS request and allowing access.

Settings at the **[edit services web-filter profile *profile-name* dns-filter-template *template-name*]** hierarchy level override the corresponding settings at the **[edit services web-filter profile *profile-name*]** hierarchy level.

Options

database-file *filename*—Name of the domain filter database file to use when filtering DNS requests.

dns-resp-ttl *seconds*— Number of seconds to live while sending the DNS response after taking the DNS sinkhole action.

Default: 1800

Range: 0 through 86,400

dns-server [*ip-address*]—(Optional) IP addresses (IPv4 or IPv6) for up to three specific DNS servers. DNS filtering examines only DNS requests that are destined for those DNS servers.

hash-key *key-string*—Hash key that you used to create the hashed domain name in the domain filter database file.

hash-method *hash-method-name*—Hash method that you used to create the hashed domain name in the domain filter database file. The only supported hash method is **hmac-sha2-256**.

statistics-log-timer *minutes*—Number of minutes in the interval for logging statistics for DNS requests and for sinkhole actions performed for each customer IP address.

Default: 5

Range: 0 through 60

wildcarding-level *level*—Level of subdomains that are searched for a match. A value of 0 indicates that subdomains are not searched.

For example, if you set the **wildcarding-level** to 4 and the database file includes an entry for **example.com**, the following comparisons are made for a DNS request that arrives with the domain **198.51.100.0.example.com**:

- **198.51.100.0.example.com**: no match
- **51.100.0.example.com**: no match for one level down
- **100.0.example.com**: no match for two levels down
- **0.example.com**: no match for three levels down
- **example.com**: match for four levels down

Range: 0 through 10

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

DNS Request Filtering for Blacklisted Website Domains | **189**

dns-filter-template

Syntax

```
dns-filter-template template-name {
    client-interfaces [ client-interface-name ];
    client-routing-instance client-routing-instance-name;
    dns-filter {
        database-file filename;
        dns-resp-ttl seconds;
        dns-server [ ip-address ];
        hash-key key-string;
        hash-method hash-method-name;
        statistics-log-timer minutes;
        wildcarding-level level;
    }
    server-interfaces [ server-interface-name ];
    server-routing-instance server-routing-instance-name;
    term term-name {
        from {
            src-ip-prefix [ source-prefix ];
        }
        then {
            accept;
            dns-sinkhole;
        }
    }
}
```

Hierarchy Level

```
[edit services web-filter profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 18.3R1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure filtering of DNS requests for blacklisted website domains for requests on specific uplink and downlink logical interfaces or routing instances, or for requests from specific source IP address prefixes. The DNS filter template overrides the corresponding settings at the DNS profile level. You can configure up to 32 DNS filter templates in a profile.

Filtering can result in either:

- Blocking access to the site by sending the client a DNS response that includes an IP address or domain name of a sinkhole server instead of the blacklisted domain.
- Logging the DNS request and allowing access.

Options

accept—Accept DNS requests for DNS filtering.

client-interfaces [***client-interface-name*** **]**—(Optional) Client-facing (uplink) logical interfaces on which the DNS filter template settings are applied.

client-routing-instance ***client-routing-instance-name***—(Optional) Client-facing (uplink) routing instance on which the DNS filter template settings are applied.

dns-filter-template ***template-name***—Name of the DNS filter template.

dns-sinkhole—Perform the sinkhole action identified in the domain filter database for blacklisted DNS requests.

server-interfaces [***server-interface-name*** **]**—(Optional) Server-facing logical interfaces (downlink) on which the DNS filter template settings are applied.

server-routing-instance ***server-routing-instance-name***—(Optional) Server-facing (downlink) routing instance on which the DNS filter template settings are applied.

NOTE: If you configure the client and server interfaces or the client and server routing instances, implicit filters are installed on the interfaces or routing instances to direct DNS traffic to the MS-MPC for DNS filtering. If you configure neither the client and server interfaces nor the routing instances, you must provide a way to direct DNS traffic to the MS-MPC (for example, via routes).

src-ip-prefix [***source-prefix*** **]**—(Optional) Source IP address prefixes of DNS requests you want to filter. You can configure a maximum of 64 prefixes in a term. If you do not specify any source prefixes, then all DNS requests are filtered.

term ***term-name***—Name for a term. You can configure a maximum of 64 terms in a template.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

DNS Request Filtering for Blacklisted Website Domains | 189

drop-member-traffic (Aggregated Multiservices)

Syntax

```
drop-member-traffic {
    rejoin-timeout rejoin-timeout;
}
```

Hierarchy Level

[edit interfaces *interface-name* load-balancing-options member-failure-options]

Release Information

Statement introduced in Junos OS Release 11.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Specify whether the broadband gateway should drop traffic to a services PIC when it fails.

For many-to-one (N:1) high availability (HA) for service applications like Network Address Translation (NAT), this configuration is valid only when two or more services PICs have failed.

The remaining statement is explained separately. See CLI Explorer.

Default

If this statement is not configured, then the default behavior is to drop member traffic with a rejoin timeout of 120 seconds.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

member-failure-options (Aggregated Multiservices) | 415

Understanding Aggregated Multiservices Interfaces

Example: Configuring an Aggregated Multiservices Interface (AMS)

dscp (Services CoS)

Syntax

```
dscp (alias | bits);
```

Hierarchy Level

```
[edit services cos application-profile profile-name (ftp | sip) (data | video | voice)],
[edit services cos rule rule-name term term-name then],
[edit services cos rule rule-name term term-name then reverse]
```

Release Information

Statement introduced in Junos OS Release 8.1.

Description

Define the Differentiated Services code point (DSCP) mapping that is applied to the packets. Change the DSCP (or TOS) on the packet to the specified value. Any conformant bit string can be specified, but only the default alias can be used.

Options

alias—Name assigned to a set of CoS markers.

bits—Mapping value in the packet header.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Actions in CoS Rules.

Configuring CoS Rules on Services PICs

ei-mapping-timeout (Source NAT Next Gen Services)

Syntax

```
ei-mapping-timeout ei-mapping-timeout;
```

Hierarchy Level

```
[edit services nat source pool nat-pool-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the timeout period for endpoint independent translations that use the NAT pool. Mappings that are inactive for this amount of time are dropped.

If you do not configure **ei-mapping-timeout** for endpoint independent translations, then the **mapping-timeout** value is used for endpoint independent translations.

Options

ei-mapping-timeout *ei-mapping-timeout*—The timeout period in seconds.

Range: 120 through 86,400

Default: 300 (timeout period for endpoint independent translations is set by **mapping-timeout** value at the **[edit services nat source pool *nat-pool-name*]** hierarchy level)

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

enable-asymmetric-traffic-processing (Service Set Next Gen Services)

Syntax

```
enable-asymmetric-traffic-processing;
```

Hierarchy Level

```
[edit services service-set service-set-name service-set-options]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Enable the service set to handle unidirectional traffic.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

enable-rejoin (aggregated Multiservices)

Syntax

```
enable-rejoin;
```

Hierarchy Level

```
[edit interfaces interface-name load-balancing-options member-failure-options redistribute-all-traffic]
```

Release Information

Statement introduced in Junos OS Release 11.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Enable the failed member to rejoin the aggregated Multiservices (AMS) interface after the member comes back online.

For many-to-one (N:1) high availability (HA) for service applications like Network Address Translation (NAT), this configuration allows the failed members to rejoin the pool of active members automatically.

Default

If you do not configure this option, then the failed members do not automatically rejoin the **ams** interface even after coming back online.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

redistribute-all-traffic (Aggregated Multiservices) | **460**

Understanding Aggregated Multiservices Interfaces

Example: Configuring an Aggregated Multiservices Interface (AMS)

enable-subscriber-analysis (Services Options VMS Interfaces)

Syntax

```
enable-subscriber-analysis;
```

Hierarchy Level

```
[edit interfaces interface-name services-options]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Enable the creation of subscribers if the following are not configured, but you want subscribers to be created:

- NAT
- The **max-sessions-per-subscriber** statement at the **[edit services service-set *service-set-name*]** hierarchy level

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

How to Configure Services Interfaces for Next Gen Services

event-rate (Next Gen Services Service-Set Local System Logging)

Syntax

```
event-rate rate-per-second;
```

Hierarchy Level

```
[edit services services-set name syslog]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

Rate at which log messages are sent per second to the local file.

Options

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

file (Next Gen Services Global System Logging)

Syntax

```
file <filename> <files files> <match match> <size size> <(world-readable | no-world-readable)>;
```

Hierarchy Level

```
[edit services rtlog traceoptions]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

Trace file information

Options

All other options are explained separately.

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

files (Next Gen Services Global System Logging)

Syntax

```
files files;
```

Hierarchy Level

```
[edit services rtlog traceoptions file filename]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

Maximum number of trace files

Options

files—Maximum number of trace files

Default: 3

Range: 2 through 1000

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

filename (Next Gen Services Global System Logging)

Syntax

```
filename;
```

Hierarchy Level

```
[edit services rtlog traceoptions file]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

Name of file in which to write trace information

Options

filename—Name of file in which to write trace information

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

filtering-type (Source NAT Next Gen Services)

Syntax

```
filtering-type {
    endpoint-independent {
        prefix-list [allowed-host] except [denied-host ];
    }
}
```

Hierarchy Level

[edit services nat source rule-set *rule-set* rule *rule-name* then source-nat]

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify prefix lists that contain prefixes of hosts that are allowed to establish inbound connections using endpoint-independent mapping, and prefix lists for hosts that are not allowed to establish inbound connections. (Prefix lists are configured at the **[edit policy-options]** hierarchy level.)

Options

[*allowed-host*]—Names of the prefix lists for hosts that are allowed to establish connections.

except [*denied-host*]—Names of prefix lists for hosts that are not allowed to establish connections.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

fin-no-ack (IDS Screen Next Gen Services)

Syntax

```
fin-no-ack;
```

Hierarchy Level

```
[edit services screen ids-option screen-name tcp]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop any packet with a FIN flag set and without the ACK flag set. The TPC FIN No Ack attack can allow the attacker to identify the operating system of the target or to identify open ports on the target.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

flag (Next Gen Services Global System Logging)

Syntax

```
flag name;
```

Hierarchy Level

[edit services rtlog **traceoptions**]

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

List of things to include in trace.

Options

name—

Values:

- all—Enable all interface trace flags. event —Trace interface events.
- cache—Enable interface flags for Web filtering cache maintained on the routing table.
- enhanced—Enable interface flags for processing through Enhanced Web Filtering.
- ipc—Trace interface IPC messages.
- media—Trace interface media changes.
- critical—Trace critical events.
- major—Trace major events

Required Privilege Level

system

RELATED DOCUMENTATION

Understanding System Logging for Next Gen Services | 35

Enabling Global System Logging for Next Gen Services | 37

Configuring System Logging to One or More Remote Servers for Next Gen Services | 40

Configuring Local System Logging for Next Gen Services | 38

format (Next Gen Services Service-Set Remote System Logging)

Syntax

```
format format;
```

Hierarchy Level

```
edit services service-set name syslog stream stream-name
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services MX-SPC3 services card.

Description

Specify the file format for the log messages being sent to the remote server.

Options

The file format can be one of the following:

binary—Binary syslog defined by Juniper Networks. Requires Juniper Networks decoders on the server side to decode the logs.

sd-syslog—Structured syslog (defined by RFC5424)

syslog—Traditional syslog (defined by RFC5424)

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

forwarding-class (Services PIC Classifiers)

Syntax

```
forwarding-class class-name;
```

Hierarchy Level

```
[edit services cos application-profile profile-name (ftp | sip) (data | video | voice)],
[edit services cos rule rule-name term term-name then],
[edit services cos rule rule-name term term-name then reflexive; | revert; | reverse {]
```

Release Information

Statement introduced in Junos OS Release 8.1.

Description

Define the forwarding class to which packets are assigned.

Options

class-name—Name of the target application.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring CoS Rules on Services PICs

forwarding-class (Services PIC Classifiers)

Syntax

```
forwarding-class class-name;
```

Hierarchy Level

```
[edit services cos application-profile profile-name (ftp | sip) (data | video | voice)],
[edit services cos rule rule-name term term-name then],
[edit services cos rule rule-name term term-name then reverse]
```

Release Information

Statement introduced in Junos OS Release 8.1.

Description

Assign the packets to the specified forwarding class.

Options

class-name—Name of the target application.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Actions in CoS Rules.

forwarding-class (Services PIC Classifiers)

Syntax

```
forwarding-class class-name;
```

Hierarchy Level

```
[edit services cos application-profile profile-name (ftp | sip) (data | video | voice)],
[edit services cos rule rule-name term term-name then],
[edit services cos rule rule-name term term-name then reflexive; | revert; | reverse {]
```

Release Information

Statement introduced in Junos OS Release 8.1.

Description

Define the forwarding class to which packets are assigned.

Options

class-name—Name of the target application.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring CoS Rules on Services PICs

fragment (IDS Screen Next Gen Services)

Syntax

```
fragment;
```

Hierarchy Level

```
[edit services screen ids-option screen-name icmp]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop ICMP packets that are IP fragments. These are considered suspicious packets because ICMP packets are usually short. When the target receives these packets, the results can range from processing packets incorrectly to crashing the entire system.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

ftp (Services CoS Next Gen Services)

Syntax

```
ftp {
    data {
        dscp (alias | bits);
        forwarding-class class-name;
    }
}
```

Hierarchy Level

[edit services cos application-profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure CoS actions for FTP traffic in an application profile. The application profile can then be used in CoS rule actions.

Options

dscp (*alias* | *bits*)—Either a code point alias or a DSCP bit value to apply to the FTP packets.

forwarding-class *class-name*—Forwarding class name to apply to the FTP packets. The choices are:

- assured-forwarding
- best-effort
- expedited-forwarding
- network-control

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Class of Service for Services PICs (Next Gen Services) | 131

gate-timeout

Syntax

```
gate-timeout seconds;
```

Hierarchy Level

```
[edit applications application ike-esp-nat]
```

Release Information

Statement introduced in Junos OS Release 17.1 on MX Series.

Description

For an IKE ALG application, configure the length of time that can pass after IKE establishes the security association between the IPsec client and server and before the ESP traffic starts in both directions. If the ESP traffic has not started before this timeout value, the ESP gates are deleted and the ESP traffic is blocked.

The IKE ALG enables the passing of IKEv1 and IPsec packets through NAPT-44 and NAT64 rules between IPsec peers that are not NAT-T compliant.

Options

seconds—Number of seconds.

Default: 120 seconds

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

ALG Descriptions

Configuring Application Sets | 269

Configuring Application Properties

global-dns-stats-log-timer

Syntax

```
global-dns-stats-log-timer minutes;
```

Hierarchy Level

```
[edit services web-filter profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 18.3R1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure the interval for logging per-client statistics for filtering of DNS requests for blacklisted website domains.

Options

minutes—The number of minutes in the logging interval.

Default: 5

Range: 0 through 60

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

DNS Request Filtering for Blacklisted Website Domains | **189**

group (Traffic Load Balancer)

Syntax

```
group group-name {
    health-check-interface-subunit health-check-interface-subunit;
    network-monitoring-profile [profile-name1, <profile-name2>];
    real-service-rejoin-options no-auto-rejoin;
    real-services [server-list];
    <routing-instance routing-instance>;
}
```

Hierarchy Level

```
[edit services traffic-load-balance instance instance-name]
```

Release Information

Statement introduced in Junos OS Release 16.1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure a group of servers as a pool for next-hop session distribution.

Options

group-name—Use the specified string identifier for a group of servers to which sessions are distributed using the server distribution table in conjunction with the session distribution API.

group health-check-interface-subunit *health-check-interface-subunit*—Use the specified subunit of the ms- interface used for health checking.

network-monitoring-profile *profile-name1*—Name of the network monitoring profile used to monitor the health of servers in the group.

network-monitoring-profile *profile-name2*—(Optional) Name of a second network monitoring profile used to monitor the health of servers in the group.

real-services *server-list*—Use the specified list of individual servers to which sessions are distributed using the server distribution table in conjunction with the session distribution API.

real-services-rejoin-options no-auto-rejoin—Disable the default behavior that allows a server to rejoin the group automatically when it comes up.

routing-instance *routing-instance*—(Optional) Use the specified routing instance if the default **inet.0** is not used.

Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Traffic Load Balancer Overview | 165

Configuring TLB | 172

hash-keys (Interfaces)

Syntax

```
hash-keys {
    egress-key (source-ip | destination-ip);
    ingress-key (source-ip | destination-ip);
    ipv6-source-prefix-length ipv6-source-prefix-length;
}
```

Hierarchy Level

```
[edit interfaces unit unit-name load-balancing-options]
```

Release Information

Statement introduced in Junos OS Release 11.4.
ipv6-source-prefix-length option introduced in Junos OS Release 18.2R1.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card. The **ipv6-source-prefix-length** option is not supported for Next Gen Services.

Description

Configure the hash keys used for load balancing in aggregated multiservices (AMS) for next-hop style services. The hash keys supported in the ingress and egress direction are the source IP address and destination IP address.

Hash keys are used to define the load-balancing behavior among the various members in the AMS. For example, if **hash-keys** is configured as **source-ip**, then the hashing is performed based on the source IP address of the packet, so that all packets with the same source IP address land on the same member. When you use **ingress-key** and **egress-key**, you must configure hash keys to take the traffic direction into consideration. For example, if you configure **hash-keys** as **source-ip** in the ingress direction, then you must configure **hash-keys** as **destination-ip** in the egress direction. This is required to ensure that the packets of the same flow reach the same member of the AMS group.

If you are configuring an AMS interface used in a service set for DS-Lite,

The remaining statements are explained separately. See CLI Explorer.

Options

egress-key destination-ip—Use the destination IP address of the flow to compute the hash used in load balancing. Configure the hash keys to be used in the egress flow direction.

egress-key source-ip—Use the source IP address of the flow to compute the hash used in load balancing. Configure the hash keys to be used in the egress flow direction.

ingress-key destination-ip—Use the destination IP address of the flow to compute the hash used in load balancing. Configure the hash keys to be used in the ingress flow direction.

ingress-key source-ip—Use the source IP address of the flow to compute the hash used in load balancing. Configure the hash keys to be used in the ingress flow direction.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Load Balancing on AMS Infrastructure | 219

header-integrity-check (Next Gen Services)

Syntax

```
header-integrity-check {
    enable-all;
}
```

Hierarchy Level

[edit services service-set *service-set* service-set-options]

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Drop packets that have packet header anomalies. These anomalies include:

- Not an IP packet
- Not an IPv4 packet or an IPv6 packet
- TTL error (TTL is 0)
- Bad source/destination IP
- IP checksum error
- Protocol error
- TCP port zero
- TCP header length error (less than 20 bytes)
- TCP SEQNUM is zero and no flags are set
- TCP SEQNUM is zero and flags are set
- No TCP flags are set
- TCP FIN with no Ack
- TCP FIN & Reset
- TCP SYN & (FIN or URG or RESET)
- UDP port zero
- UDP header length error
- ICMP header length error (not within 48-576 bytes)

- ICMP packet error length
- ICMP large packet (1024)

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

high-availability-options (Aggregated Multiservices)

Syntax

```
high-availability-options {
   (many-to-one | one-to-one) {
      preferred-backup preferred-backup;
   }
}
```

Hierarchy Level

```
[edit interfaces interface-name load-balancing-options]
```

Release Information

Statement introduced in Junos OS Release 11.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure the high availability options for the aggregated multiservices (AMS) interface. For service applications, if only the load-balancing feature is being used, then this configuration is optional.

For many-to-one (N:1) high availability support for service applications like Network Address Translation (NAT), the preferred backup services PIC, in hot standby mode, backs up one or more (N) active services PICs.

> **NOTE:** In both cases, if one of the active services PICs goes down, then the backup replaces it as the active PIC. When the failed PIC comes back up, it becomes the new backup. This is called *floating backup*.

One-to-one (1:1) high availability support associates a single backup interface with a single active interface. 1:1 configuration is supported only on the MS-MPC and MX-SPC3. In 1:1 (stateful) configurations, synchronization causes the active and back up PICs to synchronize traffic states and data structures, preventing data loss during a failover event. Stateful synchronization is required for IPsec high availability support. For IPsec connections, AMS supports 1:1 configuration only.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

- load-balancing-options | 397
- *Understanding Aggregated Multiservices Interfaces*
- *Example: Configuring an Aggregated Multiservices Interface (AMS)*

host (Next Gen Services Service-Set Remote System Logging)

Syntax

```
host host-ip-address;
```

Hierarchy Level

```
edit services service-set name syslog stream stream-name
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

Specify the IP address of syslog server to receive log messages.

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

host-address-base (Source NAT Next Gen Services)

Syntax

```
host-address-base ip-address;
```

Hierarchy Level

```
[edit services nat source pool nat-pool-name]
```

Release Information
Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description
Configure static mapping of the source address.

For static NAT that is performed on the services card, configure a one-to-one static shifting of a range of original source addresses to the range of addresses in the source pool by specifying the base address of the original source address range.

For example, if the host address base is 198.51.100.30 and the NAT pool uses the range 203.0.113.10 to 203.0.113.20, then 198.51.100.30 translates to 203.0.113.10, 198.51.100.31 translates to 203.0.113.11, and so on.

Options
host-address-base *ip-address*—The IP address used as the host address base.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

icmp (IDS Screen Next Gen Services)

Syntax

```
icmp {
    fragment;
    icmpv6-malformed;
    large;
    ping-death;
}
```

Hierarchy Level

```
[edit services screen ids-option screen-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure ICMP intrusion detection service options.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

icmp-type

Syntax

```
icmp-type value;
```

Hierarchy Level

```
[edit applications application application-name]
```

Release Information

Statement introduced before Junos OS Release 7.4.

Description

ICMP packet type value.

Options

value—The ICMP type value, such as **echo** or **echo-reply**. For a complete list, see *Configuring the ICMP Code and Type*.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

ALG Descriptions

Configuring Application Sets | **269**

Configuring the ICMP Code and Type

Examples: Configuring Application Protocols | **284**

Verifying the Output of ALG Sessions | **285**

icmpv6-malformed (IDS Screen Next Gen Services)

Syntax

```
icmpv6-malformed;
```

Hierarchy Level

```
[edit services screen ids-option screen-name icmp]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop malformed ICMPv6 packets, which might cause damage to the device and network. Examples of malformed IPv6 packets are packets that are too big (message type 2), that have the next header set to routing (43), or that have a routing header set to hop-by hop.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

ids-option (IDS Screen Next Gen Services)

Syntax

```
ids-option screen-name {
    aggregations {
        destination-prefix-ipv6-mask prefix-length;
        destination-prefix-mask prefix-length;
        source-prefix-ipv6-mask prefix-length;
        source-prefix-mask prefix-length;
    }
    alarm-without-drop;
    icmp {
        fragment;
        icmpv6-malformed;
        large;
        ping-death;
    }
    ip {
        bad-option;
        block-frag;
        ipv6-extension-header {
            AH-header;
            ESP-header;
            fragment-header;
            hop-by-hop-header {
                CALIPSO-option;
                jumbo-payload-option;
                quick-start-option;
                router-alert-option;
                RPL-option;
                SFM-DPD-option;
                user-defined-option-type <type-low> to <type-high>;
            }
            mobility-header;
            routing-header;
        }
        loose-source-route-option;
        record-route-option;
        security-option;
        source-route-option;
        stream-option;
        strict-source-route-option;
        tear-drop;
        timestamp-option;
```

```
    unknown-protocol;
}
```

```
limit-session {
    by-destination{
        by-protocol {
            icmp {
                maximum-sessions number;
                packet-rate number;
                session-rate number;
            }
            tcp {
                maximum-sessions number;
                packet-rate number;
                session-rate number;
            }
            udp {
                maximum-sessions number;
                packet-rate number;
                session-rate number;
            }
        }
        maximum-sessions number;
        packet-rate number;
        session-rate number;
    }
    by-source {
        by-protocol {
            icmp {
                maximum-sessions number;
                packet-rate number;
                session-rate number;
            }
            tcp {
                maximum-sessions number;
                packet-rate number;
                session-rate number;
            }
            udp {
                maximum-sessions number;
                packet-rate number;
                session-rate number;
            }
        }
        maximum-sessions number;
        packet-rate number;
        session-rate number;
```

```
        }
    }
    match-direction (input | output | input-output)
    tcp {
        fin-no-ack;
        land;
        syn-ack-ack-proxy {
            threshold number;
        }
        syn-fin;
        syn-frag;
        tcp-no-flag;
        winnuke;
    }
}
```

Hierarchy Level

```
[edit services screen]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure a set of intrusion detection service (IDS) options, called a screen. IDS provides protection against network attacks.

Options

ids-option *screen-name*—Name of the IDS screen.

match-direction (input | output | input-output)—Specify whether the IDS screen filtering is applied on the input or output side of the interface:

input—Apply the filtering on the input side of the interface.

input-output—Apply the filtering on both sides of the interface.

output—Apply the filtering on the output side of the interface.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

inactivity-asymm-tcp-timeout (Service Set Next Gen Services)

Syntax

```
inactivity-asymm-tcp-timeout seconds;
```

Hierarchy Level

```
[edit services service-set service-set-name service-set-options tcp-session]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure the number of seconds that a unidirectional TCP session can be inactive before it is closed. Valid settings: 4 through 86400 seconds.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

inline-services (PIC level)

Syntax

```
inline-services {
    bandwidth (1g | 10g | 20g | 30g | 40g | 100g);
}
```

Hierarchy Level

```
[edit chassis fpc slot-number pic number]
```

Release Information

Statement introduced in Junos OS Release 11.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Enable inline services on PICs residing on MPCs and optionally specify a bandwidth for traffic on the inline service interface.

The remaining statement is explained separately. Search for a statement in CLI Explorer or click a linked statement in the Syntax section for details.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

- *Enabling Inline Service Interfaces*
- *Configuring an L2TP LNS with Inline Service Interfaces*

ipv6-extension-header (IDS Screen Next Gen Services)

Syntax

```
ipv6-extension-header {
    AH-header;
    ESP-header;
    fragment-header;
    hop-by-hop-header {
        CALIPSO-option;
        jumbo-payload-option;
        quick-start-option;
        router-alert-option;
        RPL-option;
        SFM-DPD-option;
        user-defined-option-type <type-low> to <type-high>;
    }
    mobility-header;
    routing-header;
}
```

Hierarchy Level

```
[edit services screen ids-option screen-name ip]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop IP packets that have the configured IPv6 extension header values.

Options

ah-header—Authentication Header extension header

esp-header—Encapsulating Security Payload extension header

fragment-header—Fragment Header extension header

hop-by-hop-header—The specified Hop-by-Hop option:

- **CALIPSO-option**—Common Architecture Label IPv6 Security Option
- **jumbo-payload-option**—IPv6 jumbo payload option

quick-start-option—IPv6 quick start option

router-alert-option—IPv6 router alert option

RPL-option—Routing Protocol for Low-Power and Lossy Networks option

SFM-DPD-option—Simplified Muliticast Forwarding IPv6 Duplicate Packet Detection option

user-defined-option-type *type-low* to *type-high*—A range of header types

Range: 1 through 255.

mobility-header—Mobility Header extension header

routing-header—Routing Header extension header

Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | **153**

instance (Traffic Load Balancer)

Syntax

```
instance instance-name {
    client-interface client-interface;
    client-vrf client-vrf;
    group group-name {
        health-check-interface-subunit health-check-interface-subunit;
        network-monitoring-profile profile-name;
        real-service-rejoin-options no-auto-rejoin;
        real-services [ server-list ];
        <routing-instance routing-instance>;
    }
    interface interface-name;
    real-service real-service {
        address server-ip-address;
        admin-down;
    }
    server-inet-bypass-filter server-inet-bypass-filter ;
    server-inet6-bypass-filter server-inet6-bypass-filter ;
    server-interface server-interface;
    server-vrf server-vrf-name;
    virtual-service virtual-service-name {
        address virtual-ip–address;
        group group-name;
        load-balance-method {
            hash {
                hash-key method;
            }
            random;
        }
        mode (layer2-direct-server-return | direct-server-return | translated);
        <routing-instance routing-instance-name>;
        <routing-metric route-metric>;
        server-interface server-interface;
        service service-name {
            protocol (udp | tcp);
            server-listening-port port;
            virtual-port virtual-port;
        }
    }
}
```

Hierarchy Level

[edit services traffic-load-balance]

Release Information

Statement introduced in Junos OS Release 16.1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure a Traffic Load Balancer instance.

Options

client-interface *client-interface*——For translated mode, client interface where the implicit filter is installed to direct the traffic in the forward direction.

client-vrf *client-vrf*—Use the specified name of the routing instance in which the data traffic in the reverse direction is routed to the clients.

instance *instance-name*—Identifier (text string) for a TLB configuration.

server-inet-bypass-filter *server-inet-bypass-filter*—Name of the firewall filter from which the terms are referenced and added to the server-side implicit filters. This enables the operator to bypass reverse (RIP to VIP) translation of IPv4 traffic.

server-inet6-bypass-filter *server-inet6-bypass-filter*—Name of the firewall filter from which the terms are referenced and added to the server-side implicit filters. This enables the operator to bypass reverse (RIP to VIP) translation of IPv6 traffic.

server-interface *server-interface*—For translated mode, specifies the server interfaces where the server filters are implicitly installed to direct the return traffic to the load balancing next hop.

server-vrf *server-vrf-name*—The routing instance in which the data traffic in the forward direction is routed to the servers

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Traffic Load Balancer Overview | **165**

Configuring TLB | **172**

land (IDS Screen Next Gen Services)

Syntax

```
land;
```

Hierarchy Level

```
[edit services screen ids-option screen-name tcp]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop SYN packets that have the same source and destination address or port, which protects against land attacks. In a land attack, the target using up its resources as it repeatedly replies to itself.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

large (IDS Screen Next Gen Services)

Syntax

```
large;
```

Hierarchy Level

```
[edit services screen ids-option screen-name icmp]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop any ICMP frame with an IP length greater than 1024 bytes, which protects against ICMP large packet attacks.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

limit-session (IDS Screen Next Gen Services)

Syntax

```
limit-session {
    by-destination{
        by-protocol {
            icmp {
                maximum-sessions number;
                packet-rate number;
                session-rate number;
            }
            tcp {
                maximum-sessions number;
                packet-rate number;
                session-rate number;
            }
            udp {
                maximum-sessions number;
                packet-rate number;
                session-rate number;
            }
        }
        maximum-sessions number;
        packet-rate number;
        session-rate number;
    }
    by-source {
        by-protocol {
            icmp {
                maximum-sessions number;
                packet-rate number;
                session-rate number;
            }
            tcp {
                maximum-sessions number;
                packet-rate number;
                session-rate number;
            }
            udp {
                maximum-sessions number;
                packet-rate number;
                session-rate number;
            }
        }
```

```
        maximum-sessions number;
        packet-rate number;
        session-rate number;
    }
}
```

Hierarchy Level

```
[edit services screen ids-option screen-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure session limits for individual destination or source addresses, or for individual destination or source subnets. This protects against network probing attacks and network flooding attacks. You can specify limits for specific protocols (ICMP, TCP, and UDP), or specify limits independent of a protocol. When a session limit is exceeded for a source or destination, packets from the source or to the destination are dropped until the session limit is no longer exceeded.

To specify limits for destination or source subnets rather than individual addresses, include the **aggregations** statement at the **[edit services screen ids-option *screen-name*]** hierarchy level.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

load-balancing-options (Aggregated Multiservices)

Syntax

```
load-balancing-options {
    high-availability-options {
        (many-to-one | one-to-one) {
            preferred-backup preferred-backup;
        }
    }
    member-failure-options {
        drop-member-traffic {
            rejoin-timeout rejoin-timeout;
        }
        redistribute-all-traffic {
            enable-rejoin;
        }
    }
    hash-keys {
        egress-key (destination-ip | source-ip);
        ingress-key (destination-ip | source-ip);
    }
    member-interface interface-name;
}
```

Hierarchy Level

```
[edit interfaces interface-name]
```

Release Information

Statement introduced in Junos OS Release 11.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure the high availability (HA) options for the aggregated multiservices (AMS) interface.

Many-to-one (N:1) high availability mode for service applications like Network Address Translation (NAT) is supported. In the case of N:1 high availability mode, one services PIC is the backup (in hot standby mode) for one or more (N) active services PICs. If one of the active services PICs goes down, then the backup replaces it as the active services PIC. When the failed PIC comes back online, it becomes the new backup. This is called *floating backup mode*. In an N:1 (stateless) configuration, traffic states and data structures are not synchronized between active PICs and the backup PIC.

You can also configure a one-to-one (1:1) high availability mode. In the 1:1 configuration, a single interface is configured as the backup for another single active interface. If the active interface goes down, the backup interface replaces it as the active interface. A 1:1 (stateful) configuration synchronizes traffic states and data structures between the active services PIC and the backup services PIC. This is required for IPsec connections. One-to-one high availability is supported on the MS-MPC but it is not supported for MX-SPC3 in this release.

Load-balancing might not be uniform among member interfaces in certain network deployments. The variance can be because of a misconfiguration, which causes the traffic itself not to be sufficiently randomly distributed, causing the hash keys to be ineffective (for example, the hash key is destination IP but all sessions have only source IP address). The variation can be within the expected range and the load balancing depends on the IP addresses chosen. The hash calculation performs a checksum on several bits of the IP address and not only on the last few lower significant bits of the IP address. In such a scenario, the load-balancing ratio can change, for instance, if the source IP address is changed from 20.0.0.0/24 to 20.0.1.0/24.

The distribution of traffic across member interfaces of an AMS interface is static load-balancing. Flows are load balanced based on a packet hash on parameters such as source IP or destination IP. Load-balancing effectiveness depends on the IP address or protocol diversity. For example, if the hash key is destination IP and all packets have the same destination, then all flows are directed to the same member. This is flow-level load balancing and not per packet. As a result, traffic between a pair of addresses may be 10,000 pps, whereas another pair of addresses may have 1 pps. The load of the former is not distributed among members. High availability is limited to stateless HA. When a backup interface takes over as an active interface, all flows are reestablished (for example. packets may undergo NAT processing differently after failover).

With a stateful firewall, static NAT as basic-nat44 or destination-nat44, and dynamic NAT as nat64, napt-44, dynamic-nat44, and with application layer gateways (ALGs) configured, NAT hairpinning is not supported. Input direction for rule match to be applied is supported only for dynamic NAT types (NAT64, NAT44, and dynamic-NAT44). Service-set policies need to have input or input-output direction only. Flows on all active members are reset when the number of actives changes. The resetting of flows can be avoided at the cost of failed-member's traffic loss using certain options.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Aggregated Multiservices Interfaces

Example: Configuring an Aggregated Multiservices Interface (AMS)

local-category (Next Gen Services Service-Set Local System Logging)

Syntax

```
local-category category, category....category;
```

Hierarchy Level

```
[edit services service-set name  syslog
```

Release Information
Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description
Specify the category for which you want to collect local logs.

Options
all—All events are logged

content-security—Content security events are logged

fw-auth—Fw-auth events are logged

screen —Screen events are logged

alg—Alg events are logged

nat—NAT events are logged

flow—Flow events are logged

sctp—Sctp events are logged

gtp—Gtp events are logged

ipsec—Ipsec events are logged

idp—Idp events are logged

rtlog—Rtlog events are logged

pst-ds-lite—Pst-ds-lite events are logged

appqos—Appqos events are logged

secintel—Secintel events are logged

aamw—AAMW events are logged

sfw—Stateful Firewall events are logged

session —Session open and close events are logged

session-open—Session open events are logged

session-close—Session close events are logged

urlf—DNS request filtering events are logged

ha—Stateful High-Availability open and close events are logged

ha-open—Stateful High-Availability open events are logged

ha-close—Stateful High-Availability close events are logged

pcp—PCP logs

Required Privilege Level
system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

local-log-tag (Next Gen Services Service-Set System Logging)

Syntax

```
local-log-tag tag-stamp;
```

Hierarchy Level

```
[edit services service-set name  syslog
edit services service-set name syslog stream stream-name
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

Each log message is stamped with this tag.

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

loose-source-route-option (IDS Screen Next Gen Services)

Syntax

```
loose-source-route-option;
```

Hierarchy Level

```
[edit services screen ids-option screen-name ip]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop IPv4 packets that have the IP option of 3 (Loose Source Routing).

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

many-to-one (Aggregated Multiservices)

Syntax

```
many-to-one {
    preferred-backup preferred-backup;
}
```

Hierarchy Level

[edit interfaces *interface-name* load-balancing-options high-availability-options]

Release Information

Statement introduced in Junos OS Release 11.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure the many-to-one (N:1) preferred backup for the aggregated multiservices (AMS) interface.

> **NOTE:** The preferred backup must be one of the member interfaces (mams–) that have already been configured at the [**edit interfaces *interface-name* load-balancing-options**] hierarchy level. Even in the case of mobile control plane redundancy, which is one-to-one (1:1), the initial preferred backup is configured at this hierarchy level.

Options

preferred-backup *preferred-backup*—Use the specified interface as the preferred backup member interface. The member interface format is mams-*a*/*b*/0, where *a* is the FPC slot number and *b* is the PIC slot number.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

high-availability-options (Aggregated Multiservices) | 377

Understanding Aggregated Multiservices Interfaces

Example: Configuring an Aggregated Multiservices Interface (AMS)

mapping-timeout (Source NAT Next Gen Services)

Syntax

```
mapping-timeout mapping-timeout;
```

Hierarchy Level

```
[edit services nat source pool nat-pool-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the timeout period for address-pooling paired mappings that use the specified NAT pool. Mappings that are inactive for this amount of time are dropped.

If you do not configure **ei-mapping-timeout** for endpoint independent translations, then the **mapping-timeout** value is used for endpoint independent translations.

Options

mapping-timeout *mapping-timeout*—Length of timeout period in seconds.

Range: 120 through 86,400

Default: 300

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

mapping-type (Source NAT Next Gen Services)

Syntax

```
mapping-type {
    address-pooling-paired;
    endpoint-independent;
}
```

Hierarchy Level

[edit services nat source rule-set *rule-set* rule *rule-name* then source-nat]

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure the source NAT mapping type.

Options

endpoint-independent —Mapping to ensure that the same external address and port are assigned to all connections from a given host.

address-pooling-paired —Mapping to ensure assignment of the same external IP address for all sessions originating from the same internal host.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

match (Next Gen Services Global System Logging)

Syntax

```
match match;
```

Hierarchy Level

```
[edit services rtlog traceoptions file]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

Regular expression for lines to be logged

Options

match—Regular expression for lines to be logged

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

match (Services CoS Next Gen Services)

Syntax

```
match {
    application [ application-names ];
    destination-address address;
    destination-address-range low minimum-value high maximum-value;
    destination-port port-number;
    destination-prefix-list list-name;
    source-address address;
    source-address-range low minimum-value high maximum-value;
    source-prefix-list list-name;
}
```

Hierarchy Level

```
[edit services cos rule rule-name policy policy-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure the matching conditions for a policy in a services CoS rule. Matching conditions include packet source and destination addresses and packet applications. Packets that are processed by a service set and that match the conditions are assigned the Differentiated Services (DiffServ) code point (DSCP) marking and forwarding-class assignments specified in the policy.

The service set that the CoS rule is assigned to must include at least one stateful firewall rule or NAT rule, or CoS does not work. Only stateful firewall and NAT rules can be used with CoS rules in a service set.

Options

application [*application-names*]—One or more port-based applications.

destination-address *address*—Destination address of the packet.

destination-address-range low *minimum-value* high *maximum-value*—Range of destination addresses of the packet.

minimum-value—Lower boundary of address range.

maximum-value—Upper boundary of address range.

destination-port *port-number*—Destination port number of the packet.

source-address *address*—Source address of the packet.

source-address-range low *minimum-value* high *maximum-value*—Range of source addresses of the packet.

minimum-value—Lower boundary of address range.

maximum-value—Upper boundary of address range.

source-prefix-list *list-name*—Name of a prefix list for matching the source address prefix.

You configure the prefix list by using the **prefix-list** statement at the **[edit policy-options]** hierarchy level.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Class of Service for Services PICs (Next Gen Services) | **131**

match (Stateful Firewall Rule Next Gen Services)

Syntax

```
match {
    application [application-name];
    destination-address (address | any);
    destination-address-excluded address;
    source-address (address | any);
    source-address-excluded address;
}
```

Hierarchy Level

```
[edit services policies stateful-firewall-rule rule-name policy policy-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the matching properties for a stateful firewall rule policy. When a flow matches these properties, the policy actions are applied to the flow.

Options

application [*application-name*]—One or more application protocols of flows to which the stateful firewall policy applies. The application protocol definition is configured at the **[edit applications]** hierarchy level.

destination-address (*address* | any)—The destination address of the flows to which the stateful firewall rule policy applies. The option **any** matches all destination addresses.

destination-address-excluded *address*—The destination address of the flows to which the stateful firewall rule policy does not apply.

source-address (*address* | any)—The source address of the flows to which the stateful firewall rule policy applies. The option **any** matches all source addresses.

source-address-excluded *address*—The source address of the flows to which the stateful firewall rule policy does not apply.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Stateful Firewalls for Next Gen Services | 142

match-direction (NAT Next Gen Services)

Syntax

Hierarchy Level

[edit services nat source rule-set *rule-set*],
[edit services nat destination rule-set *rule-set*]

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

match-rules-on-reverse-flow (Next Gen Services)

Syntax

```
match-rules-on-reverse-flow;
```

Hierarchy Level

```
[edit services service-set service-set-name cos-options]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure the service set to create a CoS session even if a packet is first received in the reverse direction of the matching direction of the CoS rule. The CoS rule values are then applied as soon as a packet in the correct match direction is received.

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Class of Service for Services PICs (Next Gen Services) | 131

max-session-setup-rate (Service Set)

Syntax

```
max-session-setup-rate (number | numberk);
```

Hierarchy Level

```
[edit services service-set service-set-name]
```

Release Information

Statement introduced in Junos OS Release 17.1R1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Set the maximum number of session setups allowed per second for the service set. After this setup rate is reached, any additional session setup attempts are dropped. If you do not include the **max-session-setup-rate** statement, the session setup rate is not limited.

Options

max-session-setup-rate *number*—Use the specified maximum number of session setups per second.

Range: 1 through 429,496,729

Default: 0 (The session setup rate is not limited.)

numberk—Maximum number of sessions, expressed in thousands. Starting in Junos OS Release 18.4R1, 1k=1000. Prior to Junos OS Release 18.4R1, 1k=1024.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Service Set Limitations

max-sessions-per-subscriber (Service Set Next Gen Services)

Syntax

```
max-sessions-per-subscriber session-number;
```

Hierarchy Level

```
[edit services service-set service-set-name service-set-options]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Set the maximum number of sessions allowed from a single subscriber.

Options

session-number—Maximum number of sessions.

NOTE: There is no default value. You must configure a value for the configuration to take effect.

Range: 1 through 32000

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

maximum

Syntax

maximum *number*;

Hierarchy Level

[edit interfaces *interface-name* services-options session-limit]

Release Information

Statement introduced in Junos OS Release 9.6.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Specify the maximum number of sessions allowed simultaneously on services cards. If you specify the maximum number of sessions to be zero, it indicates that the configuration is not effective. You must specify a value higher than zero for the maximum number of sessions.

Options

number—Maximum number of sessions.

Range: 1 through 4,294,967,295

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

member-failure-options (Aggregated Multiservices)

Syntax

```
member-failure-options {
   drop-member-traffic {
      rejoin-timeout rejoin-timeout;
   }
   redistribute-all-traffic {
      enable-rejoin;
   }
}
```

Hierarchy Level

[edit interfaces *interface-name* load-balancing-options]

Release Information

Statement introduced in Junos OS Release 11.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure the possible behavior for the aggregated Multiservices (AMS) interface in case of failure of more than one active member.

> **NOTE:** The **drop-member-traffic** configuration and the **redistribute-all-traffic** configuration are mutually exclusive.

Table 21 on page 416 displays the behavior of the member interface after the failure of the first services PIC. Table 22 on page 416 displays the behavior of the member interface after the failure of two services PICs.

> **NOTE:** The AMS infrastructure has been designed to handle one failure automatically. However, in the unlikely event that more than one services PIC fails, the AMS infrastructure provides configuration options to minimize the impact on existing traffic flows.

Table 21: Behavior of Member Interface After One Multiservices PIC Fails

High Availability Mode	Member Interface Behavior
Many-to-one (N:1) high availability support for service applications	Automatically handled by the AMS infrastructure

Table 22: Behavior of Member Interface After Two Multiservices PICs Fail

High Availability Mode	Configuration	**rejoin-timeout**	Behavior when member rejoins before **rejoin-timeout** expires	Behavior when member rejoins after **rejoin-timeout** expires
Many-to-one (N:1) high availability support for service applications	**drop-member-traffic**	Configured	The existing traffic for the second failed member will *not* be redistributed to the other members. The first member to rejoin becomes an active member. The second member to rejoin becomes the backup. This behavior is handled automatically by the AMS infrastructure.	The existing traffic for the second failed member will *not* be redistributed to the other members. The first member will rejoin the AMS automatically. However, the other members who are rejoining will be moved to the discard state.
Many-to-one (N:1) high availability support for service applications	**redistribute-all-traffic**	Not applicable	Before rejoin, the traffic is redistributed to existing active members. After a failed member rejoins, the traffic is load-balanced afresh. This may impact existing traffic flows.	

The remaining statements are explained separately. See CLI Explorer.

Default

If **member-failure-options** are not configured, then the default behavior is to drop member traffic with a rejoin timeout of 120 seconds.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

load-balancing-options (Aggregated Multiservices) | 397

Understanding Aggregated Multiservices Interfaces

Example: Configuring an Aggregated Multiservices Interface (AMS)

member-interface (Aggregated Multiservices)

Syntax

```
member-interface interface-name;
```

Hierarchy Level

```
[edit interfaces interface-name load-balancing-options]
```

Release Information

Statement introduced in Junos OS Release 11.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Specify the member interfaces for the aggregated multiservices (AMS) interface. You can configure multiple interfaces by specifying each interface in a separate statement.

Starting with Junos OS Release 16.2, an AMS interface can have up to 32 member interfaces. In Junos OS Release 16.1 and earlier, an AMS interface can have a maximum of 24 member interfaces. If you configure more than 24 member interfaces, you must set the *pic-boot-timeout* value to 240 or 300 seconds at the **[edit interfaces *interface-name* multiservice-options]** hierarchy level for every services PIC interface on the MX Series router.

For high availability service applications like Network Address Translation (NAT) that support many-to-one (N:1) redundancy, you can specify two or more interfaces.

On an MS-MPC, you can configure one-to-one (1:1) redundancy. In a 1:1 (stateful) configuration, a single backup interface provides redundancy for a single active interface. A 1:1 configuration is required for IPsec. 1:1 redundancy is not supported on the MX-SPC3 in this release.

> **NOTE:** The member interfaces that you specify must be members of aggregated multiservices interfaces (mams-).

Options

interface-name—Name of the member interface. The member interface format is mams-*a*/*b*/0, where *a* is the FPC slot number and *b* is the PIC slot number.

Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

- Understanding Aggregated Multiservices Interfaces for Next Gen Services | 211
- Configuring Aggregated Multiservices Interfaces | 217
- load-balancing-options (Aggregated Multiservices) | 397

mode (Next Gen Services Service-Set System Logging)

Syntax

```
mode {
    event ;
    stream stream-name;
}
```

Hierarchy Level

```
[edit services services-set name syslog]
```

Release Information

Support introduced in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Mode in which the system message logger sends messages

Options

event—Send messages to a file on the local routing engine

stream—Send messages to one or more remote log servers. Each remote server requires its own stream.

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

name (Next Gen Services Global System Logging)

Syntax

```
name;
```

Hierarchy Level

```
[edit services rtlog traceoptions flag]
```

Release Information
Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description
Specify what to flag in the trace information.

Options
all—Everything

configuration—Reading of configuration

hpl—Trace HPL logging

report—Trace report

source—Communication with security log forwarder

Required Privilege Level
system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

nat-options (Next Gen Services)

Syntax

```
nat-options {
    nptv6 {
        icmpv6-error-messages;
    }
}
```

Hierarchy Level

```
[edit services service-set service-set-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Send ICMP error messages if NPTv6 address translation fails.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

nat-rule-sets (Service Set Next Gen Services)

Syntax

```
nat-rule-sets rule-set-name;
```

Hierarchy Level

```
[edit services service-set service-set-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the NAT rules set included in the service set.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

next-hop-service

Syntax

```
next-hop-service {
    inside-service-interface interface-name.unit-number;
    outside-service-interface interface-name.unit-number;
    outside-service-interface-type interface-type;
    service-interface-pool name;
}
```

Hierarchy Level

```
[edit services service-set service-set-name]
```

Release Information

Statement introduced before Junos OS Release 7.4.
service-interface-pool option added in Junos OS Release 9.3.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Specify interface names or a service interface pool for the forwarding next-hop service set. You cannot specify both a service interface pool and an inside or outside interface.

Options

inside-service-interface *interface-name.unit-number*—Name and logical unit number of the service interface associated with the service set applied inside the network.

outside-service-interface *interface-name.unit-number*—Name and logical unit number of the service interface associated with the service set applied outside the network.

outside-service-interface-type *interface-type*—Identifies the interface type of the service interface associated with the service set applied outside the network. For inline IP reassembly, set the interface type to local.

service-interface-pool *name*—Name of the pool of logical interfaces configured at the **[edit services service-interface-pools pool *pool-name*]** hierarchy level. You can configure a service interface pool only if the service set has a PGCP rule configured. The service set cannot contain any other type of rule.

> **NOTE:** **service-interface-pool** is not applicable for IP reassembly configuration on L2TP.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Service Sets to be Applied to Services Interfaces

no-remote-trace (Next Gen Services Global System Logging)

Syntax

```
no-remote-trace;
```

Hierarchy Level

[edit services rtlog **traceoptions**]

Release Information
Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description
Disable remote tracing

Required Privilege Level
system

RELATED DOCUMENTATION

Understanding System Logging for Next Gen Services | 35
Enabling Global System Logging for Next Gen Services | 37
Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
Configuring Local System Logging for Next Gen Services | 38

no-translation (Source NAT Next Gen Services)

Syntax

```
no-translation;
```

Hierarchy Level

```
[edit services nat source pool nat-pool-name port]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Disable port translation for NAT. By default, port translation is enabled for NAT.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

no-world-readable (Next Gen Services Global System Logging)

Syntax

Hierarchy Level

[edit services rtlog traceoptions file]

Release Information
Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description
Don't allow any user to read the log file

Options
no-world-readable—Don't allow any user to read the log file

Required Privilege Level
system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

off (Destination NAT Next Gen Services)

Syntax

```
off;
```

Hierarchy Level

```
[edit services nat destination rule-set rule-set-name rule rule-name then destination-nat]
```

Description

Tun off destination address translation for the rule. Use this statement when configuring port forwarding without destination address translation.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

open-timeout

Syntax

```
open-timeout seconds;
```

Hierarchy Level

```
[edit interfaces interface-name services-options]
```

```
[edit services service-set service-set-name service-set-options tcp-session]
```

Release Information

Statement introduced before Junos OS Release 7.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure a timeout period for Transmission Control Protocol (TCP) session establishment.

Options

seconds—Timeout period.

Default: 5 seconds

Range: 4 through 224 seconds

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Default Timeout Settings for Services Interfaces

ping-death (IDS Screen Next Gen Services)

Syntax

```
ping-death;
```

Hierarchy Level

```
[edit services screen ids-option screen-name icmp]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop oversized and irregular ICMP packets, which protects against the ping of death attack. In the ping of death attack, the attacker sends the target ping packets whose IP datagram length (ip_len) exceeds the maximum legal length (65,535 bytes) for IP packets, and the packets are fragmented. When the target attempts to reassemble the IP packets, a buffer overflow might occur, resulting in system crashing, freezing, and restarting.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

policy (Services CoS Next Gen Services)

Syntax

```
policy policy-name {
  match {
    application [ application-names ];
    destination-address address;
    destination-address-range low minimum-value high maximum-value;
    destination-port port-number;
    destination-prefix-list list-name;
    source-address address;
    source-address-range low minimum-value high maximum-value;
    source-prefix-list list-name;
  }
  then {
    application-profile profile-name;
    dscp (alias | bits);
    forwarding-class class-name;
    reflexive; | revert; | reverse {
      application-profile profile-name;
      dscp (alias | bits);
      forwarding-class class-name;
    }
  }
}
```

Hierarchy Level

```
[edit services cos rule rule-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure a policy in a services CoS rule. The policy specifies Differentiated Services (DiffServ) code point (DSCP) marking and forwarding-class assignment for packets that are processed by a service set. The policy identifies the matching conditions for packet source and destination addresses and for packet applications, and the actions to take on those packets. A CoS rule can include multiple policies.

The service set that the CoS rule is assigned to must include at least one stateful firewall rule or NAT rule, or CoS does not work. Only stateful firewall and NAT rules can be used with CoS rules in a service set.

Options

policy-name—Name of the policy.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Class of Service for Services PICs (Next Gen Services) | 131

policy (Stateful Firewall Rules Next Gen Services)

Syntax

```
policy policy-name {
    match {
        application [application-name];
        destination-address (address | any);
        destination-address-excluded address;
        source-address (address | any);
        source-address-excluded address;
    }
    then {
        count;
        deny;
        permit;
        reject;
    }
}
```

Hierarchy Level

```
[edit services policies stateful-firewall-rule rule-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure one or more policies in a stateful firewall rule. Each policy identifies the matching conditions for a flow, and whether or not to allow the flow. Once a policy in the rule matches a flow, that policy is applied and no other policies in the rule are processed.

Options

policy-name—Name of the policy.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Stateful Firewalls for Next Gen Services | 142

pool (Destination NAT Next Gen Services)

Syntax

```
pool nat-pool-name{
   address address-prefix;
}
```

Hierarchy Level

```
[edit services nat destination]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure a set of addresses used for Network Address Translation (NAT) of destination addresses.

Options

nat-pool-name—Name of the NAT pool.

If you are configuring twice NAT, do not use the same name that you use for the source pool.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

pool (Source NAT Next Gen Services)

Syntax

```
pool nat-pool-name {
    address address-prefix | address address-prefix to address address-prefix;
    address-pooling {
    }
    ei-mapping-timeout ei-mapping-timeout;
    host-address-base ip-address;
    mapping-timeout mapping-timeout;
    pool-utilization-alarm {
        clear-threshold value;
        raise-threshold value;
    }
    port {
        automatic (random-allocation | round-robin);
        block-allocation {
            active-block-timeout timeout-interval;
            block-size block-size;
            interim-logging-interval timeout-interval;
            last-block-recycle-timeout timeout-interval;
            maximum-blocks-per-host maximum-block-number
        }
        deterministic {
            block-size block-size;
            host {
                address address;
            }
            include-boundary-addresses;
        }
        deterministic-nat-configuration-log-interval seconds;
        no-translation;
        preserve-range;
        preserve-parity;
        range {
            port-low to port-high;
            (random-allocation | round-robin);
        }
    }
}
```

Hierarchy Level

[edit services nat source]

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure a set of addresses (or prefixes), address ranges, and ports used for Network Address Translation (NAT) of source addresses.

Options

nat-pool-name—Name of the NAT pool.

If you are configuring twice NAT, do not use the same name that you use for the destination pool.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

pool (NAT Rule Next Gen Services)

Syntax

```
pool nat-pool-name;
```

Hierarchy Level

```
[edit services nat destination rule-set rule-set rule rule-name then source-nat],
[edit services nat source rule-set rule-set rule rule-name then source-nat]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the name of the NAT pool that contains the addresses or subnets to which addresses are translated.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

pool-default-port-range (Source NAT Next Gen Services)

Syntax

```
pool-default-port-range port-low to port-high;
```

Hierarchy Level

```
[edit services nat source]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure a global default port range for NAT pools that use port translation. This port range is used when a NAT pool does not specify a port range and does not specify automatic port assignment.

Options

port-low—The lower end of the port range.

port-high—The upper end of the port range.

Range: 1024 through 65,535

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

pool-utilization-alarm (Source NAT Next Gen Services)

Syntax

```
pool-utilization-alarm {
    clear-threshold value;
    raise-threshold value;
}
```

Hierarchy Level

```
[edit services nat source pool nat-pool-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Define the NAT pool utilization level that triggers SNMP traps and the pool utilization level that clears SNMP traps. For pools that use port-block allocation, the utilization is based on the number of ports that are used; for pools that do not use port-block allocation, the utilization is based on the number of addresses that are used.

If you do not configure **pool-utilization-alarm**, traps are not created.

Options

clear-threshold *value*—NAT pool utilization percentage that clears the trap.

Range: 40 through 100

Default: 0 (traps are not created)

raise-threshold *value*—NAT pool utilization percentage that triggers the trap.

Range: 50 through 100

Default: There is not default value. Traps are not raised if you do not configure a value.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

port (Source NAT Next Gen Services)

Syntax

```
port {
    automatic (random-allocation | round-robin);
    block-allocation {
        active-block-timeout timeout-interval;
        block-size block-size;
        interim-logging-interval timeout-interval;
        last-block-recycle-timeout timeout-interval;
        maximum-blocks-per-host maximum-block-number
    }
    deterministic {
        block-size block-size;
        host {
            address address;
        }
        include-boundary-addresses;
    }
    deterministic-nat-configuration-log-interval seconds;
    no-translation;
    preserve-range;
    preserve-parity;
    range {
        port-low to port-high;
        (random-allocation | round-robin);
    }
}
```

Hierarchy Level

```
[edit services nat source pool nat-pool-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure port assignment for a source NAT pool.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

port-forwarding (Destination NAT Next Gen Services)

Syntax

```
port-forwarding map-name {
    destined-port port-id translated-port port-id;
}
```

Hierarchy Level

```
[edit services nat destination]
```

Description

Configure a port forwarding map, which translates the original destination port of a packet to a different port. This translation is a static, one-to-one mapping.

Port forwarding allows a packet to reach a host within a masqueraded, typically private, network, based on the port number on which the packet was received from the originating host. An example of this type of destination is the host of a public HTTP server within a private network.

Options

map-name—Name of the port forwarding map.

destined-port *port-id*—Original destination port number.

translated-port *port-id*—Port number to which the original port is mapped.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

port-forwarding-mappings (Destination NAT Rule Next Gen Services)

Syntax

```
port-forwarding-mappings map-name;
```

Hierarchy Level

```
[edit services nat destination rule-set rule-set-name rule rule-name then]
```

Description

Specify the name of the port-forwarding map that the NAT rule uses to translate the original destination port of a packet to a different port.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

port-round-robin (Source NAT Next Gen Services)

Syntax

```
port-round-robin {
    disable;
}
```

Hierarchy Level

```
[edit services nat source]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Disable round-robin port allocation for any NAT pools that do not specify an **automatic (random-allocation | round-robin)** setting at the **[edit services nat source pool *nat-pool-name* port]** hierarchy level. The **automatic (random-allocation | round-robin)** setting for a pool overrides the **port-round-robin disable** setting.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

ports-per-session

Syntax

```
ports-per-session ports;
```

Hierarchy Level

```
[edit services nat pool nat-pool-name pgcp]
```

Release Information

Statement introduced in Junos OS Release 8.4.

Description

Configure the number of ports required to support Real-Time Transport Protocol (RTP), Real-Time Control Protocol (RTCP), Real-Time Streaming Protocol (RTSP), and forward error correction (FEC) for voice and video flows on the Multiservices PIC.

Options

number-of-ports—Number of ports to enable: 2 or 4 for combined voice and video services.

Default: 2

Required Privilege Level

interface—To view this statement in the configuration.
interface–control—To add this statement to the configuration.

preserve-parity (Source NAT Next Gen Services)

Syntax

```
preserve-parity;
```

Hierarchy Level

```
[edit services nat source pool nat-pool-name port]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Assign a port with the same parity (even or odd) as the incoming source port. This feature is not available if you configure port-block allocation, and is not available for deterministic NAT.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

preserve-range (Source NAT Next Gen Services)

Syntax

```
preserve-range;
```

Hierarchy Level

```
[edit services nat source pool nat-pool-name port]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

For source NAT with port translation, except for deterministic NAT, assign a port within the same range as the incoming port—either 0 through 1023 or 1024 through 65,535. This feature is not available if you configure port block allocation.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

profile (Traffic Load Balancer)

Syntax

```
profile profile-name {
    custom {
        cmd priority {
            default-real-service-status (down | up);
            expect (ascii | binary) receive-string;
            port port;
            real-service-action (down | up);
            send (ascii | binary) send-string;
        }
        protocol (tcp | udp);
    }
    failure-retries number-of-retries;
    http {
        host hostname;
        method (get | option);
        port http-port-number;
        url url;
    }
    icmp;
    probe-interval interval;
    recovery-retries number-of-recovery-retries;
    ssl-hello {
        port port;
        ssl-version;
    }
    tcp {
        port tcp-port-number;
    }
}
```

Hierarchy Level

```
[edit services network-monitoring]
```

Release Information

Statement introduced in Junos OS Release 16.1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure a monitoring profile that can be used for health-checking a group of TLB servers.

Options

custom—Use custom probes for server health checking.

cmd *priority*—Use the specified command priority to send for a custom probe.

Values: 1 or 2

default-real-service-status (down | up)—Assign a server status for when the probe times out. The **up** value is used when the server or the intermediate network nodes are only expected to send a negative response to a probe.

Default: down

expect (ascii | binary) *receive-string* —Use the specified ascii or binary string as an expected probe response.

Range: 1 through 512 characters

port *port*—Use the specified port for custom probes.

protocol (tcp | udp)—Use the selected protocol for custom probes.

real-service-action (down | up)—Assign a server status for when the expected response to the probe is received.

Default: down

send (ascii | binary) *send-string* —Send the specified ascii or binary string as a probe.

Range: 1 through 512 characters

failure-retries *number-of-retries*—Use the specified number of probes that are sent after which the real server is tagged as down.

Default: 5

http—Use HTTP probes for server health checking.

host *hostname*—Use the specified hostname for HTTP probes for server health checks.

method (get | option)—Use the get or option HTTP method for server health checks.

port *http-port-number*—Use the specified port number for HTTP probes.

url *url*—Use the specified URL for HTTP probes. Maximum length is 128 bytes.

icmp—Use ICMP probes for server health checking.

probe-interval *interval*—Use the specified interval of time, in seconds, at which health check probes are sent.

Default: 5

profile-name—Identifier for the network monitoring profile.

recovery-retries ***number-of-recovery-retries***—Use the specified number of successful probe attempts after which the server is declared up.

Default: 5

ssl-hello—Use a **Client Hello** for server health checks

port ***port***—Use the specified port number for **Client Hello** server health checks.

ssl-version—SSL version.

Default: 3

tcp—Use TCP probes for server health checks.

port ***tcp-port-number***—Use the specified port number for TCP probes.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Traffic Load Balancer Overview | **165**

Configuring TLB | **172**

profile (Web Filter)

Syntax

```
profile profile-name {
dns-filter {
    database-file filename;
    dns-resp-ttl seconds;
    dns-server [ ip-address ];
    hash-key key-string;
    hash-method hash-method-name;
    statistics-log-timer minutes;
    wildcarding-level level;
}
dns-filter-template template-name {
    client-interfaces [ client-interface-name ];
    client-routing-instance client-routing-instance-name;
    dns-filter {
        database-file filename;
        dns-resp-ttl seconds;
        dns-server [ ip-address ];
        hash-key key-string;
        hash-method hash-method-name;
        statistics-log-timer minutes;
        wildcarding-level level;
    }
    server-interfaces [ server-interface-name ];
    server-routing-instance server-routing-instance-name;
    term term-name {
        from {
            src-ip-prefix [ source-prefix ];
        }
        then {
            accept;
            dns-sinkhole;
        }
    }
}
global-dns-stats-log-timer minutes;
url-filter-database filename;
(url-filter-template | template) template-name {
    client-interfaces [ client-interface-name1 client-interface-name2 ];
    disable-url-filtering;
    dns-resolution-interval minutes;
    dns-resolution-rate seconds;
```

```
    dns-retries number;
    dns-routing-instance dns-routing-instance-name;
    dns-server [ ip-address1 ip-address2 ip-address3 ];
    dns-source-interface loopback-interface-name;
    dns-routing-instance dns-routing-instance-name;
    routing-instance routing-instance-name;
    server-interfaces [ server-interface-name1 server-interface-name2 ];
    term term-name {
        from {
            src-ip-prefix [prefix1 prefix2];
            dest-port [port1 port2];
        }
        then {
            accept;
            custom-page custom-page;
            http-status-code http-status-code;
            redirect-url redirect-url;
            tcp-reset;
        }
    }
    url-filter-database filename
}
```

Hierarchy Level (starting in Junos OS Release 18.3R1

```
[edit services web-filter]
```

Hierarchy Level (before Junos OS Release 18.3R1)

```
[edit services url-filter]
```

Release Information

Statement introduced in Junos OS Release 17.2.

dns-filter, **dns-filter-templates**, **global-dns-stats-log-timer**, and **url-filter-template** options introduced in Junos OS Release 18.3R1.

Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Define URL filter profile or DNS filter profile.

A URL filter profile is for filtering access to blacklisted URLs. A URL filter profile includes a general database setting and templates. The template settings apply to specific interfaces or to access from specific source IP address prefixes, and override the database setting at the profile level.

A DNS filter profile is used to filter DNS requests for blacklisted website domains. A DNS filter profile includes general DNS filtering settings and up to 32 templates. The template settings apply to DNS requests on specific interfaces or to DNS requests from specific source IP address prefixes, and override the corresponding settings at the profile level. You can configure up to eight DNS filter profiles.

> **NOTE:** For URL filtering, use the **url-filter-template** option starting in Junos OS Release 18.3R1 and use the **template** option in Junos OS Releases before 18.3R1.

Options

profile-name—Name of the filter profile.

url-filter-database *filename*—Specify the filename of the URL filter database. This option is mandatory.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

DNS Request Filtering for Blacklisted Website Domains | 189

Configuring URL Filtering

protocol (Applications)

Syntax

```
protocol type;
```

Hierarchy Level

```
[edit applications application application-name]
```

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Networking protocol type or number.

Options

type—Networking protocol type. The following text values are supported:

ah

egp

esp

gre

icmp

icmp6

igmp

ipip

ospf

pim

rsvp

tcp

udp

NOTE: IP version 6 (IPv6) is not supported as a network protocol in application definitions.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

ALG Descriptions

Configuring Application Sets | **269**

Configuring Application Properties

Examples: Configuring Application Protocols | **284**

Verifying the Output of ALG Sessions | **285**

range (Source NAT Next Gen Services)

Syntax

```
range {
    port-low to port-high;
    (random-allocation | round-robin);
}
```

Hierarchy Level

```
[edit services nat source pool nat-pool-name port]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

To configure a range of ports to assign to a pool, specify the low and high values for the port. If you do not configure automatic port assignment, you must configure a range of ports. This statement applies to source NAT with port translation, but not to deterministic NAT.

If you specify a range, ports are selected a round-robin fashion. If you specify a range of ports to assign, the automatic statement is ignored.

Options

port-low—Lowest port number.

port-high—Highest port number.

random-allocation—Randomly assigns a port from the range 1024 through 65535 for each port translation.

round-robin—First assigns port 1024, and uses the next higher port for each successive port assignment. Round robin allocation is the default.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

rate

Syntax

```
rate new-sessions-per-second;
```

Hierarchy Level

```
[edit interfaces interface-name services-options session-limit]
```

Release Information

Statement introduced in Junos OS Release 9.6.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Specify the maximum number of new sessions allowed per second on services cards.

Options

rate *new-sessions-per-second*—Specify the maximum number of new sessions allowed per second.

Range: 0, which indicates no limit, or greater.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

real-service (Traffic Load Balancer)

Syntax

```
real-service real-service-name {
    address server-ip-address;
    admin-down;
}
```

Hierarchy Level

```
[edit services traffic-load-balance instance instance-name]
```

Release Information

Statement introduced in Junos OS Release 16.1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure a traffic load balancer server.

Options

admin-down—Set a server's status to Down.

real-service-name—Identifier for a server to which sessions can be distributed using the server distribution table in conjunction with the session distribution API.

server-ip-address—IP address for the server.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Traffic Load Balancer Overview | 165

Configuring TLB | 172

record-route-option (IDS Screen Next Gen Services)

Syntax

```
record-route-option;
```

Hierarchy Level

```
[edit services screen ids-option screen-name ip]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop IPv4 packets that have the IP option of 7 (Record Route).

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

redistribute-all-traffic (Aggregated Multiservices)

Syntax

```
redistribute-all-traffic {
    enable-rejoin;
}
```

Hierarchy Level

[edit interfaces *interface-name* load-balancing-options member-failure-options]

Release Information

Statement introduced in Junos OS Release 11.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Enable the option to redistribute traffic of a failed active member to the other active members.

For many-to-one (N:1) high availability support for Network Address Translation (NAT), the traffic for the failed member is automatically redistributed to the other active members.

The remaining statement is explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Aggregated Multiservices Interfaces

Example: Configuring an Aggregated Multiservices Interface (AMS)

member-failure-options (Aggregated Multiservices) | **415**

redundancy-event (Services Redundancy Daemon)

Syntax

```
redundancy-event event-name {
    monitor {
        <link-down interface-name;>
        <peer {
            (mastership-acquire | mastership-release);
        }>
        <process routing abort;>
        <process routing restart;>
    }
]
```

Hierarchy Level

```
[edit services event-options]
```

Release Information

Statement introduced in Junos OS Release 17.1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure events monitored to trigger change of mastership and routing using inter-chassis redundancy.

Options

event-name—Alphanumeric name for a monitored event.

link-down *interface-name*—Name of an interface, link, or link aggregation, to monitor.

peer mastership-acquire—(Optional) Monitor mastership acquisition peer events.

peer mastership-release—(Optional) Monitor mastership release peer events.

process routing abort—(Optional, and only applies to Next Gen Services) Monitor process routing daemon (rpd) abort requests.

process routing restart—(Optional) Monitor process routing daemon (rpd) restart requests.

Required Privilege Level

maintenance—To view this statement in the configuration.
maintenance-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Inter-Chassis Services Redundancy for Next Gen Services | 238

Configuring the Service Redundancy Daemon

redundancy-options (Aggregated Multiservices)

Syntax

```
redundancy-options {
    primary mams-a/b/0;
    secondary mams-a/b/0;
}
```

Hierarchy Level

```
[edit interfaces interface-name]
```

Release Information

Statement introduced in Junos OS Release 17.2 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure warm standby for an aggregated multiservices (AMS) interface. Specify a primary and a secondary (backup) member services interface for the AMS interface. The primary interface is the service interface that you want to back up, and it is the active interface unless it fails. The secondary interface is the backup interface, and does not handle any traffic unless the primary interface fails. You can use the same services interface as the backup in multiple warm standby AMS interfaces.

You cannot use both the **redundancy-options** and the **load-balancing-options** statements in the same AMS interface.

Options

primary mams-*a*/*b*/0—Name of the primary services interface, where *a* is the FPC slot number and *b* is the PIC slot number.

secondary mams-*a*/*b*/0—Name of the secondary (backup) services interface, where *a* is the FPC slot number and *b* is the PIC slot number.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Warm Standby for Services Interfaces | 223

redundancy-options (Stateful Synchronization)

Syntax

```
redundancy-options {
    redundancy-local {
        data-address address;
    }
    redundancy-peer {
        ipaddress address;
    }
    replication-threshold seconds;
    routing-instance instance-name;
    apply-groups (apply-groups-except |redundancy-local | redundancy-peer)
    replication-options (apply-groups | apply-groups-except | mtu | replication-threshold | replication-threshold
        routing-instance )
}
```

Hierarchy Level

```
[edit interfaces interface-name]
```

Release Information

Statement introduced in Junos OS Release 13.3.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card (interfaces of type **vms-x/y/z**).

Description

Specify the primary and secondary (backup) adaptive services PIC interfaces.

Options

data-address *address*—Internal IP address of the local redundant PIC.

ipaddress *address*—Internal IP address of the remote redundant PIC.

instance-name—Name of the routing instance to apply to the HA synchronization traffic between the high availability pair.

seconds—Length of time that the flow remains active for replication.

Default: 180 seconds

apply-groups *apply-groups-except*—Specify the groups from which NOT to inherit the configuration.

apply-groups *redundancy-local*—Specify information for the local peer.

apply-groups *redundancy-peer*—Specify information for peer.

replication-options *apply-groups*—Specify groups from which to inherit the configuration.

replication-options *apply-groups-except*—Specify the groups from which NOT to inherit the configuration.

replication-options *mtu*—Specify the maximal packet size for the replicated data.

Range: 1500 through 8000 bytes

replication-options *replication-threshold*—Specify the duration for which flow should remain active for replication.

Range: 60 through 3600 seconds

replication-options *replication-threshold routing-instance*—Specify routing-instance for the HA traffic.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Inter-Chassis Stateful Synchronization for Long Lived NAT and Stateful Firewall Flows (MS-MPC, MS-MIC) (Release 16.1 and later)

Inter-Chassis High Availability for MS-MIC and MS-MPC (Release 15.1 and earlier)

redundancy-policy (Interchassis Services Redundancy)

Syntax

```
redundancy-policy policy-name {
   redundancy-events [event-list] {
      then {
         acquire-mastership;
         <add-static-route destination {
            (next-hop next-hop | receive);
            routing-instance routing-instance
         }>
         <broadcast-warning> ;
         <delete-static-route destination  {
            routing-instance routing-instance;
         }>
         <(release-mastership | release-mastership-force);>
      }
   }
}
```

Hierarchy Level

```
[edit policy-options]
```

Release Information

Statement introduced in Junos OS Release 17.1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Specify the actions to be taken for redundancy events. These include acquiring or releasing mastership and adding or deleting static routes.

Options

acquire-mastership—Switch from standby to master role.

add-static-route *destination*—(Optional) Use the specified destination IP address and prefix for an added signal route.

broadcast-warning—(Optional) Switch status from Standby to Standby (Warned).

delete-static-route *destination*—(Optional) Use the specified destination IP address and prefix for a deleted signal route.

event-list—List of names of one or more monitored events that trigger the actions specified in this policy.

next-hop—Interface name for the next hop for an added signal route.

policy-name—Name of the redundancy policy.

receive—Use the added signal route as a receive route.

release-mastership—(Optional) Switch from master to standby role.

release-mastership-force—(Optional) Force switch from master to standby role.

routing-instance *routing-instance*—(Optional) Name of the vrf used for the added signal route.

Required Privilege Level
maintenance—To view this statement in the configuration.
maintenance-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Inter-Chassis Services Redundancy for Next Gen Services | **238**

Configuring the Service Redundancy Daemon

redundancy-set

Syntax

```
redundancy-set redundancy-set {
    healthcheck-timer-interval healthcheck-timer-interval;
    hold-time hold-time;
    keepalive keepalive;
    redundancy-group redundancy-group;
    redundancy-policy [redundancy-policy-list]
}
```

Hierarchy Level

```
[edit services]
```

Release Information

Statement introduced in Junos OS Release 17.1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Specify the characteristics of a redundancy set.

Options

healthcheck-timer-interval *healthcheck-timer-interval*—Frequency of health check probes in seconds.

Range: 0 through 3600 seconds

hold-time—Maximum wait time for a health check response. When this time expires, the peer is considered down.

Range: 0 through 3600 seconds

keepalive—Frequency of srd hello messages in seconds.

Range: 1 through 60 seconds

redundancy-group—Redundancy group identifier. This must match a redundancy group ID in the ICCP configuration.

Range: 1 through 100

redundancy-policy-list—Names of one or more redundancy policies applied to the redundancy set.

redundancy-set—Redundancy set identifier.

Range: 1 through 100

Required Privilege Level

maintenance—To view this statement in the configuration.

maintenance-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Inter-Chassis Services Redundancy for Next Gen Services | 238

Configuring the Service Redundancy Daemon

redundancy-set-id (Service Set)

Syntax

```
redundancy-set-id redundancy-set;
```

Hierarchy Level

```
[edit services service-set service-set-name]
```

Release Information

Statement introduced in Junos OS Release 17.1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Specify the identifier of the redundancy set to use in the stateful synchronization of services for a service set.

Options

redundancy-set—Identifier for the redundancy set. The identifier can be a number from 1-100.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Inter-Chassis Services Redundancy for Next Gen Services | 238

Configuring the Service Redundancy Daemon

rejoin-timeout (Aggregated Multiservices)

Syntax

```
rejoin-timeout rejoin-timeout;
```

Hierarchy Level

```
[edit interfaces interface-name load-balancing-options member-failure-options drop-member-traffic]
```

Release Information

Statement introduced in Junos OS Release 11.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure the time by when failed members (members in the **DISCARD** state) should rejoin the aggregated Multiservices (AMS) interface automatically. All members that do not rejoin by the configured time are moved to the **INACTIVE** state and the traffic meant for each of the members is dropped.

If multiple members fail around the same time, then they are held in the **DISCARD** state using a single timer. When the timer expires, all the failed members move to **INACTIVE** state at the same time.

Default

If you do not configure a value, the default value of 120 seconds is used.

Options

rejoin-timeout—Time, in seconds, by which a failed member must rejoin.

Default: 120 seconds

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Aggregated Multiservices Interfaces

Example: Configuring an Aggregated Multiservices Interface (AMS)

drop-member-traffic (Aggregated Multiservices) | 350

rpc-program-number

Syntax

```
rpc-program-number number;
```

Hierarchy Level

```
[edit applications application application-name]
```

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Remote procedure call (RPC) or Distributed Computing Environment (DCE) value.

Options

number—RPC or DCE program value.

Range: 100,000 through 400,000

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

ALG Descriptions

Configuring an RPC Program Number

Examples: Configuring Application Protocols | **284**

Verifying the Output of ALG Sessions | **285**

rtlog (Next Gen Services Global System Logging)

Syntax

```
rtlog {
    name {
        apply-groups group-names;
        apply-groups-except group-names;
        flag name;
        file filename,
        no-remote-trace;
    }
}
```

Hierarchy Level

```
[edit services]
```

Release Information
Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description
Enable global system logging for Next Gen Services.

traceoptions—Specify the options to include in the trace.

All other options are explained separtely.

Required Privilege Level
system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38
- traceoptions | 527

rule (Destination NAT Next Gen Services)

Syntax

```
rule rule-name {
    match {
        application [application-name]
        destination-address (NAT Next Gen Services) (address | any-unicast);
        destination-address-name address-name;
        source-address (address | any-unicast);
        source-address-name address-name;
    }
}
    then {
        destination-nat {
            destination-prefix destination-prefix;
            off;
            pool nat-pool-name;
        }
        port-forwarding-mappings map-name;
        }
    syslog;
```

Hierarchy Level

```
[edit services nat destination rule-set rule-set]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure a destination NAT rule, which translates the destination address of IP packets.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

rule (Services CoS Next Gen Services)

Syntax

```
rule rule-name {
   match-direction (input | input-output | output);
   policy policy-name {
      match {
         application [ application-names ];
         destination-address address;
         destination-address-range low minimum-value high maximum-value;
         destination-port port-number;
         destination-prefix-list list-name;
         source-address address;
         source-address-range low minimum-value high maximum-value;
         source-prefix-list list-name;
      }
      then {
         application-profile profile-name;
         dscp (alias | bits);
         forwarding-class class-name;
         reflexive; | revert; | reverse {
            application-profile profile-name;
            dscp (alias | bits);
            forwarding-class class-name;
         }
      }
   }
}
```

Hierarchy Level

```
[edit services cos]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure a services CoS rule, which specifies Differentiated Services (DiffServ) code point (DSCP) marking and forwarding-class assignment for packets that are processed by a service set. The CoS rule identifies the matching conditions for packet source and destination addresses and for packet applications, and the actions to take on those packets.

The service set that the CoS rule is assigned to must include at least one stateful firewall rule or NAT rule, or CoS does not work. Only stateful firewall and NAT rules can be used with CoS rules in a service set.

Options

match-direction (input | input-output | output)—The direction in which the rule is matched.

- **input**—Apply the rule match on input. If the CoS rule is assigned to an interface service set, input means traffic entering the interface. If the CoS rule is assigned to a next-hop service set, input means traffic routed with the inside interface.
- **input-output**—Apply the rule match in both directions.
- **output**—Apply the rule match on output. If the CoS rule is assigned to an interface service set, input means traffic leaving the interface. If the CoS rule is assigned to a next-hop service set, output means traffic routed with the outside interface.

rule-name—Name of the CoS rule.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Class of Service for Services PICs (Next Gen Services) | 131

rule (Source NAT Next Gen Services)

Syntax

```
rule rule-name {
    match {
        application [application-name]
        destination-address (NAT Next Gen Services) address;
        destination-address-name address-name;
        source-address (address | any-unicast);
        source-address-name address-name;
    }
    then {
        source-nat {
            clat-prefix clat-prefix;
            filtering-type {
                endpoint-independent {
                    prefix-list [allowed-host] except [denied-host];
                }
            }
            mapping-type {
                endpoint-independent;
            }
            pool nat-pool-name;
            secure-nat-mapping {
                eif-flow-limit number-of-flows;
                mapping-refresh (inbound | inbound-outbound | outbound);
            }
        }
        syslog;
    }
}
```

Hierarchy Level

```
[edit services nat source rule-set rule-set]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure a source NAT rule, which translates the source address of IP packets.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

rule-set (Services CoS Next Gen Services)

Syntax

```
rule-set rule-set-name {
    [ rule rule-name ];
}
```

Hierarchy Level

```
[edit services cos]
```

Release Information
Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description
Configure a set of services CoS rules. You can then assign the rule set to a service set, which processes the rules in the order they appear. Once a rule matches the packet, the router performs the corresponding action, and no further rules are applied.

Options
rule *rule-name*—The name of each rule in the rule set.

rule-set-name—The name for the set of rules.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Class of Service for Services PICs (Next Gen Services) | 131

rule-set (Softwires Next Gen Services)

Syntax

```
rule-set rule-set-name {
    match-direction (input | output);
    rule rule-name {
        then {
            v6rd v6rd-softwire-concentrator;
        }
    }
}
```

Hierarchy Level

```
[edit services softwires]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure a rule to apply a 6rd softwire concentrator to a flow.

Options

input—Apply the rule on the input side of the interface.

output—Apply the rule on the output side of the interface.

rule *rule-name*—Name of the rule.

rule-set *rule-set-name*—Name of the rule set that contains the rule.

v6rd *v6rd-softwire-concentrator*—Name of the softwire concentrator that the rule assigns to a flow.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

6rd Softwires in Next Gen Services | 11

secure-nat-mapping (Source NAT Next Gen Services)

Syntax

```
secure-nat-mapping {
    eif-flow-limit number-of-flows;
    mapping-refresh (inbound | inbound-outbound | outbound);
}
```

Hierarchy Level

```
[edit services nat source rule-set rule-set rule rule-name then source-nat]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

For endpoint-independent mapping, configure the maximum number of simultaneous inbound flows and the direction in which mappings are refreshed.

Options

eif-flow-limit *number-of-flows*—Maximum number of simultaneous inbound flows.

Range: 0 through 655334

mapping-refresh (inbound | inbound-outbound | outbound)—Direction in which mappings are refreshed.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

security-intelligence

Syntax

```
    authentication {
        auth-token auth-token;
    tls-profile tls-profile;
    traceoptions {
        no-remote-trace;
        file [ filename <files number> <size  bytes> <match expression> <world-readable | no-world-readable>];
        flag [all | feed | ipc];
        level [all| error | info | notice | verbose | warning];
    no-remote-trace;
url url;
```

Hierarchy Level

```
[edit services]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers with Juniper Sky Advanced Threat Prevention (ATP).

Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480, and MX960 with the MX-SPC3 services card.

Description

You can configure security intelligence profiles and policies to work with security intelligence feeds, such as infected hosts and C&C. You then configure a firewall policy to include the security intelligence policy, for example, block outgoing requests to a C&C host.

Options

authentication—Configure authentication, such as an auth token or TLS profile, to commute with the feed server. This operation is performed by the ops script used to enroll your devices and is typically not required afterwards. If you have problems establishing a connection with the Juniper Sky ATP cloud server, we recommend that you rerun the ops script instead of manually entering all the CLI commands.

traceoptions—Set security intelligence trace options.

- file—Name of the file to receive the output of the tracing operation.
  - **files *number*** —Maximum number of trace files

    Range: 2 through 1000
  - match— Regular expression for lines to be logged

    - no-world-readable—Prevent any user from reading the log file
    - size—Maximum size of each trace file

      Range: 10240 through 1073741824
    - world-readable—Allow any user to read the log file
  - flag—Tracing operation to perform
    - all—All interface tracing operation
    - feed—Trace feed operation
    - ipc—Trace interface interprocess communication (IPC) module messages
  - level—Level of debugging output
  - no-remote-trace—Disable the remote trace

url *url-address*—Configure the URL of the feed server. This operation is performed by the ops script used to enroll your devices and is typically not required afterwards. If you have problems establishing a connection with the Juniper Sky ATP cloud server, we recommend that you rerun the ops script instead of manually entering all the CLI commands.

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

security-intelligence-policy

Syntax

```
security-intelligence-policy {
    threat-level threat-level;
    threat-action {
        drop
        drop-and-log
        drop-and-sample
        drop-log-and-sample
        log
        log-and-sample
        sample
    }
}
```

Hierarchy Level

```
[edit services web-filter profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers with Juniper Sky Advanced Threat Prevention (ATP) .

Description

Define the threat level and action for the Web filtering profile. The packets are redirected at PFE, based on the threat action.

Options

threat-level—Define web filtering threat level. The value ranges from 1 through 10

threat-action—Define the threat-action based on the configured threat-level. Only one action can be configured for each threat level defined.

- **drop**
- **drop-and-log**
- **drop-and-sample**
- **drop-log-and-sample**
- **log-and-sample**
- **sample**

Required Privilege Level
system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

web-filter | 539

security-option (IDS Screen Next Gen Services)

Syntax

```
security-option;
```

Hierarchy Level

```
[edit services screen ids-option screen-name ip]
```

Release Information
Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description
Identify and drop IPv4 packets that have the IP option of 2 (Security).

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

service-domain

Syntax

```
service-domain (inside | outside);
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* family inet],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family inet]

Release Information

Statement introduced before Junos OS Release 7.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Specify the service interface domain. If you specify this interface using the **next-hop-service** statement at the **[edit services service-set *service-set-name*]** hierarchy level, the interface domain must match that specified with the **inside-service-interface** and **outside-service-interface** statements.

Options

inside—Interface used within the network.

outside—Interface used outside the network.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring the Address and Domain for Services Interfaces

service-interface (Services Interfaces)

Syntax

```
service-interface interface-name;
```

Hierarchy Level

```
[edit services service-set service-set-name interface-service]
```

Release Information

Statement introduced before Junos OS Release 7.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Specify the name for the services interface associated with an interface-wide service set.

Options

interface-name—Identifier of the service interface.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Service Sets to be Applied to Services Interfaces

Applying Services to Subscriber-Aware Traffic with a Service Set

services-options (Next Gen Services Interfaces)

Syntax

```
services-options {
enable-subscriber-analysis
    jflow-log {
        message-rate-limit messages-per-second;
    }
    session-limit {
        maximum number;
        rate new-sessions-per-second;
        cpu-load-threshold percentage;
    }
```

Hierarchy Level

```
[edit interfaces interfaces-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series.

Description

Define the service options to be applied on the virtual multi-service (VMS) interface.

This statement is supported only on the MX-SPC3 Services Card.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

service-set (Interfaces)

Syntax

```
service-set service-set-name;
```

Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number family inet service (input | output)],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family inet service (input
    | output)]
```

Release Information

Statement introduced before Junos OS Release 7.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Define one or more service sets to be applied to an interface. If you define multiple service sets, the router software evaluates the filters in the order in which they appear in the configuration.

Options

service-set-name—Name of the service set.

Required Privilege Level

System—To view this statement in the configuration.
System-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Guidelines for Configuring Service Filters

service-set-options (Next Gen Services Services)

Syntax

```
service-set-options {
    bypass-traffic-on-exceeding-flow-limits;
    disable-session-open-syslog ;
    enable-asymmetric-traffic-processing;
    inactivity-non-tcp-timeout ;
    max-sessions-per-subscriber
    session-limit;
    session-timeout;
    tcp-session {
        inactivity-asymm-tcp-timeout;
        inactivity-tcp-timeout ;
        open-timeout ;
        tcp-fast-open ;
        tcp-mss ;
        tcp-non-syn ;
        tcp-tickles ;
    }
}
```

Hierarchy Level

```
[edit services service-set service-set-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

Specify the service set options to apply to a service set.

disable-session-open-syslog—Disable session open information from being collected in system logs.

inactivity-non-tcp-timeout —Specify the inactivity timeout period for non-TCP established sessions.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Service Sets to be Applied to Services Interfaces

Configuring APPID Support for Unidirectional Traffic

session-limit

Syntax

```
session-limit {
    maximum number;
    rate new-sessions-per-second;
    cpu-load-threshold percentage;
}
```

Hierarchy Level

```
[edit interfaces interface-name services-options]
```

Release Information

Statement introduced in Junos OS Release 9.6.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Restrict the maximum number of sessions and the session rate on services cards.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

session-limit (Service Set Next Gen Services)

Syntax

```
session-limit {
    maximum number;
}
```

Hierarchy Level

```
[edit services service-set service-set-name service-set-options]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the maximum number of sessions allowed simultaneously on the service set. If you specify the maximum number of sessions to be zero, it indicates that the configuration is not effective. You must specify a value higher than zero for the maximum number of sessions.

Options

number—Maximum number of sessions.

Range: 1 through 4,294,967,295

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

session-timeout (Service Set Next Gen Services)

Syntax

```
session-timeout seconds;
```

Hierarchy Level

```
[edit services service-set service-set-name service-set-options]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series.

Description

Define session lifetime for the service set in seconds. The session is closed after this amount of time, even if traffic is running on the session.

Options

seconds—Duration of session.

Range: 4 through 86,400

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

severity (Next Gen Services Service-Set Remote System Logging)

Syntax

```
severity severity;
```

Hierarchy Level

```
edit services service-set name syslog stream stream-name
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

Specify the level of severity for the stream.

You can set the following severity levels:

- ANY — Includes all severity levels
- ALERT — Action must be taken immediately
- CRITICAL — Critical conditions
- EMERGENCY — System is unusable
- ERROR — Error conditions
- WARNING — Warning conditions
- NOTICE — Normal but significant condition
- INFO — Informational
- DEBUG — Debug-level messages

Required Privilege Level

system

RELATED DOCUMENTATION

Understanding System Logging for Next Gen Services | 35

Enabling Global System Logging for Next Gen Services | 37

Configuring System Logging to One or More Remote Servers for Next Gen Services | 40

Configuring Local System Logging for Next Gen Services | 38

sip (Services CoS Next Gen Services)

Syntax

```
sip {
    data {
        dscp (alias | bits);
        forwarding-class class-name;
    }
}
```

Hierarchy Level

[edit services cos application-profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure CoS actions for SIP traffic in an application profile. The application profile can then be used in CoS rule actions.

Options

dscp (*alias* | *bits*)—Either a code point alias or a DSCP bit value to apply to the SIP packets.

forwarding-class *class-name*—Forwarding class name to apply to the SIP packets. The choices are:

- assured-forwarding
- best-effort
- expedited-forwarding
- network-control

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Class of Service for Services PICs (Next Gen Services) | 131

size (Next Gen Services Global System Logging)

Syntax

```
size size;
```

Hierarchy Level

```
[edit services rtlog traceoptions file]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

Maximum trace file size

Options

size—Maximum trace file size

Default: 128k

Range: through

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

snmp-command

Syntax

```
snmp-command command;
```

Hierarchy Level

```
[edit applications application application-name]
```

Release Information

Statement introduced before Junos OS Release 7.4.

Description

SNMP command format.

Options

command—Supported commands are SNMP **get**, **get-next**, **set**, and **trap**.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

ALG Descriptions

Configuring an SNMP Command for Packet Matching

Examples: Configuring Application Protocols | 284

Verifying the Output of ALG Sessions | 285

snmp-trap-thresholds (Next Gen Services)

Syntax

```
snmp-trap-thresholds {
    flow high percent low percent;
    nat-address-port high percent low percent;
    session high percent low percent;
}
```

Hierarchy Level

```
[edit services service-set]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Define snmp traps for Next Gen Services service sets.

Options

session—Specify the low and high session threshold limits for generating SNMP traps.

The default for high = 90%.

The default for low = 70%.

Required Privilege Level

system

softwire-name (Next Gen Services)

Syntax

```
softwire-name v6rd-softwire-concentrator {
    ipv4-prefix ipv4-prefix;
    mtu-v4 number-of-bytes;
    softwire-concentrator address;
    softwire-type v6rd;
    v6rd-prefix v6rd-prefix
}
```

Hierarchy Level

```
[edit services softwires]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure a 6rd softwire concentrator. A 6rd softwire allows an IPv6 end user to send traffic over an IPv4 network to reach an IPv6 network. The softwire concentrator decapsulates IPv6 packets that were encapsulated in IPv4 packets by a software initiator at the customer edge WAN, and forwards the packets for IPv6 routing.

Options

ipv4-prefix *ipv4-prefix*—IPv4 prefix of the customer edge (CE) network.

mtu-v4 *number-of-bytes*—The size, in bytes, of the maximum transmission unit for IPv6 packets encapsulated in IPv4. Compute this as the maximum expected IPv4 packet size plus 20. Packets that are larger than the configured value are dropped.

Range: 576 through 9192

softwire-concentrator *address*—IPv4 address of a softwire concentrator. This is an IPv4 address independent of any interface and on a different prefix.

softwire-name *v6rd-softwire-concentrator*—Name of the softwire concentrator.

softwire-type v6rd—Sets softwire concentrator type to 6rd.

v6rd-prefix *v6rd-prefix*—IPv6 prefix for the 6rd domain.

Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

6rd Softwires in Next Gen Services | 11

softwires-rule-set (Service Set Next Gen Services)

Syntax

```
softwires-rule-set softwire-rule-set-name;
```

Hierarchy Level

```
[edit services service-set service-set-name]
```

Release Information
Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description
Specify the 6rd rule-set that contains the 6rd rule to be used with the service set.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

6rd Softwires in Next Gen Services | 11

source-address (Next Gen Services Service-Set Remote System Logging)

Syntax

```
source-address address;
```

Hierarchy Level

```
edit services service-set name syslog
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

Specify the IP address of the source for Next Gen Services system log messages.

BEST PRACTICE: The syslog source address can be any arbitrary IP address. It does not have to be an IP address that is assigned to the device. Rather, this IP address is used on the syslog collector to identify the syslog source. The best practice is to configure the source address as the IP address of the interface that the traffic is sent out on.

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38
- stream | 509

source-address (NAT Next Gen Services)

Syntax

```
source-address (address | any-unicast);
```

Hierarchy Level

```
[edit services nat destination rule-set rule-set rule rule-name match],
[edit services nat source rule-set rule-set rule rule-name match]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the source address that the packet must match for the NAT rule to take effect.

Options

address—A specific address that must be matched.

any-unicast—Any unicast source address results in a match.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

source-address-name (NAT Next Gen Services)

Syntax

```
source-address-name address-name;
```

Hierarchy Level

```
[edit services nat destination rule-set rule-set rule rule-name match],
[edit services nat source rule-set rule-set rule rule-name match]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the name of the range of source addresses that the packet must match for the NAT rule to take effect. The range of addresses is configured with the **address** statement at the **[edit services address-book global]** hierarchy level.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

source-port

Syntax

```
source-port port-number;
```

Hierarchy Level

```
[edit applications application application-name]
```

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Source port identifier.

Options

port-value—Identifier for the port. For a complete list, see *Configuring Source and Destination Ports*.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

- *ALG Descriptions*
- *Configuring Application Properties*
- *Configuring Source and Destination Ports*
- Verifying the Output of ALG Sessions | **285**

source-route-option (IDS Screen Next Gen Services)

Syntax

```
source-route-option;
```

Hierarchy Level

```
[edit services screen ids-option screen-name ip]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop IPv4 packets that have either the IP option of 3 (Loose Source Routing) or the IP option of 9 (Strict Source Routing).

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

stateful-firewall-rules (Service Set Next Gen Services)

Syntax

```
stateful-firewall-rules [rule-name];
```

Hierarchy Level

```
[edit services service-set service-set-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the stateful firewall rules to be used with the service set. A stateful firewall rule is configured at the **[edit services policies]** hierarchy level.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Stateful Firewalls for Next Gen Services | 142

stateful-firewall-rule-set (Next Gen Services)

Syntax

```
stateful-firewall-rule-set {
    stateful-firewall-rule [rule-name];
]
```

Hierarchy Level

```
[edit services policies]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify a set of stateful firewall rules, which are processed in the order in which they appear in the rule set configuration. Once a stateful firewall rule in the rule set matches a flow, that rule is applied and no other rules in the rule set are processed˙.

Options

stateful-firewall-rule [*rule-name*]—Names of the stateful firewall rules that belong to the rule set. A stateful firewall rule is configured at the **[edit services policies]** hierarchy level.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Stateful Firewalls for Next Gen Services | 142

stateful-firewall-rule-sets (Service Set Next Gen Services)

Syntax

```
stateful-firewall-rule-sets [rule-set-name];
```

Hierarchy Level

```
[edit services service-set service-set-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the stateful firewall rule sets to be used with the service set. A stateful firewall rule set is configured at the **[edit services policies]** hierarchy level.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Stateful Firewalls for Next Gen Services | 142

stream (Next Gen Services Service-Set Remote System Logging)

Syntax

```
stream stream-name (severity debug | category screen | format sd-syslog | host);
```

Hierarchy Level

```
edit services service-set name syslog
```

Release Information

Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Specify the name of the stream to the remote log server.

> **NOTE:** Each remote server requires a unique stream name.

Options

severity debug—

category screen—

format sd-syslog—

host—

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

stream | 509

stream-option (IDS Screen Next Gen Services)

Syntax

```
stream-option;
```

Hierarchy Level

```
[edit services screen ids-option screen-name ip]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop IPv4 packets that have the IP option of 8 (Stream ID).

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

strict-source-route-option (IDS Screen Next Gen Services)

Syntax

```
strict-source-route-option;
```

Hierarchy Level

```
[edit services screen ids-option screen-name ip]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop IPv4 packets that have the IP option of 9 (Strict Source Routing).

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

syn-ack-ack-proxy (IDS Screen Next Gen Services)

Syntax

```
syn-ack-ack-proxy {
    threshold number;
}
```

Hierarchy Level

```
[edit services screen ids-option screen-name tcp]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Configure the maximum number of connections from an IP address that can be opened without being completed. Once this threshold has been reached, further connection requests are rejected. In the SYN-ACK-ACK attack, the session table can fill up, resulting in the device rejecting legitimate connection requests.

Options

threshold *number*—Maximum number of uncompleted connections from any single IP address.

Range: 1 through 250,000

Default: 512

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

syn-fin (IDS Screen Next Gen Services)

Syntax

```
syn-fin;
```

Hierarchy Level

```
[edit services screen ids-option screen-name tcp]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop packets that have both the SYN and FIN flags set, which can cause unpredictable behavior.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

syn-frag (IDS Screen Next Gen Services)

Syntax

```
syn-frag;
```

Hierarchy Level

```
[edit services screen ids-option screen-name tcp]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop SYN packet fragments. In TCP SYN fragment attacks, the target caches SYN fragments, waiting for the remaining fragments to arrive so it can reassemble them and complete the connection. A flood of SYN fragments eventually fills the host's memory buffer, preventing valid traffic connections.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

syslog (Services CoS)

Syntax

```
syslog;
```

Hierarchy Level

```
[edit services cos rule rule-name term term-name then],
[edit services cos rule rule-name term term-name then reverse]
```

Release Information

Statement introduced in Junos OS Release 8.1.

Description

Enable system logging. The system log information from the Multiservices and Services PICs is passed to the kernel for logging in the **/var/log** directory. This setting overrides any **syslog** statement setting included in the service set or interface default configuration.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring CoS Rules on Services PICs

Configuring Actions in CoS Rules

syslog (Next Gen Services Service-Set System Logging)

Syntax

```
syslog ;
```

Hierarchy Level

```
[edit services service-set name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

Configure the filename Next Gen Services system logs.

Options

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

tcp-no-flag (IDS Screen Next Gen Services)

Syntax

```
tcp-no-flag;
```

Hierarchy Level

```
[edit services screen ids-option screen-name tcp]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop TCP packets that have no flag fields set. A TCP no flag attack can cause unpredictable behavior on the target.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

tcp-session (Service Set Next Gen Services)

Syntax

```
tcp-session {
    inactivity-asymm-tcp-timeout;
    inactivity-tcp-timeout ;
    open-timeout ;
    tcp-fast-open ;
    tcp-mss ;
    tcp-non-syn ;
    tcp-tickles ;
}
```

Hierarchy Level

[edit services service-set *service-set-name* service-set-options]

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series.

Description

Configure the TCP options for the service set.

Options

close-timeout—Timeout period for TCP session tear-down (2. through 300 seconds)

ignore-errors—Ignore anomalies or errors for TCP

inactivity-asymm-tcp-timeout—

tcp-tickles—Number of TCP keep-alive packets to be sent for bidirectional TCP flows

inactivity-tcp-timeout—Inactivity timeout period for TCP established sessions

open-timeout—Timeout period for TCP session establishment (seconds)

tcp-fast-open—Tcp-fast-Open enabled packets will be handled accordingly

tcp-mss—Enable the limit on TCP Max. Seg. Size in SYN packets

tcp-non-syn—Deny session creation on receiving first non SYN packet

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

tear-drop (IDS Screen Next Gen Services)

Syntax

```
tear-drop;
```

Hierarchy Level

```
[edit services screen ids-option screen-name ip]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop fragmented IP packets that overlap, which protects against teardrop attacks. In teardrop attacks, the target machine uses up its resources as it attempts to reassemble the packets, and then it can no longer process valid traffic.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

then (Services CoS Next Gen Services)

Syntax

```
then {
    application-profile profile-name;
    dscp (alias | bits);
    forwarding-class class-name;
    reflexive; | revert; | reverse {
        application-profile profile-name;
        dscp (alias | bits);
        forwarding-class class-name;
    }
}
```

Hierarchy Level

```
[edit services cos rule rule-name policy policy-name]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the Differentiated Services (DiffServ) code point (DSCP) marking and forwarding-class assignments for packets that are processed by a service set and that match the conditions of the policy in a services CoS rule.

The service set that the CoS rule is assigned to must include at least one stateful firewall rule or NAT rule, or CoS does not work. Only stateful firewall and NAT rules can be used with CoS rules in a service set.

Options

application-profile *profile-name*—The application profile that sets the CoS actions for FTP and SIP traffic.

dscp (*alias* | *bits*)—Either a code point alias or a DSCP bit value to apply to the packet.

forwarding-class *class-name*—Forwarding class name to apply to the packet. The choices are:

- assured-forwarding
- best-effort
- expedited-forwarding
- network-control

reflexive—Applies the CoS rule policy actions to flows in the reverse direction as well as to flows in the matching direction.

revert—Stores the DSCP and forwarding class of a packet that is received in the match direction of the rule and then applies that DSCP and forwarding class to packets that are received in the reverse direction of the same session.

reverse—Specifies actions to apply to flows in the reverse direction of the matching direction.

Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Class of Service for Services PICs (Next Gen Services) | **131**

then (Stateful Firewall Rule Next Gen Services)

Syntax

```
then {
    count;
    deny;
    permit;
    reject;
}
```

Hierarchy Level

[edit services policies stateful-firewall-rule *rule-name* policy *policy-name*]

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Specify the actions for a stateful firewall rule policy. The policy actions are applied to flows that meet the policy's matching properties.

Options

count—Enables a count, in bytes or kilobytes, of all network traffic the policy allows to pass.

deny—Drop the packets.

permit—Accept the packets and send them to their destination.

reject—Drop the packets. For TCP traffic, send a TCP reset (RST) segment to the source host. For UDP traffic, send an ICMP **destination unreachable, port unreachable** message (type 3, code 3) to the source host.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Stateful Firewalls for Next Gen Services | 142

timestamp-option (IDS Screen Next Gen Services)

Syntax

```
timestamp-option;
```

Hierarchy Level

```
[edit services screen ids-option screen-name ip]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop IPv4 packets that have the IP option of 4 (Internet timestamp).

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

traceoptions (Traffic Load Balancer)

Syntax

```
traceoptions {
    file file-name <files number> <no-word-readable | world-readable> <size size>;
    flag flag;
    level (all | critical | error | info | notice | verbose | warning);
    monitor monitor-object-name {
        instance-name instance-name;
        virtual-svc-name virtual-service-name;
    }
    no-remote-trace;
}
```

Hierarchy Level

```
[edit services traffic-load-balance]
```

Release Information

Statement introduced in Junos OS Release 16.1 on MX Series.
instance-name and **virtual-service-name** options added in Junos OS Release 16.1R6 and 18.2R1 on MX Series.
Support for Next Gen Services MX-SPC3 services card add in Junos OS Release 19.3R2.

Description

Configure tracing options for the traffic load balancer.

Options

file *file-name*—Name of the file to receive the output of the tracing operation.

files *number*—(Optional) Maximum number of trace files. When a trace file named trace-file reaches its maximum size, it is renamed trace-file.0, then trace-file.1, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten.

Range: 2 through 1000 files

Default: 3 files

flag *flag*— Specify which operations you want to trace from Table 23 on page 525. To specify more than one operation, include multiple flag statements.

Table 23: Trace Flags

Flag	Support on MS-MPC and MX-SPC3 Cards	Description
all	MS-MPC and MX-SPC3	Trace all operations.
all-real-services	MS-MPC and MX-SPC3	Trace all real services.
database	MS-MPC and MX-SPC3	Trace database events.
file-descriptor-queue	MS-MPC and MX-SPC3	Trace file descriptor queue events.
inter-thread	MS-MPC and MX-SPC3	Trace inter-thread communication events.
messages	MS-MPC and MX-SPC3	Trace normal events.
probe	MS-MPC and MX-SPC3	Trace probe events.
probe-infra	MS-MPC and MX-SPC3	Trace probe infra events.

instance-name *instance-name*—(Optional) Name of the TLB instance to monitor.

level—Use the specified level of tracing. You can specify any of the following levels:

- **all**—Match all levels.
- **error**—Match error conditions.
- **info**—Match informational messages.
- **notice**—Match conditions that must be handled specially.
- **verbose**—Match verbose messages.
- **warning**—Match warning messages.

These trace levels are available for both the MS-MPC and MX-SPC3 services cards unless otherwise specified.

monitor *monitor-object-name*—Name of a monitoring object that contains an instance name or virtual service name.

no-remote-trace—(Optional) Disable remote tracing.

no-world-readable—(Optional) Disable unrestricted file access.

For Next Gen Services on the MX-SPC3 services card, set the *monitor-object-name* to either:

group-name—Name of the group.

real-services-name—Name of the real service

size *size*—(Optional) Use the maximum size of each trace file, in kilobytes (KB) or megabytes (MB). When a trace file named trace-file reaches this size, it is renamed trace-file.0. When the trace-file again reaches its maximum size, trace-file.0 is renamed trace-file.1 and trace-file is renamed trace-file.0. This renaming scheme continues until the maximum number of trace files is reached. Then, the oldest trace file is overwritten. If you specify a maximum number of files, you must also specify a maximum file size with the size option.

Syntax: *xk* to specify KB, *xm* to specify MB, or *xg* to specify GB.

Range: 10,240 through 1,073,741,824 bytes.

Default: 128 KB

virtual-svc-name *virtual-service-name*—(Optional) Name of the virtual service to monitor.

word-readable—(Optional) Enable unrestricted file access.

Required Privilege Level
trace and interface—To view this statement in the configuration.
trace-control and interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Traffic Load Balancer Overview | **165**

Configuring TLB | **172**

traceoptions (Next Gen Services Global System Logging)

Syntax

```
traceoptions {
    apply-groups group-names;
    apply-groups-except group-names;
    flag name;
    file filename,
    no-remote-trace;
}
```

Hierarchy Level

```
[edit services rtlog]
```

Release Information

Support introduced in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Specify the trace information you want to include in the system log messages.

Options

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

traffic-load-balance (Traffic Load Balancer)

Syntax

```
traffic-load-balance {
   instance instance-name {
      client-interface client-interface;
      client-vrf client-vrf;
      group group-name {
         health-check-interface-subunit health-check-interface-subunit;
         network-monitoring-profile [profile-name1, <profile-name2>];
         real-service-rejoin-options no-auto-rejoin;
         real-services [server-list];
         <routing-instance routing-instance>;
      }
      interface interface-name;
      real-service real-service {
         address server-ip-address;
         admin-down;
      }
      server-inet-bypass-filter server-inet-bypass-filter ;
      server-inet6-bypass-filter server-inet6-bypass-filter ;
      server-interface server-interface;
      server-vrf server-vrf;
      traceoptions {
         file file-name <files number> <no-word-readable | world-readable> <size size>;
         flag flag;
         level (all | critical | error | info | notice | verbose | warning);
         monitor {
            instance-name instance-name;
            virtual-svc-name virtual-service-name;
         }
         no-remote-trace;
      }
      virtual-service virtual-service-name {
         address virtual-ip–address;
         group group-name;
         load-balance-method {
            hash {
               hash-key method;
            }
            random;
         }
         mode ( layer2-direct-server-return | direct-server-return | translated );
         <routing-instance routing-instance-name>;
```

```
        <routing-metric route-metric>;
        server-interface server-interface;
        service service-name {
            protocol (udp | tcp);
            server-listening-port port;
            virtual-port virtual-port;
        }
    }
  }
}
```

Hierarchy Level

```
[edit services]
```

Release Information

Statement introduced in Junos OS Release 16.1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure traffic load balancer options.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Traffic Load Balancer Overview | 165

Configuring TLB | 172

ttl-threshold

Syntax

```
ttl-threshold number;
```

Hierarchy Level

```
[edit applications application application-name]
```

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Specify the traceroute time-to-live (TTL) threshold value. This value sets the acceptable level of network penetration for trace routing.

Options

number—TTL threshold value.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

ALG Descriptions

Configuring the TTL Threshold.

Examples: Configuring Application Protocols | 284

Verifying the Output of ALG Sessions | 285

unknown-protocol (IDS Screen Next Gen Services)

Syntax

```
unknown-protocol;
```

Hierarchy Level

```
[edit services screen ids-option screen-name ip]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop IP frames with protocol numbers greater than 137 for IPv4 and 139 for IPv6, which protects against IP unknown protocol attacks.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

uuid

Syntax

```
uuid hex-value;
```

Hierarchy Level

```
[edit applications application application-name]
```

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Specify the Universal Unique Identifier (UUID) for DCE RPC objects.

Options

hex-value—Hexadecimal value.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

ALG Descriptions

Configuring a Universal Unique Identifier

Examples: Configuring Application Protocols | 284

Verifying the Output of ALG Sessions | 285

video (Application Profile)

Syntax

```
video {
    dscp (alias | bits);
    forwarding-class class-name;
}
```

Hierarchy Level

[edit services cos application-profile*profile-name* sip]

Release Information

Statement introduced in Junos OS Release 9.3.

Description

Set the appropriate **dscp** and **forwarding-class** values for SIP video traffic.

Default

By default, the system will not alter the DSCP or forwarding class for SIP video traffic.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

voice (Application Profile) | 538

video (Application Profile)

Syntax

```
video {
    dscp (alias | bits);
    forwarding-class class-name;
}
```

Hierarchy Level

[edit services cos application-profile*profile-name* sip]

Release Information

Statement introduced in Junos OS Release 9.3.

Description

Set the appropriate **dscp** and **forwarding-class** values for SIP video traffic.

Default

By default, the system will not alter the DSCP or forwarding class for SIP video traffic.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

voice (Application Profile) | 538

virtual-service (Traffic Load Balancer)

Syntax

```
virtual-service virtual-service-name {
    address virtual-ip–address;
    group group-name;
    load-balance-method {
        hash {
            hash-key method;
        }
        random;
    }
    mode ( layer2-direct-server-return | direct-server-return | translated );
    <routing-instance routing-instance-name>;
    <routing-metric route-metric>;
    server-interface server-interface;
    service service-name {
        protocol (udp | tcp);
        server-listening-port port;
        virtual-port virtual-port;
    }
}
```

Hierarchy Level

```
[edit services traffic-load-balance instance instance-name]
```

Release Information

Statement introduced in Junos OS Release 16.1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure a TLB virtual service.

Options

address *virtual-ip-address*—Address of the virtual service.

group *group-name*—Server group for the virtual service.

load-balance method hash hash-key *method*—Use a combination of these hash-key methods for the session distribution API:

dest-ip—Hash on destination IP address.

proto—Hash on protocol.

source-ip—Hash on source IP address.

load-balance-method random—Use randomizing algorithm for session distribution.

mode (layer2-direct-server-return | direct-server-return | translated)—Traffic load balancer mode of operation:

direct-server-return—Transparent mode Layer 3 direct server return.

layer2-direct-server-return—Transparent mode Layer 2 direct server return. Load balancing works by changing the Layer 2 MAC of packets; Layer 3 and higher level headers are not modified.

translated—The Packet Forwarding Engine performs stateless load balancing.

route-metric—(Optional) Route metric

Range: 1 through 255

routing-instance-name—(Optional) Routing instance for the virtual service. Default is **inet.0**.

server-interface *server-interface*—(Optional) The server-interface specified under the virtual-service, will be used instead of the values provided under the instance level.

service *service-name*—Translated mode details. Packets destined to this virtual ip-address + virtual-port + protocol will be load balanced to the appropriate server. The destination IP address and port are replaced by the real services IP address and the server-listening-port (configured here).

protocol (udp | tcp)—Protocol.

server-listening-port *port*—Port number.

virtual-port *virtual-port*—Virtual port number.

virtual-ip-address—Local address for the virtual service.

virtual-service-name—Identifier for the virtual service.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Traffic Load Balancer Overview | 165

Configuring TLB | 172

voice

Syntax

```
voice {
    dscp (Services CoS) (alias | bits);
    forwarding-class (Services PIC Classifiers) class-name;
}
```

Hierarchy Level

[edit services (CoS) cos application-profile *profile-name* sip]

Release Information

Statement introduced in Junos OS Release 9.3.

Description

Set the appropriate **dscp** and **forwarding-class** values for SIP voice traffic.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Application Profiles for Use as CoS Rule Actions

voice (Application Profile)

Syntax

```
voice {
    dscp (alias | bits);
    forwarding-class class-name;
}
```

Hierarchy Level

```
[edit services cos application-profileprofile-name sip]
```

Release Information

Statement introduced in Junos OS Release 9.3.

Description

Set the appropriate **dscp** and **forwarding-class** values for SIP voice traffic.

Default

By default, the system will not alter the DSCP or forwarding class for SIP voice traffic.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring CoS Rules on Services PICs

video (Application Profile) | 533

web-filter

Syntax

```
web-filter {
    profile (Web Filter) profile-name {
        dns-filter {
            database-file filename;
            dns-resp-ttl seconds;
            dns-server [ ip-address ];
            hash-key key-string;
            hash-method hash-method-name;
            statistics-log-timer minutes;
            wildcarding-level level;
        }
        dns-filter-template template-name {
            client-interfaces [ client-interface-name ];
            client-routing-instance client-routing-instance-name;
            dns-filter {
                database-file filename;
                dns-resp-ttl seconds;
                dns-server [ ip-address ];
                hash-key key-string;
                hash-method hash-method-name;
                statistics-log-timer minutes;
                wildcarding-level level;
            }
            server-interfaces [ server-interface-name ];
            server-routing-instance server-routing-instance-name;
            term term-name {
                from {
                    src-ip-prefix [ source-prefix ];
                }
                then {
                    accept;
                    dns-sinkhole;
                }
            }
        }
        global-dns-stats-log-timer minutes;
        url-filter-database filename;
        url-filter-template template-name {
            client-interfaces [ client-interface-name1 client-interface-name2 ];
            disable-url-filtering;
            dns-resolution-interval minutes;
```

```
        dns-resolution-rate seconds;
        dns-retries number;
        dns-routing-instance dns-routing-instance-name;
        dns-server [ ip-address1 ip-address2 ip-address3 ];
        dns-source-interface loopback-interface-name;
        dns-routing-instance dns-routing-instance-name;
        routing-instance routing-instance-name;
        server-interfaces [ server-interface-name1 server-interface-name2 ];
        term term-name {
            from {
                src-ip-prefix [prefix1 prefix2];
                dest-port [port1 port2];
            }
            then {
                accept;
                custom-page custom-page;
                http-status-code http-status-code;
                redirect-url redirect-url;
                tcp-reset;
            }
        }
        url-filter-database filename
    }
  }
}
```

Hierarchy Level

```
[edit services]
```

Release Information

Statement introduced in Junos OS Release 18.3R1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Configure filtering of DNS requests for blacklisted website domains. Filtering can result in either:

- Blocking access to the site by sending the client a DNS response that includes an IP address or domain name of a sinkhole server instead of the blacklisted domain.
- Logging the DNS request and allowing access.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level
system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

DNS Request Filtering for Blacklisted Website Domains | 189

web-filter-profile

Syntax

```
web-filter-profile profile-name;
```

Hierarchy Level

```
[edit services service-set service-set-name]
```

Release Information
Statement introduced in Junos OS Release 18.3R1.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description
Specify the DNS filter profile or the URL filter profile that the service set uses. The filter profile is configured at the **[edit services web-filter]** hierarchy level, and specifies how to filter DNS requests for blacklisted website domains or how to filter access to blacklisted URLs.

Options
profile-name—Name of the DNS filter profile.

Required Privilege Level
system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

DNS Request Filtering for Blacklisted Website Domains | 189

winnuke (IDS Screen Next Gen Services)

Syntax

```
winnuke;
```

Hierarchy Level

```
[edit services screen ids-option screen-name tcp]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 on MX Series routers (MX240, MX480 and MX960) running Next Gen Services with the MX-SPC3 services card.

Description

Identify and drop TCP segments that are destined for port 139 and have the urgent (URG) flag set, which provides protection against WinNuke attacks.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Network Attack Protection With IDS Screens for Next Gen Services | 153

world-readable (Next Gen Services Global System Logging)

Syntax

```
world-readable;
```

Hierarchy Level

```
[edit services rtlog traceoptions file]
```

Release Information

Statement introduced in Junos OS Release 19.3R2 for Next Gen Services.

Description

Allow any user to read the log file

Options

world-readable—Allow any user to read the log file

Required Privilege Level

system

RELATED DOCUMENTATION

- Understanding System Logging for Next Gen Services | 35
- Enabling Global System Logging for Next Gen Services | 37
- Configuring System Logging to One or More Remote Servers for Next Gen Services | 40
- Configuring Local System Logging for Next Gen Services | 38

11

PART

Operational Commands

CHAPTER 25

Operational Commands

IN THIS CHAPTER

clear services alg statistics

Syntax

```
clear services alg statistics
```

Release Information

Command introduced in Junos OS Release 10.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Clear ALG statistics for Junos OS extension-provider packages.

Options

application-profile—Clear all sessions for the application profile.

interface—Clear all sessions for the interface.

Required Privilege Level

view

clear services nat source mappings

Syntax

```
clear services nat source mappings
<app | eim | pcp>
subscriber private-ip [port port-num] [service-set service-set]
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Clear services NAT source mappings.

Options

app—Clear all APP mappings.

app subscriber *private-ip* [port *port-num*] [service-set *service-set*]—Clear one APP mapping by matching conditions

eim—Clear all EIM mappings.

eim subscriber *private-ip* [port *port-num*] [service-set *service-set*]—Clear one EIM mapping by matching conditions

pcp—Clear all PCP mappings.

Required Privilege Level

view

List of Sample Output

clear services nat source mappings eim on page 552
clear service nat source mappings eim subscriber 2.1.1.1 on page 552
clear services nat source mappings subscriber 2.1.1.1 port 1026 service-set ss1 on page 552
clear services nat source mappings app on page 552
clear services nat source mappings app subscriber 2.1.1.1 on page 553
clear services nat source mappings app subscriber 2.1.1.1 port 1026 service-set ss1 on page 553

Output Fields

Table 24 on page 552 lists the output fields for the **clear services nat source mappings** command. Output fields are listed in the approximate order in which they appear.

Table 24: clear services nat source mappings Output Fields

Field Name	Field Description
NAT pool	Name of the NAT pool.
Mappings removed	Number of mappings removed.
Sessions removed	Number of sessions removed.

Sample Output

clear services nat source mappings eim

```
user@host> clear services nat source mappings eim

NAT pool                        Mappings removed   Sessions removed
Test-pool                                                1                 0
```

clear service nat source mappings eim subscriber 2.1.1.1

```
user@host> clear service nat source mappings eim subscriber 2.1.1.1

NAT pool                        Mappings removed   Sessions removed
Test-pool                                                1                 0
```

clear services nat source mappings subscriber 2.1.1.1 port 1026 service-set ss1

```
user@host> clear services nat source mappings subscriber 2.1.1.1 port 1026 service-set ss1

NAT pool                        Mappings removed   Sessions removed
Test-pool                                                1                 0
```

clear services nat source mappings app

```
user@host> clear services nat source mappings app

  NAT pool                        Mappings removed   Sessions removed
Test-pool                                                1                 0
```

clear services nat source mappings app subscriber 2.1.1.1

```
user@host> clear services nat source mappings app subscriber 2.1.1.1
```

```
  NAT pool                        Mappings removed   Sessions removed
Test-pool                                            1                 0
```

clear services nat source mappings app subscriber 2.1.1.1 port 1026 service-set ss1

```
user@host> clear services nat source mappings app subscriber 2.1.1.1 port 1026 service-set ss1
```

```
  NAT pool                        Mappings removed   Sessions removed
Test-pool                                            1                 0
```

clear services sessions

Syntax

```
clear services sessions
<application-protocol protocol>
<destination-port destination-port>
<destination-prefix destination-prefix>
<interface interface-name>
<ip-action>
<protocol protocol>
<service-set service-set>
<source-port source-port>
<source-prefix source-prefix>
```

Release Information

Command introduced in Junos OS Release 13.1.

Description

Clear services sessions currently active on the embedded PIC or MIC. When you enter this command, the sessions are marked for deletion and are cleared thereafter. The time that is taken to clear the currently active sessions varies, depending on the scaled nature of the environment.

Options

none—Clear all sessions.

application-protocol *protocol*—(Optional) Clear sessions for one of the following application protocols:

- **bootp**—Bootstrap protocol
- **dce-rpc**—Distributed Computing Environment-Remote Procedure Call protocols
- **dce-rpc-portmap**—Distributed Computing Environment-Remote Procedure Call protocols portmap service
- **dns**—Domain Name System protocol
- **exec**—Exec
- **ftp**—File Transfer Protocol
- **h323**—H.323 standards
- **icmp**—Internet Control Message Protocol
- **iiop**—Internet Inter-ORB Protocol
- **ip**—IP
- **login**—Login

- **netbios**—NetBIOS
- **netshow**—NetShow
- **pptp**—Point-to-Point Tunneling Protocol
- **realaudio**—RealAudio
- **rpc**—Remote Procedure Call protocol
- **rpc-portmap**—Remote Procedure Call protocol portmap service
- **rtsp**—Real-Time Streaming Protocol
- **shell**—Shell
- **sip**—Session Initiation Protocol
- **snmp**—Simple Network Management Protocol
- **sqlnet**—SQLNet
- **talk**—Talk Program
- **tftp**—Trivial File Transfer Protocol
- **traceroute**—Traceroute
- **winframe**—WinFrame

destination-port *destination-port*—(Optional) Clear sessions for the specified destination port. The range of values is from 0 to 65535.

destination-prefix *destination-prefix*—(Optional) Clear sessions for the specified destination prefix.

interface *interface-name*—(Optional) Clear sessions for the specified interface. On M Series and T Series routers, the ***interface-name*** can be **ms-*fpc/ pic/ port*** or **rspn*umber***.

ip-action—(Optional) Clear **ip-action** entries generated by the router to log, drop, or block traffic based on previous matches. The IP action options and targets are configured at the **{edit security idp idp-policy *policy-name* rulebase-ips rule *rule-name* then]** hierarchy level.

protocol *protocol*—(Optional) Clear sessions for one of the following IP types:

- ***number***—Numeric protocol value from **0** to **255**
- **ah**—IPsec Authentication Header protocol
- **egp**—An exterior gateway protocol
- **esp**—IPsec Encapsulating Security Payload protocol
- **gre**—A generic routing encapsulation protocol
- **icmp**—Internet Control Message Protocol

- **icmp6**—Internet Control Message Protocol version 6
- **igmp**—Internet Group Management Protocol
- **ipip**—IP-over-IP Encapsulation Protocol
- **ospf**—Open Shortest Path First protocol
- **pim**—Protocol Independent Multicast protocol
- **rsvp**—Resource Reservation Protocol
- **sctp**—Stream Control Transmission Protocol
- **tcp**—Transmission Control Protocol
- **udp**—User Datagram Protocol

service-set *service-set*—(Optional) Clear sessions for the specified service set.

source-port *source-port*—(Optional) Clear sessions for the specified source port. The range of values is from 0 through 65535.

source-prefix *source-prefix*—(Optional) Clear sessions for the specified source prefix.

Required Privilege Level
clear

RELATED DOCUMENTATION

show services sessions | 740

List of Sample Output
clear services sessions on page 557

Output Fields
Table 25 on page 556 lists the output fields for the **clear services sessions** command. Output fields are listed in the approximate order in which they appear.

Table 25: clear services sessions Output Fields

Field Name	Field Description
Interface	Name of an interface.
Service set	Name of the service set from which sessions are being cleared.

Table 25: clear services sessions Output Fields *(continued)*

Field Name	Field Description
Sessions marked for deletion	Number of sessions that are marked for deletion and are subsequently cleared.

Sample Output

clear services sessions

`user@host>` **clear services sessions**

```
Interface   Service set          Sessions marked for deletion
ms-0/0/0    sset                 10
```

clear services sessions analysis

Syntax

```
clear services sessions analysis
```

Release Information

Statement introduced in Junos OS Release 17.1 on MX Series MS-MPC.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Clear session statistics.

Options

interface *interface-name*—(Optional) Clear sessions statistics for the specified interface. The ***interface-name*** can be **vms-*fpc/ pic/ port***.

Required Privilege Level

view

clear services stateful-firewall flows

Syntax

```
clear services stateful-firewall flows
<application-protocol protocol>
<destination-port destination-port>
<destination-prefix destination-prefix>
<interface interface-name>
<protocol protocol>
<service-set service-set>
<source-port source-port>
<source-prefix source-prefix>
```

Release Information

Command introduced before Junos OS Release 7.4.

Description

Clear stateful firewall flows. Issue this command to clear the stateful firewall flows for the specified option. The default option is "none", that is, to close all stateful firewall flows unless another option is specified.

Starting in Junos Release 14.1, the method for closing flows has changed. With the change, even for peak flows, the command prompt now returns to an active state after 30 seconds and the clear command completes in 90 to 120 seconds. In previous releases, closing peak flows could take as long as 4 minutes, after which the command prompt would return. Note too that during the first 30 seconds of issuing the command, the flows to be deleted remain visible in the **show services stateful-firewall flows** command output.

Options

none—Clear all stateful firewall flows.

destination-port *destination-port*—(Optional) Clear stateful firewall flows for a particular destination port. The range of values is 0 to 65535.

destination-prefix *destination-prefix*—(Optional) Clear stateful firewall flows for a particular destination prefix.

interface *interface-name*—(Optional) Clear stateful firewall flows for a particular interface. On M Series and T Series routers, the ***interface-name*** can be **ms-*fpc/pic/port*** or **rsp*number***.

protocol—(Optional) Clear stateful firewall flows for one of the following IP types:

- ***number***—Numeric protocol value from **0** to **255**.
- **ah**—IPsec Authentication Header protocol
- **egp**—An exterior gateway protocol

- **esp**—IPsec Encapsulating Security Payload protocol
- **gre**—A generic routing encapsulation protocol
- **icmp**—Internet Control Message Protocol
- **igmp**—Internet Group Management Protocol
- **ipip**—IP-over-IP Encapsulation Protocol
- **ospf**—Open Shortest Path First protocol
- **pim**—Protocol Independent Multicast protocol
- **rsvp**—Resource Reservation Protocol
- **sctp**—Stream Control Protocol
- **tcp**—Transmission Control Protocol
- **udp**—User Datagram Protocol

service-set *service-set*—(Optional) Clear stateful firewall flows for a particular service set.

source-port *source-port*—(Optional) Clear stateful firewall flows for a particular source port. The range of values is from 0 through 65535.

source-prefix *source-prefix*—(Optional) Clear stateful firewall flows for a particular source prefix.

Required Privilege Level
view

RELATED DOCUMENTATION

show services stateful-firewall flows | 785

List of Sample Output
clear services stateful-firewall flows on page 561

Output Fields
Table 26 on page 560 lists the output fields for the **clear services stateful-firewall flows** command. Output fields are listed in the approximate order in which they appear.

Table 26: clear services stateful-firewall flows Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface.

Table 26: clear services stateful-firewall flows Output Fields *(continued)*

Field Name	Field Description
Service set	Name of the service set from which flows are being cleared.
Conv removed	Number of conversations removed.

Sample Output

clear services stateful-firewall flows

`user@host>` **clear services stateful-firewall flows**

```
Interface   Service set                                          Conv removed
ms-0/3/0    svc_set_trust                                                   0
ms-0/3/0    svc_set_untrust                                                 0
```

clear services stateful-firewall sip-call

Syntax

```
clear services stateful-firewall sip-call
<application-protocol protocol>
<destination-port destination-port>
<destination-prefix destination-prefix>
<interface interface-name>
<protocol protocol>
<service-set service-set>
<source-port source-port>
<source-prefix source-prefix>
```

Release Information

Command introduced in Junos OS Release 7.4.

Description

Clear Session Initiation Protocol (SIP) call information in stateful firewall flows.

Options

none—Clear stateful firewall statistics for all interfaces and all service sets.

application-protocol—(Optional) Clear information about one of the following application protocols:

- **bootp**—(SIP only) Bootstrap protocol
- **dce-rpc**—(SIP only) Distributed Computing Environment-Remote Procedure Call protocols
- **dce-rpc-portmap**—(SIP only) Distributed Computing Environment-Remote Procedure Call protocols portmap service
- **dns**—(SIP only) Domain Name System protocol
- **exec**—(SIP only) Exec
- **ftp**—(SIP only) File Transfer Protocol
- **h323**—H.323 standards
- **icmp**—Internet Control Message Protocol
- **iiop**—Internet Inter-ORB Protocol
- **login**—Login
- **netbios**—NetBIOS
- **netshow**—NetShow
- **realaudio**—RealAudio

- **rpc**—Remote Procedure Call protocol
- **rpc-portmap**—Remote Procedure Call protocol portmap service
- **rtsp**—Real-Time Streaming Protocol
- **shell**—Shell
- **sip**—Session Initiation Protocol
- **snmp**—Simple Network Management Protocol
- **sqlnet**—SQLNet
- **tftp**—Trivial File Transfer Protocol
- **traceroute**—Traceroute
- **winframe**—WinFrame

destination-port *destination-port*—(Optional) Clear information for a particular destination port. The range of values is 0 to 65535.

destination-prefix *destination-prefix*—(Optional) Clear information for a particular destination prefix.

interface *interface-name*—(Optional) Clear information for a particular adaptive services interface. On M Series and T Series routers, the ***interface-name*** can be **sp-*fpc/pic/port*** or **rsp*number***.

protocol—(Optional) Clear information about one of the following IP types:

- **ah**—IPsec Authentication Header protocol
- **egp**—An exterior gateway protocol
- **esp**—IPsec Encapsulating Security Payload protocol
- **gre**—A generic routing encapsulation protocol
- **icmp**—Internet Control Message Protocol
- **igmp**—Internet Group Management Protocol
- **ipip**—IP-within-IP Encapsulation Protocol
- **ipv6**—IPv6 within IP
- **ospf**—Open Shortest Path First protocol
- **pim**—Protocol Independent Multicast protocol
- **rsvp**—Resource Reservation Protocol
- **sctp**—Stream Control Protocol
- **tcp**—Transmission Control Protocol
- **udp**—User Datagram Protocol

service-set *service-set*—(Optional) Clear information for a particular service set.

source-port *source-port*—(Optional) Clear information for a particular source port. The range of values is 0 to 65535.

source-prefix *source-prefix*—(Optional) Clear information for a particular source prefix.

Required Privilege Level
view

RELATED DOCUMENTATION

show services stateful-firewall sip-call | 792

List of Sample Output
clear services stateful-firewall sip-call on page 564

Output Fields
Table 27 on page 564 lists the output fields for the **clear services stateful-firewall sip-call** command. Output fields are listed in the approximate order in which they appear.

Table 27: clear services stateful-firewall sip-call Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface.
Service set	Name of the service set from which flows are being cleared.
SIP calls removed	Number of SIP calls removed.

Sample Output

clear services stateful-firewall sip-call

```
user@host> clear services stateful-firewall sip-call

Interface   Service set                                    SIP calls removed
sp-0/3/0    test_sip_777                                                 1
```

clear services stateful-firewall sip-register

Syntax

```
clear services stateful-firewall sip-register
<application-protocol protocol>
<destination-port destination-port>
<destination-prefix destination-prefix>
<interface interface-name>
<protocol protocol>
<service-set service-set>
<source-port source-port>
<source-prefix source-prefix>
```

Release Information

Command introduced in Junos OS Release 7.4.

Description

Clear Session Initiation Protocol (SIP) register information in stateful firewall flows.

Options

application-protocol—(Optional) Clear information about one of the following application protocols:

- **bootp**—(SIP only) Bootstrap protocol
- **dce-rpc**—(SIP only) Distributed Computing Environment-Remote Procedure Call protocols
- **dce-rpc-portmap**—(SIP only) Distributed Computing Environment-Remote Procedure Call protocols portmap service
- **dns**—(SIP only) Domain Name System protocol
- **exec**—(SIP only) Exec
- **ftp**—(SIP only) File Transfer Protocol
- **h323**—H.323 standards
- **icmp**—Internet Control Message Protocol
- **iiop**—Internet Inter-ORB Protocol
- **login**—Login
- **netbios**—NetBIOS
- **netshow**—NetShow
- **realaudio**—RealAudio
- **rpc**—Remote Procedure Call protocol

- **rpc-portmap**—Remote Procedure Call protocol portmap service
- **rtsp**—Real-Time Streaming Protocol
- **shell**—Shell
- **sip**—Session Initiation Protocol
- **snmp**—Simple Network Management Protocol
- **sqlnet**—SQLNet
- **tftp**—Trivial File Transfer Protocol
- **traceroute**—Traceroute
- **winframe**—WinFrame

destination-port *destination-port*—(Optional) Clear information for a particular destination port. The range of values is 0 to 65535.

destination-prefix *destination-prefix*—(Optional) Clear information for a particular destination prefix.

interface *interface*—(Optional) Clear information about a particular interface. On M Series and T Series routers, the ***interface-name*** can be **sp-*fpc/pic/port*** or **rsp*number***.

protocol—(Optional) Clear information about one of the following IP types:

- **ah**—IPsec Authentication Header protocol
- **egp**—An exterior gateway protocol
- **esp**—IPsec Encapsulating Security Payload protocol
- **gre**—A generic routing encapsulation protocol
- **icmp**—Internet Control Message Protocol
- **igmp**—Internet Group Management Protocol
- **ipip**—IP-within-IP Encapsulation Protocol
- **ipv6**—IPv6 within IP
- **ospf**—Open Shortest Path First protocol
- **pim**—Protocol Independent Multicast protocol
- **rsvp**—Resource Reservation Protocol
- **sctp**—Stream Control Protocol
- **tcp**—Transmission Control Protocol
- **udp**—User Datagram Protocol

service-set *service-set*—(Optional) Clear information for a particular service set.

source-port *source-port*—(Optional) Clear information for a particular source port. The range of values is 0 through 65535.

source-prefix *source-prefix*—(Optional) Clear information for a particular source prefix.

Required Privilege Level
view

RELATED DOCUMENTATION

show services stateful-firewall sip-register | 798

List of Sample Output
clear services stateful-firewall sip-register on page 567

Output Fields
Table 28 on page 567 lists the output fields for the **clear services stateful-firewall sip-register** command. Output fields are listed in the approximate order in which they appear.

Table 28: clear services stateful-firewall sip-register Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface.
Service set	Name of the service set from which flows are being cleared.
SIP registration removed	Number of SIP registers removed.

Sample Output

clear services stateful-firewall sip-register

```
user@host> clear services stateful-firewall sip-register

Interface   Service set                              SIP registration removed
sp-0/3/0    test_sip_777                                                   1
```

clear services stateful-firewall statistics

Syntax

```
clear services stateful-firewall statistics
<interface interface-name>
<service-set service-set>
```

Release Information

Command introduced before Junos OS Release 7.4.

Description

Clear stateful firewall statistics.

Options

none—Clear stateful firewall statistics for all interfaces and all service sets.

interface *interface-name*—(Optional) Clear stateful firewall statistics for the specified interface. On M Series and T Series routers, the ***interface-name*** can be **ms-*fpc/pic/port*** or **rsp*number***.

service-set *service-set*—(Optional) Clear stateful firewall statistics for the specified service set.

Required Privilege Level

view

RELATED DOCUMENTATION

show services stateful-firewall statistics | **802**

List of Sample Output

clear services stateful-firewall statistics on page 568

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

clear services stateful-firewall statistics

```
user@host> clear services stateful-firewall statistics
```

clear services subscriber analysis

Syntax

```
clear services subscriber analysis
```

Release Information

Statement introduced in Junos OS Release 17.1 on MX Series MS-MPC.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Clear information about the number of active subscribers on the services PIC.

Options

interface *interface-name*—(Optional) Display information about a particular interface.

Required Privilege Level

view

clear services web-filter statistics profile

Syntax

```
clear services web-filter statistics profile profile-name
<dns-filter-template template-name>
<fpc-slot fpc-slot pic-slot pic-slot>
<url-filter-template template-name>
```

Release Information

Command introduced in Junos OS Release 18.3R1.

Description

Clear statistics for DNS request filtering or URL filtering for the specified filter profile.

Options

dns-filter-template *template-name*—(Optional) Name of the DNS filter template for which statistics are cleared.

fpc-slot *fpc-slot* pic-slot *pic-slot*—(Optional) Location of the services PIC for which statistics are cleared.

profile *profile-name*—Name of the filter profile for which statistics are cleared.

url-filter-template *template-name*—(Optional) Name of the URL filter template for which statistics are cleared.

Required Privilege Level

clear

RELATED DOCUMENTATION

DNS Request Filtering for Blacklisted Website Domains | 189

Configuring URL Filtering

List of Sample Output

clear services web-filter statistics profile on page 571

Output Fields

When you enter this command, the statistics for DNS request filtering are cleared. There is no specific output.

Sample Output

clear services web-filter statistics profile

```
user@host> clear services web-filter statistics profile profile1
```

request services web-filter update dns-filter-database

Syntax

```
request services web-filter update dns-filter-database filename
```

Release Information

Command introduced in Junos OS Release 18.3R1.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

When you make changes to the domain filter database file, which is used in filtering DNS requests for blacklisted domains, apply the changes.

Options

filename—File name of the database file.

Required Privilege Level

maintenance

RELATED DOCUMENTATION

DNS Request Filtering for Blacklisted Website Domains | 189

request services web-filter validate dns-filter-file-name

Syntax

```
request services web-filter validate dns-filter-file-name filename hash-key key-string hash-method hash-method-name
```

Release Information

Command introduced in Junos OS Release 18.3R1.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Validate the file format of the domain filter database file, which is used in filtering DNS requests for blacklisted domains.

Options

filename—File name of the database file.

hash-method-name—Hash method you used to produce the hashed domain name values in the database file.

key-string—Hash key you used to produce the hashed domain name values in the database file.

Required Privilege Level

maintenance

RELATED DOCUMENTATION

DNS Request Filtering for Blacklisted Website Domains | 189

show interfaces load-balancing (Aggregated Multiservices)

Syntax

```
show interfaces load-balancing
<detail>
<interface-name>
```

Release Information

Command introduced in Junos OS Release 11.4.
interface-name option added in Junos OS Release 16.1.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display information about the aggregated multiservices interface (AMS) as well as its individual member interfaces and the status of the replication state.

Options

none—Display standard information about status of all AMS interfaces.

detail—(Optional) Display detailed status of all AMS interfaces.

interface-name—(Optional) Name of the aggregated multiservices interface (**ams**). If this is omitted, then the information for all the aggregated multiservices interfaces, including those used in control plane redundancy and high availability (HA) for service applications, is displayed.

Required Privilege Level

view

RELATED DOCUMENTATION

Understanding Aggregated Multiservices Interfaces

Understanding Aggregated Multiservices Interfaces for Next Gen Services | 211

Example: Configuring an Aggregated Multiservices Interface (AMS)

List of Sample Output

show interfaces load-balancing on page 576
show interfaces load-balancing detail on page 577
show interfaces load-balancing detail (Specific Interface) on page 577

Output Fields

Table 29 on page 575 lists the output fields for the **show interfaces load-balancing** (aggregated multiservices interfaces) command. Output fields are listed in the approximate order in which they appear.

Table 29: Aggregated Multiservices show interfaces load-balancing Output Fields

Field Name	Field Description	Level of Output
Interface	Name of the aggregated multiservices (AMS) interface.	**detail** none
State	Status of AMS interfaces: • **Coming Up**—Interface is becoming operational. • **Members Seen**—Member interfaces (mams) are available. • **Up**—Interface is configured and operational. • **Wait for Members**—Member interfaces (mams) are not available. • **Wait Timer**—Interface is waiting for member interfaces (mams) to come online.	**detail** none
Last change	Time (in *hh:mm:ss* [*hours:minutes:seconds*] format) when the state last changed.	**detail** none
Members	Number of member interfaces (mams-).	none specified
Member count	Number of member PICs (mams) that are part of the aggregated interface.	**detail** none
HA Model	High availability (HA) model supported on the interface. • **Many-to-One**—The preferred backup Multiservices PIC, in hot standby mode, backs up one or more (N) active Multiservices PICs. • **One-to-One**—–The preferred backup Multiservices PIC, in hot standby mode, backs up only one active Multiservices PIC. NOTE: **One-to-One** is not supported on MX-SPC3 cards.	**detail** none

Table 29: Aggregated Multiservices show interfaces load-balancing Output Fields *(continued)*

Field Name	Field Description	Level of Output

Members	Information about the member interfaces:
	• **Interface**—Name of the member interface.
	• **Weight**—Not applicable for the current release.
	• **State**—State of the member interface (mams-).
	  ◦ **Active**—Member is an active member.
	  ◦ **Backup**—Member is a backup.
	  ◦ **Discard**—Member has not yet rejoined the ams interface after failure.
	  ◦ **Down**—Member has not yet powered on.
	  ◦ **Inactive**—Member has failed to rejoin the ams interface within the configured **rejoin-timeout**.
	  ◦ **Invalid**—Multiservices PIC corresponding to the member interface has been configured but is not physically present in the chassis.
		detail

Sync-state	Synchronization (sync) status of the control plane redundancy. The sync state is displayed only when the ams interface is **Up**.
	• **Interface**—Name of the member interface.
	• **Status**—Synchronization status of the member interfaces.
	  ◦ **In progress**—The active member is currently synchronizing its state information with the backup member.
	  ◦ **In sync**—The active member has finished synchronizing its state information with the backup and the backup is ready to take over if the active member fails.
	  ◦ **NA (Not applicable)**—The backup member is not yet ready to synchronize with the active (primary) member. This condition may occur if the backup is still powered off or still booting.
	  ◦ **Unknown**—The daemons are still initializing and the state information is unavailable.
		detail

Sample Output

show interfaces load-balancing

```
user@host> show interfaces load-balancing
```

```
Interface  State       Last change  Members  HA Model
ams0       Up          00:10:02     4        Many-to-One
```

show interfaces load-balancing detail

`user@host>` **show interfaces load-balancing detail**

```
Load-balancing interfaces detail
Interface        : ams0
  State          : Up
  Last change    : 00:10:23
  Member count   : 4
  HA Model       : Many-to-One
  Members        :
      Interface    Weight   State
      mams-4/0/0   10       Active
      mams-4/1/0   10       Active
      mams-5/0/0   10       Active
      mams-5/1/0   10       Backup
  Sync-state     :
      Interface    Status
      mams-4/0/0   Unknown
      mams-4/1/0   Unknown
      mams-5/0/0   Unknown
```

show interfaces load-balancing detail (Specific Interface)

`user@host>` **show interfaces load-balancing ams0 detail**

```
Load-balancing interfaces detail
Interface        : ams0
  State          : Up
  Last change    : 00:11:28
  Member count   : 4
  HA Model       : Many-to-One
  Members        :
      Interface    Weight   State
      mams-4/0/0   10       Active
      mams-4/1/0   10       Active
      mams-5/0/0   10       Active
      mams-5/1/0   10       Backup
```

```
Sync-state     :
    Interface    Status
    mams-4/0/0   Unknown
    mams-4/1/0   Unknown
    mams-5/0/0   Unknown
```

show services alg conversations

Syntax

```
show services alg conversations
<brief >
<application-protocol protocol>
<extensive>
<interface interface-name>
```

Release Information

Command introduced in Junos OS Release 10.4.
h323 option introduced in Junos OS Release 17.1.
ike-esp-nat option introduced in Junos OS Release 17.1.

Description

Display ALG information for Junos OS extension-provider packages.

> **NOTE:** In Junos OS releases earlier than 12.3, the extension-provider packages were variously referred to as Junos Services Framework (JSF), MP-SDK, and eJunos.

Options

none—Display standard information about all Junos OS extension-provider packages ALG sessions.

brief —(Optional) Display the specified level of output.

application-protocol—(Optional) Display information about one of the following application protocols:

- **dce-rpc**—Distributed Computing Environment-Remote Procedure Call protocols
- **dce-rpc-portmap**—Distributed Computing Environment-Remote Procedure Call protocols portmap service
- **dns**—Domain Name System protocol
- **ftp**—File Transfer Protocol
- **h323**—H323 protocol
- **ike-esp-nat**—IKE ALG
- **pptp**—Point-to-Point Tunneling Protocol
- **rpc**—Remote Procedure Call protocol

rpc-portmap—Remote Procedure Call protocol portmap service

rtsp—Real-Time Streaming Protocol

rsh—Remote Shell

sip—Session Initiation Protocol

sql—SQLNet

talk—Talk Program

extensive—Display extensive information

interface *interface-name*—(Optional) Display information about a particular interface.

Required Privilege Level
view

List of Sample Output
show services alg conversations on page 581
show services alg conversations brief on page 581
show services alg conversations extensive on page 582
show services alg conversations application-protocol on page 582
show services alg conversations interface on page 586

Output Fields
Table 30 on page 580 lists the output fields for the **show services alg conversations** command. Output fields are listed in the approximate order in which they appear.

Table 30: show services alg conversations Output Fields

Field Name	Field Description
Interface	Name of the interface.
ALG	Name of the ALG in use.
Number of conversations	Number of ALG conversations open. A conversation is a group of parent and child sessions.
Group ID	Numeric identifier for the session.
Parent session status	Status of the parent session: • **Active** • **Closed**

Table 30: show services alg conversations Output Fields *(continued)*

Field Name	Field Description
Parent session ID	Numeric identifier for the parent session.
Protocol	Protocol used for the parent session.
Forward Flow	The source and destination prefixes for forward flow.
Reverse Flow	The source and destination prefixes for reverse flow.
Child session status	Status of the child session: • **Active** • **Closed**
Child session ID	Numeric identifier for the child session.
Number of Resources	Total number of active child sessions associated with the parent session.
Resource ID	Numeric identifier for the resources associated with the parent session.
Protocol	Protocol used for the child session.

Sample Output

show services alg conversations

`user@host>` **show services alg conversations**

```
Interface name: ms-2/1/0
ALG : SQLV2 ALG, State : active
Number of conversations: 1
Parent session status: closed
Child session : 1, protocol: TCP
Forward Flow : {10.50.50.2:37244 -> 10.40.40.10:4334}
Reverse Flow : {10.40.40.10:4334 -> 10.11.11.10:37244}
```

show services alg conversations brief

The output for the **show services alg conversations brief** command is identical to that for the **show services alg conversations** command. For sample output, see show services alg conversations on page 581.

show services alg conversations extensive

user@host> **show services alg conversations extensive**

```
Interface name: ms-1/0/0
ALG : H323 ALG, State : active
Number of conversations: 1
Group ID : 3499913712, State : active
Parent session state: active
Parent session ID: 33554433, protocol : TCP
Forward Flow : {198.51.100.2:30000 -> 192.0.2.2:1720}
Reverse Flow : {192.0.2.2:1720 -> 203.0.113.1:57730}
Number of resources: 4
Resource ID: 3499927656, State: active
Number of sessions: 1
Child session ID: 33554436, protocol : UDP
Forward Flow : {198.51.100.2:5086 -> 192.0.2.2:5090}
Reverse Flow : {192.0.2.2:5090 -> 203.0.113.3:55916}
Resource ID: 3499927376, State: active
Number of sessions: 1
Child session ID: 67108867, protocol : UDP
Forward Flow : {192.0.2:5091 -> 203.0.113.3:55917}
Reverse Flow : {198.51.100.2:5087 -> 192.0.2.2:5091}
Resource ID: 3499926816, State: active
Number of sessions: 1
Child session ID: 33554438, protocol : UDP
Forward Flow : {198.51.100.2:5089 -> 192.0.2.2:5093}
Reverse Flow : {192.0.2.2:5093 -> 203.0.113.2:63435}
Resource ID: 3499926536, State: active
Number of sessions: 1
Child session ID: 33554437, protocol : UDP
Forward Flow : {198.51.100.2:5088 -> 192.0.2.2:5092}
Reverse Flow : {192.0.2.2:5092 -> 203.0.113.2:63434}
ALG : RAS ALG, State : active
Number of conversations: 1
Group ID : 799037592, State : active
Parent session state: closed
Number of resources: 0
```

show services alg conversations application-protocol

This command has the same output for the rpc, dce-rpc, rpc-portmap and dce-rpc-portmap ALGs.

user@router> **show services alg conversations application-protocol rpc**

```
Interface name: ms-1/1/0
ALG : SUNRPC ALG, State : active
  Number of conversations: 2
    Parent session status: closed
      Child session : 1, protocol: UDP
        Forward Flow : {192.168.203.198:1019 -> 192.168.203.194:2049}
        Reverse Flow : {192.168.203.194:2049 -> 192.168.203.198:1019}
      Child session : 2, protocol: UDP
        Forward Flow : {192.168.203.198:36595 -> 192.168.203.194:2049}
        Reverse Flow : {192.168.203.194:2049 -> 192.168.203.198:36595}
    Parent session status: closed
      Child session : 1, protocol: UDP
        Forward Flow : {192.168.203.198:954 -> 192.168.203.194:613}
        Reverse Flow : {192.168.203.194:613 -> 192.168.203.198:954}
      Child session : 2, protocol: UDP
        Forward Flow : {192.168.203.198:53836 -> 192.168.203.194:613}
        Reverse Flow : {192.168.203.194:613 -> 192.168.203.198:53836}
```

user@router> **show services alg conversations application-protocol dns**

```
Interface name: ms-1/1/0
ALG : DNS ALG, State : active
  Number of conversations: 1
    Parent session status: closed
      Child session : 1, protocol: UDP
        Forward Flow : {192.168.203.198:1019 -> 192.168.203.194:2049}
        Reverse Flow : {192.168.203.194:2049 -> 192.168.203.198:1019}
```

user@router> **show services alg conversations application-protocol ftp**

```
Interface name: ms-1/1/0
ALG : DNS ALG, State : active
  Number of conversations: 1
    Parent session status: closed
      Child session : 1, protocol: UDP
        Forward Flow : {192.168.203.198:53836 -> 192.168.203.194:613}
        Reverse Flow : {192.168.203.194:613 -> 192.168.203.198:53836}
```

user@router> **show services alg conversations application-protocol ike-esp-nat**

```
Interface name: ms-2/2/0
ALG : IKE ALG, State : active
  Number of conversations: 1
    Parent session status: closed
    Child session : 1, protocol: ESP
      Forward Flow : {198.51.100.101:2623 -> 203.0.113.1:46838}
      Reverse Flow : {192.0.2.101:46838 -> 198.51.10.101:2623}
    Child session : 2, protocol: ESP
      Forward Flow : {192.0.2.101:2666 -> 198.51.10.101:57882}
      Reverse Flow : {198.51.10.101:57882 -> 203.0.113.1:2666}
```

user@router> **show services alg conversations application-protocol pptp**

```
Interface name: ms-2/0/0
ALG : PPTP ALG, State : active
  Number of conversations: 1
    Parent session status: active
    Parent session : 1, protocol : TCP
      Forward Flow : {192.0.2.10:1511 -> 198.51.100.10:1723}
      Reverse Flow : {198.51.100.10:1723 -> 192.0.2.10:1511}
      Child session : 1, protocol: GRE
        Forward Flow : {192.0.2.10:0 -> 198.51.100.10:49913}
        Reverse Flow : {198.51.100.10:49913 -> 192.0.2.10:65001}
      Child session : 2, protocol: GRE
        Forward Flow : {198.51.100.10:0 -> 192.0.2.10:0}
        Reverse Flow : {192.0.2.10:0 -> 198.51.100.10:65000}
```

user@router> **show services alg conversations application-protocol rtsp**

```
Interface name: ms-0/1/0
ALG : RTSP ALG, State : active
  Number of conversations: 1
    Parent session : 1, protocol : TCP
      Forward Flow : {198.51.100.2:3985 -> 192.0.2.1:554}
      Reverse Flow : {203.0.113.2:554 -> 198.51.100.2:3985}
    Child session : 1, protocol: UDP
      Forward Flow : {203.0.113.2:35859 -> 198.51.100.2:38159}
      Reverse Flow : {198.51.100.2:38159 -> 192.0.2.1:35859}
    Child session : 2, protocol: UDP
      Forward Flow : {203.0.113.2:35859 -> 198.51.100.2:37391}
      Reverse Flow : {198.51.100.2:37391 -> 192.0.2.1:35859}
```

user@router> **show services alg conversations application-protocol rsh**

```
Interface name: ms-0/1/0
ALG : RSH ALG, State : active
  Number of conversations: 1
    Parent session : 1, protocol : TCP
      Forward Flow : {198.51.100.2:3985 -> 192.0.2.1:554}
      Reverse Flow : {203.0.113.2:554 -> 198.51.100.2:3985}
    Child session : 1, protocol: UDP
      Forward Flow : {203.0.113.2:35859 -> 198.51.100.2:38159}
      Reverse Flow : {198.51.100.2:38159 -> 192.0.2.1:35859}
```

user@router> **show services alg conversations application-protocol sip**

```
Interface name: ms-1/1/0
ALG : SIP ALG, State : active
  Number of conversations: 1
    Parent session status: active
    Parent session : 1, protocol : UDP
      Forward Flow : {192.0.2.2:5060 -> 198.51.100.2:5060}
      Reverse Flow : {198.51.100.2:5060 -> 203.0.113.2:5060}
    Child session : 1, protocol: UDP
        Forward Flow : {192.0.2.2:6000 -> 198.51.100.2:12442}
        Reverse Flow : {198.51.100.2:12442 -> 203.0.113.2:6000}
```

user@router> **show services alg conversations application-protocol sql**

```
Interface name: ms-2/0/0
ALG : SQLV2 ALG, State : active
  Number of conversations: 1
    Parent session : 1, protocol : 0
      Forward Flow : {0.0.0.0:0 -> 0.0.0.0:0}
      Reverse Flow : {0.0.0.0:0 -> 0.0.0.0:0}
    Child session : 1, protocol: TCP
      Forward Flow : {203.0.113.2:19099 -> 198.51.100.10:32773}
      Reverse Flow : {198.51.100.10:32773 -> 192.0.2.1:19099}
```

user@router> **show services alg conversations application-protocol talk**

```
Interface name: ms-0/1/0
ALG : TALK ALG, State : active
  Number of conversations: 1
    Parent session : 1, protocol : TCP
      Forward Flow : {198.51.2:3985 -> 192.0.2.1:554}
```

```
      Reverse Flow : {203.0.113.2:554 -> 198.51.2:3985}
    Child session : 1, protocol: UDP
      Forward Flow : {203.0.113.2:35859 -> 198.51.2:38159}
      Reverse Flow : {198.51.2:38159 -> 192.0.2.1:35859}
```

show services alg conversations interface

user@router> **show services alg conversations interface ms-1/1/0**

```
ALG : FTP ALG, State : active
Number of conversations: 1
Parent session status: active
Parent session : 1, protocol : TCP
Forward Flow : {10.20.20.10:47164 -> 10.30.30.30:21}
```

show services alg statistics

Syntax

```
show services alg statistics
<application-protocol protocol>
<interface interface-name>
```

Release Information

Command introduced in Junos OS Release 10.4.
h323 option introduced in Junos OS Release 17.1.
ike-esp-nat option introduced in Junos OS Release 17.1.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display ALG statistics for Junos OS extension-provider packages.

> **NOTE:** In Junos OS releases earlier than 12.3, the extension-provider packages were variously referred to as Junos Services Framework (JSF), MP-SDK, and eJunos.

Options

application-protocol—(Optional) Display statistics for one of the following application protocols:

- **dce-rpc**—Distributed Computing Environment-Remote Procedure Call protocols
- **dce-rpc-portmap**—Distributed Computing Environment-Remote Procedure Call protocols portmap service
- **dns**—Domain Name System protocol
- **ftp**—File Transfer Protocol
- **h323**—H323 protocol
- **ike-esp-nat**—IKE ALG
- **pptp**—Point-to-Point Tunneling Protocol
- **rpc**—Remote Procedure Call protocol
- **rpc-portmap**—Remote Procedure Call protocol portmap service
- **rtsp**—Real-Time Streaming Protocol

rsh—Remote Shell

sip—Session Initiation Protocol

sql—SQLNet

talk—Talk Program

tftp—Trivial File Transfer Protocol

interface *interface-name*—(Optional) Display information about a particular interface.

Required Privilege Level
view

List of Sample Output
show services alg statistics application-protocol on page 597
show services alg statistics interface on page 602

Output Fields
Table 31 on page 588 lists the output fields for the **show services alg statistics** command. Output fields are listed in the approximate order in which they appear.

Table 31: show services alg statistics Output Fields

Field Name	Field Description
Interface	Name of the interface.
ALG statistics	Name of the ALG for which the statistics are displayed.
Packets with wrong header	Number of packets with wrong header.
Non epm 3.0 packets	Number of non epm 3.0 packets.
Packets with type mismatch	Number of packets with type mismatch.
Packets with id mismatch	Number of packets with id mismatch.
Packets with call mismatch	Number of packets with call mismatch.

Table 31: show services alg statistics Output Fields *(continued)*

Field Name	Field Description
Packets fragmented	Number of packets fragmented.
Packets queued	Number of packets queued.
Packets dropped	Number of packets dropped.
Packets released	Number of packets released.
Invalid packets received	Number of invalid packets received.
Reply packets received	Number of reply packets received.
Oversized packets received	Number of oversized packets received.
ALG parser errors	Number of parsing failed errors.
Packets translated	Number of packets translated.
H323 total calls	Total number of audio/video calls that have been established.
H323 active calls	Current number of active H.323 calls.
H323 gate install failed	Number of gate installation failures for child sessions.
H323 pinhole opened too late	Number of H323 parent sessions that released the resources before pinhole creation.
H323 pinhole hit dropped	Number of H323 gate hits that have been dropped.
H323 gate timeout failed	Number of gate timeout failures due to an error.
H323 packets dropped	Number of packets dropped.

Table 31: show services alg statistics Output Fields *(continued)*

Field Name	Field Description
H323 get virtual ctx failed	Number of failures to get the session virtualization ctx information.
H323 obj alloc failed	Number of memory allocation failures for H323 session cookie.
H323 group alloc failed	Number of H323 session resource/group memory allocation failures.
H323 ce alloc failed	Number of H323 session call entity object memory allocation failures.
H323 Q931 decode error	Number of errors in decoding Q931 packets.
H323 H245 decode error	Number of errors in decoding H245 packets.
H323 Q931 process error	Number of errors in processing Q931 packets.
H323 H245 process error	Number of errors in processing H245 packets.
H323 do nat failed	Number of NAT translation failures after packet decode.
H323 do rm failed	Number of H323 vsip table creation failures.
H323 dscp marked	Number of Differentiated Services code point (DSCP) packets marked.
H323 dscp marked error	Number of Differentiated Services code point (DSCP) packets marked as errors.
RAS obj alloc failed	Number of RAS session object memory allocation failures.
RAS group alloc failed	Number of RAS session group memory allocation failures.

Table 31: show services alg statistics Output Fields *(continued)*

Field Name	Field Description
RAS packets dropped	Number of RAS packets dropped.
RAS packet exists in cookie error	Number of times that some packets exist in existing RAS sessions cookie.
RAS decode error	Number of errors in decoding RAS packets.
RAS flood error	Number of gatekeeper requests that were dropped because of too many RAS request messages.
RAS do nat failed	Number of RAS session payload IP translation errors.
PPTP Objects Active	Number of PPTP objects active.
PPTP Objects Total	Number of PPTP objects in total.
PPTP Objects Error	Number of PPTP objects having errors.
PPTP ASL Group Active	Number of PPTP groups active.
PPTP ASL Group Total	Number of PPTP groups in total.
PPTP ASL Group Error	Number of PPTP groups having errors.
PPTP Packets received	Number of PPTP packets received.
PPTP Packets Discarded	Number of PPTP packets discarded.
PPTP Packets Free	Number of PPTP packets freed.

Table 31: show services alg statistics Output Fields *(continued)*

Field Name	Field Description
PPTP OCRQ Received	Number of Outgoing Call Requests received.
PPTP OCRQ Discarded	Number of Outgoing Call Requests discarded.
PPTP OCRP Received	Number of Outgoing Call Packets received.
PPTP OCRP Discarded	Number of Outgoing Call Packets discarded.
PPTP WEN(SLI) Received	Number of WEN (SLI) packets received.
PPTP WEN(SLI) Discarded	Number of WEN (SLI) packets discarded.
PPTP CCRQ-CDSN Received	Number of Call Clear Requests received.
PPTP CDSN Received	Number of Call Disconnection Notifications received.
PPTP CCRQ-CDSN Discarded	Number of Call Clear Requests discarded.
PPTP Session Create	Number of PPTP sessions created.
PPTP Session Destroy	Number of PPTP sessions destroyed.
PPTP Gate Create	Number of PPTP gates created.
PPTP Gate Hit	Number of PPTP gates hit.

Table 31: show services alg statistics Output Fields *(continued)*

Field Name	Field Description
PPTP Gate Timeout	Number of PPTP gates timed out.
PPTP NAT Events	Number of NAT events.
PPTP DO-NAT Total	Number of DO NATs in total.
PPTP DO-NAT Ok	Number of DO NATs okay.
PPTP DO-NAT Pending	Number of DO NATs pending.
PPTP DO-NAT Fail	Number of DO NATs failed.
PPTP DO-RM Total	Number of DO RMs in total.
PPTP DO-RM Ok	Number of DO RMs okay.
PPTP DO-RM Pending	Number of DO RMs pending.
PPTP DO-RM Fail	Number of DO RMs failed.
PPTP NAT-ASYNC Total	Number of NAT-ASYNCs in total.
PPTP NAT-ASYNC Invalid	Number of NAT-ASYNCs invalid.
PPTP NAT-ASYNC Error1	Number of NAT-ASYNCs error1.

Table 31: show services alg statistics Output Fields *(continued)*

Field Name	Field Description
PPTP NAT-ASYNC Error2	Number of NAT-ASYNCs error2.
PPTP ASL Hole Ok	Number of ASYNC holes okay.
PPTP ASL Hole Error	Number of ASYNC hole errors.
PPTP ASL First Hit	Number of ASYNC holes first hit.
PPTP ASL Hole Timeout	Number of ASYNC holes timed out.
PPTP ASL Invalid	Number of ASYNC holes invalid.
PPTP NAT Ctx Free	Number of NAT Ctxs free.
PPTP Create Resource Error	Number of create resource errors.
PPTP set S2C hole error	Number of server-to-client hole errors.
PPTP set C2S hole error	Number of client-to-server hole errors.
PPTP lnbrk error	Number of PPTP lnbrk errors.
PPTP Mpool Create Error	Number of Mpool create errors.
PPTP RM register client Error	Number of client registration errors.
Call packet with rpcbind2	Number of call packets with rpcbind2.

Table 31: show services alg statistics Output Fields *(continued)*

Field Name	Field Description
Call packet with rpcbind3	Number of call packets with rpcbind3.
Call packet with rpcbind4	Number of call packets with rpcbind4.
Invalid rpcbind call	Number of invalid rpcbind calls.
Reply packet with rpcbind2	Number of reply packets with rpcbind2.
Reply packet with rpcbind3	Number of reply packets with rpcbind3.
Reply packet with rpcbind4	Number of reply packets with rpcbind4.
Invalid rpcbind reply	Number of invalid rpcbind replies.
Packets exceeded maximum length	Number of packets exceeding maximum length.
Packets dropped by ALG	Number of packets dropped by the ALG.
Number of describe messages received	Number of describe messages received.
Number of setup messages received	Number of setup messages received.
Number of teardown messages received	Number of teardown messages received.

Table 31: show services alg statistics Output Fields *(continued)*

Field Name	Field Description
Total packets dropped	Total number of SIP packets dropped.
Unexpected requests dropped	Number of unexpected requests dropped.
Unexpected responses dropped	Number of unexpected responses dropped.
Packets DSCP marked	Number of Differentiated Services code point (DSCP) packets marked.
Packets DSCP marked error	Number of Differentiated Services code point (DSCP) packets marked as error.
NAT errors	Number of Network Address Translation errors.
RR headers exceeded maximum limits	Number of RR headers exceeded maximum limits.
Contact headers exceeded maximum limits	Number of contact headers exceeded maximum limits.
Invite dropped due to call limit	Number of invites dropped due to call limit.
Messages not processed by sip stack	Number of messages not processed by sip stack.
Unknown packets dropped	Number of unknown packets dropped.
Decoding Errors	Number of decoding errors.
Packets received in out of state	Number of packets received in out of state.

Table 31: show services alg statistics Output Fields *(continued)*

Field Name	Field Description
Packets received	Number of packets received.
Packets freed by ALG	Number of packets freed by ALG.
Gate fail errors	Number of gate fail errors.
Lookup packets	Number of lookup packets.
Announce packets	Number of announce packets.
Delete packets	Number of delete packets.
Number of packets received	Number of packets received.
Number of Invalid packets	Number of invalid packets.
Total number of sessions	Total number of sessions.
Number of actives sessions	Number of active sessions.

Sample Output

show services alg statistics application-protocol

While the statistics are the same for dce-rpc and dce-rpc-portmap, both rpc and rpc-portmap have the same output too.

`user@router>` **show services alg statistics application-protocol dce-rpc**

```
Interface name: ms-1/1/0
  DCE-RPC ALG statistics:
    Packets with wrong header : 0
    Non epm 3.0 packets       : 0
```

```
    Packets with type mismatch: 0
    Packets with id mismatch  : 0
    Packets with call mismatch: 0
    Packets fragmented        : 0
    Packets queued            : 0
    Packets dropped           : 0
    Packets released          : 0
```

user@router> **show services alg statistics application-protocol dns**

```
Interface name: ms-2/0/0
  DNS ALG statistics:
    Invalid packets received   : 0
    Reply packets received     : 3509
    Oversized packets received : 0
```

user@router> **show services alg statistics application-protocol ftp**

```
Interface name: ms-1/1/0
FTP ALG statistics:
Packets dropped           : 0
ALG parser errors         : 0
Packets translated        : 0
```

user@router> **show services alg conversations application-protocol h323**

```
Interface name: ms-1/0/0
H323 ALG statistics:
  H323 total calls: 1
  H323 active calls: 1
  H323 gate install failed: 0
  H323 pinhole opened too late: 0
  H323 pinhole hit dropped: 0
  H323 gate timeout failed: 0
  H323 packets dropped: 0
  H323 get virtual ctx failed: 0
  H323 obj alloc failed: 0
  H323 group alloc failed: 0
  H323 ce alloc failed: 0
  H323 Q931 decode error: 0
  H323 H245 decode error: 0
  H323 Q931 process error: 0
```

```
  H323 H245 process error: 0
  H323 do nat failed: 0
  H323 do rm failed: 0
  H323 dscp marked: 0
  H323 dscp marked error: 0
  RAS obj alloc failed: 0
  RAS group alloc failed: 0
  RAS packets dropped: 0
  RAS packet exists in cookie error: 0
  RAS decode error: 0
  RAS flood error: 0
  RAS do nat failed: 0
```

user@router> **show services alg statistics application-protocol ike-esp-nat**

```
Interface name: ms-4/1/0
  IKE ESP ALG statistics:
    Session interests processed: 2
    Sessions created: 2
    Sessions destroyed: 1
    Control sessions created: 2
    Control sessions destroyed: 1
    Data sessions created: 0
    Data sessions destroyed: 0
    Gates created: 4
    Gate hits: 0
    Gates timedout: 4
```

user@router> **show services alg statistics application-protocol pptp**

```
Interface name: ms-2/0/0
  PPTP ALG statistics:
    PPTP Objects Active  : 1
    PPTP Objects Total  : 1
    PPTP Objects Error  : 0
    PPTP ASL Group Active  : 1
    PPTP ASL Group Total  : 1
    PPTP ASL Group Error  : 0
    PPTP Packets received  : 11
    PPTP Packets Discarded  : 0
    PPTP Packets Free  : 0
    PPTP OCRQ Received  : 1
    PPTP OCRQ Discarded  : 0
```

```
    PPTP OCRP Received  : 1
    PPTP OCRP Discarded  : 0
    PPTP WEN(SLI) Received  : 3
    PPTP WEN(SLI) Discarded  : 0
    PPTP CCRQ-CDSN Received  : 0
    PPTP CDSN Received  : 0
    PPTP CCRQ-CDSN Discarded  : 0
    PPTP Session Create  : 3
    PPTP Session Destroy  : 0
    PPTP Gate Create  : 0
    PPTP Gate Hit  : 2
    PPTP Gate Timeout  : 0
    PPTP NAT Events  : 0
    PPTP DO-NAT Total  : 1
    PPTP DO-NAT Ok  : 1
    PPTP DO-NAT Pending  : 0
    PPTP DO-NAT Fail  : 0
    PPTP DO-RM Total  : 1
    PPTP DO-RM Ok  : 2
    PPTP DO-RM Pending  : 0
    PPTP DO-RM Fail  : 0
    PPTP NAT-ASYNC Total  : 0
    PPTP NAT-ASYNC Invalid  : 0
    PPTP NAT-ASYNC Error1  : 0
    PPTP NAT-ASYNC Error2  : 0
    PPTP ASL Hole Ok  : 2
    PPTP ASL Hole Error  : 0
    PPTP ASL First Hit  : 2
    PPTP ASL Hole Timeout  : 0
    PPTP ASL Invalid  : 0
    PPTP NAT Ctx Free  : 0
    PPTP Create Resource Error  : 0
    PPTP set S2C hole error  : 0
    PPTP set C2S hole error  : 0
    PPTP lnbrk error  : 0
    PPTP Mpool Create Error  : 0
    PPTP RM register client Error  : 0
```

user@router> **show services alg statistics application-protocol rpc**

```
Interface name: ms-1/1/0
  RPC ALG statistics:
    Call packet with rpcbind2 : 2
    Call packet with rpcbind3 : 0
```

```
    Call packet with rpcbind4 : 0
    Invalid rpcbind call      : 0
    Reply packet with rpcbind2: 2
    Reply packet with rpcbind3: 0
    Reply packet with rpcbind4: 0
    Invalid rpcbind reply     : 0
    Packets fragmented        : 0
    Packets dropped           : 0
    Packets released          : 0
```

user@router> **show services alg statistics application-protocol rtsp**

```
Interface name: ms-0/1/0
  RTSP ALG statistics:
    Packets exceeded maximum length : 0
    Packets dropped by ALG : 0
    Number of describe messages received : 8
    Number of setup messages received : 30
    Number of teardown messages received : 7
```

user@router> **show services alg statistics application-protocol rsh**

```
Interface name: ms-2/0/0
  RSH ALG statistics:
    Invalid packets received   : 0
    Packets dropped by ALG   : 0
    ALG parser errors  : 0
    Packets freed by ALG     : 0
```

user@router> **show services alg statistics application-protocol sip**

```
Interface name: ms-2/0/0
  SIP ALG statistics:
    Total packets dropped  : 0
    Unexpected requests dropped : 0
    Unexpected responses dropped : 0
    Packets DSCP marked  : 0
    Packets DSCP marked error  : 0
    NAT errors : 0
    RR headers exceeded maximum limits : 0
    Contact headers exceeded maximum limits  : 0
```

```
    Invite dropped due to call limit : 0
    Messages not processed by sip stack : 0
    Unknown packets dropped  : 0
    Decoding Errors : 0
    Packets received in out of state  : 0
```

user@router> **show services alg statistics application-protocol sql**

```
Interface name: ms-2/0/0
  SQLNET ALG statistics:
    Packets received  : 5
    ALG parser errors  : 0
    Packets freed by ALG : 0
    Gate fail errors  : 0
```

user@router> **show services alg statistics application-protocol talk**

```
Interface name: ms-2/0/0
  TALK ALG statistics:
    Lookup packets  : 5
    Announce packets  : 0
    Delete packets : 0
```

user@router> **show services alg statistics application-protocol tftp**

```
Interface name: ms-0/0/0
  TFTP ALG statistics:
    Number of packets received : 0
    Number of Invalid packets  : 0
    Total number of sessions :   0
    Number of active sessions:   0
```

show services alg statistics interface

user@router> **show services alg statistics interface ms-1/1/0**

```
Interface name: ms-1/1/0
FTP ALG statistics:
Packets dropped           : 0
```

```
ALG parser errors         : 0
Packets translated        : 0
```

show services cos statistics (Next Gen Services)

Syntax

```
show services cos statistics
<brief | detail | extensive>
<diffserv | forwarding-class>
<interface interface-name>
<service-set service-set-name>
<summary>
```

Release Information

Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display the mapping of class-of-service (CoS) code point aliases to corresponding bit patterns and the mapping of forwarding class names to queue numbers as configured in CoS services for Next Gen Services services PICs.

Options

none—Display all services CoS statistics.

brief | detail | extensive—(Optional) Display the specified level of output.

diffserv | forwarding-class—(Optional) Display only the selected information, either DiffServ codepoints or forwarding classes.

interface *interface-name*—(Optional) Display statistics for the specified interface only.

service-set *service-set-name*—(Optional) Display statistics for the specified service set only.

summary—(Optional) Display summary of statistics on a per-interface basis.

Required Privilege Level

view

List of Sample Output

show services cos statistics on page 605
show services cos statistics brief on page 607
show services cos statistics detail on page 607
show services cos statistics extensive on page 607

Output Fields

Table 32 on page 605 describes the output fields for the **show services cos statistics** command. Output fields are listed in the approximate order in which they appear.

Table 32: show services cos statistics Output Fields

Field Name	Field Description	Level of Output
Interface	Name of interface.	All levels
Service set	Name of service set.	All levels
DSCP	DiffServ code point bit pattern.	All levels
Packets in	Number of packets received.	All levels
Packets out	Number of packets transmitted.	All levels
Forwarding class	Forwarding class queue number.	All levels

Sample Output

show services cos statistics

`user@host>` **show services cos statistics details**

```
Interface: vms-0/2/0, Service set: ss1
DSCP               Packets in          Packets out
DSCP              Packets in          Packets out
000000                     0                    0
000001                     0                    0
000010                     0                    0
000011                     0                    0
000100                     0                    0
000101                     0                    0
000110                     0                    0
000111                     0                    0
001000                     0                    0
001001                     0                    0
001010                     0                    0
001011                     0                    0
001100                     0                    0
001101                     0                    0
```

```
001110                  0                  0
001111                  0                  0
010000                  0                  0
010001                  0                  0
010010                  0                  0
010011                  0                  0
010100                  0                  0
010101                  0                  0
010110                  0                  0
010111                  0                  0
011000                  0                  0
011001                  0                  0
011010                  0                  0
011011                  0                  0
011100                  0                  0
011101                  0                  0
011110                  0                  0
011111                  0                  0
100000                  0                  0
100001                  0                  0
100010                  0                  0
100011                  0                  0
100100                  0                  0
100101                  0                  0
100110                  0                  0
100111                  0                  0
101000                  0                  0
101001                  0                  0
101010                  0                  0
101011                  0                  0
101100                  0                  0
101101                  0                  0
101110                  0                  0
101111                  0                  0
110000                  0                  0
110001                  0                  0
110010                  0                  0
110011                  0                  0
110100                  0                  0
110101                  0                  0
110110                  0                  0
110111                  0                  0
111000                  0                  0
111001                  0                  0
```

```
111010                          0                    0
111011                          0                    0
111100                          0                    0
111101                          0                    0
111110                          0                    0
111111                          0                    0
Forwarding class           Packets in          Packets out
0                                  0                    0
1                                  0                    0
2                                  0                    0
3                                  0                    0
4                                  0                    0
5                                  0                    0
6                                  0                    0
7                                  0                    0
8                                  0                    0
9                                  0                    0
10                                 0                    0
11                                 0                    0
12                                 0                    0
13                                 0                    0
14                                 0                    0
15                                 0                    0
```

show services cos statistics brief

The output for the **show services cos statistics brief** command is identical to that for the **show services cos statistics** command.

show services cos statistics detail

The output for the **show services cos statistics detail** command is identical to that for the **show services cos statistics** command.

show services cos statistics extensive

The output for the **show services cos statistics extensive** command is identical to that for the **show services cos statistics** command.

show services inline ip-reassembly statistics

Syntax

```
show services inline ip-reassembly statistics
<fpc fpc-slot>
<pfe pfe-slot>
```

Release Information

Statement introduced in Junos OS Release 12.2X49.

Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display the inline IP reassembly statistics for the Packet Forwarding Engines on one or more MPCs or Next Gen Services MX-SPC3 services card. Inline IP reassembly statistics are collected at the Packet Forwarding Engine level.

> **NOTE:** For more information on MPCs that support inline IP reassembly, refer to *Protocols and Applications Supported on the MPC1E for MX Series Routers*.

Options

none—Displays standard inline IP reassembly statistics for all MPCs or MX-SPC3 services card.

fpc *fpc*—(Optional) Displays inline IP reassembly statistics for the specified MPC or MX-SPC3 services card.

> **NOTE:** Starting with Junos OS Release 14.2, the FPC option is not displayed for MX Series routers that do not contain switch fabrics, such as MX80 and MX104 routers.

pfe *pfe*—(Optional) Displays inline IP reassembly for the specified Packet Forwarding Engine slot. You must specify an FPC slot number before specifying a Packet Forwarding Engine slot.

Required Privilege Level

view

RELATED DOCUMENTATION

ip-reassembly

List of Sample Output

show services inline ip-reassembly statistics fpc on page 612

Output Fields

Table 33 on page 609 lists the output fields for the **show services inline ip-reassembly statistics** command. Output fields are listed in the approximate order in which they appear.

Table 33: show services inline ip-reassembly statistics Output Fields

Field Name	Field Description
FPC	MPC or MX-SPC3 services card slot number for which the statistics are displayed.
PFE	Packet Forwarding Engine on the MPC or MX-SPC3 services card for which the statistics are displayed.
NOTE: The output fields displayed (per Packet Forwarding Engine) are arranged in a logical sequence from top to bottom to enable users to understand how the inline IP reassembly statistics are gathered. The information about total number of fragments received is displayed first, and then the information about the reassembled packets and those pending reassembly are displayed. Then, the reasons why the fragments were dropped or not reassembled are displayed. Finally, the information about the fragments reassembled, fragments dropped, and fragments sent to the backup user plane PIC (services PIC) are displayed.	
Total Fragments Received	Total number of fragments received and the current rate of fragments received for inline IP reassembly. The following information is also displayed: • **First Fragments**—Number of first fragments received and current rate of first fragments processed. • **Intermediate Fragments**—Number of intermediate fragments received and current rate of intermediate fragments processed. • **Last Fragments**—Number and rate of last fragments received. **NOTE:** Current rate refers to the current number of fragments processed per second in the instant preceding the command's execution.
Total Packets Reassembled	Total number of packets reassembled and current rate, in the instant preceding the command's execution, at which the packets are reassembled.

Table 33: show services inline ip-reassembly statistics Output Fields *(continued)*

Field Name	Field Description
Approximate Packets Pending Reassembly	Approximate number of packets pending reassembly.
Fragments Dropped Reasons	Total number of fragments dropped reasons and the current rate of total fragment dropped reasons. The number of dropped reasons and rate corresponding to each of the following reasons are also displayed: • Buffers not available • Fragments per packet exceeded • Packet length exceeded • Record insert error • Record in use error • Duplicate first fragments • Duplicate last fragments • Missing first fragment **NOTE:** • These fields indicate *why* a fragment was dropped. When a fragment is dropped, the corresponding reason field is incremented by 1. For example, when a fragment is dropped because the memory runs out, the **Buffers not available** field increases by 1. • The maximum number of fragments allowed for reassembly is 16. If the interface encounters a 17th fragment, it drops the entire packet and increments the **Fragment per packet exceeded** field by 17. • Current rate refers to the current number of fragment dropped reasons per second in the instant preceding the command's execution.
Reassembly Errors Reasons	Number of errors during reassembly and the current rate of reassembly errors. The number of errors and the rate for each of the following types of errors are also displayed: • Fragment not found • Fragment not in sequence • ASIC errors **NOTE:** Current rate refers to the current number of reassembly errors processed per second in the instant preceding the command's execution.

Table 33: show services inline ip-reassembly statistics Output Fields *(continued)*

Field Name	Field Description
Aged out packets	Number of aged out packets and the current number of packets aged out per second in the instant preceding the command's execution. **NOTE:** In some cases, aged out packets can refer to aged out fragments. If previous fragments of the packet have already been discarded then linking of the dropped fragments to the aged out fragments cannot occur.
Total Fragments Successfully Reassembled	Number of fragments successfully reassembled and the current number of fragments reassembled per second in the instant preceding the command's execution.
Total Fragments Dropped	Total number of fragments dropped and the current rate of total number of fragments dropped. The number of fragments dropped and rate corresponding to each of the following reasons are also displayed: • Buffers not available • Fragments per packet exceeded • Packet length exceeded • Record insert error • Record in use error • Duplicate first fragments • Duplicate last fragments • Missing first fragment • Fragment not found • Fragment not in sequence • ASIC errors • Aged out fragments
Total fragments punted to UPIC	Number of fragments sent to the backup user plane PIC (services PIC) and current rate of fragments sent per second in the instant preceding the command's execution

The following information applies to the **Total Fragments Dropped** field.

- These fields indicate *how many* of the packet fragments received were then dropped due to a particular reason.

For example, consider a packet that has 10 fragments, 9 of which have been received and stored in memory. When the tenth fragment arrives, if the memory runs out (Buffers not available), then this fragment is dropped. Because the tenth fragment has been dropped, the other 9 fragments must also be dropped. In this case, the **Buffers not available** field (under the **Fragments Dropped Reasons** field) is incremented by 1 and the **Buffers not available** field (under the **Total Fragments Dropped** field) is incremented by 10.

For the next packet arriving, which also has 10 fragments, the first four fragments are stored but the memory runs out for the fifth fragment. Then the first 5 fragments (fifth and the first four) are dropped. In this case, the **Buffers not available** field (under the **Fragments Dropped Reasons** field) is incremented by 1 and the **Buffers not available** field (under the **Total Fragments Dropped** field) is incremented by 5.

For fragments of the packet, if memory becomes available, the next 5 fragments (6 through 10) that arrive are stored in memory. The fragments are stored until the timeout period elapses, and are eventually dropped. In this case, the **Aged out packets** field is incremented by 1 and the **Aged out fragments** field (under the **Total Fragments Dropped** field) is incremented by 5.

The fragment counters (after both packets have been processed) are as follows:

- **Fragments Dropped Reasons**
  - **Buffers not available** 2
  - **Aged out packets** 1
- **Total Fragment Dropped**
  - **Buffers not available** 15
  - **Aged out packets** 5

- Current rate refers to the current total number fragments dropped per second in the instant preceding the command's execution.

Sample Output

show services inline ip-reassembly statistics fpc

`user@host>` **show services inline ip-reassembly statistics fpc 0**

```
FPC: 0 PFE: 0
=============
                                                Total   Current Rate
Total Fragments Received                    728177644          83529
   First Fragments                          260759430          29924
   Intermediate Fragments                   206658784          23681
   Last Fragments                           260759430          29924
```

Total Packets Successfully Reassembled	260746982	29924
Approximate Packets Pending Reassembly	4	
Fragments Dropped Reasons	34558	3
Buffers not available	0	0
Fragments per packet exceeded	0	0
Packet length exceeded	0	0
Record insert error	0	0
Record in use error	34558	3
Duplicate first fragments	0	0
Duplicate last fragments	0	0
Missing first fragment	0	0
Reassembly Errors Reasons	0	0
Fragment not found	0	0
Fragment not in sequence	0	0
ASIC errors	0	0
Aged out packets	63	0
Total Fragments Successfully Reassembled	728142977	83528
Total Fragments Dropped	34673	3
Buffers not available	0	0
Fragments per packet exceeded	0	0
Packet length exceeded	0	0
Record insert error	0	0
Record in use error	34558	3
Duplicate first fragments	0	0
Duplicate last fragments	0	0
Missing first fragment	0	0
Fragment not found	0	0
Fragment not in sequence	0	0
ASIC errors	0	0
Aged out fragments	115	0
Total fragments punted to UPIC	0	0

show services nat destination pool

Syntax

```
show services nat destination pool
<interface interface-name>
<service-set service set>
<all>
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display destination NAT address pool information.

Options

interface *interface-name*>—Optional. Display destination NAT information specific to the interface.

service-set *service-set*>—Optional. Display destination NAT information specific to the service set.

all—Optional. Display all destination NAT address pool information.

Required Privilege Level

view

List of Sample Output

show services nat destination pool on page 615

Output Fields

Table 34 on page 614lists the output fields for the **show services nat destination pool** command. Output fields are listed in the approximate order in which they appear.

Table 34: show services nat destination pool Output Fields

Field Name	Description
Interface	Interface name.
Service set	Service set name.
Pool name	Pool name.
Pool id	Pool identification.
Total address	Number of IP addresses that are in use.

Table 34: show services nat destination pool Output Fields *(continued)*

Field Name	Description
Translation hits	Number of times a translation in the translation table is used for a source NAT rule.
Address range	IP address range in the source pool.
Port	Port number used to access the pool.

Sample Output

show services nat destination pool

`user@host>` **show services nat destination pool service-set ss1_interface_style1 interface vms-0/2/0 all**

```
ss1_interface_style1 interface vms-0/2/0 all | no-more
Interface: vms-0/2/0 , Service set: ss1_interface_style1
Pool name       : dest_pool
Pool id         : 1
Total address   : 253
Translation hits: 11
Address range                       Port
       30.1.1.2 - 30.1.1.254           0
```

show services nat destination rule

Syntax

```
show services nat destination rule
rule-name
<service-set service-set>
<interface interface-name>
<all>
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display destination NAT rule-set information.

Options

rule-name—Display information about the specified destination NAT rule.

service-set ***service-set***— Display information specific to the service-set.

interface ***interface-name*** — Display information specific to the interface.

all—Display all NAT rule-set information.

Required Privilege Level

view

List of Sample Output

show services nat destination rule service-set ss1_interface_style1 interface vms-0/2/0 all | no-more on page 617

Output Fields

Table 35 on page 616 lists the output fields for the **show services nat destination rule** command. Output fields are listed in the approximate order in which they appear.

Table 35: show services nat destination rule Output Fields

Field Name	Description
Interface	Interface name.
Service set	Service set name.
Destination NAT rule	Name of the destination NAT rule.

Table 35: show services nat destination rule Output Fields *(continued)*

Field Name	Description
Rule-Id	Rule identification number.
Rule-position	Position of the destination NAT rule.
Match-direction	Three options: • input—Apply the rule match on the input side of the interface. • input-output—Apply the rule match bidirectionally. • output—Apply the rule match on the output side of the interface.
Destination addresses	Name of the destination addresses that match the rule. The default value is any.
Action	The action taken when a packet matches the rule's tuples. Actions include the following: • destination NAT pool—Use user-defined destination NAT pool to perform destination NAT. • off—Do not perform destination NAT.
Translation hits	Number of times a translation in the translation table is used for a source NAT rule.
Successful sessions	Number of successful session installations after the NAT rule is matched.
Failed sessions	Number of unsuccessful session installations after the NAT rule is matched.
Number of sessions	Number of sessions that reference the specified rule.

Sample Output

show services nat destination rule service-set ss1_interface_style1 interface vms-0/2/0 all | no-more

`user@host>` **show services nat destination rule service-set ss1_interface_style1 interface vms-0/2/0 all | no-more**

```
ss1_interface_style1 interface vms-0/2/0 all | no-more

Interface: vms-0/2/0 , Service set: ss1_interface_style1
Destination NAT rule: r1                    Rule-set: rs2
  Rule-Id                   : 2
```

```
Rule position              : 1
Match-direction            : input
  Destination addresses    : 50.1.1.2        - 50.1.1.2
Action                     : dest_pool
Translation hits           : 34
  Successful sessions      : 34
  Failed sessions          : 0
Number of sessions         : 0
```

show services nat destination summary

Syntax

```
show services nat destination summary
<interface interface-name>
<service-set service-set>
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display summary destination NAT information.

Options

interface *interface-name*—Display summary destination NAT information for the specified service interface.

service-set *service-set*—Display summary destination NAT information for the specified service set.

Required Privilege Level

view

List of Sample Output

show services nat destination summary service-set ss1_interface_style1 interface vms-0/2/0 on page 620

Output Fields

Table 36 on page 619 lists the output fields for the **show services nat destination summary** command. Output fields are listed in the approximate order in which they appear.

Table 36: show services nat destination summary Output Fields

Field Name	Description
Interface	Interface name.
Service set	Service set name.
Pool name	Name of the destination address pool.
Address Range	IP address or IP address range for the pool.
Routing Instance	Name of the routing instance.
Port	Port number.

Table 36: show services nat destination summary Output Fields *(continued)*

Field Name	Description
Total Address	Number of IP addresses that are in use.
Rule name	Rule name.
Rule set	The set of rules for destination NAT.
Match-direction	Three options: • input—Apply the rule match on the input side of the interface. • input-output—Apply the rule match bidirectionally. • output—Apply the rule match on the output side of the interface.
Action	The action taken when a packet matches the rule's tuples. Actions include the following: • destination NAT pool—Use user-defined destination NAT pool to perform destination NAT. • off—Do not perform destination NAT.

Sample Output

show services nat destination summary service-set ss1_interface_style1 interface vms-0/2/0

`user@host>` **show services nat destination summary service-set ss1_interface_style1 interface vms-0/2/0**

```
Interface: vms-0/2/0 , Service set: ss1_interface_style1
Pool name           Address                          Routing        Port  Total

                   Range                            Instance            Address

dest_pool           30.1.1.2       - 30.1.1.254                     0     253
Interface: vms-0/2/0 , Service set: ss1_interface_style1
Rule name    Rule set                        Match-direction   Action
r1            rs2                              input         dest_pool
```

show services nat ipv6-multicast-interfaces

Syntax

```
show services nat ipv6-multicast-interfaces
```

Release Information

Command introduced in Junos OS Release 8.5.

Description

Displays a list of interfaces enabled for IPv6 multicast.

Required Privilege Level

view

List of Sample Output

show services nat ipv6-multicast-interfaces on page 621

Output Fields

Table 37 on page 621 lists the output fields for the **show services nat ipv6-multicast-interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 37: show services nat ipv6-multicast-interfaces Output Fields

Field Name	Field Description	Level of Output
Interface	Name of a service interface.	All levels
Admin State	Configured IPv6 multicast capability of an interface ,	All levels
Operational State	Operation IPv6 multicast status of an interface.	All levels

Sample Output

show services nat ipv6-multicast-interfaces

```
user@host> show services nat ipv6-multicast-interfaces
```

```
Interface          Admin          Operational
                   State             State
ge-5/1/9           Enabled        Enabled
ge-5/1/8           Enabled        Enabled
```

```
ge-5/1/7          Enabled       Enabled
ge-5/1/6          Enabled       Enabled
ge-5/1/5          Enabled       Enabled
ge-5/1/4          Enabled       Enabled
ge-5/1/3          Enabled       Enabled
ge-5/1/2          Enabled       Enabled
ge-5/1/1          Enabled       Enabled
ge-5/1/0          Enabled       Enabled
ge-5/0/9          Enabled       Enabled
ge-5/0/8          Enabled       Enabled
ge-5/0/7          Enabled       Enabled
ge-5/0/6          Enabled       Enabled
ge-5/0/5          Enabled       Enabled
ge-5/0/4          Enabled       Enabled
ge-5/0/3          Enabled       Enabled
ge-5/0/2          Enabled       Enabled
ge-5/0/1          Enabled       Enabled
ge-5/0/0          Enabled       Enabled
ge-1/3/9          Enabled       Enabled
ge-1/3/8          Enabled       Enabled
ge-1/3/7          Enabled       Enabled
ge-1/3/6          Enabled       Enabled
ge-1/3/5          Enabled       Enabled
ge-1/3/4          Enabled       Enabled
ge-1/3/3          Enabled       Enabled
ge-1/3/2          Enabled       Enabled
ge-1/3/1          Enabled       Enabled
ge-1/3/0          Enabled       Enabled
ge-1/2/9          Enabled       Enabled
ge-1/2/8          Enabled       Enabled
ge-1/2/7          Enabled       Enabled
ge-1/2/6          Enabled       Enabled
ge-1/2/5          Enabled       Enabled
ge-1/2/4          Enabled       Enabled
ge-1/2/3          Enabled       Enabled
ge-1/2/2          Enabled       Enabled
ge-1/2/1          Enabled       Enabled
ge-1/2/0          Enabled       Enabled
ge-1/1/9          Enabled       Enabled
ge-1/1/8          Enabled       Enabled
ge-1/1/7          Enabled       Enabled
ge-1/1/6          Enabled       Enabled
ge-1/1/5          Enabled       Enabled
ge-1/1/4          Enabled       Enabled
```

```
ge-1/1/3          Enabled       Enabled
ge-1/1/2          Enabled       Enabled
ge-1/1/1          Enabled       Enabled
ge-1/1/0          Enabled       Enabled
ge-1/0/9          Enabled       Enabled
ge-1/0/8          Enabled       Enabled
ge-1/0/7          Enabled       Enabled
ge-1/0/6          Enabled       Enabled
ge-1/0/5          Enabled       Enabled
ge-1/0/4          Enabled       Enabled
ge-1/0/3          Enabled       Enabled
ge-1/0/2          Enabled       Enabled
ge-1/0/1          Enabled       Enabled
ge-1/0/0          Enabled       Enabled
xe-0/3/0          Enabled       Enabled
xe-0/2/0          Enabled       Enabled
xe-0/1/0          Enabled       Enabled
xe-0/0/0          Enabled       Enabled
```

show services nat resource-usage source-pool

Syntax

```
show services nat resource-usage source-pool
<all>
pool-name
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display NAT resource usage.

Options

<all>—Display all NAT resource usage statistics.

pool-name—Display NAT resource usage statistics for the specified pool.

Required Privilege Level

view

List of Sample Output

show services nat resource-usage source-pool all on page 625
show services nat resource-usage source-pool src-nat-pool-2 on page 625

Output Fields

Table 38 on page 624 lists the output fields for the **show services nat resource-usage** command. Output fields are listed in the approximate order in which they appear.

Table 38: show services nat resource-usage Output Fields

Field Name	Description
Pool	Name of the pool.
Address	Address of the pool.
Used	Number of used resources in the pool.
Available	Number of available resources in the pool.
Total	Total number of addresses in the pool.
Usage	Percent of resources used.

Sample Output

show services nat resource-usage source-pool all

`user@host>` **show services nat resource-usage source-pool all**

```
PAT pools(including address-shared pool) port utilization:
  Pool                                Address      Used     Avail     Total Usage

  src-nat-pool-1                            1        64         0        64  100%

  src-nat-pool-2                            4         0    258048    258048    0%
```

show services nat resource-usage source-pool src-nat-pool-2

show services nat resource-usage source-pool src-nat-pool-2

```
Pool name: src-nat-pool-2
Total address: 4
Port-overloading-factor: 1
Total ports: 258048 Used: 0  Avail: 258048
Current usage: 0%   Peak usage: 0% at 1970-01-01 00:00:00 UTC
  Address    Factor-index Port-range        Used     Avail     Total Usage
  1.1.1.20
             0            Single Ports         0     64512     64512    0%
  1.1.1.21
             0            Single Ports         0     64512     64512    0%
  1.1.1.22
             0            Single Ports         0     64512     64512    0%
  1.1.1.23
             0            Single Ports         0     64512     64512    0%
```

show services nat source deterministic

Syntax

```
show services source nat deterministic
host-address-range
host-ip ip-address
pool pool-name
xlated-ip translated-ip-address
xlated-port translated-port-number
```

Release Information

This command was introduced in Junos OS 19.3R2.

Description

Display deterministic port block allocation information.

Options

host-address-range—Display the deterministic host address range without overlap.

host-ip *ip-address*—Display the internal host IP address.

pool *pool-name*—Display the source NAT pool.

xlated-ip *translated-ip-address*—Display translated IP address.

xlated-port *translated-port-number*—Display the translated port number.

Required Privilege Level

view

List of Sample Output

show services nat source deterministic on page 627
show services nat source deterministic host-address-range on page 628

Output Fields

Table 39 on page 626 lists the output fields for the command. Output fields are listed in the approximate order in which they appear.

Table 39: show services nat source deterministic Output Fields

Field Name	Field Description
Pool name	Name of the NAT source pool.

Table 39: show services nat source deterministic Output Fields *(continued)*

Field Name	Field Description
Port overloading factor	Factor of port overloading for the source pool.
Used/total port blocks	Port block used number and port block total number for this source NAT pool.
Host IP	Host IP address.
External IP	IP address of external router.
Port Block Range	The range of ports in a block, ranging from lowest to highest.
Ports Used/Ports Total	Number of ports used and total ports.
Total host ranges number	Host ranges in total.
Min Host Address	Minimum host address.
Max Host Address	Maximum host address.

Sample Output

show services nat source deterministic

`user@host>` **show services nat source deterministic**

```
Pool name: src-nat-pool-1
Port-overloading-factor: 1 Port block size: 256
Used/total port blocks: 0/12
Host_IP External_IP Port_Block Ports_Used/
                          Range           Ports_Total
10.1.1.1 202.0.0.1     1280-1535             0/256*1
10.1.1.2 202.0.0.1     1536-1791             0/256*1
```

show services nat source deterministic host-address-range

user@host> **show services nat source deterministic host-address-range**

```
Pool name: src-nat-pool-1
Total host ranges number: 1
Min Host Address Max Host Address
10.1.1.1 10.1.1.2
```

show services nat source mappings address-pooling-paired

Syntax

```
show services nat source mappings address-pooling-paired
```

Description

Options

address-pooling-paired—(Optional) Display only information about address-pooling paired mappings.

endpoint-independent—(Optional) Display only information about endpoint-independent mappings.

pcp—(Optional) Display only information about port control protocol mappings.

> **NOTE:** PCP requests with the prefer-failure option request a particular external IP address and port. When the request cannot be fulfilled, the mapping is not created. In this case, the subscriber does not have a mapped IP address. Such a subscriber is counted in the summary of the number or address mappings, but is not displayed in the list of address mappings, as shown in the following examples:
>
> `user@host#` **show services nat mappings summary**
>
> ```
> Service Interface:                                sp-2/0/0
> Total number of address mappings:                        1
> Total number of endpoint independent port mappings:      0
> Total number of endpoint independent filters:            0
> ```
>
> `user@host#` **show services nat mappings address-pooling-paired**
>
> ```
> [edit]
> ```
>
> This is expected behavior because unfulfilled address mappings (IP of 0.0.0.0) are not displayed in the output of the second CLI command. These address mappings will time out based on configured or default values.

Required Privilege Level

view

List of Sample Output

show services nat source mappings address-pooling-paired on page 630

Sample Output

show services nat source mappings address-pooling-paired

```
user@host> show services nat source mappings address-pooling-paired
```

```
Interface: ms-2/0/0, Service set: ss1
Pool name: sp1
Internal address          External address     Session Count       Mapping State
1.1.1.100                     30.30.30.1           1                     Active
1.1.1.101                     30.30.30.2           1                     Active
```

show services nat source mappings address-pooling-paired private 1.1.1.100

```
user@host> show services nat source mappings address-pooling-paired private 1.1.1.100
```

```
Interface: ms-2/0/0, Service set: ss1
Pool name: sp1
Internal address          External address     Session Count       Mapping State
1.1.1.100                     30.30.30.1           1                   Active
```

show services nat source mappings address-pooling-paired public 30.30.30.2

```
user@host> show services nat source mappings address-pooling-paired public 30.30.30.2
```

```
Interface: ms-2/0/0, Service set: ss1
Pool name: sp1
Internal address          External address     Session Count       Mapping State
1.1.1.101                     30.30.30.2           1                   Active
```

show services nat source mappings address-pooling-paired pool-name sp1

```
user@host> show services nat source mappings address-pooling-paired pool-name sp1
```

```
  Interface: ms-2/0/0, Service set: ss1
Pool name: sp1
Internal address          External address     Session Count       Mapping State
1.1.1.100                     30.30.30.1             1                  Active
1.1.1.101                     30.30.30.2             1                   Active
```

show services nat mappings address-pooling-paired

```
user@host> show services nat mappings address-pooling-paired
```

```
Interface: sp-3/0/0, Service set: NAPT44-SS1
NAT pool: napt44-SS1-p1
Mapping          : 29.32.38.255    --> 192.168.75.23
Ports In Use     :     9
Session Count    :     1
Mapping State    : Active
```

show services nat mappings address-pooling-paired (mapping of active B4 for a subscriber)

```
user@host> show services nat mappings address-pooling-paired
```

```
Interface: sp-0/0/0, Service set: sset_1

NAT pool: nat_pool1

Mapping          : 2001::          --> 33.33.33.2
Ports In Use     :     1
Session Count    :     9
Mapping State    : Timeout
```

show services nat mappings endpoint-independent

```
user@host> show services nat mappings endpoint-independent
```

```
Interface: sp-3/0/0, Service set: NAPT44-SS1
NAT pool: napt44-SS1-p1
Mapping          : 29.32.38.255:10000    --> 192.168.75.23:1024
Session Count    : 1
Mapping State    : Active
```

show services nat mappings pcp

```
user@host> show services nat mappings pcp
```

```
PCP Client       : 172.16.0.1        PCP Lifetime : 45
Mapping          : 29.32.38.255:10000    --> 192.168.75.23:1024
Session Count    : 1
Mapping State    : Active
```

show services nat mappings nptv6 internal

```
user@host> show services nat mappings nptv6 internal 1111:2222:3333:aaaa:bbbb::1
```

```
 Interface       Service-set     NAT-Pool           Address Mapping
 vms-0/1/0       ss_nptv6       ss_nptv6_pool   1111:2222:3333:aaaa:bbbb::1 ->
aaaa:bbbb:cccc:dddd:bbbb::1
```

show services nat mappings nptv6 external

```
user@host> show services nat mappings nptv6 external aaaa:bbbb:cccc:dddd:bbbb::1
```

```
 Interface       Service-set     NAT-Pool              Address Mapping
 vms-0/1/0        ss_nptv6            ss_nptv6_pool   1111:2222:3333:aaaa:bbbb::1
 -> aaaa:bbbb:cccc:dddd:bbbb::1
```

show services nat source mappings endpoint-independent

Syntax

```
show services nat source mappings endpoint-independent
<pool-name>
<private | public>
```

Release Information

Command introduced in Junos OS 19.3R2.

Description

Displays NAT endpoint independent mapping.

Options

<*pool-name*>—Name of address pool.

<private>—Private IPv4/IPv6 prefix to use as a filter.

<public>—Public IP prefix to use as a filter.

Required Privilege Level

view

List of Sample Output

show services nat source mappings endpoint-independent on page 634
show services nat source mappings endpoint-independent private 15.4.4.2 public 20.20.20.1 on page 634
show services nat source mappings endpoint-independent pool-name p1 on page 634
show services nat source mappings address-pooling-paired pool-name sp1 on page 635

Output Fields

Table 40 on page 633 lists the output fields from the **show services nat source mappings endpoint-independent** command. Output fields are listed in the approximate order in which they appear.

Table 40: show services nat source mappings endpoint-independent Output Fields

Field Name	Description
Interface	Name of the interface.
Service set	Name of the service set.
NAT pool	Name of the NAT pool.
Mapping	Shows the mapping of IP addresses.

Table 40: show services nat source mappings endpoint-independent Output Fields *(continued)*

Field Name	Description
Session Count	Number of sessions currently using the mapping.
Mapping State	NAT mapping state. The following states are possible: • ACTIVE—Indicates that the entry is active and in use. • TIMEOUT—Indicates that the mapping is not is in use. After the mapping-timeout, configured at the **[edit services nat pool pool-name]** hierarchy level, lapses, the mapping is deleted. This fields also displays the number of seconds after which the timeout occurs.

Sample Output

show services nat source mappings endpoint-independent

```
user@host> show services nat source mappings endpoint independent
```

```
Interface: ms-2/0/0, Service set: ss1
NAT pool: test-pool
Mapping          : 2.1.1.1         : 1026  --> 123.0.0.5       :10926
Session Count    :     1
Mapping State    : Active
```

show services nat source mappings endpoint-independent private 15.4.4.2 public 20.20.20.1

```
user@host> show services nat source mappings endpoint-independent private 15.4.4.2 public 20.20.20.1
```

```
Interface: ms-2/0/0, Service set: ss1
NAT pool: p1
Mapping          : 15.4.4.2        :12841  --> 20.20.20.1      :11205
Session Count    :     1
Mapping State    : Active
```

show services nat source mappings endpoint-independent pool-name p1

```
user@host> show services nat source mappings endpoint-independent pool-name p1
```

```
Interface: ms-2/0/0, Service set: ss1
NAT pool: p1
```

```
Mapping          : 15.4.4.2        :12841  --> 20.20.20.1      :11205
Session Count    :     1
Mapping State    : Active
```

show services nat source mappings address-pooling-paired pool-name sp1

user@host> **show services nat source mappings address-pooling-paired pool-name sp1**

```
  Interface: ms-2/0/0, Service set: ss1
Pool name: sp1
Internal address          External address     Session Count       Mapping State
1.1.1.100                     30.30.30.1             1                 Active
1.1.1.101                     30.30.30.2             1                  Active
```

show services nat source mappings summary

Syntax

```
show services nat source mappings summary
<interface interface-name>
<service-set service-set.>
```

Release Information

Command introduced in Junos OS 19.3R2.

Description

Display NAT mapping summary information.

Options

interface *interface-name*—Display source NAT mapping information for the specified interface.

service-set *service-set*—Display source NAT mapping information for the specified service set.

Required Privilege Level

view

List of Sample Output

show services nat source mappings summary on page 637

Output Fields

Table 41 on page 636 lists the output fields for the **show services nat source mappings summary** command. Output fields are listed in the approximate order in which they appear.

Table 41: show services nat source mappings summary Output Fields

Field Name	Field Description
Service Interface	Name of the service interface.
Total number of address mappings	Displays total number of address mappings.
Total number of endpoint independent port mappings	Displays total number of endpoint independent port mappings.
Total number of endpoint independent filters	Displays total number of endpoint independent filters.

Sample Output

show services nat source mappings summary

user@host> **show services nat source mappings summary**

```
Service Interface:                              ms-2/0/0
Total number of address mappings:                          2
Total number of endpoint independent port mappings:        1
Total number of endpoint independent filters:              1
```

show services nat source pool

Syntax

```
show services nat source pool pool-name
<all>
<interface interface-name>
<service-set service-set>
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display source NAT information for a pool.

Options

pool-name—Display information about the specified pool.

all—Display all source NAT pool information.

interface *interface-name*—Display information specific to the adaptive services interface.

service-set *service-set*—Display information specific to the service set.

Required Privilege Level

view

List of Sample Output

show services nat source pool JNPR-CGNAT-PUB-POOL (NAT Pool) on page 640
show services nat source pool JNPR-CGNAT-PUB-POOL (PBA Pool) on page 641
show services nat source pool JNPR-CGNAT-PUB-POOL (Deterministic) on page 642
show services nat source pool service-set ss1_interface_style1 interface vms-0/2/0 all on page 642

Output Fields

Table 42 on page 638 lists the output fields for the **show services nat source pool** command. Output fields are listed in the approximate order in which they appear.

Table 42: show services nat source pool Output Fields

Field Name	Description
Pool name	Name of the source pool.
Pool id	Pool identification number.
Routing instance	Name of the routing instance.

Table 42: show services nat source pool Output Fields *(continued)*

Field Name	Description
Host address base	Base address of the original source IP address range.
Port	Port numbers used for the source pool.
Port overloading	Number of port overloading for the source pool.
Address assignment	Type of address assignment.
Total addresses	Number of IP addresses that are in use.
Translation hits	Number of times there is traffic that matches the source rule.
Limit ports per host	
Include-boundary-addresses	Include the lowest and highest addresses in the source address range of the NAT rule to be translated when the NAT pool is used.
Ei-mapping-timeout	Duration for endpoint independent translations that use the specified NAT pool.
Mapping-timeout	Duration for mappings that use the specified NAT pool.
EIF Inbound session count	Number of EIF inbound sessions.
EIF Inbound session limit exceeded drops	Number of EIF inbound sessions that exceed the drop limit.
Address range	IP address range for the source pool.
Ports	
Total used ports	

Table 42: show services nat source pool Output Fields *(continued)*

Field Name	Description
Error Counters • **Out of port errors** • **Out of address errors** • **Parity port errors** • **Preserve Range errors** • **APP port allocation errors** • **App port limit allocation errors** • **Port block allocation errors** • **Port blocks limit exceeded errors**	The following bullets describe the fields: • No ports available. • No room in the pool for another address. • • • • • •

Sample Output

show services nat source pool JNPR-CGNAT-PUB-POOL (NAT Pool)

`user@host>` **show services nat source pool JNPR-CGNAT-PUB-POOL**

```
Interface: vms-0/2/0 , Service set: JNPR-IF-SSET
Pool name          : JNPR-CGNAT-PUB-POOL
Pool id            : 4
Routing instance   : default
Host address base  : 0.0.0.0
Port               : [1024, 65535]
Port overloading   : 1
Address assignment : no-paired
Total addresses    : 254
Translation hits   : 0
+Limit ports per host : 10
Include-boundary-addresses: Disable
Ei-mapping-timeout : 300
Mapping-timeout    : 300
EIF Inbound session count: 0
EIF Inbound session limit exceeded drops: 0
Address range                          Ports
         20.20.20.1 - 20.20.20.254       0
Total used ports   :                     0
+Error Counters:
+    Out of port errors              : 0
```

```
+    Out of address errors           : 0
+    Parity port errors              : 0
+    Preserve Range errors           : 0
+    APP port allocation errors      : 0
+    APP port limit allocation errors : 0
+    Port block allocation errors    : 0
+    Port blocks limit exceeded errors: 0
```

show services nat source pool JNPR-CGNAT-PUB-POOL (PBA Pool)

`user@host>` **show services nat source pool JNPR-CGNAT-PUB-POOL**

```
Interface: vms-0/2/0 , Service set: JNPR-IF-SSET
Pool name          : JNPR-CGNAT-PUB-POOL
Pool id            : 4
Routing instance   : default
Port               : [1024, 65535]
Port overloading   : 1
Address assignment : no-paired
Total addresses    : 510
Translation hits   : 0
Port block size      : 256
Max blocks per host  : 8
Active block timeout : 0
Last block recycle timeout : 0
Interim logging interval   : 0
PBA block log        : Enable
Used/total port blocks: 0/128520
+Max number of port blocks used: 0
Include-boundary-addresses: Disable
Ei-mapping-timeout : 300
Mapping-timeout    : 300
EIF Inbound session count: 0
EIF Inbound session limit exceeded drops: 0
Address range                          Ports
          100.0.0.1 - 100.0.1.254        0
Total used ports   :                     0
Error Counters:
    Out of port errors              : 0
    Out of address errors           : 0
    Parity port errors              : 0
    Preserve Range errors           : 0
    APP port allocation errors      : 0
    APP port limit allocation errors  : 0
```

```
    Port block allocation errors      : 0
Port blocks limit exceeded errors : 0
```

show services nat source pool JNPR-CGNAT-PUB-POOL (Deterministic)

`user@host>` **show services nat source pool JNPR-CGNAT-PUB-POOL**

```
Interface: vms-0/2/0 , Service set: JNPR-IF-SSET
Pool name          : JNPR-CGNAT-PUB-POOL
Pool id            : 4
Routing instance   : default
Port               : [1024, 65535]
Port overloading   : 1
Address assignment : no-paired
Total addresses    : 510
Translation hits   : 0
Port block size      : 256
Determ host range num: 1
+Unique pool users: 0
Include-boundary-addresses: Disable
Ei-mapping-timeout : 300
Mapping-timeout    : 300
EIF Inbound session count: 0
EIF Inbound session limit exceeded drops: 0
Address range                        Single Ports   Twin Ports
          100.0.0.1 - 100.0.1.254        0              0
Total used ports   :                     0              0
Error Counters:
    Out of port errors                : 0
    Out of address errors             : 0
    Parity port errors                : 0
    Preserve Range errors             : 0
    APP port allocation errors        : 0
    APP port limit allocation errors  : 0
    Port block allocation errors      : 0
    Port blocks limit exceeded errors : 0
```

show services nat source pool service-set ss1_interface_style1 interface vms-0/2/0 all

`user@router>`**show services nat source pool service-set ss1_interface_style1 interface vms-0/2/0 all**

```
Interface: vms-0/2/0 , Service set: ss1_interface_style1
Pool name          : src_pool1
```

```
Pool id            : 4
Routing instance   : default
Host address base  : 0.0.0.0
Port               : [1024, 63487]
Twin port          : [63488, 65535]
Port overloading   : 1
Address assignment : no-paired
Total addresses    : 254
Translation hits   : 3
Address range                        Single Ports   Twin Ports
           44.0.0.1 - 44.0.0.254         1              0
Total used ports   :                     1              0
```

show services nat source port-block

Syntax

```
show services nat source port-block
<host-ip ip-address>
<pool pool-name>
<xlated-ip translated-ip-address>
<xlated-port translated-port-number>
```

Release Information

Command introduced in Junos OS 19.3R2.

Description

Display port block allocation information.

Options

host-ip *ip-address*—Display port block allocation information for the specified host.

pool *pool-name*—Display port block allocation information for the specified pool.

xlated-ip *translated-ip-address*—Display port block allocation information for the specified translated IP address.

xlated-port *translated-port-number* —Display port block allocation information for the specified translated port number.

Required Privilege Level

view

List of Sample Output

show services nat source port-block on page 646

Output Fields

Table 43 on page 644 lists the output fields for the **show services nat source port block** command. Output fields are listed in the approximate order in which they appear.

Table 43: show services nat source port block Output Fields

Field Name	Field Description
Pool name	Name of the pool.
Port-overloading-factor	Factor of port overloading for the source pool.
Port block size	Number of ports that a port block contains.

Table 43: show services nat source port block Output Fields *(continued)*

Field Name	Field Description
Max port blocks per host	Maximum number of blocks that one host can use for translation.
Port block active timeout	Longest duration that a block remains active for port allocation.
Last active block recycle timeout	Amount of time before the last active block is released when **active-port-block–timeout** is set to zero.
Used/total port blocks	Current number of used ports and total number of ports in this source pool.
Host IP	Host IP address.
External IP	External IP address.
Port Block Range	Port range of one PBA port block entry from the lowest to the highest port number that can be allowed to allocate ports for this block.
Ports Used/Ports Total	Current number of used ports and total number of ports in this source pool.
Block State/Left Time (s)	PBA port block entry state for NAT port allocation, including Active, Inactive, Query, and the time left for a port block that is in the Active or Query state. • Active–When an internal subscriber initiates a NAT request, a port block is allocated from the pool, and the status is set to Active. When there is a subsequent request from the same subscriber, a port is allocated from the existing Active block. • Inactive–When there is a request from an internal subscriber who had previously had a port allocated from this port block, but the time on the Active port block has expired or the ports are used up, the port block status changes from Active to Inactive. • InactiveB–When a chassis cluster is in active/passive mode, and a port block is created on the active node, the status for the synced port block on the backup node is InactiveB. • Query–When no ports are used in an Active port block, the status changes from Active to Query.
Failed sessions	Number of failed sessions.
Number of sessions	Total number of sessions.

Sample Output

show services nat source port-block

user@host> **show services nat source port-block**

```
Pool name: sp1
Port-overloading-factor:     1     Port block size:  512
Max port blocks per host:    8     Port block active timeout:  100
Last active block recycle timeout:    0
Used/total port blocks: 1/64260
Host_IP           External_IP                   Port_Block          Ports_Used/
       Block_State/
                                                   Range             Ports_Total
       Left_Time(s)
1.1.1.100          30.30.30.1                     13824-14335          1/512*1
          Active/71

    Failed sessions          : 0
  Number of sessions         : 0
```

show services nat source rule

Syntax

```
show services nat source rule
rule-name
<all>
<interface interface-name>
<service-set service-set>
```

Release Information

Command introduced in Junos OS 19.3R2.

Description

Display source NAT rule-set information.

Options

rule-name—Display source NAT rule-set information for the specified rule.

all—Display all source NAT rule-set information.

interface *interface-name*—Display rule-set information about the adaptive services interface.

service-set *service-set*—Display rule-set information about the service set.

Required Privilege Level

view

List of Sample Output

show services nat source rule on page 648
show services nat source rule (Mapping and EIF Configuration) on page 649

Output Fields

Table 44 on page 647 lists the output fields for the **show services nat source rule** command. Output fields are described in the approximate order in which they appear.

Table 44: show services nat source rule Output Fields

Field Name	Description
Interface	Interface name.
Service set	Service set name.
Rule Id	Rule identification number.

Table 44: show services nat source rule Output Fields *(continued)*

Field Name	Description
Rule position	Position of the source NAT rule.
Match-direction	Specifies the direction in which to match traffic that meets the rule conditions.
Match • **Source address** • **Destination address** • **Application**	Match the following: • Name of the source address that matches the rule. • Name of the destination address that matches the rule. • Indicates whether the application option is configured.
Action • **Persistent NAT type** • **Persistent NAT mapping type** • **Inactivity timeout** • **Max session number**	
Translation hits • **Successful sessions** • **Failed sessions**	Use this field to check for traffic that matches the rule. Note the successful or failed sessions.
Number of sessions	Number of active sessions.

Sample Output

show services nat source rule

`user@host>` **show services nat source rule all**

```
ss1_interface_style1 interface vms-0/2/0 all | no-more
Interface: vms-0/2/0 , Service set: ss1_interface_style1
source NAT rule: r1                     Rule-set: rs1
  Rule-Id                   : 1
  Rule position             : 1
  Match-direction           : input
  Match
    Source addresses        : 0.0.0.0         - 255.255.255.255
    Destination addresses   : 0.0.0.0         - 255.255.255.255
```

```
    Application              : configured
  Action                       : src_pool1
    Persistent NAT type        : N/A
    Persistent NAT mapping type : address-port-mapping
    Inactivity timeout         : 0
    Max session number         : 0
  Translation hits           : 3
    Successful sessions      : 3
    Failed sessions          : 0
  Number of sessions         : 1
```

show services nat source rule (Mapping and EIF Configuration)

show services nat source rule all

```
Total rules: 1
Total referenced IPv4/IPv6 ip-prefixes: 1/0
source NAT rule: r1                     Rule-set: rs1
  Rule-Id                  : 1
  Rule position            : 1
  From zone                : nh-JNPR-NH-SSET-ZoneIn
  To zone                  : nh-JNPR-NH-SSET-ZoneOut
  Match
    Source addresses       : 30.30.30.0      - 30.30.30.255
  Action                       : p2
  +Mapping-type : endpoint-independent;
  +Mapping-refresh : inbound
  +Filtering-type: endpoint-independent
  +Prefix-list :
1.2.2.0 --- 2.2.2.3
3.3.3.0   --- 3.3.3.3  except
Translation hits           : 0
    Successful sessions      : 0
    Failed sessions          : 0
  Number of sessions         : 0
```

show services nat source rule-application

Syntax

```
show services nat source rule-application
<all>
<interface interface-name>
<service-set service-set>
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display source NAT rule application information.

Options

all—Display all source NAT rule application information.

interface *interface-name*—Display source NAT rule application information for the specified interface.

service-set *service-set*—Display source NAT rule application information for the specified service set.

Required Privilege Level

view

List of Sample Output

show services nat source rule-application on page 651

Output Fields

Table 45 on page 650 lists the output fields for the **show services nat source rule-application** command. Output fields are described in the approximate order in which they appear.

Table 45: show services nat source rule-application Output Fields

Field Name	Description
Interface	Displays rule application for the specified interface.
Service set	Displays rule application for the specified service set.

Table 45: show services nat source rule-application Output Fields *(continued)*

Field Name	Description
Source NAT rule • Rule-set • Rule-Id • Match-direction • Application • IP Protocol • Source port range • Destination port range	The name of the source NAT rule. • Set of rules for matching traffic. • Rule identification number. • Specifies the direction in which to match traffic that meets the rule conditions. • Name of the application or application set. • IP protocol identifier. • Source port range identifier. • Destination port range identifier.

Sample Output

show services nat source rule-application

`user@host>` **show services nat source rule-application service-set ss1_interface_style1 interface vms-0/2/0 all**

```
Interface: vms-0/2/0 , Service set: ss1_interface_style1
source NAT rule: r1                    Rule-set: rs1
  Rule-Id                  : 1
  Match-direction          : input
    Application: any
      IP protocol: 0
      Source port range: [0-0]
      Destination port range: [0-0]
```

show services nat source summary

Syntax

```
show services nat source summary
<interface interface-name>
<service-set service-set>
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Displays source NAT summary information.

Options

interface *interface-name*—Display source NAT summary information for the specified interface.

service-set *service-set*—Display source NAT summary information for the specified service set.

Required Privilege Level

view

List of Sample Output

show services nat source summary on page 653

Output Fields

Table 46 on page 652 lists the output fields for the **show services nat source summary** command. Output fields are listed in the approximate order in which they appear.

Table 46: show services nat source summary Output Fields

Field Name	Description
Interface	Interface name.
Service set	Service set name.
Pool Name	Name of the source address pool.
Address Range	IP address or IP address range for the pool.
Routing Instance	Name of the routing instance.
PAT	Whether Port Address Translation (PAT) is enabled (yes or no).

Table 46: show services nat source summary Output Fields *(continued)*

Field Name	Description
Total Address	Number of IP addresses that are in use.
Rule name	Name of the rule.
Rule set	Set of rules.
Match-direction	Specifies the direction in which to match traffic that meets the rule conditions.
Action	Action taken for a packet that matches a rule.

Sample Output

show services nat source summary

`user@host>` **show services nat source summary service-set ss1_interface_style11 interface vms-0/2/0**

```
Interface: vms-0/2/0 , Service set: ss1_interface_style1
Pool                Address                 Routing             PAT  Total
Name                Range                   Instance                 Address
src_pool1           44.0.0.1-44.0.0.254     default             yes  254
Interface: vms-0/2/0 , Service set: ss1_interface_style1
Rule name  Rule set              Match-direction     Action
r1         rs1                        input          src_pool1
```

show services policies

Syntax

```
show services policies
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display services policy information.

Required Privilege Level

view

List of Sample Output

show services policies on page 655

Output Fields

Table 47 on page 654 lists the output fields for the **show services policies** command. Fields are listed in the approximate order in which they appear.

Table 47: show services policies Output Fields

Field Name	Description
Default policy	
Policy	Name of the applicable policy.
State	Status of the policy: • **enabled**: The policy can be used in the policy lookup process, which determines access rights for a packet and the action taken in regard to it. • **disabled**: The policy cannot be used in the policy lookup process, and therefore it is not available for access control.
Index	Internal number associated with the policy.
Scope policy	

Table 47: show services policies Output Fields *(continued)*

Field Name	Description
Sequence number	Number of the policy within a given context. For example, three policies that are applicable in a from-zoneA-to-zoneB context might be ordered with sequence numbers 1,2,3. Also, in a from-zoneC-to-zoneD context, four policies might have sequence numbers 1,2,3,4.
Stateful firewall rule	
Service set	Name of the service set.
Interface	Name of the interface.
Match direction	
Source addresses	Names of the source addresses for a policy. Address sets are resolved to their individual Names of the source addresses for a policy. Address sets are resolved to their individual
Destination addresses	Name of the destination address (or address set as it was entered om the destination zone's address book.
Application	

Sample Output

show services policies

`user@host>` **show services policies**

```
Default policy: deny-all
  Policy: p1, State: enabled, Index: 1007, Scope Policy: 0, Sequence number: 1
    Stateful firewall rule: sfw1, Service set: JNPR-NH-SSET, Interface: vms-0/2/0,
 Match Direction: input
    Source addresses: any-ipv4
    Destination addresses: any
    Applications: junos-ftp
  Policy: p2, State: enabled, Index: 1008, Scope Policy: 0, Sequence number: 2
    Stateful firewall rule: sfw1, Service set: JNPR-NH-SSET, Interface: vms-0/2/0,
 Match Direction: input
    Source addresses: any
```

```
    Destination addresses: any
    Applications: any
```

show services policies detail

Syntax

```
show services policies detail
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display detailed information about configured services policies.

Required Privilege Level

view

List of Sample Output

show services policies detail on page 658

Output Fields

Table 48 on page 657 lists the output fields for the **show services policies detail** command. Output fields are listed in the approximate order in which they appear.

Table 48: show services policies detail

Field Name	Description
Default policy	
Policy	
Action type	
State	Status of the policy: • **enabled**: The policy can be used in the policy lookup process, which determines access rights for a packet and the action taken in regard to it. • **disabled**: The policy cannot be used in the policy lookup process, and therefore it is not available for access control.
Index	Internal number associated with the policy.
Scope policy	
Policy type	

Table 48: show services policies detail *(continued)*

Field Name	Description
Sequence number	Number of the policy within a given context. For example, three policies that are applicable in a from-zoneA-to-zoneB context might be ordered with sequence numbers 1,2,3. Also, in a from-zoneC-to-zoneD context, four policies might have sequence numbers 1,2,3,4.
Stateful firewall rule	
Service set	Service set name.
Interface	Interface name.
Source addresses	The names and corresponding IP addresses for the policy. Address sets are resolved to their individual address name-IP address pairs.
Destination addresses	Name of the destination address (or address set) as it was entered in the destination zone's address book. A packet's destination address must match this value for the policy to apply to it.
Application	
IP protocol	
Inactivity timeout	
Source port range	
Destination port range	
Per policy TCP Options	

Sample Output

show services policies detail

```
user@host> show services policies detail
```

```
Default policy: deny-all
Policy: p1, action-type: permit, State: enabled, Index: 1007, Scope Policy: 0
  Policy Type: Configured
```

```
  Sequence number: 1
  Stateful firewall rule: sfw1, Service set: JNPR-NH-SSET, Interface: vms-0/2/0,
Match Direction: input
  Source addresses:
    any-ipv4(global): 0.0.0.0/0
  Destination addresses:
    any-ipv4(global): 0.0.0.0/0
    any-ipv6(global): ::/0
  Application: junos-ftp
    IP protocol: tcp, ALG: ftp, Inactivity timeout: 1800
      Source port range: [0-0]
      Destination port range: [21-21]
  Per policy TCP Options: SYN check: No, SEQ check: No, Window scale: No
Policy: p2, action-type: permit, State: enabled, Index: 1008, Scope Policy: 0
  Policy Type: Configured
  Sequence number: 2
  Stateful firewall rule: sfw1, Service set: JNPR-NH-SSET, Interface: vms-0/2/0,
Match Direction: input
  Source addresses:
    any-ipv4(global): 0.0.0.0/0
    any-ipv6(global): ::/0
  Destination addresses:
    any-ipv4(global): 0.0.0.0/0
    any-ipv6(global): ::/0
  Application: any
    IP protocol: 0, ALG: 0, Inactivity timeout: 0
      Source port range: [0-0]
      Destination port range: [0-0]
  Per policy TCP Options: SYN check: No, SEQ check: No, Window scale: No
```

show services policies hit-count

Syntax

```
show services policies hit-count
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display the hit count of policies.

Required Privilege Level

view

List of Sample Output

show services policies hit-count on page 660

Output Fields

Sample Output

show services policies hit-count

`user@host>` **show services policies hit-count**

```
Index   Service Set      Interface         Name           Sfw rule        Direction
       Policy count
         1       JNPR-NH-SSET     vms-0/2/0         p1             sfw1
  input           0
         2       JNPR-NH-SSET     vms-0/2/0         p2             sfw1
  input           0
Number of policy: 2
```

show services policies interface

Syntax

show services policies interface *interface-name*

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display services policies for the specified interface.

Required Privilege Level

view

List of Sample Output

show services policies interface vms-0/2/0 on page 661

Output Fields

Sample Output

show services policies interface vms-0/2/0

`user@host>` **show services policies interface vms-0/2/0**

```
Default policy: deny-all
  Policy: p1, State: enabled, Index: 1007, Scope Policy: 0, Sequence number: 1
    Stateful firewall rule: sfw1, Service set: JNPR-NH-SSET, Interface: vms-0/2/0,
 Match Direction: input
    Source addresses: any-ipv4
    Destination addresses: any
    Applications: junos-ftp
  Policy: p2, State: enabled, Index: 1008, Scope Policy: 0, Sequence number: 2
    Stateful firewall rule: sfw1, Service set: JNPR-NH-SSET, Interface: vms-0/2/0,
 Match Direction: input
    Source addresses: any
    Destination addresses: any
    Applications: any
```

show services policies service-set

Syntax

```
show services policies service-set service-set
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display policy information for the specified service set.

Required Privilege Level

view

List of Sample Output

show services policies service-set on page 662

Output Fields

Sample Output

show services policies service-set

`user@host>` **show services policies service-set JNPR-NH-SSET**

```
Default policy: deny-all
  Policy: p1, State: enabled, Index: 1007, Scope Policy: 0, Sequence number: 1
    Stateful firewall rule: sfw1, Service set: JNPR-NH-SSET, Interface: vms-0/2/0,
 Match Direction: input
    Source addresses: any-ipv4
    Destination addresses: any
    Applications: junos-ftp
  Policy: p2, State: enabled, Index: 1008, Scope Policy: 0, Sequence number: 2
    Stateful firewall rule: sfw1, Service set: JNPR-NH-SSET, Interface: vms-0/2/0,
 Match Direction: input
    Source addresses: any
    Destination addresses: any
    Applications: any
```

show services redundancy-group

Syntax

```
show services redundancy-group
<rg-id>
<brief | extensive | terse>
```

Release Information

Statement introduced in Junos OS Release 16.1 on MX Series.

Description

Display redundancy group status information for all redundancy groups or a specified redundancy group.

Options

rg-id—(Optional) Name of a specific redundancy group.

brief | extensive | terse—(Optional) Display the specified level of output. When no level is specified, display terse level output.

Default: terse

Required Privilege Level

view

List of Sample Output

show services redundancy-group terse on page 669
show services redundancy-group brief (Health Status Passed) on page 669
show services redundancy-group brief (Health Status Failed) on page 670
show services redundancy-group extensive on page 671

Output Fields

Table 49 on page 663 lists the output fields for the **show services redundancy-group** command. Output fields are listed in the approximate order in which they appear.

Table 49: show services redundancy-group Output Fields

Field Name	Field Description	Level of Output
ICCP process connection	Status of the connection between the srd and iccpd. • Connected • Not connected	all levels
Redundancy Group ID	Identifier of the redundancy group.	all levels

Table 49: show services redundancy-group Output Fields *(continued)*

Field Name	Field Description	Level of Output
Number of peer RG connections	Total number of peers in the redundancy group.	brief, extensive
Local RG IP	IP address of the local redundancy group.	all levels
RS ID		terse
Local RS state	State of the local redundancy set. • MASTER • STANDBY • INITIALIZING • STANDBY (WARNED)	terse
Peer RS state	State of the peer redundancy set. • MASTER • STANDBY • INITIALIZING • STANDBY (WARNED)	terse
Peer RG IP	Peer redundancy group IP address.	all
Status	Status of redundancy group connection with this peer. • Connected • Not Connected	terse
Number of peer RG connections	Total number of peers in the redundancy group.	brief
Redundancy Set ID	Identifier of the redundancy set.	brief, extensive
Connection status	Status of the connection between the srd and iccpd. • Connected • Not Connected	brief, extensive

Table 49: show services redundancy-group Output Fields *(continued)*

Field Name	Field Description	Level of Output
Redundancy Set state	State of the local redundancy set state. • INITIALIZING • MASTER • STANDBY • STANDBY (WARNED)	brief, extensive
Redundancy Set peer state	State of the peer redundancy set state. • INITIALIZING • MASTER • STANDBY • STANDBY (WARNED)	brief, extensive
Redundancy Set health status	• Passed • Failed	brief, extensive
Number of Monitored interface down	Number of monitored interfaces that are d	brief, extensive
Failed Interfaces	List of all monitored interfaces that are down.	brief, extensive
Service Set	Service set used for stateful sync.	brief, extensive
Service Interface	Service set used for	brief, extensive
Type	Type of redundancy and stateful sync for the listed service interface. • Inter-chassis • Intra-chassis	brief, extensive
Role	Role of the listed service interface. • active • backup	brief, extensive
Connection	Status of connection with peer service PIC. • Up • Down	brief, extensive

Table 49: show services redundancy-group Output Fields *(continued)*

Field Name	Field Description	Level of Output
Synchronization	Type of synchronization. When all eligible sessions are still synchronizing, it is cold synchronization. When all current existing sessions are synchronized, it is a HOT synchronization, When long lived sessions are eligible, they are synchronized. • Hot—All current existing sessions are synced. When long-lived sessions are eligible, they are synchronized. • Cold–Eligible sessions are in the processing of synchronizing.	brief, extensive
ICCP process connection open complete count	Number of completed opens of ICCP process connections.	extensive
ICCP process connection close complete count	Number of completed closes of ICCP process connections.	
ICCP packet sent count	Number of ICCP packets sent.	extensive
ICCP packet receive count	Number of ICCP packets received.	extensive
ICCP process keepalive receive count	Number of ICCP process keepalive messages received.	extensive
ICCP process keepalive sent count	Number of ICCP process keepalive messages sent.	extensive
ICCP redundancy group add count	Number of redundancy group add messages received by srd from ICCP.	extensive
ICCP redundancy group delete count	Number of redundancy group delete messages received by srd from ICCP.	extensive
RG connection up count	Number of redundancy group connection up messages received by srd from ICCP.	extensive
RG connection down count	Number of redundancy group connection down messages received by srd from ICCP.	extensive

Table 49: show services redundancy-group Output Fields *(continued)*

Field Name	Field Description	Level of Output
RG join count	Number of redundancy group join messages sent from srd to ICCP.	extensive
RG data receive count	Number of packets of messages received by srd from a peer.	extensive
RG data sent count	Number of packets of messages sent from srd to a peer.	extensive
RG connect message sent count	Number of connect messages sent from srd to ICCP.	extensive
RG connect message receive count	Number of connect messages received by srd from ICCP.	extensive
RG disconnect message sent count	Number of disconnect messages sent from srd to ICCP.	extensive
RG disconnect message receive count	Number of disconnect messages received by srd from ICCP.	extensive
RG ack sent count	Number of RG ack messages sent.	extensive
RG nack sent count	Number of RG nack messages sent.	extensive
RG nack receive count	Number of RG nack messages received.	extensive
Transition Events Received	Number of transition events received in each of the following categories: • Acquire mastership auto • Acquire mastership manual • Release mastership auto • Release mastership manual	extensive

Table 49: show services redundancy-group Output Fields *(continued)*

Field Name	Field Description	Level of Output
Transition Events Ignored	Number of transition events ignored in each of the following categories: • Acquire mastership auto • Acquire mastership manual • Release mastership auto • Release mastership manual In a high-availability or redundancy pair of SDGs, in which one SDG is the master and the other is the standby, when perform a double failover of the SDGs, the second failover event is not ignored, which is the expected behavior. The event is not disregarded because it arrives as a critical redundancy-event based on the redundancy-policy. However, because the SDG is already be in Standby state, the finite state machine transitions to the Standby-Warned state until it recovers. Therefore, the event is honored and not ignored. Although there was no mastership transition, it is because of a valid reason that the SDG is already in Standby state. The redundancy-event is associated with to a mastership release policy based on the configuration and the Release mastership field under the Transition Events Ignored column displays a number that corresponds to the redundancy event. The services redundancy daemon (SRD) finite state machine quickly recovers (transitions from Standby-Warned to Standby) during restart-routing because the rpd restart-handling and recovery are fast and the following critical event is not ignored. However, disabling or deactivating the interface results in the FSM remaining in Standby-Warned until the interface is up. Any critical events during the time when the interface is down are ignored because the state is already Standby-Warned and does not transition to a different state. In summary, the following is the manner in which critical events are analyzed during state transitions: • Standby -> Standby Warned = Critical Event Not ignored [valid state transition] • Standby Warned -> Standby Warned = Critical Event Ignored [no state transition]	extensive

Table 49: show services redundancy-group Output Fields *(continued)*

Field Name	Field Description	Level of Output
Monitored Events Received	Number of monitored events received in each of the following categories: • Link-down • Routing restart/abort • Route update error • Peer mastership-acquire • Peer mastership-release	extensive
Monitored Events Ignored	Number of monitored events ignored in each of the following categories: • Link-down • Routing restart/abort • Route update error • Peer mastership-acquire • Peer mastership-release	extensive

Sample Output

show services redundancy-group terse

`user@host>` **show services redundancy-group terse**

```
ICCP process connection               : Connected

Redundancy Group ID             : 1
  Number of peer RG connections  : 1
  Local RG IP                   : 172.19.39.70
  RS ID     Local RS state     Peer RS state     Peer RG IP        Status
  1         MASTER             STANDBY           172.19.39.69      Connected
```

show services redundancy-group brief (Health Status Passed)

`user@host>` **show services redundancy-group brief**

```
ICCP process connection                 : Connected
Redundancy Group ID                     : 1
```

```
  Number of peer RG connections          : 1
  Local RG IP                            : 172.19.39.70
  Redundancy Set ID                      : 1
    Connection status                    : Connected
    Redundancy Set state                 : MASTER
    Redundancy Set peer state            : STANDBY
    Peer RG IP                           : 172.19.39.69
    Redundancy Set health status         : Passed
      Service Set : IPv6-SFW
        Service interface     Type              Role       Connection
Synchronization
        ms-1/3/0              Inter-chassis     active     Up             Hot

        ms-1/2/0              Inter-chassis     active     Up             Hot

        ms-1/1/0              Inter-chassis     active     Up             Hot

        ms-1/0/0              Inter-chassis     active     Up             Hot

      Service Set : NAPT44-SS1-SS4
        Service interface     Type              Role       Connection
Synchronization
        ms-1/3/0              Inter-chassis     active     Up             Hot

        ms-1/2/0              Inter-chassis     active     Up             Hot

        ms-1/1/0              Inter-chassis     active     Up             Hot

        ms-1/0/0              Inter-chassis     active     Up             Hot
```

show services redundancy-group brief (Health Status Failed)

`user@host>` **show services redundancy-group brief**

```
ICCP Process Connection               : Connected
Redundancy Group ID   : 1
  Number of Members   : 2
  Redundancy Set ID       : 1
    Remote IP address                          : 203.0.113.2
    Connection Status                           : Connected
    Redundancy Set State                       : STANDBY (WAIT)
    Redundancy Set Peer State                : MASTER
    Redundancy Set Health Status           : Failed
      Number of  Monitored interface down : 1            <<<<<<< Failure Reasons
```

```
      Failed Interfaces
<<<<<<<  Name of the monitored interfaces which have gone  down
        ms-2/3/0
      Service Set : ss2
        Service Interface     Type                  Role           Connection
 Synchronization
        ms-2/2/0                  Inter-chassis     backup     Up
     Hot
        ms-2/1/0                  Inter-chassis     backup     Down
  Off
        ms-2/0/0                  Inter-chassis     backup     Down
  Off
      Service Set : ss_new
        Service Interface     Type                  Role          Connection
Synchronization
        ms-2/3/0
```

show services redundancy-group extensive

user@host> **show services redundancy-group extensive**

```
ICCP process connection                        : Connected
ICCP process connection close count            : 0
ICCP process connection open complete count    : 1
ICCP packet sent count                         : 7303
ICCP packet receive count                      : 7321
ICCP process keepalive receive count           : 7253
ICCP process keepalive sent count              : 7253
ICCP redundancy group add count                : 0
ICCP redundancy group delete count             : 0
Redundancy Group ID                      : 1
  Number of peer RG connections          : 1
  Local RG IP                            : 172.19.39.70
  RG connection up count                 : 4
  RG connection down count               : 2
  RG join count                          : 4
  RG data receive count                  : 37
  RG data sent count                     : 0
  RG connect message sent count          : 4
  RG connect message receive count       : 4
  RG disconnect message sent count       : 0
  RG disconnect message receive count    : 4
  RG ack sent count                      : 4
```

```
  RG nack sent count                    : 0
  RG nack receive count                 : 4
  Redundancy Set ID                     : 1
    Connection status                   : Connected
    Redundancy Set state                : MASTER
    Redundancy Set peer state           : STANDBY
    Peer RG IP                          : 172.19.39.69
    Redundancy Set health status        : Passed
      Service Set : IPv6-SFW
        Service interface     Type              Role       Connection
Synchronization
        ms-1/3/0              Inter-chassis     active     Up             Hot

        ms-1/2/0              Inter-chassis     active     Up             Hot

        ms-1/1/0              Inter-chassis     active     Up             Hot

        ms-1/0/0              Inter-chassis     active     Up             Hot

      Service Set : NAPT44-SS1-SS4
        Service interface     Type              Role       Connection
Synchronization
        ms-1/3/0              Inter-chassis     active     Up             Hot

        ms-1/2/0              Inter-chassis     active     Up             Hot

        ms-1/1/0              Inter-chassis     active     Up             Hot

        ms-1/0/0              Inter-chassis     active     Up             Hot

    Transition events              Received         Ignored
      Acquire mastership auto      3                0
      Acquire mastership manual    0                0
      Release mastership auto      3                0
      Release mastership manual    0                0

    Monitored events               Received         Ignored
      Link-down                    145              31
      Routing restart/abort        1                0
      Route update error           0                0
      Peer mastership-acquire      3                0
      Peer mastership-release      3                0
```

show services screen ids-option (Next Gen Services)

Syntax

```
show services screen <ids-option>
screen-name
logical-system
root-logical-system
tenant
```

Release Information

Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display the configuration information about the specified services screen. You can configure a **ids-option** to enable screen protection on the MX Series devices.

Options

- ***screen-name*** —Name of the screen.
- **logical-system**—Name of the logical system.
- **root-logical-system**—Displays root logical system as default.
- **tenant | all**—Name of the tenant system or all tenants.

Required Privilege Level

view

RELATED DOCUMENTATION

ids-option

List of Sample Output

show services screen ids-option on page 673

Sample Output

show services screen ids-option

```
user@host> show services screen ids-option <option1>
```

```
Screen object status:

Name                                    Value
ICMP flood threshold                      0
UDP flood threshold                       0
TCP winnuke                             enabled
TCP port scan threshold                   0
ICMP address sweep threshold              0
TCP sweep threshold                       0
UDP sweep threshold                       0
IP tear drop                            enabled
TCP SYN flood attack threshold            0
TCP SYN flood alarm threshold             0
TCP SYN flood source threshold            0
TCP SYN flood destination threshold       0
TCP SYN flood timeout                     0
ICMP ping of death                      enabled
IP source route option                  enabled
TCP land attack                         enabled
TCP SYN fragment                        enabled
TCP no flag                             enabled
IP unknown protocol                     enabled
IP bad options                          enabled
IP record route option                  enabled
IP timestamp option                     enabled
IP security option                      enabled
IP lose source route option             enabled
IP stream option                        enabled
ICMP fragmentation                      enabled
ICMP large packet                       enabled
TCP SYN FIN                             enabled
TCP FIN no ACK                          enabled
Session source limit threshold              0
Session destination limit threshold         0
Alarm without drop                      enabled
```

show services screen-statistics service-set (Next Gen Services)

Syntax

```
show services screen statistics service-set service-set
```

Release Information

Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display intrusion detection service (IDS) screen statistics.

Options

- ***screen-name*** —Name of the screen.
- **logical-system**—Name of the logical system.
- **root-logical-system**—Displays root logical system as default.
- **tenant**—Name of the tenant system.

Required Privilege Level

view

RELATED DOCUMENTATION

> *ids-option*
>
> *Example: Configuring Multiple Screening Options*

List of Sample Output

show services screen statistics service-set on page 678

Output Fields

Table 50 on page 675 lists the output fields for the **show services screen statistics service-set** command. Output fields are listed in the approximate order in which they appear.

Table 50: show services screen statistics service-set Output Fields

Field Name	Field Description
ICMP flood	Internet Control Message Protocol (ICMP) flood counter. An ICMP flood typically occurs when ICMP echo requests use all resources in responding, such that valid network traffic can no longer be processed.

Table 50: show services screen statistics service-set Output Fields *(continued)*

Field Name	Field Description
UDP flood	User Datagram Protocol (UDP) flood counter. UDP flooding occurs when an attacker sends IP packets containing UDP datagrams with the purpose of slowing down the resources, such that valid connections can no longer be handled.
TCP winnuke	Number of Transport Control Protocol (TCP) WinNuke attacks. WinNuke is a denial-of-service (DoS) attack targeting any computer on the Internet running Windows.
TCP port scan	Number of TCP port scans. The purpose of this attack is to scan the available services in the hopes that at least one port will respond, thus identifying a service to target.
ICMP address sweep	Number of ICMP address sweeps. An IP address sweep can occur with the intent of triggering responses from active hosts.
IP tear drop	Number of teardrop attacks. Teardrop attacks exploit the reassembly of fragmented IP packets.
TCP SYN flood	Number of TCP SYN attacks.
IP spoofing	Number of IP spoofs. IP spoofing occurs when an invalid source address is inserted in the packet header to make the packet appear to come from a trusted source.
ICMP ping of death	ICMP ping of death counter. Ping of death occurs when IP packets are sent that exceed the maximum legal length (65,535 bytes).
IP source route option	Number of IP source route attacks.
TCP address sweep	Number of TCP address sweeps.
TCP land attack	Number of land attacks. Land attacks occur when an attacker sends spoofed SYN packets containing the IP address of the victim as both the destination and source IP address.
TCP SYN fragment	Number of TCP SYN fragments.
TCP no flag	Number of TCP headers without flags set. A normal TCP segment header has at least one control flag set.
IP unknown protocol	Number of IPs.

Table 50: show services screen statistics service-set Output Fields *(continued)*

Field Name	Field Description
IP bad options	Number of invalid options.
IP record route option	Number of packets with the IP record route option enabled. This option records the IP addresses of the network devices along the path that the IP packet travels.
IP timestamp option	Number of IP timestamp option attacks. This option records the time (in Universal Time) when each network device receives the packet during its trip from the point of origin to its destination.
IP security option	Number of IP security option attacks.
IP loose source route option	Number of IP loose source route option attacks. This option specifies a partial route list for a packet to take on its journey from source to destination.
IP strict source route option	Number of IP strict source route option attacks. This option specifies the complete route list for a packet to take on its journey from source to destination.
IP stream option	Number of stream option attacks. This option provides a way for the 16-bit SATNET stream identifier to be carried through networks that do not support streams.
ICMP fragment	Number of ICMP fragments. Because ICMP packets contain very short messages, there is no legitimate reason for ICMP packets to be fragmented. If an ICMP packet is so large that it must be fragmented, something is amiss.
ICMP large packet	Number of large ICMP packets.
TCP SYN FIN	Number of TCP SYN FIN packets.
TCP FIN no ACK	Number of TCP FIN flags without the acknowledge (ACK) flag.
Source session limit	Number of concurrent sessions that can be initiated from a source IP address.
TCP SYN-ACK-ACK proxy	Number of TCP flags enabled with SYN-ACK-ACK. To prevent flooding with SYN-ACK-ACK sessions, you can enable the SYN-ACK-ACK proxy protection screen option. After the number of connections from the same IP address reaches the SYN-ACK-ACK proxy threshold and SRX Series devices running Junos OS reject further connection requests from that IP address.
IP block fragment	Number of IP block fragments.

Table 50: show services screen statistics service-set Output Fields *(continued)*

Field Name	Field Description
Destination session limit	Number of concurrent sessions that can be directed to a single destination IP address.

Sample Output

show services screen statistics service-set

`user@host>` **show services screen statistics service-set USF-Service-Set-X**

```
Screen statistics:

IDS attack type
                          Statistics
ICMP flood                     0
UDP flood                      0
TCP winnuke                    0
TCP port scan                  0
ICMP address sweep             0
TCP sweep                      0
UDP sweep                      0
IP tear drop                   0
TCP SYN flood                  0
ICMP ping of death             0
IP source route option         0
TCP land attack                0
TCP SYN fragment               0
TCP no flag                    0
IP unknown protocol            0
IP bad options                 0
IP record route option         0
IP timestamp option            0
IP security option             0
IP loose source route option   0
IP strict source route option  0
IP stream option               0
ICMP fragment                  0
ICMP large packet              0
TCP SYN FIN                    0
TCP FIN no ACK                 0
```

```
Source session limit            0
TCP SYN-ACK-ACK proxy           0
IP block fragment               0
Destination session limit       0
```

show services security-intelligence category summary

Syntax

```
show services security-intelligence category summary category-name
```

Release Information

Command introduced before Junos OS Release 18.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display summary for the specified security-intelligence category.

Options

category-name— Name of the category.

Required Privilege Level

View

RELATED DOCUMENTATION

security-intelligence | 481

List of Sample Output

show services security-intelligence category summary on page 681

Output Fields

Table 51 on page 680 lists the output fields for the **show services security-intelligence category summary** command. Output fields are listed in the approximate order in which they appear.

Table 51: show services security-intelligence category summary Output Fields

Field Name	Field Description
Category name	Name of the security-intelligence category
Status	Status of the security-intelligence category
Description	Description of the security-intelligence category
Update interval	Amount of time after which the Policy Enforcer sends an update for the feed

Table 51: show services security-intelligence category summary Output Fields *(continued)*

Field Name	Field Description
TTL	Length of time (in minutes) the file remains open, receiving statistics before it is closed, transferred, and rotated. When either the time or the file size is exceeded, the file is closed and a new one opened, whether or not a transfer site is specified.
Feed name	Information about the feed, including: • **Version** • **Object umber** • **Create time** • **Update time** • **Update status** • **Expired** • **Options**

Sample Output

show services security-intelligence category summary

`user@host>` **show services security-intelligence category summary**

```
node1:
--------------------------------------------------------------------------

Category name     :CC
  Status          :Enable
  Description     :Command and Control data schema
  Update interval :1800s
  TTL             :3456000s
  Feed name       :cc_ip_data
    Version       :N/A
    Objects number:0
    Create time   :2018-03-16 05:57:39 PDT
    Update time   :2018-03-19 12:30:32 PDT
    Update status :N/A
    Expired       :No
    Options       :N/A
  Feed name       :cc_ipv6_data
    Version       :20180228.1
    Objects number:1
```

```
Create time   :2018-03-16 05:57:39 PDT
Update time   :2018-03-16 06:19:47 PDT
Update status :Store succeeded
Expired       :No
Options       :N/A
```

show services security-intelligence update status

Syntax

```
show services security-intelligence update status
```

Release Information

Command introduced before Junos OS Release 18.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display the status of connection with the Policy Enforcer.

Required Privilege Level

View

RELATED DOCUMENTATION

security-intelligence | 481

List of Sample Output

show services security-intelligence update status on page 683

Sample Output

show services security-intelligence update status

`user@host>` **show services security-intelligence update status**

```
node1:
--------------------------------------------------------------------------
Current action        :Start downloading the latest manifest.
Last update status    :Download manifest failed.
Last connection status:succeeded
Last update time      :2018-03-21 16:59:59 PDT
```

show services service-sets cpu-usage

Syntax

```
show services service-sets cpu-usage
<interface interface-name>
<service-set service-set-name>
```

Release Information

Command introduced before Junos OS Release 7.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display service set CPU usage as a percentage. The command is supported only on Adaptive Services PICs (SP PICs).

Options

none—Display CPU usage for all adaptive services interfaces and service sets.

interface *interface-name*—(Optional) Display CPU usage for a particular interface. On M Series and T Series routers, the ***interface-name*** parameter can have the value **sp-*fpc/pic/port*** or **rsp*number***.

service-set *service-set-name*—(Optional) Display CPU usage for a particular service set. For the Layer 2 Tunneling Protocol (L2TP), you can use a tunnel group to represent a service set.

Required Privilege Level

view

List of Sample Output

show services service-sets cpu-usage on page 685

Output Fields

Table 52 on page 684 lists the output fields for the **show services service-sets cpu-usage** command. Output fields are listed in the approximate order in which they appear.

Table 52: show services service-sets cpu-usage Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface

Table 52: show services service-sets cpu-usage Output Fields *(continued)*

Field Name	Field Description
Service set (system category)	Name of the CPU usage category: • idp_recommended—Name of the service sets (displays all the service sets attached to the service PICs) • Idle • System • Receive • Transmit
CPU utilization %	Percentage of the CPU resources being used

Sample Output

show services service-sets cpu-usage

`user@host>` **show services service-sets cpu-usage**

```
Interface   Service set (system category)                CPU utilization %
sp-4/1/0    idp_recommended                                        18.20 %
sp-4/1/0    Idle                                                   44.69 %
sp-4/1/0    System                                                  7.01 %
sp-4/1/0    Receive                                                15.10 %
sp-4/1/0    Transmit                                               15.00 %
```

show services service-sets memory-usage

Syntax

```
show services service-sets memory-usage
<interface interface-name>
<service-set service-set-name>
<zone>
```

Release Information

Command introduced before Junos OS Release 7.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display service set memory usage.

Options

none—Display service set memory usage.

interface *interface-name*—(Optional) Display memory usage for a particular interface. On M Series and T Series routers, the ***interface-name*** can be **sp-*fpc/pic/port***, or **rsp*number***.

> **NOTE:** This command is not supported on Multilink Protocol–based services PICs.
>
> The interface option is not supported on Multiservice PICs.

service-set *service-set-name*—(Optional) Display memory usage for a particular service set. For Layer 2 Tunneling Protocol (L2TP), you can use a tunnel group to represent a service set.

zone—(Optional) Display the memory usage zone of the adaptive services interface or an individual service set.

Required Privilege Level

view

List of Sample Output

show services service-sets memory-usage on page 687
show services service-sets memory-usage zone on page 687
show services service-sets memory-usage interface on page 687

Output Fields

Table 53 on page 687 lists the output fields for the **show services service-sets memory-usage** command. Output fields are listed in the approximate order in which they appear.

Table 53: show services service-sets memory-usage Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface
Service set	Name of a service set
Bytes Used	Number of bytes of memory being used
Memory zone	Memory zone in which the adaptive services interface is currently operating: • **Green**—All new flows are allowed. • **Yellow**—Unused memory is reclaimed. All new flows are allowed. • **Orange**—New flows are allowed only for service sets that are using less than their equal share of memory. • **Red**—No new flows are allowed.

Sample Output

show services service-sets memory-usage

```
user@host> show services service-sets memory-usage
```

```
Interface   Service set                                Bytes Used
ms-4/0/0    N/A                                           14817036
ms-4/1/0    N/A                                           14691700
```

show services service-sets memory-usage zone

```
user@host> show services service-sets memory-usage zone
```

```
Interface   Memory zone
```

show services service-sets memory-usage interface

```
user@host> show services service-sets memory-usage interface ms-4/1/0
```

```
Interface   Service Set                                      Bytes Used
 ms-4/1/0    N/A                                                 14691700
```

show services service-sets plug-ins

Syntax

```
show services service-sets plug-ins <interface interface-name>
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display service set plug-ins summary.

Options

interface *interface-name*—Display service set plug-ins information for the specified interface.

Required Privilege Level

view

List of Sample Output

show services service-sets plug-ins on page 689

Sample Output

show services service-sets plug-ins

```
user@host> show services service-sets plug-ins
```

```
Interface: vms-0/2/0
  Service-set: ss1_interface_style1, State: Ready
  Plugins configured: 1
Plugin: junos-alg, ID: 25
```

show services service-sets statistic screen-drops (Next Gen Services)

Syntax

```
show services service-sets statistic screen-drops [service-set| interface interface-name]
```

Release Information

Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display statistics for packet drops resulting from header-integrity, suspicious packet pattern, and session-limit checks performed by an MS-MPC or MS-MIC.

Options

none—Display statistics for all configured service interfaces and service sets.

<interface *interface-name*>—(Optional) Display statistics for the specified services interface.

<service-set *service-set-name* >—(Optional) Display statistics for the specified service set.

Required Privilege Level

view

RELATED DOCUMENTATION

Configuring Protection Against Network Attacks on an MS-MPC

List of Sample Output

show services service-sets statistic screen-drops on page 697

Output Fields

Table 54 on page 690 lists the output fields for the **show services service-set integrity-drops** command. Output fields are listed in the approximate order in which they appear.

Table 54: show services service-set statistics screen drops Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface.
Service set	Name of a service set.

Table 54: show services service-set statistics screen drops Output Fields *(continued)*

Field Name	Field Description
Errors	Total errors, categorized by protocol: • **IP**—Total IP version 4 errors. • **TCP**—Total Transmission Control Protocol (TCP) errors. • **UDP**—Total User Datagram Protocol (UDP) errors. • **ICMP**—Total Internet Control Message Protocol (ICMP) errors.

Table 54: show services service-set statistics screen drops Output Fields *(continued)*

Field Name	Field Description
IP Errors	

Table 54: show services service-set statistics screen drops Output Fields *(continued)*

Field Name	Field Description
	Number of IPv4 errors for the following categories: • **IP packet length inconsistencies**—IP packet length did not match the Layer 2 reported length. • **Minimum IP header length check failures**—Minimum IP header length is 20 bytes. The received packet contained less than 20 bytes. • **Reassembled packet exceeds maximum IP length**—After fragment reassembly, the reassembled IP packet length exceeded 65,535. • **Illegal source address 0**—Source address is not a valid address. Invalid addresses are loopback, broadcast, multicast, and reserved addresses. Source address **0**, however, is allowed to support BOOTP and the destination address **0xffffffff**. • **Illegal destination address** —Destination address was not a valid address. The address is reserved. • **TTL zero errors**—Received packet had a time-to-live (TTL) value of 0. • **Illegal IP protocol number 0 or 255**—IP protocol is 0 or 255. • **Land attack**—IP source address is the same as the destination address. • **Non-IP packets**—Packet did not conform to the IP standard. • **IP option**—Packet had a non-allowed IP option. • **Non-IPv4 packets**—Packet was not of the IPv4 type. • **Non-IPv6 packets**—Packet was not of the IPv6 type. • **Bad checksum**—Packet had an invalid IP checksum. • **Illegal IP fragment length**—Illegal fragment length. All fragments (other than the last fragment) must have a length that is a multiple of 8 bytes. • **IP fragment overlap**—Fragments had overlapping fragment offsets. • **IP fragment limit exceeded** —Configured number of allowed fragments for a packet was exceeded. • **IP fragment reassembly timeout**—Some of the fragments for an IP packet were not received in time, and the reassembly handler dropped partial fragments. Whenever a fragment is received, it is maintained in a chain until all other fragments are received. If other fragments do not arrive

Table 54: show services service-set statistics screen drops Output Fields *(continued)*

Field Name	Field Description
	within the configured value of reassembly-timeout, this packet is dropped and the value of the counter shown in this field is incremented. If other fragments arrive in time but the total number of fragments is more than the configured value of fragment-limit, all the fragments (of this packet) are dropped and the value of the counter shown in this field is incremented. • **IPv4 bad options**—Packet IP header contained IPv4 option that is not allowed. • **IPv6 bad extension headers**—Packet contained IPv6 extension header type that is not allowed. • **session-limit exceeded for source**—Number of concurrent sessions from an individual source address or subnet exceeded limit. • **session-limit exceeded for destination**—Number of concurrent sessions to an individual destination address or subnet exceeded limit. • **connections/second limit exceeded for source**—Number of connections per second for an individual source address or subnet exceeded limit. • **connections/second limit exceeded for destination**—Number of connections per second for an individual destination address or subnet exceeded limit. • **packets/second limit exceeded for source**—Number of packets per second for an individual source address or subnet exceeded limit. • **packet/second limit exceeded for destination**—Number of packets per second for an individual destination address or subnet exceeded limit. • **Unknown** —Unknown fragments.

Table 54: show services service-set statistics screen drops Output Fields *(continued)*

Field Name	Field Description
TCP Errors	Number of TCP protocol errors for the following categories: • **TCP header length inconsistencies**—Minimum TCP header length is 20 bytes, and the IP packet received did not contain at least 20 bytes. • **Source or destination port number is zero**—TCP source or destination port was zero. • **Illegal sequence number, flags combination**—Packet had any type of TCP header anomaly. • **TCP winnuke**—TCP segments destined for port 139 with the urgent (URG) flag set. • **TCP SYN Fragment**—TCP SYN packet was a fragment. • **TCP connection closed due to SYN defense**—Unestablished TCP connection closed because **open-timeout** value expired. • **TCP session-limit exceeded for source**—Number of concurrent TCP sessions from an individual source address or subnet exceeded limit. • **TCP session-limit exceeded for destination**—Number of concurrent TCP sessions to an individual destination address or subnet exceeded limit. • **TCP connections/second limit exceeded for source**—Number of TCP connections per second for an individual source address or subnet exceeded limit. • **TCP connections/second limit exceeded for destination**—Number of TCP connections per second for an individual destination address or subnet exceeded limit. • **TCP packets/second limit exceeded for source**—Number of TCP packets per second for an individual source address or subnet exceeded limit. • **TCP packet/second limit exceeded for destination**—Number of TCP packets per second for an individual destination address or subnet exceeded limit.

Table 54: show services service-set statistics screen drops Output Fields *(continued)*

Field Name	Field Description
UDP Errors	Number of UDP protocol errors for the following categories: • **IP data length less than minimum UDP header length (8 bytes)**—Minimum UDP header length is 8 bytes. The received IP packets contained less than 8 bytes. • **Source or destination port is zero**—UDP source or destination port was **0**. • **UDP session-limit exceeded for source**—Number of concurrent UDP sessions from an individual source address or subnet exceeded limit. • **UDP session-limit exceeded for destination**—Number of concurrent UDP sessions to an individual destination address or subnet exceeded limit. • **UDP connections/second limit exceeded for source**—Number of UDP connections per second for an individual source address or subnet exceeded limit. • **UDP connections/second limit exceeded for destination**—Number of UDP connections per second for an individual destination address or subnet exceeded limit. • **UDP packets/second limit exceeded for source**—Number of UDP packets per second for an individual source address or subnet exceeded limit. • **UDP packet/second limit exceeded for destination**—Number of UDP packets per second for an individual destination address or subnet exceeded limit.

Table 54: show services service-set statistics screen drops Output Fields *(continued)*

Field Name	Field Description
ICMP Errors	Number of ICMP protocol errors for the following categories: • **IP data length less than minimum ICMP header length (8 bytes)**—ICMP header length contained less than 8 bytes. • **ICMP error length inconsistencies**—ICMP error packet length was outside range of 48 bytes through 576 bytes. • **ICMP fragments**— ICMP packet was an IP fragment. • **ICMP session-limit exceeded for source**—Number of concurrent ICMP sessions from an individual source address or subnet exceeded limit. • **ICMP session-limit exceeded for destination**—Number of concurrent ICMP sessions to an individual destination address or subnet exceeded limit. • **ICMP connections/second limit exceeded for source**—Number of ICMP connections per second for an individual source address or subnet exceeded limit. • **ICMP connections/second limit exceeded for destination**—Number of ICMP connections per second for an individual destination address or subnet exceeded limit. • **ICMP packets/second limit exceeded for source**—Number of ICMP packets per second for an individual source address or subnet exceeded limit. • **ICMP packet/second limit exceeded for destination**—Number of ICMP packets per second for an individual destination address or subnet exceeded limit.

Sample Output

show services service-sets statistic screen-drops

`user@host>` **show services service-sets statistic screen-drops USF-Service-Set-X interface vms-0/2/0**

```
Interface: vms-0/2/0
  Service set: sset1
    Errors:
      IP: 0, TCP: 0
      UDP: 0, ICMP: 0
    IP errors:
```

```
    IP packet length inconsistencies: 0
    Illegal source address: 0
    Illegal destination address: 0
    TTL zero errors: 0, Illegal IP protocol number (0 or 255): 0
    Land attack: 0
    Non-IPv4 packets: 0
    Non-IPv6 packets: 0
    Bad checksum: 0
    Illegal IP fragment length: 0
    IP fragment overlap: 0
    IP fragment reassembly timeout: 0
    IP fragment limit exceeded: 0
    IPv4 bad options: 0
    IPv6 bad extension headers: 0
    session-limit exceeded for source: 0
    session-limit exceeded for destination: 0
    connections/second limit exceeded for source: 0
    connections/second limit exceeded for destination: 0
    packets/second limit exceeded for source: 0
    packet/second limit exceeded for destination: 0
    Unknown: 0
  TCP errors:
    TCP header length inconsistencies: 0
    Source or destination port number is zero: 0
    Illegal sequence number and flags combinations: 0
    TCP winnuke: 0
    TCP SYN Fragment: 0
    TCP connection closed due to SYN defense: 0
    TCP session-limit exceeded for source: 0
    TCP session-limit exceeded for destination: 0
    TCP connections/second limit exceeded for source: 0
    TCP connections/second limit exceeded for destination: 0
    TCP packets/second limit exceeded for source: 0
    TCP packet/second limit exceeded for destination: 0
  UDP errors:
    IP data length less than minimum UDP header length (8 bytes): 0
    Source or destination port number is zero: 0
    UDP session-limit exceeded for source: 0
    UDP session-limit exceeded for destination: 0
    UDP connections/second limit exceeded for source: 0
    UDP connections/second limit exceeded for destination: 0
    UDP packets/second limit exceeded for source: 0
    UDP packet/second limit exceeded for destination: 0
  ICMP errors:
```

```
IP data length less than minimum ICMP header length (8 bytes): 0
ICMP error length inconsistencies: 0
ICMP fragments: 0
ICMP session-limit exceeded for source: 0
ICMP session-limit exceeded for destination: 0
ICMP connections/second limit exceeded for source: 0
ICMP connections/second limit exceeded for destination: 0
ICMP packets/second limit exceeded for source: 0
ICMP packet/second limit exceeded for destination: 0
```

show services service-sets statistic screen-session-limit-counters (Next Gen Services)

Syntax

```
show services service-set statistic screen-session-limit-counters
<interface interface>
<service-set service-set>
```

Release Information

Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display counters for session drops and packet drops resulting from session-limit checks performed by an IDS rule on an MS-MPC or MS-MIC.

Options

none—Display statistics for all configured services interfaces.

interface *interface-name*—(Optional) Display statistics for the specified services interface.

service *service-set*—Display statistics for the specified service set.

Required Privilege Level

view

List of Sample Output

show services service-sets statistic screen-session-limit-counters on page 704

Output Fields

Table 55 on page 700 lists the output fields for the **show services service-set statistics ids session-limits counters** command. Output fields are listed in the approximate order in which they appear.

Table 55: show services service-sets statistics ids session-limits counters Output Fields

Field Name	Field Description

Table 55: show services service-sets statistics ids session-limits counters Output Fields *(continued)*

Field Name	Field Description
TCP Counters	Session-limit TCP counters in the ingress direction for the following: • **Sessions allowed**—Number of TCP sessions allowed by the IDS rule. • **Sessions ignored**—Number of TCP sessions that did not undergo IDS processing because traffic matched a stateful firewall rule that included **accept skip-ids**. • **Sessions dropped due to maximum reached**—Number of TCP sessions dropped because the number of TCP sessions exceeded the limit. • **Sessions dropped due to high rate**—Number of TCP sessions dropped because the number of TCP connections per second exceeded the limit. • **Packets allowed**—Number of TCP packets that the IDS rule allowed. • **Packets dropped due to high pps**—Number of TCP packets dropped because the number of TCP packets per second exceeded the limit.
UDP Counters	Session-limit UDP counters in the ingress direction for the following: • **Sessions allowed**—Number of UDP sessions allowed by the IDS rule. • **Sessions ignored**—Number of UDP sessions that did not undergo IDS processing because traffic matched a stateful firewall rule that included **accept skip-ids**. • **Sessions dropped due to maximum reached**—Number of UDP sessions dropped because the number of UDP sessions exceeded the limit. • **Sessions dropped due to high rate**—Number of UDP sessions dropped because the number of UDP connections per second exceeded the limit. • **Packets allowed**—Number of UDP packets that the IDS rule allowed. • **Packets dropped due to high pps**—Number of UDP packets dropped because the number of TCP packets per second exceeded the limit.

Table 55: show services service-sets statistics ids session-limits counters Output Fields *(continued)*

Field Name	Field Description
ICMP Counters	Session-limit ICMP counters in the ingress direction for the following: • **Sessions allowed**—Number of ICMP sessions allowed by the IDS rule. • **Sessions ignored**—Number of ICMP sessions that did not undergo IDS processing because traffic matched a stateful firewall rule that included **accept skip-ids**. • **Sessions dropped due to maximum reached**—Number of ICMP sessions dropped because the number of ICMP sessions exceeded the limit. • **Sessions dropped due to high rate**—Number of ICMP sessions dropped because the number of ICMP connections per second exceeded the limit. • **Packets allowed**—Number of ICMP packets that the IDS rule allowed. • **Packets dropped due to high pps**—Number of ICMP packets dropped because the number of ICMP packets per second exceeded the limit.
Other-Protocols Counters	Session-limit counters in the ingress direction for protocols other than TCP, UDP, and ICMP for the following: • **Sessions allowed**—Number of sessions allowed by the IDS rule. • **Sessions ignored**—Number of sessions that did not undergo IDS processing because traffic matched a stateful firewall rule that included **accept skip-ids**. • **Sessions dropped due to maximum reached**—Number of sessions dropped because the number of sessions exceeded the limit. • **Sessions dropped due to high rate**—Number of sessions dropped because the number of connections per second exceeded the limit. • **Packets allowed**—Number of packets that the IDS rule allowed. • **Packets dropped due to high pps**—Number of packets dropped because the number of packets per second exceeded the limit.
Egress General Info	Information for IDS rules for the service set in the egress direction. • **Match-direction**—Displays **output**. • **Rule name**—Name of the IDS rule. • **Term name**—Name of the term in the IDS rule.

Table 55: show services service-sets statistics ids session-limits counters Output Fields *(continued)*

Field Name	Field Description
Egress TCP Counters	Session-limit TCP counters in the egress direction for the following: • **Sessions allowed**—Number of TCP sessions allowed by the IDS rule. • **Sessions ignored**—Number of TCP sessions that did not undergo IDS processing because traffic matched a stateful firewall rule that included **accept skip-ids**. • **Sessions dropped due to maximum reached**—Number of TCP sessions dropped because the number of TCP sessions exceeded the limit. • **Sessions dropped due to high rate**—Number of TCP sessions dropped because the number of TCP connections per second exceeded the limit. • **Packets allowed**—Number of TCP packets that the IDS rule allowed. • **Packets dropped due to high pps**—Number of TCP packets dropped because the number of TCP packets per second exceeded the limit.
Egress UDP Counters	Session-limit UDP counters in the egress direction for the following: • **Sessions allowed**—Number of UDP sessions allowed by the IDS rule. • **Sessions ignored**—Number of UDP sessions that did not undergo IDS processing because traffic matched a stateful firewall rule that included **accept skip-ids**. • **Sessions dropped due to maximum reached**—Number of UDP sessions dropped because the number of UDP sessions exceeded the limit. • **Sessions dropped due to high rate**—Number of UDP sessions dropped because the number of UDP connections per second exceeded the limit. • **Packets allowed**—Number of UDP packets that the IDS rule allowed. • **Packets dropped due to high pps**—Number of UDP packets dropped because the number of TCP packets per second exceeded the limit.

Table 55: show services service-sets statistics ids session-limits counters Output Fields *(continued)*

Field Name	Field Description
Egress ICMP Counters	Session-limit ICMP counters in the egress direction for the following: • **Sessions allowed**—Number of ICMP sessions allowed by the IDS rule. • **Sessions ignored**—Number of ICMP sessions that did not undergo IDS processing because traffic matched a stateful firewall rule that included **accept skip-ids**. • **Sessions dropped due to maximum reached**—Number of ICMP sessions dropped because the number of ICMP sessions exceeded the limit. • **Sessions dropped due to high rate**—Number of ICMP sessions dropped because the number of ICMP connections per second exceeded the limit. • **Packets allowed**—Number of ICMP packets that the IDS rule allowed. • **Packets dropped due to high pps**—Number of ICMP packets dropped because the number of ICMP packets per second exceeded the limit.
Egress Other-Protocols Counters	Session-limit counters in the egress direction for protocols other than TCP, UDP, and ICMP for the following: • **Sessions allowed**—Number of sessions allowed by the IDS rule. • **Sessions ignored**—Number of sessions that did not undergo IDS processing because traffic matched a stateful firewall rule that included **accept skip-ids**. • **Sessions dropped due to maximum reached**—Number of sessions dropped because the number of sessions exceeded the limit. • **Sessions dropped due to high rate**—Number of sessions dropped because the number of connections per second exceeded the limit. • **Packets allowed**—Number of packets that the IDS rule allowed. • **Packets dropped due to high pps**—Number of packets dropped because the number of packets per second exceeded the limit.

Sample Output

show services service-sets statistic screen-session-limit-counters

`user@host>` **show services service-sets statistic screen-session-limit-counters**

```
IDS Option Name: option-1
------------------------------------------------------------
```

```
TCP Counters:
    Sessions allowed: 0
    Sessions ignored: 0
    Sessions dropped due to maximum reached: 0
    Sessions dropped due to high rate: 0
    Packets allowed: 0
    Packets dropped due to high pps: 0
UDP Counters:
    Sessions allowed: 0
    Sessions ignored: 0
    Sessions dropped due to maximum reached: 0
    Sessions dropped due to high rate: 0
    Packets allowed: 0
    Packets dropped due to high pps: 0
ICMP Counters:
    Sessions allowed: 0
    Sessions ignored: 0
    Sessions dropped due to maximum reached: 0
    Sessions dropped due to high rate: 0
    Packets allowed: 0
    Packets dropped due to high pps: 0
Other-Protocols Counters:
    Sessions allowed: 0
    Sessions ignored: 0
    Sessions dropped due to maximum reached: 0
    Sessions dropped due to high rate: 0
    Packets allowed: 0
    Packets dropped due to high pps: 0

IDS Option Name: option-2
------------------------------------------------------------------
TCP Counters:
    Sessions allowed: 0
    Sessions ignored: 0
    Sessions dropped due to maximum reached: 0
    Sessions dropped due to high rate: 0
    Packets allowed: 0
    Packets dropped due to high pps: 0
UDP Counters:
    Sessions allowed: 0
    Sessions ignored: 0
    Sessions dropped due to maximum reached: 0
    Sessions dropped due to high rate: 0
    Packets dropped due to high pps: 0
```

```
ICMP Counters:
    Sessions allowed: 0
    Sessions ignored: 0
    Sessions dropped due to maximum reached: 0
    Sessions dropped due to high rate: 0
    Packets allowed: 0
    Packets dropped due to high pps: 0
Other-Protocols Counters:
    Sessions allowed: 0
    Sessions ignored: 0
    Sessions dropped due to maximum reached: 0
    Sessions dropped due to high rate: 0
    Packets allowed: 0
    Packets dropped due to high pps: 0 Destination session limit       0
```

show services service-sets statistics integrity-drops

Syntax

```
show services service-sets statistics integrity-drops
<interface interface-name>
<service-set service-set-name>
```

Release Information

Command introduced in Junos OS Release 13.1

Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display integrity-drops statistics for one adaptive services interface, for all adaptive services interfaces, or for one service-set. You can configure use the output of this command to verify the packet header for anomalies in IP, TCP, UDP, and IGMP information and to examine any anomalies and errors.

Options

none—Display integrity-drops statistics for all configured adaptive service interfaces/ service-set.

service-set *service-set-name* —(Optional) Display integrity-drops statistics for the specified service-set

interface *interface-name*—(Optional) Display integrity-drops statistics for the specified adaptive services interface.

Required Privilege Level

view

RELATED DOCUMENTATION

clear services service-sets statistics integrity-drops

List of Sample Output

show services service-sets statistics integrity-drops on page 712

Output Fields

Table 56 on page 708 lists the output fields for the **show services service-sets integrity-drops** command. Output fields are listed in the approximate order in which they appear.

Table 56: show services service-sets integrity-drops Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface.
Service set	Name of a service set.
Errors	Total errors, categorized by protocol: • **IP**—Total IP version 4 errors. • **TCP**—Total Transmission Control Protocol (TCP) errors. • **UDP**—Total User Datagram Protocol (UDP) errors. • **ICMP**—Total Internet Control Message Protocol (ICMP) errors.

Table 56: show services service-sets integrity-drops Output Fields *(continued)*

Field Name	Field Description
IP Errors	

Table 56: show services service-sets integrity-drops Output Fields *(continued)*

Field Name	Field Description
	IPv4 errors: • **IP packet length inconsistencies**—IP packet length does not match the Layer 2 reported length. • **Minimum IP header length check failures**—Minimum IP header length is 20 bytes. The received packet contains less than 20 bytes. • **Reassembled packet exceeds maximum IP length**—After fragment reassembly, the reassembled IP packet length exceeds 65,535. • **Illegal source address 0**—Source address is not a valid address. Invalid addresses are, loopback, broadcast, multicast, and reserved addresses. Source address **0**, however, is allowed to support BOOTP and the destination address **0xffffffff**. • **Illegal destination address** —Destination address is not a valid address. The address is reserved. • **TTL zero errors**—Received packet had a time-to-live (TTL) value of 0. • **Illegal IP protocol number 0 or 255**—IP protocol is 0 or 255. • **Land attack**—IP source address is the same as the destination address. • **Non-IP packets**—Packet did not conform to the IP standard. • **IP option**—Packet dropped because of a nonallowed IP option. • **Non-IPv4 packets**—Packet was not of the IPv4 type. • **Non-IPv6 packets**—Packet was not of the IPv6 type. • **Bad checksum**—Packet had an invalid IP checksum. • **Illegal IP fragment length**—Illegal fragment length. All fragments (other than the last fragment) must have a length that is a multiple of 8 bytes. • **IP fragment overlap**—Fragments have overlapping fragment offsets. • **IP fragment limit exceeded:** —Fragments dropped because the configured number of allowed fragments for a packet was exceeded. • **IP fragment reassembly timeout**—Some of the fragments for an IP packet were not received in time, and the reassembly handler dropped partial fragments. Whenever a

Table 56: show services service-sets integrity-drops Output Fields *(continued)*

Field Name	Field Description
	fragment is received, it is maintained in a chain until all other fragments are received. If other fragments do not arrive within the configured value of reassembly-timeout, this packet is dropped and the value of the counter shown in this field is incremented. If other fragments arrive in time but the total number of fragments is more than the configured value of fragment-limit, all the fragments (of this packet) are dropped and the value of the counter shown in this field is incremented. • **Unknown:** —Unknown fragments.
TCP Errors	TCP protocol errors: • **TCP header length inconsistencies**—Minimum TCP header length is 20 bytes, and the IP packet received does not contain at least 20 bytes. • **Source or destination port number is zero**—TCP source or destination port is zero. • **Illegal sequence number, flags combination**—Dropped because of TCP errors, such as an illegal sequence number, which causes an illogical combination of flags to be set.
UDP Errors	UDP protocol errors: • **IP data length less than minimum UDP header length (8 bytes)**—Minimum UDP header length is 8 bytes. The received IP packets contain less than 8 bytes. • **Source or destination port is zero**—UDP source or destination port is **0**.
ICMP Errors	ICMP protocol errors: • **IP data length less than minimum ICMP header length (8 bytes)**—ICMP header length is 8 bytes. This counter is incremented when received IP packets contain less than 8 bytes. • **ICMP error length inconsistencies**—Minimum length of an ICMP error packet is 48 bytes, and the maximum length is 576 bytes. This counter is incremented when the received ICMP error falls outside this range.

Sample Output

show services service-sets statistics integrity-drops

user@host> **show services service-sets statistics integrity-drops**

```
Interface: ms-1/0/0
 Service set: sset1
   Errors:
     IP: 0, TCP: 0
     UDP: 0, ICMP: 0
   IP errors:
     IP packet length inconsistencies: 0
     Illegal source address: 0
     Illegal destination address: 0
     TTL zero errors: 0, Illegal IP protocol number (0 or 255): 0
     Land attack: 0
     Non-IPv4 packets: 0
     Non-IPv6 packets: 0
     Bad checksum: 0
     Illegal IP fragment length: 0
     IP fragment overlap: 0
     IP fragment limit exceeded: 0
     IP fragment reassembly timeout: 0
     Unknown: 0
   TCP errors:
     TCP header length inconsistencies: 0
     Source or destination port number is zero: 0
     Illegal sequence number and flags combinations: 0
   UDP errors:
     IP data length less than minimum UDP header length (8 bytes): 0
     Source or destination port number is zero: 0
   ICMP errors:
     IP data length less than minimum ICMP header length (8 bytes): 0
     ICMP error length inconsistencies: 0
```

show services service-sets statistics packet-drops

Syntax

```
show services service-sets statistics packet-drops
<interface interface-name>
```

Release Information

Command introduced in Junos OS Release 7.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display the number of dropped packets for service sets exceeding CPU limits or memory limits.

Options

none—Display the number of dropped service sets packets for all adaptive services interfaces.

interface *interface-name*—(Optional) Display the number of dropped service sets packets for a particular interface. On M Series and T Series routers, *interface-name* can be *ms-fpc/pic/port*, *sp-fpc/pic/port*, or *rspnumber*.

Required Privilege Level

view

RELATED DOCUMENTATION

clear services flow-collector statistics

List of Sample Output

show services service-sets statistics packet-drops on page 714

Output Fields

Table 56 on page 708 lists the output fields for the **show services service-sets packet-drops** command. Output fields are listed in the approximate order in which they appear.

Table 57: show services service-sets packet-drops Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface.
Service set	Name of a service set.

Table 57: show services service-sets packet-drops Output Fields *(continued)*

Field Name	Field Description
CPU limit Drops	Number of packets dropped because the service set exceeded the average CPU limit.
Memory limit Drops	Number of packets dropped because the service set exceeded the memory limit.
Flow limit Drops	Number of packets dropped because the service set exceeded the flow limit.

Sample Output

show services service-sets statistics packet-drops

```
user@host> show services service-sets statistics packet-drops
```

```
Interface: vms-1/0/0
  Service set: ss1
    CPU limit drops: 0
    Memory limit drops: 0
    Flow limit drops: 0
```

show services service-sets statistics syslog

Syntax

```
show services service-sets statistics syslog
<interface interface-name>
<service-set service-set-name>
<brief | detail>
```

Release Information

Command introduced in Junos OS Release 11.1.
Support for this command introduced in Junos OS Release 19.3R2 for Next Gen Services with the MX-SPC3 services card on MX240, MX480 and MX960 routers.

Description

Display the system log statistics with optional filtering by interface and service set name.

Options

none—Display the system log statistics for all services interfaces and all service sets.

brief—(Default) (Optional) Display abbreviated system log statistics.

detail—(Optional) Display detailed system log statistics.

interface *interface-name*—(Optional) Display the system log statistics for a specific adaptive service interface.
On M Series and T Series routers, *interface-name* can be **ms-*fpc/pic/port***, **sp-*fpc/pic/port***, or **rsp*number***.

service-set *service-set-name*—(Optional) Display the system log statistics for a specific named service-set.

Required Privilege Level

view

RELATED DOCUMENTATION

clear services service-sets statistics syslog

List of Sample Output

show services service-sets statistics syslog brief on page 719
show services service-sets statistics syslog detail on page 720

Output Fields

Table 58 on page 716 lists the output fields for the **show services service-sets statistics syslog** command. Output fields are listed in the approximate order in which they appear.

Table 58: show services service-sets statistics syslog Output Fields

Field Name	Field Description	Level
Interface	Name of a services interface.	all
Rate limit	Maximum number of messages per second written to the interface's system log.	all
Sent	Number of messages sent that are not associated with a service set.	all
Dropped	Number of messages dropped that are not associated with a service set.	all
Service-set		
Service-set	Name of a service set.	all
Sent	Number of sent messages that are associated with the service set.	all
Dropped	Number of dropped messages that are associated with the service set.	all

Session open logs	The following information is displayed for system log messages for session open events that are logged and are associated with the service set:
	• **Sent**—Number of messages sent.
	• **Dropped**—Number of messages dropped. Counts are given for these drop reasons:
	  ◦ **low priority**—Priority of the message was too low for the message to be sent.
	  ◦ **no class set**—Specific classes of event messages were configured and this class was not selected.
	  ◦ **above rate limit**—Maximum number of system log messages per second was exceeded.
		detail

Table 58: show services service-sets statistics syslog Output Fields *(continued)*

Field Name	Field Description	Level

Session close logs	The following information is displayed for system log messages for session close events that are logged and are associated with the service set:
	• **Sent**—Number of messages sent.
	• **Dropped**—Number of messages dropped. Counts are given for these drop reasons:
	  ◦ **low priority**—Priority of the message was too low for the message to be sent.
	  ◦ **no class set**—Specific classes of event messages were configured and this class was not selected.
	  ◦ **above rate limit**—Maximum number of system log messages per second was exceeded.
		detail

Packet logs	The following information is displayed for system log messages for packet events that are logged and are associated with the service set:
	• **Sent**—Number of messages sent.
	• **Dropped**—Number of messages dropped. Counts are given for these drop reasons:
	  ◦ **low priority**—Priority of the message was too low for the message to be sent.
	  ◦ **no class set**—Specific classes of event messages were configured and this class was not selected.
	  ◦ **above rate limit**—Maximum number of system log messages per second was exceeded.
		detail

Stateful firewall logs	The following information is displayed for system log messages for stateful firewall events that are logged and are associated with the service set:
	• **Sent**—Number of messages sent.
	• **Dropped**—Number of messages dropped. Counts are given for these drop reasons:
	  ◦ **low priority**—Priority of the message was too low for the message to be sent.
	  ◦ **no class set**—Specific classes of event messages were configured and this class was not selected.
	  ◦ **above rate limit**—Maximum number of system log messages per second was exceeded.
		detail

Table 58: show services service-sets statistics syslog Output Fields *(continued)*

Field Name	Field Description	Level

ALG logs	The following information is displayed for system log messages for ALG events that are logged and are associated with the service set:
	• **Sent**—Number of messages sent.
	• **Dropped**—Number of messages dropped. Counts are given for these drop reasons:
	  ◦ **low priority**—Priority of the message was too low for the message to be sent.
	  ◦ **no class set**—Specific classes of event messages were configured and this class was not selected.
	  ◦ **above rate limit**—Maximum number of system log messages per second was exceeded.
		detail

NAT logs	The following information is displayed for system log messages for NAT events that are logged and are associated with the service set:
	• **Sent**—Number of messages sent.
	• **Dropped**—Number of messages dropped. Counts are given for these drop reasons:
	  ◦ **low priority**—Priority of the message was too low for the message to be sent.
	  ◦ **no class set**—Specific classes of event messages were configured and this class was not selected.
	  ◦ **above rate limit**—Maximum number of system log messages per second was exceeded.
		detail

IDS logs	The following information is displayed for system log messages for IDS events that are logged and are associated with the service set:
	• **Sent**—Number of messages sent.
	• **Dropped**—Number of messages dropped. Counts are given for these drop reasons:
	  ◦ **low priority**—Priority of the message was too low for the message to be sent.
	  ◦ **no class set**—Specific classes of event messages were configured and this class was not selected.
	  ◦ **above rate limit**—Maximum number of system log messages per second was exceeded.
		detail

Table 58: show services service-sets statistics syslog Output Fields *(continued)*

Field Name	Field Description	Level

Other logs	The following information is displayed for system log messages for other types of events that are logged and are associated with the service set:
	• **Sent**—Number of messages sent.
	• **Dropped**—Number of messages dropped. Counts are given for these drop reasons:
	  ◦ **low priority**—Priority of the message was too low for the message to be sent.
	  ◦ **no class set**—Specific classes of event messages were configured and this class was not selected.
	  ◦ **above rate limit**—Maximum number of system log messages per second was exceeded.
		detail

Sample Output

show services service-sets statistics syslog brief

`user@host>` **show services service-sets statistics syslog brief**

```
Interface: sp-1/1/0
  Rate limit: 200000
  Sent: 0
  Dropped: 0
  Service-set: sset-sfw-sp1
    Sent: 20
    Dropped: 3488
  Service-set: sset-nat-sp1
    Sent: 18
    Dropped: 91
Interface: sp-1/2/0
  Rate limit: 15000
  Sent: 0
  Dropped: 0
  Service-set: sset-sfw-sp2
    Sent: 210
    Dropped: 579
```

Sample Output

show services service-sets statistics syslog detail

user@host> **show services service-sets statistics syslog detail**

```
Interface: ms-2/1/0
  Rate limit: 0
  Sent: 0
  Dropped: 0
  Service-set: sset1
    Sent: 0
    Dropped: 0
    Session open logs:
      Sent: 0
      Dropped: 0 (low priority: 0, none severity: 0, no class set: 0, above rate
limit: 0)
    Session close logs:
      Sent: 0
      Dropped: 0 (low priority: 0, none severity: 0, no class set: 0, above rate
limit: 0)
    Packet logs:
      Sent: 0
      Dropped: 0 (low priority: 0, none severity: 0, no class set: 0, above rate
limit: 0)
    Stateful firewall logs:
      Sent: 0
      Dropped: 0 (low priority: 0, none severity: 0, no class set: 0, above rate
limit: 0)
    ALG logs:
      Sent: 0
      Dropped: 0 (low priority: 0, none severity: 0, no class set: 0, above rate
limit: 0)
    NAT logs:
      Sent: 0
      Dropped: 0 (low priority: 0, none severity: 0, no class set: 0, above rate
limit: 0)
    IDS logs:
      Sent: 0
      Dropped: 0 (low priority: 0, none severity: 0, no class set: 0, above rate
limit: 0)
    PCP MAP logs:
      Sent: 0
      Dropped: 0 (low priority: 0, none severity: 0, no class set: 0, above rate
```

```
limit: 0)
    PCP protocol logs:
      Sent: 0
      Dropped: 0 (low priority: 0, none severity: 0, no class set: 0, above rate
limit: 0)
    PCP protocol error logs:
Sent: 0
      Dropped: 0 (low priority: 0, none severity: 0, no class set: 0, above rate
limit: 0)
    PCP debug logs:
      Sent: 0
      Dropped: 0 (low priority: 0, none severity: 0, no class set: 0, above rate
limit: 0)
    Other logs:
      Sent: 0
      Dropped: 0 (low priority: 0, none severity: 0, no class set: 0, above rate
limit: 0)
```

For Next Gen Services MX-SPC3 Services Card

Following shows the output for the **show services service-sets statistics syslog** on the MX-SPC3 services cards **vms-x/y/z** interfaces.

`user@host>` **show services service-sets statistics syslog**

```
show services service-sets statistics syslog
Log Module Statistics
Interface-Name- vms-2/0/0
Service-set Name- Sset1
Name               Generated       Discarded
-----------------------------------------
UTM                0               0
FW_AUTH            0               0
SCREEN             0               0
ALG                0               0
NAT                0               0
FLOW               0               0
SCTP               0               0
GTP                0               0
IPSEC              0               0
```

```
IDP                0              0
RTLOG              0              0
PST_DS_LITE        0              0
APPQOS             0              0
SECINTEL           0              0
AAMW               0              0
OTHERS             0              0

Log stream Statistics
Interface-Name- vms-2/0/0
Service-set Name- Sset1
Name               send           Fail
-------------------------------------------
database           0              0
```

show services service-sets statistics tcp

Syntax

```
show services service-sets statistics tcp
<interface interface-name>
<service-set service-set-name>
```

Release Information

Command introduced in Junos OS Release 17.2.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display TCP-related statistics.

Options

interface *interface-name*—Name of adaptive services interface.

service-set *service-set-name*—Name of service set.

Required Privilege Level

view

RELATED DOCUMENTATION

Configuring TFO

List of Sample Output

show services service-sets statistics tcp on page 723

Output Fields

Sample Output

show services service-sets statistics tcp

`user@host>` **show services service-sets statistics tcp**

```
Interface:vms-0/2/0
  Service set: ss1_interface_style1
```

```
TCP open/close statistics:
  TCP first packet non-syn: 1
  TCP first packet reset: 0
  TCP first packet FIN: 0
  TCP non syn discard: 0
  TCP extension alloc fail: 0
  TFO SYN with cookie request: 0
  TFO SYN with cookie: 0
  TFO SYN ACK with cookie: 0
  TFO packets forwarded: 0
  TFO packets dropped: 0
  TFO packets stripped: 0
  TCP invalid syn ack: 0
  TCP invalid ack window check: 0
  TCP invalid syn transmit: 0
  TCP invalid reset in listen: 0
  TCP invalid reset in syn received: 0
  TCP invalid reset in syn sent: 0
  TCP invalid flags handshake: 0
TCP MSS statistics:
  TCP SYN MSS Received: 0
  TCP SYN MSS Modified: 0
```

show services service-sets summary

Syntax

```
show services service-sets summary
<interface interface-name>
```

Release Information

Command introduced before Junos OS Release 7.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display service set summary information.

Options

none—Display service set summary information for all adaptive services interfaces.

interface *interface-name*—(Optional) Display service set summary information for a particular interface.

On M Series and T Series routers, ***interface-name*** can be **ms-*fpc/pic/port***, **sp-*fpc/pic/port***, or **rsp*number***.

On MX Series MX240, MX480, and MX960 routers, ***interface-name*** can be **vms-*fpc/pic/port*** for the MX-SPC3 services card for Next Gen Services.

Required Privilege Level

view

List of Sample Output

show services service-sets summary on page 726
show services service-sets summary interface on page 726

Output Fields

Table 59 on page 725 lists the output fields for the **show services service-sets summary** command. Output fields are listed in the approximate order in which they appear.

Table 59: show services service-sets summary Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface
Service type	Type of adaptive service, such as stateful firewall (SFW), Network Address Translation (NAT), intrusion detection service (IDS), Layer 2 Tunneling Protocol (L2TP), Compressed Real-Time Transport Protocol (CRTP), or IP Security (IPsec)

Table 59: show services service-sets summary Output Fields *(continued)*

Field Name	Field Description
Service sets configured	Total number of service sets configured on the PIC that use internal service set IDs and do not consume external service sets, including CRTP and L2TP
Bytes used	Bytes used by a particular service or all services
Policy bytes used	Policy bytes used by a particular service or all services
CPU utilization	Percentage of the CPU resources being used

Sample Output

show services service-sets summary

`user@host>` **show services service-sets summary**

```
                Service sets
              CPU
Interface    configured            Bytes used       Session bytes used     Policy
 bytes used      utilization
vms-3/0/0         1          3453621040 (24.93%)         0 ( 0.00%)      8161168
 ( 0.90%)        0.14 %
```

show services service-sets summary interface

`user@host>` **show services service-sets summary interface sp-1/3/0**

```
Interface: sp-1/3/0
                 Service sets                          CPU
  Service type   configured              Bytes used   utilization
  SFW/NAT/IDS               1           54 ( 0.00 %)       N/A
  L2TP                      1           58 ( 0.00 %)       N/A
  CRTP                      1           58 ( 0.00 %)       N/A
  System                    0       920831 ( 0.44 %)       N/A
  Idle                      0            0 ( 0.00 %)       N/A
  Total                     3       921001 ( 0.44 %)       N/A
```

show services sessions (Next Gen Services)

Syntax

```
show services sessions
<brief | extensive | terse>
<application-protocol protocol>
<count>
<destination-port destination-port>
<destination-prefix destination-prefix>
<interface interface-name>
<limit number>
<protocol protocol>
<service-set service-set>
<source-port source-port>
<source-prefix source-prefix>
<utilization>
```

Release Information

Command introduced in Junos OS Release 19.3R2 on MX Series for USF.

Description

Display session information.

> **NOTE:** On MX Series routers (with interchassis redundancy configured), the idle timeout for every flow is displayed in the **show services session extensive** and **show services flows extensive** commands.

Options

none—Display standard information about all sessions.

brief | extensive | terse—(Optional) Display the specified level of output.

application-protocol *protocol*—(Optional) Display information about one of the following application protocols:

- **bootp**—Bootstrap protocols
- **dce-rpc**—Distributed Computing Environment-Remote Procedure Call protocols
- **dce-rpc-portmap**—Distributed Computing Environment-Remote Procedure Call protocols portmap service
- **dns**—Domain Name System protocol

- **exec**—Remote Execution Protocol
- **ftp**—File Transfer Protocol
- **h323**—H.323
- **icmp**—ICMP
- **icmpv6**—ICMPv6
- **iiop**—Internet Inter-ORB Protocol
- **ike-esp-nat**—IKE ALG
- **ip**—IP
- **login**—LOGIN
- **netbios**—NETBIOS
- **netshow**—NETSHOW
- **pptp**—Point-to-Point Tunneling Protocol
- **realaudio**—RealAudio
- **rpc**—Remote Procedure Call protocol
- **rpc-portmap**—Remote Procedure Call protocol portmap service
- **rtsp**—Real-Time Streaming Protocol
- **rsh**—Remote Shell
- **sip**—Session Initiation Protocol
- **shell**—Shell
- **snmp**—SNMP
- **sql**—SQLNet
- **talk**—Talk Program
- **tftp**—Trivial File Transfer Protocol
- **traceroute**—Traceroute
- **winframe**—WinFrame

NOTE: You can use the **none** option with the **show services sessions count application-protocol** command to display information about sessions other than ALG sessions.

count—(Optional) Display a count of the matching entries.

destination-port *destination-port*—(Optional) Display information for the specified destination port. The range of values is from 0 to 65,535.

destination-prefix *destination-prefix*—(Optional) Display information for the specified destination prefix.

interface *interface-name*—(Optional) Display information about the specified services interface.

limit *number*—(Optional) Maximum number of entries to display.

protocol *protocol*—(Optional) Display information about one of the following IP types:

- ***number***—Numeric protocol value from 0 to 255
- **ah**—IPsec Authentication Header protocol
- **egp**—An exterior gateway protocol
- **esp**—IPsec Encapsulating Security Payload protocol
- **gre**—A generic routing encapsulation protocol
- **icmp**—Internet Control Message Protocol
- **icmp6**—Internet Control Message Protocol version 6
- **igmp**—Internet Group Management Protocol
- **ipip**—IP-within-IP Encapsulation Protocol
- **ospf**—Open Shortest Path First protocol
- **pim**—Protocol Independent Multicast protocol
- **rsvp**—Resource Reservation Protocol
- **sctp**—Stream Control Transmission Protocol
- **tcp**—Transmission Control Protocol
- **udp**—User Datagram Protocol

service-set *service-set*—(Optional) Display information for the specified service set.

source-port *source-port*—(Optional) Display information for the specified source port. The range of values is from 0 to 65,535.

source-prefix *source-prefix*—(Optional) Display information for the specified source prefix.

utilization—(Optional) Display statistical details about session utilization.

Required Privilege Level
view

List of Sample Output
show services sessions on page 731

Output Fields

Table 60 on page 730 lists the output fields for the **show services sessions** command. Output fields are listed in the approximate order in which they appear.

Table 60: show services sessions Output Fields

Field Name	Field Description	Level of Output
Interface	Name of the services interface.	**application-protocol**
Session	Session ID that uniquely identifies the session.	All levels
ALG	Name of the application.	**terse**
Flags	Session flag for the ALG: • **0x1**—Found an existing session. • **0x2**—Reached session or flow limit. • **0x3**—No memory available for new sessions. • **0x4**—No free session ID available. • **0x0000**—No session ID found.	All levels
IP Action	Flag indicating whether IP action has been set for the session.	All levels
Offload	Flag indicating whether the session has been offloaded to the Packet Forwarding Engine.	All levels
Asymmetric	Flag indicating whether the session is uni-directional.	**terse** **application-protocol**

Table 60: show services sessions Output Fields *(continued)*

Field Name	Field Description	Level of Output
Service set	Name of a service set. Individual empty service sets are not displayed.	**count**
Sessions Count	Number of sessions.	**count**

Sample Output

show services sessions

`user@host>` **show services sessions**

```
Session ID: 3, Service-set: ss1_interface_style1, Policy name: R11/7, Timeout: 28,
 Valid
  In: 20.1.1.2/48102 --> 30.1.1.2/22;tcp, Conn Tag: 0x0, If: vms-0/2/0.16387, Pkts:
 69, Bytes: 6205,
  Out: 30.1.1.2/22 --> 44.0.0.3/29071;tcp, Conn Tag: 0x0, If: vms-0/2/0.0, Pkts:
58, Bytes: 8089,
Total sessions: 1
```

show services sessions brief

The output for the **show services flows brief** command is identical to that for the **show services sessions** command. For sample output, see show services sessions on page 731.

show services sessions extensive

`user@host>` **show services sessions extensive**

```
Session ID: 3, Service-set: ss1_interface_style1, Status: Normal
Flags: 0x0/0x0/0x8003
Policy name: R11/7
Source NAT pool: src_pool1, Application: junos-ssh/22
Dynamic application: junos:UNKNOWN,
Encryption:  Unknown
Application traffic control rule-set: INVALID, Rule: INVALID
Maximum timeout: 30, Current timeout: 28
Session State: Valid
Start time: 26, Duration: 64
   In: 20.1.1.2/48102 --> 30.1.1.2/22;tcp,
```

```
  Conn Tag: 0x0, Interface: vms-0/2/0.16387,
    Session token: 0x3d, Flag: 0x401021
    Route: 0x0, Gateway: 20.1.1.2, Tunnel: 0
    Port sequence: 0, FIN sequence: 0,
    FIN state: 0,
    Pkts: 69, Bytes: 6205
   Out: 30.1.1.2/22 --> 44.0.0.3/29071;tcp,
  Conn Tag: 0x0, Interface: vms-0/2/0.0,
    Session token: 0x3d, Flag: 0x401020
    Route: 0x0, Gateway: 30.1.1.2, Tunnel: 0
    Port sequence: 0, FIN sequence: 0,
    FIN state: 0,
    Pkts: 58, Bytes: 8089
Total sessions: 1
```

show services sessions terse

user@router> **show services sessions terse**

```
vms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I              33
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O              31
```

show services sessions analysis

user@router>**show services sessions analysis**

```
vms-1/0/0
  Interface:   vms-1/0/0

Session Analysis Statistics:

  Total sessions Active                  :0
  Total TCP Sessions Active              :0
      Tcp sessions from gate             :0
      Tunneled TCP sessions              :0
      Regular TCP sessions               :0
      IPv4 active Session                :0
      IPv6 active Session                :0
  Total UDP sessions Active              :0
      UDP sessions from gate             :0
      Tunneled UDP sessions              :0
```

```
      Regular UDP sessions               :0
      IPv4 active Session                :0
      IPv6 active Session                :0
  Total Other sessions Active            :0
      IPv4 active Session                :0
      IPv6 active Session                :0
  Created sessions per Second            :0
  Deleted sessions per Second            :0
  Peak Total sessions Active             :0
  Peak Total TCP sessions Active         :0
  Peak Total UDP sessions Active         :0
  Peak Total Other sessions Active       :0
  Peak Created Sessions per Second       :0
  Peak Deleted Sessions per Second       :0
  Packets received                       :0
  Packets transmitted                    :0
  Slow path forward                      :0
  Slow path discard                      :0

Session Rate Data:
  Number of Samples: 638051

 Session Rate Distribution(sec)

 Session Operation :Creation

    400000+            :0
    350001  - 400000   :0
    300001  - 350000   :0
    250001  - 300000   :0
    200001  - 250000   :0
    150001  - 200000   :0
     50001  - 150000   :0
     40001  -  50000   :0
     30001  -  40000   :0
     20001  -  30000   :0
     10001  -  20000   :0
      1001  -  10000   :0
         1  -   1000   :0
                   0   :638051


 Session Operation :Deletion
```

```
    400000+           :0
    350001  - 400000   :0
    300001  - 350000   :0
    250001  - 300000   :0
    200001  - 250000   :0
    150001  - 200000   :0
     50001  - 150000   :0
     40001  -  50000   :0
     30001  -  40000   :0
     20001  -  30000   :0
     10001  -  20000   :0
      1001  -  10000   :0
         1  -   1000   :0
                   0   :638051


Session Lifetime Distribution(sec):

                TCP               UDP             HTTP
  240+          :0                0               0
  120 - 240     :0                0               0
   60 - 120     :0                0               0
   30 - 60      :0                0               0
   15 - 30      :0                0               0
    5 - 15      :0                0               0
    1 - 5       :0                0               0
    0 - 1       :0                0               0
```

show services sessions application-protocol

This command has the same output for the rpc, dce-rpc, rpc-portmap and dce-rpc-portmap ALGs.

`user@router>` **show services sessions application-protocol dce-rpc**

```
Interface name: vms-1/1/0
Session: 8, ALG: portmapper, Flags: 0x1800, IP Action: no, Offload: no
UDP    192.168.203.198:1019  ->192.168.203.194:2049  Forward  I              4
UDP    192.168.203.194:2049  ->192.168.203.198:1019  Forward  O              4
Session: 7, ALG: portmapper, Flags: 0x1800, IP Action: no, Offload: no
UDP    192.168.203.198:954   ->192.168.203.194:613   Forward  I              1
UDP    192.168.203.194:613   ->192.168.203.198:954   Forward  O              1
Session: 6, ALG: portmapper, Flags: 0x1800, IP Action: no, Offload: no
UDP    192.168.203.198:53836 ->192.168.203.194:613   Forward  I              1
UDP    192.168.203.194:613   ->192.168.203.198:53836 Forward  O              1
```

```
Session: 5, ALG: portmapper, Flags: 0x1000, IP Action: no, Offload: no
UDP    192.168.203.198:59813 ->192.168.203.194:111   Forward  I              1
UDP    192.168.203.194:111   ->192.168.203.198:59813 Forward  O              1
Session: 4, ALG: portmapper, Flags: 0x1800, IP Action: no, Offload: no
UDP    192.168.203.198:36595 ->192.168.203.194:2049  Forward  I              1
UDP    192.168.203.194:2049  ->192.168.203.198:36595 Forward  O              1
Session: 3, ALG: portmapper, Flags: 0x1000, IP Action: no, Offload: no
UDP    192.168.203.198:56050 ->192.168.203.194:111   Forward  I              1
UDP    192.168.203.194:111   ->192.168.203.198:56050 Forward  O              1
```

user@router> **show services sessions application-protocol dns**

```
Interface name: vms-2/0/0
Session: 293, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     198.51.100.2:43677 ->    203.0.113.10:53    Forward  I        1
UDP    203.0.113.10:53    ->        192.0.2.1:43677 Forward  O        1
Session: 53, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     198.51.100.2:37494 ->    203.0.113.10:53    Forward  I        1
UDP    203.0.113.10:53    ->        192.0.2.1:37494 Forward  O        1
Session: 66, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     198.51.100.2:48161 ->    203.0.113.10:53    Forward  I        1
UDP    203.0.113.10:53    ->        192.0.2.1:48161 Forward  O        1
Session: 17, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     198.51.100.2:38908 ->    203.0.113.10:53    Forward  I        1
UDP    203.0.113.10:53    ->        192.0.2.1:38908 Forward  O        1
Session: 42, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     198.51.100.2:58189 ->    203.0.113.10:53    Forward  I        1
UDP    203.0.113.10:53    ->        192.0.2.1:58189 Forward  O        1
```

user@router> **show services sessions application-protocol ftp**

```
Interface name: vms-4/1/0
Session: 1, ALG: 1, Flags: 0x0040, IP Action: no, Offload: no
TCP       192.0.2.129:32843 ->       198.51.100.129:21    Forward  I       26
TCP       198.51.100.129:21    ->        192.0.2.0:32843 Forward  O       30
```

user@router> **show services sessions application-protocol ike-esp-nat**

```
Service Set: ss_ipv4, Session: 33554435, ALG: ike-esp-nat, Flags: 0x0800, IP Action:
 no, Offload: no, Asymmetric: no
ESP 198.51.100.2:4689  ->        203.0.113.1:62108 Forward O 2199
ESP 192.0.2.2:62108  ->       198.51.100.2:4689 Forward I 0
```

```
Service Set: ss_ipv4, Session: 33554434, ALG: ike-esp-nat, Flags: 0x0800, IP Action:
 no, Offload: no, Asymmetric: no
ESP 192.0.2.2:44179  ->       198.51.100.2:43809 Forward I 2199
ESP 198.51.100.2:43809  ->       203.0.113.1:44179 Forward O 0
Service Set: ss_ipv4, Session: 33554433, ALG: ike-esp-nat, Flags: 0x0000, IP Action:
 no, Offload: no, Asymmetric: no
UDP 192.0.2.2:500  ->         198.51.100.2:500 Forward I 8
UDP 198.51.100.2:500  ->         203.0.113.1:57730 Forward O
```

user@router> **show services sessions application-protocol pptp**

```
Interface name: vms-2/0/0
Session: 3, ALG: pptp, Flags: 0x2800, IP Action: no, Offload: no, Asymmetric: no
GRE        203.0.113.138:0     ->    203.0.113.138:0     Forward  O
21
GRE        192.0.2.794:0     ->    203.0.113.138:0:65000 Forward  I
 0
Session: 2, ALG: pptp, Flags: 0x2800, IP Action: no, Offload: no, Asymmetric: no
GRE        192.0.2.794:0     ->    203.0.113.138:0:49913 Forward  I
88
GRE        203.0.113.138:0:49913 ->    192.0.2.794:65001 Forward  O
 0
Session: 1, ALG: pptp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP        192.0.2.794:1511  ->    203.0.113.138:0:1723  Forward  I
13
TCP        203.0.113.138:0:1723  ->    192.0.2.794:1511  Forward  O
12
```

user@router> **show services sessions application-protocol rtsp**

```
Interface name: vms-0/1/0
Session: 13, ALG: rtsp, Flags: 0x0800, IP Action: no, Offload: no
UDP        203.0.113.66:5004  ->        198.51.100.66:3989  Forward  O      152
UDP        198.51.100.66:3989  ->        192.0.2.161:5004  Forward  I        0
Session: 9, ALG: rtsp, Flags: 0x0800, IP Action: no, Offload: no
UDP        203.0.113.66:5004  ->        198.51.100.66:3986  Forward  O        3
UDP        198.51.100.66:3986  ->        192.0.2.161:5004  Forward  I        0
```

user@router> **show services sessions application-protocol rsh**

```
Interface name: vms-2/0/0
Session: 3, ALG: 2, Flags: 0x0840, IP Action: no, Offload: no
```

```
TCP    203.0.113.10:1023  ->     198.51.100.2:1020  Forward  O        4
TCP     198.51.100.2:1020  ->    203.0.113.10:1023  Forward  I        3
Session: 1, ALG: 2, Flags: 0x0040, IP Action: no, Offload: no
TCP     198.51.100.2:1021  ->    203.0.113.10:514   Forward  I     1331
TCP    203.0.113.10:514   ->     198.51.100.2:1021  Forward  O     2485
```

user@router> **show services sessions application-protocol sip**

```
Interface name: vms-2/0/0
Session: 4, ALG: sip, Flags: 0x0800, IP Action: no, Offload: no
UDP           198.51.100.130:6000  ->       192.0.2.129:12682 Forward  I
    246
UDP           192.0.2.129:12682 ->       198.51.100.162:6000  Forward  O
      0
Session: 1, ALG: sip, Flags: 0x0000, IP Action: no, Offload: no
UDP           198.51.100.130:5060  ->       192.0.2.130:5060  Forward  I
     10
UDP           192.0.2.130:5060  ->       198.51.100.162:5060  Forward  O
      9
```

user@router> **show services sessions application-protocol sql**

```
Interface name: vms-2/0/0
Session: 3934, ALG: sqlnet, Flags: 0x0800, IP Action: no, Offload: no
TCP     198.51.100.2:39754 ->    203.0.113.138:0:1408  Forward  I       26
TCP    203.0.113.138:0:1408  ->        192.0.2.1:39754 Forward  O       23
```

user@router> **show services sessions application-protocol talk**

```
Interface name: vms-0/2/0
Session: 4, ALG: 65, Flags: 0x0800, IP Action: no, Offload: no
TCP            203.0.113.162:36888 ->        192.0.2.2:33294 Forward  O
     4
TCP            192.0.2.1:33294 ->        203.0.113.162:36888 Forward  I
     3
Session: 7, ALG: 65, Flags: 0x0800, IP Action: no, Offload: no
UDP            203.0.113.162:1165  ->        192.0.2.2:518   Forward  O
     1
UDP            192.0.2.2:518   ->        203.0.113.162:1165  Forward  I
     1
Session: 8, ALG: 65, Flags: 0x0000, IP Action: no, Offload: no
UDP            192.0.2.2:1509  ->        203.0.113.162:518   Forward  I
```

```
     3
UDP            203.0.113.162:518   ->        192.0.2.2:1509  Forward  O
     3
Session: 6, ALG: 0, Flags: 0x0000, IP Action: no, Offload: no
UDP            192.0.2.1:123   ->        192.0.2.2:123   Forward  O
 4
```

show services sessions count

`user@host>` **show services sessions count**

```
Interface   Service set                  Valid      Invalid      Pending  Other
state
vms-0/2/0   ss1_interface_style1                1            0            0
         0
```

show services sessions destination-port

`user@router>` **show services sessions destination-port 21**

```
vms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I              25
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O              24
```

show services sessions destination-prefix

`user@router>` **show services sessions destination-prefix 10.1.1.2**

```
vms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I              25
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O              24
```

show services sessions interface

`user@router>` **show services sessions interface vms-1/1/0**

```
vms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
```

```
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I              30
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O              29
```

show services sessions protocol

```
user@router> show services sessions protocol tcp
```

```
vms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I              30
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O              29
```

show services sessions service-set

```
user@router> show services sessions service-set ss1_interface_style1
```

```
Session ID: 3, Service-set: ss1_interface_style1, Policy name: R11/7, Timeout: 30,
 Valid
  In: 20.1.1.2/48102 --> 30.1.1.2/22;tcp, Conn Tag: 0x0, If: vms-0/2/0.16387, Pkts:
 70, Bytes: 6257,
  Out: 30.1.1.2/22 --> 44.0.0.3/29071;tcp, Conn Tag: 0x0, If: vms-0/2/0.0, Pkts:
59, Bytes: 8193,
Total sessions: 1
```

show services sessions source-port

```
user@router> show services sessions source-port 21
```

```
vms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I              33
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O              31
```

show services sessions source-prefix

```
user@router> show services sessions source-prefix 10.2.2.2
```

```
vms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I              33
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O              31
```

show services sessions

Syntax

```
show services sessions
<brief | extensive | terse>
<application-protocol protocol>
<count>
<destination-port destination-port>
<destination-prefix destination-prefix>
<interface interface-name>
<limit number>
<protocol protocol>
<service-set service-set>
<source-port source-port>
<source-prefix source-prefix>
<utilization>
```

Release Information

Command introduced in Junos OS Release 10.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display session information.

> **NOTE:** On MX Series routers (with interchassis redundancy configured), the idle timeout for every flow is displayed in the **show services session extensive** and **show services flows extensive** commands.

Options

none—Display standard information about all sessions.

brief | extensive | terse—(Optional) Display the specified level of output.

application-protocol *protocol*—(Optional) Display information about one of the following application protocols:

- **bootp**—Bootstrap protocols
- **dce-rpc**—Distributed Computing Environment-Remote Procedure Call protocols

- **dce-rpc-portmap**—Distributed Computing Environment-Remote Procedure Call protocols portmap service
- **dns**—Domain Name System protocol
- **exec**—Remote Execution Protocol
- **ftp**—File Transfer Protocol
- **h323**—H.323
- **icmp**—ICMP
- **icmpv6**—ICMPv6
- **iiop**—Internet Inter-ORB Protocol
- **ike-esp-nat**—IKE ALG
- **ip**—IP
- **login**—LOGIN
- **netbios**—NETBIOS
- **netshow**—NETSHOW
- **pptp**—Point-to-Point Tunneling Protocol
- **realaudio**—RealAudio
- **rpc**—Remote Procedure Call protocol
- **rpc-portmap**—Remote Procedure Call protocol portmap service
- **rtsp**—Real-Time Streaming Protocol
- **rsh**—Remote Shell
- **sip**—Session Initiation Protocol
- **shell**—Shell
- **snmp**—SNMP
- **sql**—SQLNet
- **talk**—Talk Program
- **tftp**—Trivial File Transfer Protocol
- **traceroute**—Traceroute
- **winframe**—WinFrame

NOTE: You can use the **none** option with the **show services sessions count application-protocol** command to display information about sessions other than ALG sessions.

count—(Optional) Display a count of the matching entries.

destination-port *destination-port*—(Optional) Display information for the specified destination port. The range of values is from 0 to 65,535.

destination-prefix *destination-prefix*—(Optional) Display information for the specified destination prefix.

interface *interface-name*—(Optional) Display information about the specified interface. On M Series and T Series routers, ***interface-name*** can be **ms-*fpc/pic/port*** or **rsp*number***. On J Series routers, ***interface-name*** is **ms-*pim*/0/*port***.

limit *number*—(Optional) Maximum number of entries to display.

protocol *protocol*—(Optional) Display information about one of the following IP types:

- ***number***—Numeric protocol value from 0 to 255
- **ah**—IPsec Authentication Header protocol
- **egp**—An exterior gateway protocol
- **esp**—IPsec Encapsulating Security Payload protocol
- **gre**—A generic routing encapsulation protocol
- **icmp**—Internet Control Message Protocol
- **icmp6**—Internet Control Message Protocol version 6
- **igmp**—Internet Group Management Protocol
- **ipip**—IP-within-IP Encapsulation Protocol
- **ospf**—Open Shortest Path First protocol
- **pim**—Protocol Independent Multicast protocol
- **rsvp**—Resource Reservation Protocol
- **sctp**—Stream Control Transmission Protocol
- **tcp**—Transmission Control Protocol
- **udp**—User Datagram Protocol

service-set *service-set*—(Optional) Display information for the specified service set.

source-port *source-port*—(Optional) Display information for the specified source port. The range of values is from 0 to 65,535.

source-prefix *source-prefix*—(Optional) Display information for the specified source prefix.

utilization—(Optional) Display statistical details about session utilization.

Required Privilege Level
view

List of Sample Output
show services sessions on page 744
show services sessions brief on page 745
show services sessions extensive on page 745
show services sessions terse on page 745
show services sessions application-protocol on page 745
show services sessions count on page 749
show services sessions destination-port on page 749
show services sessions destination-prefix on page 749
show services sessions interface on page 750
show services sessions protocol on page 750
show services sessions service-set on page 750
show services sessions source-port on page 750
show services sessions source-prefix on page 750

Output Fields
Table 60 on page 730 lists the output fields for the **show services sessions** command. Output fields are listed in the approximate order in which they appear.

Table 61: show services sessions Output Fields

Field Name	Field Description	Level of Output
Interface	Name of the interface.	**application-protocol**
Session	Session ID that uniquely identifies the session.	All levels
ALG	Name of the application.	**terse**

Table 61: show services sessions Output Fields *(continued)*

Field Name	Field Description	Level of Output
Flags	Session flag for the ALG: • **0x1**—Found an existing session. • **0x2**—Reached session or flow limit. • **0x3**—No memory available for new sessions. • **0x4**—No free session ID available. • **0x0000**—No session ID found.	All levels
IP Action	Flag indicating whether IP action has been set for the session.	All levels
Offload	Flag indicating whether the session has been offloaded to the Packet Forwarding Engine.	All levels
Asymmetric	Flag indicating whether the session is uni-directional.	**terse** **application-protocol**
Service set	Name of a service set. Individual empty service sets are not displayed.	**count**
Sessions Count	Number of sessions.	**count**

Sample Output

show services sessions

`user@host>` **show services sessions**

```
ms-2/0/0
Session: 293, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     10.10.10.2:43677 ->    10.20.20.1:53    Forward  I        1
UDP    10.20.20.1:53    ->        192.0.2.1:43677 Forward  O        1
Session: 53, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     10.10.10.2:37494 ->    10.20.20.1:53    Forward  I        1
UDP    10.20.20.1:53    ->        10.11.11.11:37494 Forward  O        1
Session: 66, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     10.10.10.2:48161 ->    10.20.20.1:53    Forward  I        1
UDP    10.20.20.1:53    ->        10.11.11.11:48161 Forward  O        1
Session: 17, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     10.10.10.2:38908 ->    10.20.20.1:53    Forward  I        1
```

```
UDP    10.20.20.1:53    ->        10.11.11.11:38908 Forward  O        1
Session: 42, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     10.10.10.2:58189 ->    10.20.20.1:53    Forward  I        1
UDP    10.20.20.1:53    ->        10.11.11.11:58189 Forward  O        1
```

show services sessions brief

The output for the **show services flows brief** command is identical to that for the **show services sessions** command. For sample output, see show services sessions on page 731.

show services sessions extensive

`user@host>` **show services sessions extensive**

```
ms-0/1/0
Session: 2, ALG: 0, Flags: 0x0080, IP Action: no, Offload: no
NAT PLugin Data:
  NAT Action:   Translation Type - DYNAMIC NAT44
    NAT source         192.0.21.2         ->    10.10.10.127
TCP            192.0.2.2:52145 ->        198.51.100.2:23    Forward  I
   22
  Byte count: 1483
  Flow role: Unknown, Timeout: 0
TCP            198.51.100.2:23    ->   10.10.10.127:52145 Forward  O
 18
  Byte count: 2712
  Flow role: Unknown, Timeout: 0
```

show services sessions terse

`user@router>` **show services sessions terse**

```
ms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I              33
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O              31
```

show services sessions application-protocol

This command has the same output for the rpc, dce-rpc, rpc-portmap and dce-rpc-portmap ALGs.

`user@router>` **show services sessions application-protocol dce-rpc**

```
Interface name: ms-1/1/0
Session: 8, ALG: portmapper, Flags: 0x1800, IP Action: no, Offload: no
UDP    192.168.203.198:1019  ->192.168.203.194:2049  Forward  I              4
UDP    192.168.203.194:2049  ->192.168.203.198:1019  Forward  O              4
Session: 7, ALG: portmapper, Flags: 0x1800, IP Action: no, Offload: no
UDP    192.168.203.198:954   ->192.168.203.194:613   Forward  I              1
UDP    192.168.203.194:613   ->192.168.203.198:954   Forward  O              1
Session: 6, ALG: portmapper, Flags: 0x1800, IP Action: no, Offload: no
UDP    192.168.203.198:53836 ->192.168.203.194:613   Forward  I              1
UDP    192.168.203.194:613   ->192.168.203.198:53836 Forward  O              1
Session: 5, ALG: portmapper, Flags: 0x1000, IP Action: no, Offload: no
UDP    192.168.203.198:59813 ->192.168.203.194:111   Forward  I              1
UDP    192.168.203.194:111   ->192.168.203.198:59813 Forward  O              1
Session: 4, ALG: portmapper, Flags: 0x1800, IP Action: no, Offload: no
UDP    192.168.203.198:36595 ->192.168.203.194:2049  Forward  I              1
UDP    192.168.203.194:2049  ->192.168.203.198:36595 Forward  O              1
Session: 3, ALG: portmapper, Flags: 0x1000, IP Action: no, Offload: no
UDP    192.168.203.198:56050 ->192.168.203.194:111   Forward  I              1
UDP    192.168.203.194:111   ->192.168.203.198:56050 Forward  O              1
```

user@router> **show services sessions application-protocol dns**

```
Interface name: ms-2/0/0
Session: 293, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     198.51.100.2:43677 ->    203.0.113.10:53    Forward  I        1
UDP    203.0.113.10:53    ->        192.0.2.1:43677 Forward  O        1
Session: 53, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     198.51.100.2:37494 ->    203.0.113.10:53    Forward  I        1
UDP    203.0.113.10:53    ->        192.0.2.1:37494 Forward  O        1
Session: 66, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     198.51.100.2:48161 ->    203.0.113.10:53    Forward  I        1
UDP    203.0.113.10:53    ->        192.0.2.1:48161 Forward  O        1
Session: 17, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     198.51.100.2:38908 ->    203.0.113.10:53    Forward  I        1
UDP    203.0.113.10:53    ->        192.0.2.1:38908 Forward  O        1
Session: 42, ALG: 16, Flags: 0x0040, IP Action: no, Offload: no
UDP     198.51.100.2:58189 ->    203.0.113.10:53    Forward  I        1
UDP    203.0.113.10:53    ->        192.0.2.1:58189 Forward  O        1
```

user@router> **show services sessions application-protocol ftp**

```
Interface name: ms-4/1/0
Session: 1, ALG: 1, Flags: 0x0040, IP Action: no, Offload: no
```

```
TCP       192.0.2.129:32843 ->       198.51.100.129:21    Forward  I       26
TCP       198.51.100.129:21    ->        192.0.2.0:32843 Forward  O       30
```

user@router> **show services sessions application-protocol ike-esp-nat**

```
Service Set: ss_ipv4, Session: 33554435, ALG: ike-esp-nat, Flags: 0x0800, IP Action:
 no, Offload: no, Asymmetric: no
ESP 198.51.100.2:4689  ->        203.0.113.1:62108 Forward O 2199
ESP 192.0.2.2:62108  ->       198.51.100.2:4689 Forward I 0
Service Set: ss_ipv4, Session: 33554434, ALG: ike-esp-nat, Flags: 0x0800, IP Action:
 no, Offload: no, Asymmetric: no
ESP 192.0.2.2:44179  ->       198.51.100.2:43809 Forward I 2199
ESP 198.51.100.2:43809  ->       203.0.113.1:44179 Forward O 0
Service Set: ss_ipv4, Session: 33554433, ALG: ike-esp-nat, Flags: 0x0000, IP Action:
 no, Offload: no, Asymmetric: no
UDP 192.0.2.2:500  ->         198.51.100.2:500 Forward I 8
UDP 198.51.100.2:500  ->         203.0.113.1:57730 Forward O
```

user@router> **show services sessions application-protocol pptp**

```
Interface name: ms-2/0/0
Session: 3, ALG: pptp, Flags: 0x2800, IP Action: no, Offload: no, Asymmetric: no
GRE        203.0.113.138:0     ->    203.0.113.138:0     Forward  O
21
GRE        192.0.2.794:0     ->    203.0.113.138:0:65000 Forward  I
 0
Session: 2, ALG: pptp, Flags: 0x2800, IP Action: no, Offload: no, Asymmetric: no
GRE        192.0.2.794:0     ->    203.0.113.138:0:49913 Forward  I
88
GRE        203.0.113.138:0:49913 ->    192.0.2.794:65001 Forward  O
 0
Session: 1, ALG: pptp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP        192.0.2.794:1511  ->    203.0.113.138:0:1723  Forward  I
13
TCP        203.0.113.138:0:1723  ->    192.0.2.794:1511  Forward  O
12
```

user@router> **show services sessions application-protocol rtsp**

```
Interface name: ms-0/1/0
Session: 13, ALG: rtsp, Flags: 0x0800, IP Action: no, Offload: no
UDP        203.0.113.66:5004  ->        198.51.100.66:3989  Forward  O      152
```

```
UDP        198.51.100.66:3989  ->        192.0.2.161:5004  Forward  I        0
Session: 9, ALG: rtsp, Flags: 0x0800, IP Action: no, Offload: no
UDP        203.0.113.66:5004  ->        198.51.100.66:3986  Forward  O        3
UDP        198.51.100.66:3986  ->        192.0.2.161:5004  Forward  I        0
```

user@router> **show services sessions application-protocol rsh**

```
Interface name: ms-2/0/0
Session: 3, ALG: 2, Flags: 0x0840, IP Action: no, Offload: no
TCP    203.0.113.10:1023  ->     198.51.100.2:1020  Forward  O        4
TCP     198.51.100.2:1020  ->    203.0.113.10:1023  Forward  I        3
Session: 1, ALG: 2, Flags: 0x0040, IP Action: no, Offload: no
TCP     198.51.100.2:1021  ->    203.0.113.10:514   Forward  I     1331
TCP    203.0.113.10:514   ->     198.51.100.2:1021  Forward  O     2485
```

user@router> **show services sessions application-protocol sip**

```
Interface name: ms-2/0/0
Session: 4, ALG: sip, Flags: 0x0800, IP Action: no, Offload: no
UDP           198.51.100.130:6000  ->       192.0.2.129:12682 Forward  I
    246
UDP           192.0.2.129:12682 ->       198.51.100.162:6000  Forward  O
      0
Session: 1, ALG: sip, Flags: 0x0000, IP Action: no, Offload: no
UDP           198.51.100.130:5060  ->       192.0.2.130:5060  Forward  I
     10
UDP           192.0.2.130:5060  ->       198.51.100.162:5060  Forward  O
      9
```

user@router> **show services sessions application-protocol sql**

```
Interface name: ms-2/0/0
Session: 3934, ALG: sqlnet, Flags: 0x0800, IP Action: no, Offload: no
TCP     198.51.100.2:39754 ->    203.0.113.138:0:1408  Forward  I       26
TCP    203.0.113.138:0:1408  ->        192.0.2.1:39754 Forward  O       23
```

user@router> **show services sessions application-protocol talk**

```
Interface name: ms-0/2/0
Session: 4, ALG: 65, Flags: 0x0800, IP Action: no, Offload: no
TCP            203.0.113.162:36888 ->        192.0.2.2:33294 Forward  O
```

```
     4
TCP            192.0.2.1:33294 ->        203.0.113.162:36888 Forward  I
     3
Session: 7, ALG: 65, Flags: 0x0800, IP Action: no, Offload: no
UDP            203.0.113.162:1165  ->        192.0.2.2:518   Forward  O
     1
UDP            192.0.2.2:518   ->        203.0.113.162:1165  Forward  I
     1
Session: 8, ALG: 65, Flags: 0x0000, IP Action: no, Offload: no
UDP            192.0.2.2:1509  ->        203.0.113.162:518   Forward  I
     3
UDP            203.0.113.162:518   ->        192.0.2.2:1509  Forward  O
     3
Session: 6, ALG: 0, Flags: 0x0000, IP Action: no, Offload: no
UDP            192.0.2.1:123   ->        192.0.2.2:123   Forward  O
 4
```

show services sessions count

`user@host>` **show services sessions count**

```
Interface   Service set                                          Sessions count
ms-1/1/0    ss                                                              2
```

show services sessions destination-port

`user@router>` **show services sessions destination-port 21**

```
ms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I              25
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O              24
```

show services sessions destination-prefix

`user@router>` **show services sessions destination-prefix 10.1.1.2**

```
ms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I              25
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O              24
```

show services sessions interface

```
user@router> show services sessions interface ms-1/1/0
```

```
ms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I             30
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O             29
```

show services sessions protocol

```
user@router> show services sessions protocol tcp
```

```
ms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I             30
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O             29
```

show services sessions service-set

```
user@router> show services sessions service-set sample
```

```
ms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I             33
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O             31
```

show services sessions source-port

```
user@router> show services sessions source-port 21
```

```
ms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I             33
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O             31
```

show services sessions source-prefix

```
user@router> show services sessions source-prefix 10.2.2.2
```

```
ms-1/1/0
Session: 1, ALG: ftp, Flags: 0x2000, IP Action: no, Offload: no, Asymmetric: no
```

```
TCP           10.2.2.2:52138 ->       10.1.1.2:21    Forward  I             33
TCP           10.1.1.2:21    ->       10.2.2.2:52138 Forward  O             31
```

show services sessions (Aggregated Multiservices)

Syntax

```
show services sessions
<brief | extensive | terse>
<application-protocol protocol>
<count>
<destination-port destination-port>
<destination-prefix destination-prefix>
<interface interface-name>
<limit number>
<protocol protocol>
<service-set service-set>
<source-port source-port>
<source-prefix source-prefix>
```

Release Information

Statement introduced in Junos OS Release 16.1 on MX Series.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display the session information for each service set in each member interface of the AMS interface.

Options

none—Display standard information about all sessions.

brief | extensive | terse—(Optional) Display the specified level of output.

application-protocol—(Optional) Display information about one of the following application protocols:

- **ftp**—File Transfer Protocol
- **icmp**—Internet Control Message Protocol
- **pptp**—Point-to-Point Tunneling Protocol
- **rtsp**—Real-Time Streaming Protocol
- **sqlnet**—SQL *Net
- **tcp**—Transmission Control Protocol
- **traceroute**—Traceroute
- **tftp**—Trivial File Transfer Protocol
- **udp**—User Datagram Protocol

count—(Optional) Display a count of the matching entries.

destination-port *destination-port*—(Optional) Display information for a particular destination port. The range of values is from 0 through 65,535.

destination-prefix *destination-prefix*—(Optional) Display information for a particular destination prefix.

interface *interface-name*—(Optional) Display information about a particular interface. On M Series and T Series routers, ***interface-name*** can be **ms-*fpc*/*pic*/*port*** or **rsp*number***. On J Series routers, ***interface-name*** is **ms-*pim*/0/*port***.

limit *number*—(Optional) Maximum number of entries to display.

protocol *protocol*—(Optional) Display information about one of the following IP types:

- ***number***—Numeric protocol value from 0 through 255
- **ah**—IPsec Authentication Header protocol
- **egp**—An exterior gateway protocol
- **esp**—IPsec Encapsulating Security Payload protocol
- **gre**—A generic routing encapsulation protocol
- **icmp**—Internet Control Message Protocol
- **icmp6**—Internet Control Message Protocol version 6
- **igmp**—Internet Group Management Protocol
- **ipip**—IP-over-IP encapsulation protocol
- **ospf**—Open Shortest Path First protocol
- **pim**—Protocol Independent Multicast protocol
- **rsvp**—Resource Reservation Protocol
- **sctp**—Stream Control Transmission Protocol
- **tcp**—Transmission Control Protocol
- **udp**—User Datagram Protocol

service-set *service-set*—(Optional) Display information for a particular service set.

source-port *source-port*—(Optional) Display information for a particular source port. The range of values is from 0 through 65,535.

source-prefix *source-prefix*—(Optional) Display information for a particular source prefix.

Required Privilege Level
view

List of Sample Output

show services sessions brief on page 755
show services sessions interface mams-5/0/0 extensive on page 755
show services sessions terse on page 758
show services sessions count on page 760

Output Fields

Table 60 on page 730 lists the output fields for the **show services sessions** command. Output fields are listed in the approximate order in which they appear.

Table 62: show services sessions Output Fields

Field Name	Field Description
Interface	Name of the member interface (**mams-**) and the aggregated multiservices interface (**ams**) to which it belongs.
Session ID	Session ID that uniquely identifies the session.
ALG	Name of the application.
Flags	Session flag for the ALG: • **0x1**—Found an existing session. • **0x2**—Reached session or flow limit. • **0x3**—No memory available for new sessions. • **0x4**—No free session ID available.
IP Action	Flag indicating whether IP action has been set for the session.
Offload	Flag indicating whether the session has been offloaded to the Packet Forwarding Engine.
Asymmetric	Flag indicating whether the session is unidirectional.
Service set	Name of a service set. Individual empty service sets are not displayed.
Sessions Count	Number of sessions.
Flow or Flow Prot	Protocol used for this session.
Source	Source prefix of the flow in the format ***source-prefix:port***. For ICMP flows, port information is not displayed.
Dest	Destination prefix of the flow. For ICMP flows, port information is not displayed.

Table 62: show services sessions Output Fields *(continued)*

Field Name	Field Description
State	Status of the flow: • **Drop**—Drop all packets in the flow without response. • **Forward**—Forward the packet in the flow without looking at it. • **Reject**—Drop all packets in the flow with response. • **Watch**—Inspect packets in the flow. • **Bypass**—Bypass packets in the flow. • **Unknown**—Unknown flow status.
Packet Direction	Direction of the flow: ingress **(I)**, egress **(O)**, or unknown.
Frm count	Number of frames in the flow.

Sample Output

show services sessions brief

`user@host>` **show services sessions brief**

```
mams-1/0/0 (ams0)
Service Set: napt_set, Session: 16777217, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP         30.30.30.2:63    ->     40.40.40.2:63    Forward  I           85689
UDP         40.40.40.2:63    ->   30.30.30.160:6000  Forward  O               0
```

show services sessions interface mams-5/0/0 extensive

`user@host>` **show services sessions interface mams-5/0/0 extensive**

```
mams-1/0/0 (ams0)
Service Set: napt_set, Session: 16777235, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
NAT PLugin Data:
  NAT Action:   Translation Type - NAPT-44
    NAT source     30.30.30.62:63      ->    30.30.30.176:6003
UDP        30.30.30.62:63    ->    40.40.40.62:63    Forward  I            1805
  Byte count: 83030
  Flow role: Initiator, Timeout: 0
```

```
UDP        40.40.40.62:63    ->   30.30.30.176:6003  Forward  O               0
  Byte count: 0
  Flow role: Responder, Timeout: 0
Service Set: napt_set, Session: 16777234, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no

NAT PLugin Data:
  NAT Action:   Translation Type - NAPT-44
    NAT source     30.30.30.57:63      ->    30.30.30.163:6003
UDP        30.30.30.57:63    ->    40.40.40.57:63    Forward  I            1805
  Byte count: 83030
  Flow role: Initiator, Timeout: 0
UDP        40.40.40.57:63    ->   30.30.30.163:6003  Forward  O               0
  Byte count: 0
  Flow role: Responder, Timeout: 0

[...output truncated...]
mams-1/1/0 (ams0)
Service Set: napt_set, Session: 16777234, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no

NAT PLugin Data:
  NAT Action:   Translation Type - NAPT-44
    NAT source     30.30.30.63:63      ->    30.30.30.165:6004
UDP        30.30.30.63:63    ->    40.40.40.63:63    Forward  I            1805
  Byte count: 83030
  Flow role: Initiator, Timeout: 0
UDP        40.40.40.63:63    ->   30.30.30.165:6004  Forward  O               0
  Byte count: 0
  Flow role: Responder, Timeout: 0
Service Set: napt_set, Session: 16777233, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no

NAT PLugin Data:
  NAT Action:   Translation Type - NAPT-44
    NAT source     30.30.30.60:63      ->    30.30.30.164:6004
UDP        30.30.30.60:63    ->    40.40.40.60:63    Forward  I            1805
  Byte count: 83030
  Flow role: Initiator, Timeout: 0
UDP        40.40.40.60:63    ->   30.30.30.164:6004  Forward  O               0
  Byte count: 0
  Flow role: Responder, Timeout: 0
Service Set: napt_set, Session: 16777232, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
```

```
[...output truncated...]
mams-5/0/0 (ams0)
Service Set: napt_set, Session: 16777225, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no

NAT PLugin Data:
  NAT Action:   Translation Type - NAPT-44
    NAT source     30.30.30.64:63      ->    30.30.30.168:6002
UDP        30.30.30.64:63    ->    40.40.40.64:63    Forward  I            1805
  Byte count: 83030
  Flow role: Initiator, Timeout: 0
UDP        40.40.40.64:63    ->   30.30.30.168:6002  Forward  O               0
  Byte count: 0
  Flow role: Responder, Timeout: 0
Service Set: napt_set, Session: 16777224, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no

NAT PLugin Data:
  NAT Action:   Translation Type - NAPT-44
    NAT source     30.30.30.56:63      ->    30.30.30.171:6001
UDP        30.30.30.56:63    ->    40.40.40.56:63    Forward  I            1805
  Byte count: 83030
  Flow role: Initiator, Timeout: 0
UDP        40.40.40.56:63    ->   30.30.30.171:6001  Forward  O               0
  Byte count: 0
  Flow role: Responder, Timeout: 0
Service Set: napt_set, Session: 16777223, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no

[...output truncated...]
mams-5/1/0 (ams0)
Service Set: napt_set, Session: 16777233, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no

NAT PLugin Data:
  NAT Action:   Translation Type - NAPT-44
    NAT source     30.30.30.61:63      ->    30.30.30.172:6004
UDP        30.30.30.61:63    ->    40.40.40.61:63    Forward  I            1805
  Byte count: 83030
  Flow role: Initiator, Timeout: 0
UDP        40.40.40.61:63    ->   30.30.30.172:6004  Forward  O               0
  Byte count: 0
  Flow role: Responder, Timeout: 0
```

```
Service Set: napt_set, Session: 16777232, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no

NAT PLugin Data:
  NAT Action:   Translation Type - NAPT-44
    NAT source     30.30.30.52:63      ->    30.30.30.175:6003
UDP        30.30.30.52:63    ->    40.40.40.52:63    Forward  I            1805
  Byte count: 83030
  Flow role: Initiator, Timeout: 0
UDP        40.40.40.52:63    ->   30.30.30.175:6003  Forward  O               0
  Byte count: 0
  Flow role: Responder, Timeout: 0
Service Set: napt_set, Session: 16777231, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no

[...output truncated...]
```

show services sessions terse

`user@router>` **show services sessions terse**

```
mams-1/0/0 (ams0)
Service Set: napt_set, Session: 16777235, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.62:63    ->    40.40.40.62:63    Forward  I            2541
UDP        40.40.40.62:63    ->   30.30.30.176:6003  Forward  O               0
Service Set: napt_set, Session: 16777234, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.57:63    ->    40.40.40.57:63    Forward  I            2541
UDP        40.40.40.57:63    ->   30.30.30.163:6003  Forward  O               0
Service Set: napt_set, Session: 16777233, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.50:63    ->    40.40.40.50:63    Forward  I            2541
UDP        40.40.40.50:63    ->   30.30.30.162:6003  Forward  O               0
Service Set: napt_set, Session: 16777232, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.48:63    ->    40.40.40.48:63    Forward  I            2541
UDP        40.40.40.48:63    ->   30.30.30.161:6003  Forward  O               0
[...output truncated...]
mams-1/1/0 (ams0)
Service Set: napt_set, Session: 16777234, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.63:63    ->    40.40.40.63:63    Forward  I            2543
UDP        40.40.40.63:63    ->   30.30.30.165:6004  Forward  O               0
```

```
Service Set: napt_set, Session: 16777233, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.60:63    ->    40.40.40.60:63    Forward  I            2543
UDP        40.40.40.60:63    ->   30.30.30.164:6004  Forward  O               0
Service Set: napt_set, Session: 16777232, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.59:63    ->    40.40.40.59:63    Forward  I            2543
UDP        40.40.40.59:63    ->   30.30.30.167:6003  Forward  O               0
Service Set: napt_set, Session: 16777231, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.58:63    ->    40.40.40.58:63    Forward  I            2543
UDP        40.40.40.58:63    ->   30.30.30.166:6003  Forward  O               0
[...output truncated...]
mams-5/0/0 (ams0)
Service Set: napt_set, Session: 16777225, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.64:63    ->    40.40.40.64:63    Forward  I            2543
UDP        40.40.40.64:63    ->   30.30.30.168:6002  Forward  O               0
Service Set: napt_set, Session: 16777224, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.56:63    ->    40.40.40.56:63    Forward  I            2543
UDP        40.40.40.56:63    ->   30.30.30.171:6001  Forward  O               0
Service Set: napt_set, Session: 16777223, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.55:63    ->    40.40.40.55:63    Forward  I            2543
UDP        40.40.40.55:63    ->   30.30.30.170:6001  Forward  O               0
Service Set: napt_set, Session: 16777222, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.51:63    ->    40.40.40.51:63    Forward  I            2543
UDP        40.40.40.51:63    ->   30.30.30.169:6001  Forward  O               0
[...output truncated...]
mams-5/1/0 (ams0)
Service Set: napt_set, Session: 16777233, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.61:63    ->    40.40.40.61:63    Forward  I            2544
UDP        40.40.40.61:63    ->   30.30.30.172:6004  Forward  O               0
Service Set: napt_set, Session: 16777232, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.52:63    ->    40.40.40.52:63    Forward  I            2545
UDP        40.40.40.52:63    ->   30.30.30.175:6003  Forward  O               0
Service Set: napt_set, Session: 16777231, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.47:63    ->    40.40.40.47:63    Forward  I            2545
UDP        40.40.40.47:63    ->   30.30.30.174:6003  Forward  O               0
```

```
Service Set: napt_set, Session: 16777230, ALG: none, Flags: 0x2000, IP Action: no,
 Offload: no, Asymmetric: no
UDP        30.30.30.46:63    ->    40.40.40.46:63    Forward  I            2545
UDP        40.40.40.46:63    ->   30.30.30.173:6003  Forward  O               0
[...output truncated...]
```

show services sessions count

user@host> **show services sessions count**

```
Interface   Service set                                        Sessions count
mams-1/0/0  napt_set                                                    19
mams-1/0/0  ss1                                                          0
mams-1/1/0  napt_set                                                    18
mams-1/1/0  ss1                                                          0
mams-5/0/0  napt_set                                                     9
mams-5/0/0  ss1                                                          0
mams-5/1/0  napt_set                                                    17
mams-5/1/0  ss1                                                          0
```

show services sessions analysis

Syntax

```
show services sessions analysis
<interface interface-name>
```

Release Information

Statement introduced in Junos OS Release 17.1 on MX Series MS-MPC.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display session statistics.

Options

none—Display standard information about all session statistics.

interface *interface-name*—(Optional) Display information about the specified interface.

Required Privilege Level

view

List of Sample Output

show services sessions analysis interface on page 763

Output Fields

Table 63 on page 761 lists the output fields for the **show services sessions analysis** command. Output fields are listed in the approximate order in which they appear.

Table 63: show services sessions analysis Output Fields

Field Name	Field Description
Services PIC Name	FPC and PIC slots for the services PIC on which the sessions are running.
Session Analysis Statistics:	
Total Sessions Active	Total active sessions in the MS-PIC including TCP, UDP, ICMP and Softwires.
Total TCP Sessions Active	Total active TCP sessions in the MS-PIC.

Table 63: show services sessions analysis Output Fields *(continued)*

Field Name	Field Description
Total UDP Sessions Active	Total active UDP session in the MS-PIC.
Total Other Sessions Active	Total other active sessions in the MS-PIC including ICMP and softwires.
Total Predicted Sessions Active	Predicted sessions are created only by the ALG traffic using the L3/L4 information available.
Created Sessions per Second	Session setup rate at the time of running the command.
Deleted Sessions per Second	Session deletion rate at the time of running the command.
Peak Total Sessions Active	Highest number of active sessions since the last PIC restart or since the last time session statistics are flushed.
Peak Total TCP Sessions Active	Highest number of active TCP sessions since the last PIC restart or since the last time session stats are flushed.
Peak Total UDP Sessions Active	Highest number of active UDP sessions since the last PIC restart or since the last time session statistics are flushed.
Peak Total Other Sessions Active	Highest number of other active sessions since the last PIC restart or since the last time session statistics are flushed.
Peak Created Sessions per Second	Maximum session setup rate observed since the last PIC restart or since the last time session statistics are flushed.
Peak Deleted Sessions per Second	Maximum session deletion rate observed since the last PIC restart or from the last time session statistics are flushed.
Packets received	Total number of packets received by the MS-PIC.
Packets transmitted	Total number of packets transmitted by the MS-PIC.
Slow path forward	Number of packets forwarded in the slow path (that is, after the successful rule match and session creation).
Slow path discard	Number of packets discarded before the session creation.

Table 63: show services sessions analysis Output Fields *(continued)*

Field Name	Field Description
Session Rate Data: Number of Samples	Number of samples used to calculate the session rate since the last PIC restart or since the last time session statistics are flushed.
Session Rate Distribution(sec)	
Session Operation :Creation	Number of sampling intervals during which a number of sessions in the indicated range were created during the current sampling period.
Session Operation :Deletion	Number of sampling intervals during which a number of sessions in the indicated range were deleted during the current sampling period.
Session Lifetime Distribution(sec):	Number of TCP, UDP, and HTTP sessions whose length was in the indicated range in seconds.

Sample Output

show services sessions analysis interface

`user@host>` **show services sessions analysis interface ms-5/1/0**

```
    Services PIC Name:    ms-5/1/0

Session Analysis Statistics:

  Total sessions Active                  :0
  Total TCP Sessions Active              :0
      Tcp sessions from gate             :0
      Tunneled TCP sessions              :0
      Regular TCP sessions               :0
      IPv4 active Session                :0
      IPv6 active Session                :0
  Total UDP sessions Active              :0
      UDP sessions from gate             :0
      Tunneled UDP sessions              :0
      Regular UDP sessions               :0
      IPv4 active Session                :0
      IPv6 active Session                :0
  Total Other sessions Active            :0
      IPv4 active Session                :0
```

```
      IPv6 active Session                :0
  Created sessions per Second            :0
  Deleted sessions per Second            :0
  Peak Total sessions Active             :0
  Peak Total TCP sessions Active         :0
  Peak Total UDP sessions Active         :0
  Peak Total Other sessions Active       :0
  Peak Created Sessions per Second       :0
  Peak Deleted Sessions per Second       :0
  Packets received                       :0
  Packets transmitted                    :0
  Slow path forward                      :0
  Slow path discard                      :0
Session Rate Data:
  Number of Samples: 3518

 Session Rate Distribution(sec)

 Session Operation :Creation

    400000+            :0
    350001  - 400000   :0
    300001  - 350000   :0
    250001  - 300000   :0
    200001  - 250000   :0
    150001  - 200000   :0
     50001  - 150000   :0
     40001  -  50000   :0
     30001  -  40000   :0
     20001  -  30000   :0
     10001  -  20000   :0
      1001  -  10000   :0
         1  -   1000   :0
                0   :3518


 Session Operation :Deletion

    400000+            :0
    350001  - 400000   :0
    300001  - 350000   :0
    250001  - 300000   :0
    200001  - 250000   :0
    150001  - 200000   :0
```

```
     50001  - 150000   :0
     40001  -  50000   :0
     30001  -  40000   :0
     20001  -  30000   :0
     10001  -  20000   :0
      1001  -  10000   :0
         1  -   1000   :0
                   0   :3518


Session Lifetime Distribution(sec):

                TCP                UDP              HTTP
  240+          :0                 0                0
  120 - 240     :0                 0                0
   60 - 120     :0                 0                0
   30 - 60      :0                 0                0
   15 - 30      :0                 0                0
    5 - 15      :0                 0                0
    1 - 5       :0                 0                0
    0 - 1       :0                 0                0
```

show services sessions analysis (USF)

Syntax

```
show services sessions analysis
<interface interface-name>
```

Release Information

Command introduced in Junos OS Release 19.3R2 on MX Series for USF.

Description

Display session statistics.

Options

none—Display standard information about all session statistics.

interface *interface-name*—(Optional) Display information about the specified services interface.

Required Privilege Level

view

List of Sample Output

show services sessions analysis interface on page 768

Output Fields

Table 63 on page 761 lists the output fields for the **show services sessions analysis** command. Output fields are listed in the approximate order in which they appear.

Table 64: show services sessions analysis Output Fields

Field Name	Field Description
Services PIC Name	FPC and PIC slots for the services PIC on which the sessions are running.
Session Analysis Statistics:	
Total Sessions Active	Total active sessions in the services PIC, including TCP, UDP, ICMP and Softwires.
Total TCP Sessions Active	Total active TCP sessions in the services PIC.
Total UDP Sessions Active	Total active UDP session in the services PIC.

Table 64: show services sessions analysis Output Fields *(continued)*

Field Name	Field Description
Total Other Sessions Active	Total other active sessions in the services PIC, including ICMP and softwires.
Total Predicted Sessions Active	Predicted sessions are created only by the ALG traffic using the L3/L4 information available.
Created Sessions per Second	Session setup rate at the time of running the command.
Deleted Sessions per Second	Session deletion rate at the time of running the command.
Peak Total Sessions Active	Highest number of active sessions since the last PIC restart or since the last time session statistics are flushed.
Peak Total TCP Sessions Active	Highest number of active TCP sessions since the last PIC restart or since the last time session stats are flushed.
Peak Total UDP Sessions Active	Highest number of active UDP sessions since the last PIC restart or since the last time session statistics are flushed.
Peak Total Other Sessions Active	Highest number of other active sessions since the last PIC restart or since the last time session statistics are flushed.
Peak Created Sessions per Second	Maximum session setup rate observed since the last PIC restart or since the last time session statistics are flushed.
Peak Deleted Sessions per Second	Maximum session deletion rate observed since the last PIC restart or from the last time session statistics are flushed.
Packets received	Total number of packets received by the services PIC.
Packets transmitted	Total number of packets transmitted by the services PIC.
Slow path forward	Number of packets forwarded in the slow path (that is, after the successful rule match and session creation).
Slow path discard	Number of packets discarded before the session creation.
Session Rate Data: Number of Samples	Number of samples used to calculate the session rate since the last PIC restart or since the last time session statistics are flushed.

Table 64: show services sessions analysis Output Fields *(continued)*

Field Name	Field Description
Session Rate Distribution(sec)	
Session Operation :Creation	Number of sampling intervals during which a number of sessions in the indicated range were created during the current sampling period.
Session Operation:Deletion	Number of sampling intervals during which a number of sessions in the indicated range were deleted during the current sampling period.
Session Lifetime Distribution(sec):	Number of TCP, UDP, and HTTP sessions whose length was in the indicated range in seconds.

Sample Output

show services sessions analysis interface

`user@host>` **show services sessions analysis interface vms-5/1/0**

```
    Services PIC Name:    vms-5/1/0

Session Analysis Statistics:

  Total sessions Active                  :0
  Total TCP Sessions Active              :0
      Tcp sessions from gate             :0
      Tunneled TCP sessions              :0
      Regular TCP sessions               :0
      IPv4 active Session                :0
      IPv6 active Session                :0
  Total UDP sessions Active              :0
      UDP sessions from gate             :0
      Tunneled UDP sessions              :0
      Regular UDP sessions               :0
      IPv4 active Session                :0
      IPv6 active Session                :0
  Total Other sessions Active            :0
      IPv4 active Session                :0
      IPv6 active Session                :0
  Created sessions per Second            :0
  Deleted sessions per Second            :0
```

```
  Peak Total sessions Active              :0
  Peak Total TCP sessions Active          :0
  Peak Total UDP sessions Active          :0
  Peak Total Other sessions Active        :0
  Peak Created Sessions per Second        :0
  Peak Deleted Sessions per Second        :0
  Packets received                        :0
  Packets transmitted                     :0
  Slow path forward                       :0
  Slow path discard                       :0
Session Rate Data:
  Number of Samples: 3518

 Session Rate Distribution(sec)

 Session Operation :Creation

    400000+            :0
    350001  - 400000   :0
    300001  - 350000   :0
    250001  - 300000   :0
    200001  - 250000   :0
    150001  - 200000   :0
     50001  - 150000   :0
     40001  -  50000   :0
     30001  -  40000   :0
     20001  -  30000   :0
     10001  -  20000   :0
      1001  -  10000   :0
         1  -   1000   :0
                0   :3518


 Session Operation :Deletion

    400000+            :0
    350001  - 400000   :0
    300001  - 350000   :0
    250001  - 300000   :0
    200001  - 250000   :0
    150001  - 200000   :0
     50001  - 150000   :0
     40001  -  50000   :0
     30001  -  40000   :0
```

```
     20001  -  30000   :0
     10001  -  20000   :0
      1001  -  10000   :0
         1  -   1000   :0
                   0   :3518


Session Lifetime Distribution(sec):

                TCP                UDP              HTTP
  240+          :0                 0                0
  120 - 240     :0                 0                0
   60 - 120     :0                 0                0
   30 - 60      :0                 0                0
   15 - 30      :0                 0                0
    5 - 15      :0                 0                0
    1 - 5       :0                 0                0
    0 - 1       :0                 0                0
```

show services sessions count

Syntax

```
show services sessions count
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display the count of matching entries.

Required Privilege Level

view

List of Sample Output

show services sessions count on page 771

Output Fields

Sample Output

show services sessions count

`user@host>` **show services sessions count**

```
Interface   Service set     Valid    Invalid      Pending  Other state
vms-0/2/0   ss1_interface_style1     1         0           0           0
```

show services sessions service-set

Syntax

```
show services sessions service-set service-set
```

Release Information

Command introduced in Junos OS release 19.3R2.

Description

Display table session entries for the specified service set.

Required Privilege Level

view

List of Sample Output

show services sessions service-set on page 772

Output Fields

Sample Output

show services sessions service-set

```
user@host> show services sessions service-set ss1_interface_style1
```

```
Session ID: 3, Service-set: ss1_interface_style1, Policy name: R11/7, Timeout: 30,
 Valid
  In: 20.1.1.2/48102 --> 30.1.1.2/22;tcp, Conn Tag: 0x0, If: vms-0/2/0.16387, Pkts:
 70, Bytes: 6257,
  Out: 30.1.1.2/22 --> 44.0.0.3/29071;tcp, Conn Tag: 0x0, If: vms-0/2/0.0, Pkts:
59, Bytes: 8193,
Total sessions: 1
```

show services sessions utilization

Syntax

```
show services sessions utilization
<interface interface-name>
```

Release Information

Command introduced in Junos OS Release 19.3R2.

Description

Display session utilization statistics.

Options

interface *interface-name*—Display session utilization statistics specific to the interface.

Required Privilege Level

view

List of Sample Output

show services sessions utilization on page 773

Output Fields

Sample Output

show services sessions utilization

`user@host>` **show services sessions utilization**

```
            Session  %Memory  %Session-Memory    Setup   %Rate   Drop     Teardown
   %CPU
Interface   Count                               Rate            Rate     Rate
vms-3/0/0   0        24.96    0.00              0                        0
   0.13     Green
```

show services stateful-firewall conversations

Syntax

```
show services stateful-firewall conversations
<brief | extensive | terse>
<application-protocol protocol>
<destination-port destination-port>
<destination-prefix destination-prefix>
<interface interface-name>
<limit number>
<pgcp>
<protocol protocol>
<service-set service-set>
<source-port source-port>
<source-prefix source-prefix>
```

Release Information

Command introduced before Junos OS Release 7.4.
pgcp option introduced in Junos OS Release 8.4.

Description

Display information about stateful firewall conversations.

Options

none—Display standard information about all stateful firewall conversations.

brief | extensive | terse—(Optional) Display the specified level of output.

application-protocol *protocol*—(Optional) Display information about one of the following application protocols:

- **bootp**—Bootstrap protocol
- **dce-rpc**—Distributed Computing Environment-Remote Procedure Call protocols
- **dce-rpc-portmap**—Distributed Computing Environment-Remote Procedure Call protocols portmap service
- **dns**—Domain Name System protocol
- **exec**—Exec
- **ftp**—File Transfer Protocol
- **h323**—H.323 standards
- **icmp**—Internet Control Message Protocol

- **iiop**—Internet Inter-ORB Protocol
- **login**—Login
- **netbios**—NetBIOS
- **netshow**—NetShow
- **realaudio**—RealAudio
- **rpc**—Remote Procedure Call protocol
- **rpc-portmap**—Remote Procedure Call protocol portmap service
- **rtsp**—Real-Time Streaming Protocol
- **shell**—Shell
- **sip**—Session Initiation Protocol
- **snmp**—Simple Network Management Protocol
- **sqlnet**—SQLNet
- **tftp**—Trivial File Transfer Protocol
- **traceroute**—Traceroute
- **winframe**—WinFrame

destination-port *destination-port*—(Optional) Display information for a particular destination port. The range of values is 0 to 65535.

destination-prefix *destination-prefix*—(Optional) Display information for a particular destination prefix.

interface *interface-name*—(Optional) Display information about a particular interface. On M Series and T Series routers, the ***interface-name*** can be **sp-*fpc/pic/port*** or **rsp*number***.

limit *number*—(Optional) Maximum number of entries to display.

pgcp —(Optional) Display information about stateful firewall conversations for Packet Gateway Control Protocol (PGCP) flows.

protocol *protocol*—(Optional) Display information about one of the following IP types:

- ***number***—Numeric protocol value from 0 to 255
- **ah**—IPsec Authentication Header protocol
- **egp**—An exterior gateway protocol
- **esp**—IPsec Encapsulating Security Payload protocol
- **gre**—A generic routing encapsulation protocol
- **icmp**—Internet Control Message Protocol

- **igmp**—Internet Group Management Protocol
- **ipip**—IP-within-IP Encapsulation Protocol
- **ospf**—Open Shortest Path First protocol
- **pim**—Protocol Independent Multicast protocol
- **rsvp**—Resource Reservation Protocol
- **sctp**—Stream Control Protocol
- **tcp**—Transmission Control Protocol
- **udp**—User Datagram Protocol

service-set *service-set*—(Optional) Display information for the specific service set.

source-port *source-port*—(Optional) Display information for a particular source port. The range of values is 0 to 65535.

source-prefix *source-prefix*—(Optional) Display information for a particular source prefix.

Required Privilege Level
view

List of Sample Output
show services stateful-firewall conversations on page 778
show services stateful-firewall conversations destination-port on page 778

Output Fields
Table 65 on page 776 lists the output fields for the **show services stateful-firewall conversations** command. Output fields are listed in the approximate order in which they appear.

Table 65: show services stateful-firewall conversations Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface.
Service set	Name of a service set. Individual empty service sets are not displayed, but if no service set has any flows, a flow table header is printed for each service set.
Conversation	Information about a group of related flows. • **ALG Protocol**—Application-level gateway protocol. • **Number of initiators**—Number of flows that initiated a session. • **Number of responders**—Number of flows that responded in a session.

Table 65: show services stateful-firewall conversations Output Fields *(continued)*

Field Name	Field Description
Flow or Flow Prot	Protocol used for this flow.
Source	Source prefix of the flow, in the format ***source-prefix-port***.
Destination	Destination prefix of the flow.
State	Status of the flow: • **Drop**—Drop all packets in the flow without response. • **Forward**—Forward the packet in the flow without looking at it. • **Reject**—Drop all packets in the flow with response. • **Watch**—Inspect packets in the flow.
Dir	Direction of the flow: input (**I**) or output (**O**).
Source NAT	Original and translated source IPv4 or IPv6 addresses are displayed if Network Address Translation (NAT) is configured on this particular flow or conversation.
Frm Count	Number of frames in the flow.
Destin NAT	Original and translated destination IPv4 or IPv6 addresses are displayed if NAT is configured on this particular flow or conversation.
Byte count	Number of bytes forwarded in the flow.
TCP established	Whether a TCP connection was established: **Yes** or **No**.
TCP window size	Negotiated TCP connection window size, in bytes.
TCP acknowledge	TCP acknowledgment sequence number.
TCP tickle	Whether TCP inquiry mode is on (**enabled** or **disabled**) and the time remaining to send the next inquiry, in seconds.
Master flow	Flow that initiated the conversation.
TImeout	Lifetime of the flow, in seconds.

Sample Output

show services stateful-firewall conversations

user@host> **show services stateful-firewall conversations**

```
Interface: sp-1/3/0, Service set: green
Conversation: ALG Protocol: any, Number of initiators: 1,
Number of responders: 1

Flow
Prot     Source                 Dest               State      Dir   Frm count
TCP      10.58.255.50:33005->   10.58.255.178:23   Forward    I      13
  Source NAT     10.58.255.50:33005->    10.59.16.100:4000
  Destin NAT     10.58.255.178:23  ->         0.0.0.0:4000
Byte count:          918
TCP established, TCP window size: 65535, TCP acknowledge: 2502627025
TCP tickle enabled, 0 seconds,
Master flow, Timeout: 30 seconds
TCP     10.58.255.178:23   ->    10.59.16.100:4000 Forward    O        8
```

show services stateful-firewall conversations destination-port

user@host> **show services stateful-firewall conversations destination-port 21**

```
Interface: sp-0/3/0, Service set: svc_set_trust

Interface: sp-0/3/0, Service set: svc_set_untrust
Conversation: ALG protocol: ftp
  Number of initiators: 1, Number of responders: 1
Flow                                                State    Dir       Frm count
TCP         10.50.10.2:2143  ->     10.50.20.2:21    Watch    O               0
TCP         10.50.20.2:21    ->     10.50.10.2:2143  Watch    I               0
TCP         10.50.20.2:21    ->     10.50.10.2:2143  Watch    I               0
```

show services stateful-firewall flow-analysis

Syntax

```
show services stateful-firewall flow-analysis
<interface interface-name>
```

Release Information

Command introduced in Junos OS Release 10.4R1.

Description

Display stateful firewall flow statistics.

Options

none—Display standard information about all stateful firewall flow statistics.

interface *interface-name*—(Optional) Display information about a particular interface.

Required Privilege Level

view

List of Sample Output

show services stateful-firewall flow-analysis on page 781
show services stateful-firewall flow-analysis interface sp-3/0/0 on page 782

Output Fields

Table 63 on page 761 lists the output fields for the **show services stateful-firewall flow-analysis** command. Output fields are listed in the approximate order in which they appear.

Table 66: show services stateful-firewall flow-analysis Output Fields

Field Name	Field Description
Total Flows Active	Total active flows in the MS-PIC including TCP, UDP, ICMP and Softwires.
Total TCP Flows Active	Total active TCP flows in the MS-PIC.
Total UDP Flows Active	Total active UDP flows in the MS-PIC.
Total Other Flows Active	Total other active flows in the MS-PIC including ICMP and softwires.
Total Predicted Flows Active	Predicted flows are created only by the ALG traffic using the L3/L4 information available.

Table 66: show services stateful-firewall flow-analysis Output Fields *(continued)*

Field Name	Field Description
Created Flows per Second	Flow setup rate at the time of running the command.
Deleted Flows per Second	Flow deletion rate at the time of running the command.
Peak Total Flows Active	The highest number of active flows since the last PIC restart or since the last time flow statistics are flushed.
Peak Total TCP Flows Active	The highest number of active TCP flows since the last PIC restart or since the last time flow stats are flushed.
Peak Total UDP Flows Active	The highest number of active UDP flows since the last PIC restart or since the last time flow statistics are flushed.
Peak Total Other Flows Active	The highest number of other active flows since the last PIC restart or since the last time flow statistics are flushed.
Peak Created Flows per Second	The maximum flow setup rate observed since the last PIC restart or since the last time flow statistics are flushed.
Peak Deleted Flows per Second	The maximum flow deletion rate observed since the last PIC restart or from the last time flow statistics are flushed.
Average HTTP Flow Lifetime(ms)	Average HTTP Flow Lifetime in millisecond.
Packets received	The total number of packets received by the MS-PIC.
Packets transmitted	The total number of packets transmitted by the MS-PIC.
Slow path forward	The number of packets forwarded in the slow path (i.e. after the successful rule match and flow creation).
Slow path discard	The number of packets discarded before the flow creation.
Flow Rate Data: Number of Samples	The number of samples used to calculate the flow rate, since the last PIC restart or since the last time flow statistics are flushed.

Table 66: show services stateful-firewall flow-analysis Output Fields *(continued)*

Field Name	Field Description
Flow Rate Distribution(sec) Flow Operation :Creation Flow Operation :Deletion	Histogram of the samples used for flow rate calculation.
Flow Lifetime Distribution(sec):	Histogram of the samples used to calculate the flow life time in sec.

Sample Output

show services stateful-firewall flow-analysis

`user@host>` **show services stateful-firewall flow-analysis**

```
Services PIC Name: sp-3/0/0
 Flow Analysis Statistics:
      Total Flows Active               :40
      Total TCP Flows Active           :0
      Total UDP Flows Active           :40
      Total Other Flows Active         :0
      Total Predicted Flows Active     :0
      Created Flows per Second         :0
      Deleted Flows per Second         :0
      Peak Total Flows Active          :40
      Peak Total TCP Flows Active      :0
      Peak Total UDP Flows Active      :40
      Peak Total Other Flows Active    :0
      Peak Created Flows per Second    :20
      Peak Deleted Flows per Second    :20
      Average HTTP Flow Lifetime(ms)   :0
      Packets received                 :48682539117
      Packets transmitted              :48682502703
      Slow path forward                :6550
      Slow path discard                :0
 Flow Rate Data:
      Number of Samples: 19720
 Flow Rate Distribution(sec)
 Flow Operation :Creation
```

```
     300000+            :0
     250000  - 300000   :0
     200000  - 250000   :0
     160000  - 200000   :0
     150000  - 160000   :0
     50000  - 150000   :0
     40000  -  50000   :0
     30000  -  40000   :0
     20000  -  30000   :0
     10000  -  20000   :0
     1000  -  10000   :0
     0  -   1000   :19720
Flow Operation :Deletion
     300000+            :0
     250000  - 300000   :0
     200000  - 250000   :0
     160000  - 200000   :0
     150000  - 160000   :0
     50000  - 150000   :0
     40000  -  50000   :0
     30000  -  40000   :0
     20000  -  30000   :0
     10000  -  20000   :0
     1000  -  10000   :0
     0  -   1000   :19720
Flow Lifetime Distribution(sec):
               TCP                UDP              HTTP
 240+         :0                 0                0
 120 - 240    :0                 0
  60 - 120    :0                 0
  30 - 60     :0                 0
  15 - 30     :0                 6530
   5 - 15     :0                 0
   1 - 5      :0                 0
   0 - 1      :0                 6530
```

Sample Output

show services stateful-firewall flow-analysis interface sp-3/0/0

`user@host>` **show services stateful-firewall flow-analysis interface sp-3/0/0**

```
Services PIC Name: sp-3/0/0
 Flow Analysis Statistics:
      Total Flows Active               :40
      Total TCP Flows Active           :0
      Total UDP Flows Active           :40
      Total Other Flows Active         :0
      Total Predicted Flows Active     :0
      Created Flows per Second         :0
      Deleted Flows per Second         :0
      Peak Total Flows Active          :40
      Peak Total TCP Flows Active      :0
      Peak Total UDP Flows Active      :40
      Peak Total Other Flows Active    :0
      Peak Created Flows per Second    :20
      Peak Deleted Flows per Second    :20
      Average HTTP Flow Lifetime(ms)   :0
      Packets received                 :54696856768
      Packets transmitted              :54696815873
      Slow path forward                :7350
      Slow path discard                :0
 Flow Rate Data:
      Number of Samples: 22139
 Flow Rate Distribution(sec)
 Flow Operation :Creation
      300000+            :0
      250000  - 300000   :0
      200000  - 250000   :0
      160000  - 200000   :0
      150000  - 160000   :0
      50000  - 150000   :0
      40000  -  50000   :0
      30000  -  40000   :0
      20000  -  30000   :0
      10000  -  20000   :0
      1000  -  10000   :0
      0  -   1000   :22139
 Flow Operation :Deletion
      300000+            :0
      250000  - 300000   :0
      200000  - 250000   :0
      160000  - 200000   :0
      150000  - 160000   :0
      50000  - 150000   :0
      40000  -  50000   :0
```

```
     30000  -  40000   :0
     20000  -  30000   :0
     10000  -  20000   :0
     1000  -  10000   :0
     0  -   1000   :22139
Flow Lifetime Distribution(sec):
               TCP                UDP              HTTP
 240+          :0                 0                0
 120 - 240     :0                 0
  60 - 120     :0                 0
  30 - 60      :0                 0
  15 - 30      :0                 7330
   5 - 15      :0                 0
   1 - 5       :0                 0
   0 - 1       :0                 7330
```

show services stateful-firewall flows

Syntax

```
show services stateful-firewall flows
<brief | extensive | summary | terse>
<application-protocol protocol>
<count>
<destination-port destination-port>
<destination-prefix destination-prefix>
<interface interface-name>
<limit number>
<protocol protocol>
<service-set service-set>
<source-port source-port>
<source-prefix source-prefix>
```

Release Information

Command introduced before Junos OS Release 7.4.
pgcp option introduced in Junos OS Release 8.4.
application-protocol option introduced in Junos OS Release 10.4.

Description

Display stateful firewall flow table entries. When the interface is used for softwire processing, the type of softwire concentrator (**DS-LITE** or **6rd**) is shown, and frame counts are provided.

Options

none—Display standard information about all stateful firewall flows.

brief | extensive | summary | terse—(Optional) Display the specified level of output.

application-protocol *application-protocol*—(Optional) Display information about one of the following application-level gateway (ALG) protocol types:

- **bootp**—Bootstrap protocol
- **dce-rpc**—Distributed Computing Environment (DCE) remote procedure call (RPC) protocol

  NOTE: Use this option to select Microsoft Remote Procedure Call (MSRPC).

- **dce-rpc-portmap**—Distributed Computing Environment (DCE) remote procedure call (RPC) portmap protocol
- **dns**—Domain Name Service protocol

- **exec**—Remote execution protocol
- **ftp**—File Transfer Protocol
- **h323**—H.323 protocol
- **icmp**—Internet Control Message Protocol
- **iiop**—Internet Inter-ORB Protocol
- **ip**—Internet protocol
- **netbios**—NetBIOS protocol
- **netshow**—Netshow protocol
- **pptp** —Point-to-Point Tunneling Protocol
- **realaudio**—RealAudio protocol
- **rpc**—Remote Procedure Call protocol

  NOTE: Use this option to select Sun Microsystems Remote Procedure Call protocol (SunRPC).

- **rpc-portmap**—Remote Procedure Call portmap protocol
- **rtsp**—Real-Time Streaming Protocol
- **sip**—Session Initiation Protocol
- **snmp**—Simple Network Management Protocol
- **talk**—Talk protocol
- **tftp**—Trivial File Transfer Protocol
- **traceroute**—Traceroute
- **winframe**—WinFrame

count—(Optional) Display a count of the matching entries.

destination-port *destination-port*—(Optional) Display information for a particular destination port. The range of values is from 0 to 65535.

destination-prefix *destination-prefix*—(Optional) Display information for a particular destination prefix.

interface *interface-name*—(Optional) Display information about a particular interface. On M Series and T Series routers, ***interface-name*** can be **ms-*fpc/pic/port*** or **rspnumber**.

limit *number*—(Optional) Maximum number of entries to display.

protocol *protocol*—(Optional) Display information about one of the following IP types:

- ***number***—Numeric protocol value from 0 to 255
- **ah**—IPsec Authentication Header protocol
- **egp**—An exterior gateway protocol
- **esp**—IPsec Encapsulating Security Payload protocol
- **gre**—A generic routing encapsulation protocol
- **icmp**—Internet Control Message Protocol
- **igmp**—Internet Group Management Protocol
- **ipip**—IP-within-IP Encapsulation Protocol
- **ospf**—Open Shortest Path First protocol
- **pim**—Protocol Independent Multicast protocol
- **rsvp**—Resource Reservation Protocol
- **sctp**—Stream Control Protocol
- **tcp**—Transmission Control Protocol
- **udp**—User Datagram Protocol

service-set *service-set*—(Optional) Display information for a particular service set.

source-port *source-port*—(Optional) Display information for a particular source port. The range of values is from 0 to 65535.

source-prefix *source-prefix*—(Optional) Display information for a particular source prefix.

Required Privilege Level
view

RELATED DOCUMENTATION

clear services stateful-firewall flows | **559**

List of Sample Output

show services stateful-firewall flows source port on page 790
show services stateful-firewall flows (Twice NAT) on page 791

Output Fields

Table 67 on page 788 lists the output fields for the **show services stateful-firewall flows** command. Output fields are listed in the approximate order in which they appear.

Table 67: show services stateful-firewall flows Output Fields

Field Name	Field Description
Interface	Name of the interface.
Service set	Name of a service set. Individual empty service sets are not displayed. If no service set has any flows, a flow table header is displayed for each service set.
Flow Count	Number of flows in a session.
Flow or Flow Prot	Protocol used for this flow.
Source	Source prefix of the flow in the format ***source-prefix:port***. For ICMP flows, port information is not displayed.
Dest	Destination prefix of the flow. For ICMP flows, port information is not displayed.
State	Status of the flow: • **Drop**—Drop all packets in the flow without response. • **Forward**—Forward the packet in the flow without looking at it. • **Reject**—Drop all packets in the flow with response. • **Watch**—Inspect packets in the flow.
Dir	Direction of the flow: input **(I)** or output **(O)**. For any configured stateful firewall rule, the reverse flow is dynamically created, so you will see an input and an output flow.
Frm count	Number of frames in the flow. If this value is zero, then that flow does not yet exist.

Sample Output

show services stateful-firewall flows

On the MX Series router, both input (I) and output (O) flow entries appear, even if traffic only flows in one direction. This applies to both NAT and non-NAT cases.

user@host> **show services stateful-firewall flows**

```
Interface: ms-1/3/0, Service set: green

Flow
Prot     Source                 Dest               State      Dir     Frm count
TCP     10.58.255.178:23   ->    10.59.16.100:4000 Forward    O
TCP      10.58.255.50:33005->   10.58.255.178:23   Forward    I              1
  Source NAT    10.58.255.50:33005->    10.59.16.100:4000
  Destin NAT    10.58.255.178:23   ->         0.0.0.0:4000
```

show services stateful-firewall flows (For Softwire Flows)

When a service set includes softwire processing, the following output format is used for the softwire flows:

user@host> **show services stateful-firewall flows**

```
Interface: sp-0/1/0, Service set: dslite-svc-set2
Flow                                                State    Dir       Frm count
TCP      200.200.200.2:80    ->     44.44.44.1:1025  Forward  O          219942
    NAT dest        44.44.44.1:1025    ->       20.20.1.4:1025
    Softwire           2001::2         ->         1001::1
TCP          20.20.1.2:1025  ->  200.200.200.2:80    Forward  I          110244
    NAT source       20.20.1.2:1025    ->      44.44.44.1:1024
    Softwire           2001::2         ->         1001::1
TCP      200.200.200.2:80    ->     44.44.44.1:1024  Forward  O          219140
    NAT dest        44.44.44.1:1024    ->       20.20.1.2:1025
    Softwire           2001::2         ->         1001::1
DS-LITE         2001::2      ->        1001::1       Forward  I          988729
TCP      200.200.200.2:80    ->     44.44.44.1:1026  Forward  O          218906
    NAT dest        44.44.44.1:1026    ->       20.20.1.3:1025
    Softwire           2001::2         ->         1001::1
TCP          20.20.1.3:1025  ->  200.200.200.2:80    Forward  I          110303
    NAT source       20.20.1.3:1025    ->      44.44.44.1:1026
    Softwire           2001::2         ->         1001::1
TCP          20.20.1.4:1025  ->  200.200.200.2:80    Forward  I          110944
    NAT source       20.20.1.4:1025    ->      44.44.44.1:1025
    Softwire           2001::2         ->         1001::1
```

show services stateful-firewall flows brief

The output for the **show services stateful-firewall flows brief** command is identical to that for the **show services stateful-firewall flows** command. For sample output, see show services stateful-firewall flows.

show services stateful-firewall flows extensive

```
user@host> show services stateful-firewall flows extensive
```

```
Interface: ms-0/3/0, Service set: ss_nat
Flow                                                    State     Dir       Frm
count
TCP           16.1.0.1:2330  ->      16.49.0.1:21        Forward    I
  8
    NAT source        16.1.0.1:2330    ->       16.41.0.1:2330
    NAT dest         16.49.0.1:21      ->       16.99.0.1:21
  Byte count: 455, TCP established, TCP window size: 57344
  TCP acknowledge: 3251737524, TCP tickle enabled, tcp_tickle: 0
  Flow role: Master, Timeout: 720
TCP          16.99.0.1:21    ->      16.41.0.1:2330      Forward    O
  5
    NAT source       16.99.0.1:21      ->       16.49.0.1:21
    NAT dest         16.41.0.1:2330    ->        16.1.0.1:2330
  Byte count: 480, TCP established, TCP window size: 57344
  TCP acknowledge: 463128048, TCP tickle enabled, tcp_tickle: 0
  Flow role: Responder, Timeout: 720
```

show services stateful-firewall flows count

```
user@host> show services stateful-firewall flows count
```

```
Interface             Service set                                  Flow Count

ms-1/3/0              green                                               2
```

show services stateful-firewall flows destination port

```
user@host> show services stateful-firewall flows destination-port 21
```

```
Interface: ms-0/3/0, Service set: svc_set_trust
Flow
                                                State    Dir       Frm count
Interface: ms-0/3/0, Service set: svc_set_untrust
Flow                                                 State    Dir       Frm count
TCP         10.50.10.2:2143  ->     10.50.20.2:21    Watch    O               0
```

show services stateful-firewall flows source port

```
user@host> show services stateful-firewall flows source-port 2143
```

```
Interface: ms-0/3/0, Service set: svc_set_trust
Flow                                                State    Dir       Frm count
Interface: ms-0/3/0, Service set: svc_set_untrust
Flow                                                State    Dir       Frm count
TCP         10.50.10.2:2143  ->     10.50.20.2:21    Watch    O              0
```

show services stateful-firewall flows (Twice NAT)

`user@host>` **show services stateful-firewall flows**

```
Flow                                                State    Dir       Frm count
UDP          40.0.0.8:23439 ->     80.0.0.1:16485   Watch    I             20
    NAT source        40.0.0.8:23439   ->     172.16.1.10:1028
    NAT dest          80.0.0,1:16485   ->     192.16.1.10:22415
UDP      192.16.1.10:22415  ->  172.16.1.10:1028    Watch    O             20
    NAT source     192.16.1.10:22415   ->        80.0.0.1:16485
    NAT dest       172.16.1.10:1028    ->        40.0.0.8:23439
```

show services stateful-firewall sip-call

Syntax

```
show services stateful-firewall sip-call
<brief | extensive | terse>
<application-protocol protocol>
<destination-port destination-port>
<destination-prefix destination-prefix>
<interface interface-name>
<limit number>
<protocol protocol>
<service-set service-set>
<source-port source-port>
<source-prefix source-prefix>
```

Release Information

Command introduced in Junos OS Release 7.4.

Description

Display stateful firewall Session Initiation Protocol (SIP) call information.

Options

count—(Optional) Display a count of the matching entries.

brief—(Optional) Display brief SIP call information.

extensive—(Optional) Display detailed SIP call information.

terse—(Optional) Display terse SIP call information.

application-protocol—(Optional) Display information about one of the following application protocols:

- **bootp**—(SIP only) Bootstrap protocol
- **dce-rpc**—(SIP only) Distributed Computing Environment-Remote Procedure Call protocols
- **dce-rpc-portmap**—(SIP only) Distributed Computing Environment-Remote Procedure Call protocols portmap service
- **dns**—(SIP only) Domain Name System protocol
- **exec**—(SIP only) Exec
- **ftp**—(SIP only) File Transfer Protocol
- **h323**—H.323 standards
- **icmp**—Internet Control Message Protocol

- **iiop**—Internet Inter-ORB Protocol
- **login**—Login
- **netbios**—NetBIOS
- **netshow**—NetShow
- **realaudio**—RealAudio
- **rpc**—Remote Procedure Call protocol
- **rpc-portmap**—Remote Procedure Call protocol portmap service
- **rtsp**—Real-Time Streaming Protocol
- **shell**—Shell
- **sip**—Session Initiation Protocol
- **snmp**—Simple Network Management Protocol
- **sqlnet**—SQLNet
- **tftp**—Trivial File Transfer Protocol
- **traceroute**—Traceroute
- **winframe**—WinFrame

destination-port *destination-port*—(Optional) Display information for a particular destination port. The range of values is from 0 to 65535.

destination-prefix *destination-prefix*—(Optional) Display information for a particular destination prefix.

interface *interface-name*—(Optional) Display information about a particular adaptive services interface. On M Series and T Series routers, ***interface-name*** can be **sp-*fpc/pic/port*** or **rsp*number***.

limit *number*—(Optional) Maximum number of entries to display.

protocol—(Optional) Display information about one of the following IP types:

- **ah**—IPsec Authentication Header protocol
- **egp**—An exterior gateway protocol
- **esp**—IPsec Encapsulating Security Payload protocol
- **gre**—A generic routing encapsulation protocol
- **icmp**—Internet Control Message Protocol
- **igmp**—Internet Group Management Protocol
- **ipip**—IP-within-IP Encapsulation Protocol
- **ipv6**—IPv6 within IP

- **ospf**—Open Shortest Path First protocol
- **pim**—Protocol Independent Multicast protocol
- **rsvp**—Resource Reservation Protocol
- **sctp**—Stream Control Protocol
- **tcp**—Transmission Control Protocol
- **udp**—User Datagram Protocol

service-set *service-set*—(Optional) Display information for a particular service set.

source-port *source-port*—(Optional) Display information for a particular source port. The range of values is from 0 to 65535.

source-prefix *source-prefix*—(Optional) Display information for a particular source prefix.

Required Privilege Level
view

RELATED DOCUMENTATION

clear services stateful-firewall sip-call | 562

List of Sample Output
show services stateful-firewall sip-call extensive on page 795

Output Fields
Table 68 on page 794 lists the output fields for the **show services stateful-firewall sip-call** command. Output fields are listed in the approximate order in which they appear.

Table 68: show services stateful-firewall sip-call Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface.
Service set	Name of a service set.
From	Initiator address.
To	Responder address.
Call ID	SIP call identification string.

Table 68: show services stateful-firewall sip-call Output Fields *(continued)*

Field Name	Field Description
Number of initiator flows	Number of **control**, **contact**, or **media** initiator flows.
Number of responder flows	Number of **control**, **contact**, or **media** responder flows.
protocol	Protocol used for this flow.
source-prefix	Source prefix of the flow in the format ***source-prefix* : *port***.
destination-prefix	Destination prefix of the flow.
state	Status of the flow: • **Drop**—Drop all packets in the flow without a response. • **Forward**—Forward the packet in the flow without examining it. • **Reject**—Drop all packets in the flow with a response. • **Unknown**—Unknown status. • **Watch**—Inspect packets in the flow.
direction	Direction of the flow: input (**I**), output (**O**), or unknown (**U**).
frame-count	Number of frames in the flow.
Byte count	Number of bytes forwarded in the flow.
Flow role	Role of the flow that is under evaluation: **Initiator**, **Master**, **Responder**, or **Unknown**.
Timeout	Lifetime of the flow, in seconds.

Sample Output

show services stateful-firewall sip-call extensive

`user@host>` **show services stateful-firewall sip-call extensive**

```
Interface: sp-0/3/0, Service set: test_sip_777
```

```
From: : 6507771234@10.200.100.1:0;000ff73ac89900021bb231dc-3ef68435
To: : 4085551234@10.200.100.1:0;0011bb65c2a30007777bd0fc-5748b749
Call ID: : 000ff73a-c8990004-0741adac-3e027c7e@10.20.70.2
Number of control initiator flows: : 1, Number of control responder flows:
: 1
UDP         10.20.70.2:50354 ->   10.200.100.1:5060  Watch    I
2
  Byte count: 1112
  Flow role: Master, Timeout: 30
UDP       10.200.100.1:5060  ->  10.20.170.111:50354 Watch    O
0
  Byte count: 0
  Flow role: Responder, Timeout: 30
UDP           0.0.0.0:0     ->  10.20.170.111:5060  Watch    O
7
  Byte count: 2749
  Flow role: Responder, Timeout: 30
Number of contact initiator flows: 1, Number of contact responder flows: 1
UDP           0.0.0.0:0     ->   10.20.140.11:5060  Watch    I
1
  Byte count: 409
  Flow role: Master, Timeout: 30
UDP       10.20.140.11:31864 ->  10.20.170.111:18808 Forward  O
622
  Byte count: 124400
  Flow role: Master, Timeout: 30
UDP           0.0.0.0:0     ->  10.20.170.111:18809 Forward  O
0
  Byte count: 0
  Flow role: Initiator, Timeout: 30
Number of media initiator flows: 4, Number of media responder flows: 0
UDP         10.20.70.2:18808 ->   10.20.140.11:31864 Forward  I
628
  Byte count: 125600
  Flow role: Initiator, Timeout: 30
UDP           0.0.0.0:0     ->   10.20.140.11:31865 Forward  I
0
  Byte count: 0
  Flow role: Initiator, Timeout: 30
0             0.0.0.0:0     ->        0.0.0.0:0     Unknown  U
0
  Byte count: 0
  Flow role: Unknown, Timeout: 0
```

```
0               0.0.0.0:0     ->        0.0.0.0:0     Unknown  U
Interface: sp-0/3/0, Service set: test_sip_888
```

show services stateful-firewall sip-register

Syntax

```
show services stateful-firewall sip-register
<brief | extensive | terse>
<application-protocol protocol>
<destination-port destination-port>
<destination-prefix destination-prefix>
<interface interface-name>
<limit number>
<protocol protocol>
<service-set service-set>
<source-port source-port>
<source-prefix source-prefix>
```

Release Information

Command introduced in Junos OS Release 7.4.

Description

Display stateful firewall Session Initiation Protocol (SIP) register information.

Options

count—(Optional) Display a count of the matching entries.

brief—(Optional) Display brief SIP register information.

extensive—(Optional) Display detailed SIP register information.

terse—(Optional) Display terse SIP register information.

application-protocol—(Optional) Display information about one of the following application protocols:

- **bootp**—(SIP only) Bootstrap protocol
- **dce-rpc**—(SIP only) Distributed Computing Environment-Remote Procedure Call protocols
- **dce-rpc-portmap**—(SIP only) Distributed Computing Environment-Remote Procedure Call protocols portmap service
- **dns**—(SIP only) Domain Name System protocol
- **exec**—(SIP only) Exec
- **ftp**—(SIP only) File Transfer Protocol
- **h323**—H.323 standards
- **icmp**—Internet Control Message Protocol

- **iiop**—Internet Inter-ORB Protocol
- **login**—Login
- **netbios**—NetBIOS
- **netshow**—NetShow
- **realaudio**—RealAudio
- **rpc**—Remote Procedure Call protocol
- **rpc-portmap**—Remote Procedure Call protocol portmap service
- **rtsp**—Real-Time Streaming Protocol
- **shell**—Shell
- **sip**—Session Initiation Protocol
- **snmp**—Simple Network Management Protocol
- **sqlnet**—SQLNet
- **tftp**—Trivial File Transfer Protocol
- **traceroute**—Traceroute
- **winframe**—WinFrame

destination-port *destination-port*—(Optional) Display information for a particular destination port.

destination-prefix *destination-prefix*—(Optional) Display information for a particular destination prefix. The range of values is from 0 to 65535.

interface *interface-name*—(Optional) Display information about a particular interface. On M Series and T Series routers, the ***interface-name*** can be **sp-*fpc/pic/port*** or **rsp*number***.

limit *number*—(Optional) Maximum number of entries to display.

protocol—(Optional) Display information about one of the following IP types:

- **ah**—IPsec Authentication Header protocol
- **egp**—An exterior gateway protocol
- **esp**—IPsec Encapsulating Security Payload protocol
- **gre**—A generic routing encapsulation protocol
- **icmp**—Internet Control Message Protocol
- **igmp**—Internet Group Management Protocol
- **ipip**—IP-within-IP Encapsulation Protocol
- **ipv6**—IPv6 within IP

- **ospf**—Open Shortest Path First protocol
- **pim**—Protocol Independent Multicast protocol
- **rsvp**—Resource Reservation Protocol
- **sctp**—Stream Control Protocol
- **tcp**—Transmission Control Protocol
- **udp**—User Datagram Protocol

service-set *service-set*—(Optional) Display information for a particular service set.

source-port *source-port*—(Optional) Display information for a particular source port. The range of values is from 0 to 65535.

source-prefix *source-prefix*—(Optional) Display information for a particular source prefix.

Required Privilege Level
view

RELATED DOCUMENTATION

clear services stateful-firewall sip-register | 565

List of Sample Output
show services stateful-firewall sip-register extensive on page 801

Output Fields
Table 69 on page 800 lists the output fields for the **show services stateful-firewall sip-register** command. Output fields are listed in the approximate order in which they appear.

Table 69: show services stateful-firewall sip-register Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface.
Service set	Name of a service set.
SIP Register	Register information header.
Protocol	Protocol used for this flow.
Registered IP	Register IP address.

Table 69: show services stateful-firewall sip-register Output Fields *(continued)*

Field Name	Field Description
Port	Register port number.
Expiration timeout	Configured lifetime, in seconds.
Timeout remaining	Lifetime remaining, in seconds.
From	Initiator address.
To	Responder address.
Call ID	SIP call identification string.

Sample Output

show services stateful-firewall sip-register extensive

`user@host>` **show services stateful-firewall sip-register extensive**

```
Interface: sp-0/3/0, Service set: test_sip_777

SIP Register: Protocol: UDP, Registered IP: 10.20.170.111, Port: 5060, Acked
    Expiration timeout: 36000, Timeout remaining: 35544
    From: : 6507771234@10.200.100.1:0;
    To: : 6507771234@10.200.100.1:0;
    Call ID: : 000ff73a-c8990002-23b1d942-2ba1f91f@10.20.70.2

Interface: sp-0/3/0, Service set: test_sip_888

SIP Register: Protocol: UDP, Registered IP: 10.20.170.112, Port: 5060, Acked
    Expiration timeout: 36000, Timeout remaining: 35549
    From: : 8881234@10.200.100.1:0;
    To: : 8881234@10.200.100.1:0;
    Call ID: : 00112096-81fc0002-23b38905-7cb41f62@10.20.71.2
```

show services stateful-firewall statistics

Syntax

```
show services stateful-firewall statistics
<application-protocol protocol>
<brief | detail | extensive | summary>
<interface interface-name>
<service-set service-set>
```

Release Information

Command introduced before Junos OS Release 7.4.

Description

Display stateful firewall statistics.

Options

none—Display standard information about all stateful firewall statistics.

brief | detail | extensive | summary—(Optional) Display the specified level of output.

interface *interface-name*—(Optional) Display information about a particular interface. On M Series and T Series routers, the ***interface-name*** can be **ms-*fpc/pic/port*** or **rsp*number***.

service-set *service-set*—(Optional) Display information about a particular service set.

Required Privilege Level

view

RELATED DOCUMENTATION

clear services stateful-firewall statistics | 568

List of Sample Output

show services stateful-firewall statistics extensive on page 810

Output Fields

Table 70 on page 803 lists the output fields for the **show services stateful-firewall statistics** command. Output fields are listed in the approximate order in which they appear.

Table 70: show services stateful-firewall statistics Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface.
Service set	Name of a service set.
New flows	Rule match counters for new flows: • **Rule Accepts**—New flows accepted. • **Rule Discards**—New flows discarded. • **Rule Rejects**—New flows rejected.
Existing flow types packet counters	Rule match counters for existing flows: • **Accepts**—Match existing forward or watch flow. • **Drop**—Match existing discard flow. • **Rejects**—Match existing reject flow.
Hairpinning Counters	Hairpinning counters: • **Slow Path Hairpinned Packets**—Slow path packets that were hairpinned back to the internal network. • **Fast Path Hairpinned Packets**—Fast path packets that were hairpinned back to the internal network.
Drops	Drop counters: • **IP option**—Packets dropped in IP options processing. • **TCP SYN defense**—Packets dropped by SYN defender. • **NAT ports exhausted**—Hide mode. The router has no available Network Address Translation (NAT) ports for a given address or pool. • **Sessions dropped due to subscriber flow limit**—Sessions dropped because the subscriber's flow limit was exceeded.
Errors	Total errors, categorized by protocol: • **IP**—Total IP version 4 errors. • **TCP**—Total Transmission Control Protocol (TCP) errors. • **UDP**—Total User Datagram Protocol (UDP) errors. • **ICMP**—Total Internet Control Message Protocol (ICMP) errors. • **Non-IP packets**—Total non-IPv4 errors. • **ALG**—Total application-level gateway (ALG) errors

Table 70: show services stateful-firewall statistics Output Fields *(continued)*

Field Name	Field Description
IP Errors	IPv4 errors: • **IP packet length inconsistencies**—IP packet length does not match the Layer 2 reported length. • **Minimum IP header length check failures**—Minimum IP header length is 20 bytes. The received packet contains less than 20 bytes. • **Reassembled packet exceeds maximum IP length**—After fragment reassembly, the reassembled IP packet length exceeds 65,535. • **Illegal source address 0**—Source address is not a valid address. Invalid addresses are, loopback, broadcast, multicast, and reserved addresses. Source address **0**, however, is allowed to support BOOTP and the destination address **0xffffffff**. • **Illegal destination address 0**—Destination address is not a valid address. The address is reserved. • **TTL zero errors**—Received packet had a time-to-live (TTL) value of 0. • **Illegal IP protocol number (0 or 255)**—IP protocol is 0 or 255. • **Land attack**—IP source address is the same as the destination address. • **Non-IPv4 packets**—Packet was not IPv4. (Only IPv4 is supported.) • **Bad checksum**—Packet had an invalid IP checksum. • **Illegal IP fragment length**—Illegal fragment length. All fragments (other than the last fragment) must have a length that is a multiple of 8 bytes. • **IP fragment overlap**—Fragments have overlapping fragment offsets. • **IP fragment reassembly timeout**—Some of the fragments for an IP packet were not received in time, and the reassembly handler dropped partial fragments. • **IP fragment limit exceeded: 0**—Fragments that exceeded the limit. • **Unknown: 0**—Unknown fragments.

Table 70: show services stateful-firewall statistics Output Fields *(continued)*

Field Name	Field Description
TCP Errors	

Table 70: show services stateful-firewall statistics Output Fields *(continued)*

Field Name	Field Description
	TCP protocol errors: • **TCP header length inconsistencies**—Minimum TCP header length is 20 bytes, and the IP packet received does not contain at least 20 bytes. • **Source or destination port number is zero**—TCP source or destination port is zero. • **Illegal sequence number and flags combinations** — Dropped because of TCP errors, such as an illegal sequence number, which causes an illogical combination of flags to be set. • **SYN attack (multiple SYN messages seen for the same flow)**—Multiple SYN packets received for the same flow are treated as a SYN attack. The packets might be retransmitted SYN packets and therefore valid, but a large number is cause for concern. • **First packet not a SYN message**—First packets for a connection are not SYN packets. These packets might originate from previous connections or from someone performing an ACK/FIN scan. • **TCP port scan (TCP handshake, RST seen from server for SYN)**—In the case of a SYN defender, if an RST (reset) packet is received instead of a SYN/ACK message, someone is probably trying to scan the server. This behavior can result in false alarms if the RST packet is not combined with an intrusion detection service (IDS). • **Bad SYN cookie response**—SYN cookie generates a SYN/ACK message for all incoming SYN packets. If the ACK received for the SYN/ACK message does not match, this counter is incremented. • **TCP reconstructor sequence number error**—This counter is incremented in the following cases: The TCP seqno is 0 and all the TCP flags are also 0. The TCP seqno is 0 and FIN/PSH/URG TCP flags are set. • **TCP reconstructor retransmissions**—This counter is incremented for the retransmitted packets during connection 3-way handshake. • **TCP partially opened connection timeout (SYN)**—This counter is incremented when the SYN Defender is enabled and the 3-way handshake is not completed within the SYN DEFENDER TIMEOUT. The connection will be closed and resources will be released by sending RST to the responder. • **TCP partially opened connection timeout (SYN-ACK)**—This counter is incremented when the SYN Defender is enabled and the 3-way handshake is not completed within the SYN DEFENDER TIMEOUT. The connection will be closed and resources will be released by sending RST to the responder.

Table 70: show services stateful-firewall statistics Output Fields *(continued)*

Field Name	Field Description
	• **TCP partially closed connection reuse**—Not supported. • **TCP 3-way error - client sent SYN+ACK**—A SYN/ACK should be sent by the server on receiving a SYN. This counter is incremented when the first message received from the initiator is SYN+ACK. • **TCP 3-way error - server sent ACK**—ACK should be sent by the client on receiving a SYN/ACK from the server. This counter is incremented when the ACK is received from the Server instead of from the Client. • **TCP 3-way error - SYN seq number retransmission mismatch**—This counter is incremented when the SYN is received again with a different sequence number from the first SYN sequence number. • **TCP 3-way error - RST seq number mismatch**—A reset could be received from either side. The server could send a RST on receiving a SYN or the client could send a RST on receiving SYN/ACK. This counter is incremented when the RST is received either from the client or server with a non-matching sequence number. • **TCP 3-way error - FIN received**—This counter is incremented when the FIN is received during the 3-way handshake. • **TCP 3-way error - invalid flags (PSH, URG, ECE, CWR)**—This counter is incremented when any of the PSH, URG, ECE, or CWR flags were received during the 3-way handshake. • **TCP 3-way error - SYN recvd but no client flows**—This counter is incremented when SYN is received but not from the connection initiator. The counter is not incremented in the case of simultaneous open, when the SYN is received in both the directions. • **TCP 3-way error - first packet SYN+ACK**—The first packet received was SYN+ACK instead of SYN. • **TCP 3-way error - first packet FIN+ACK**—The first packet received was FIN+ACK instead of SYN. • **TCP 3-way error - first packet FIN**—The first packet received was FIN instead of SYN. • **TCP 3-way error - first packet RST**—The first packet received was RST instead of SYN. • **TCP 3-way error - first packet ACK**—The first packet received was ACK instead of SYN. • **TCP 3-way error - first packet invalid flags (PSH, URG, ECE, CWR)**—The first packet received had invalid flags. • **TCP Close error - no final ACK**—This counter is incremented when ACK is not received after the FINs are received from both directions.

Table 70: show services stateful-firewall statistics Output Fields *(continued)*

Field Name	Field Description
	• **TCP Resumed Flow**—Plain ACKs create flows if rule match permits, and these are classified as TCP Resumed Flows. This counter is incremented in the case of a TCP Resumed Flow.
UDP Errors	UDP protocol errors: • **IP data length less than minimum UDP header length (8 bytes)**—Minimum UDP header length is 8 bytes. The received IP packets contain less than 8 bytes. • **Source or destination port is zero**—UDP source or destination port is **0**. • **UDP port scan (ICMP error seen for UDP flow)**—ICMP error is received for a UDP flow. This could be a genuine UDP flow, but it is counted as an error.
ICMP Errors	ICMP protocol errors: • **IP data length less than minimum ICMP header length (8 bytes)**—ICMP header length is 8 bytes. This counter is incremented when received IP packets contain less than 8 bytes. • **ICMP error length inconsistencies**—Minimum length of an ICMP error packet is 48 bytes, and the maximum length is 576 bytes. This counter is incremented when the received ICMP error falls outside this range. • **Duplicate ping sequence number**—Received ping packet has a duplicate sequence number. • **Mismatched ping sequence number**—Received ping packet has a mismatched sequence number. • **No matching flow**—No matching existing flow was found for the ICMP error.

Table 70: show services stateful-firewall statistics Output Fields *(continued)*

Field Name	Field Description
ALG errors	Accumulation of all the application-level gateway protocol (ALG) drops counted separately in the ALG context: • **BOOTP**—Bootstrap protocol errors • **DCE-RPC**—Distributed Computing Environment-Remote Procedure Call protocols errors • **DCE-RPC portmap**—Distributed Computing Environment-Remote Procedure Call protocols portmap service errors • **DNS**—Domain Name System protocol errors • **Exec**—Exec errors • **FTP**—File Transfer Protocol errors • **H323**—H.323 standards errors • **ICMP**—Internet Control Message Protocol errors • **IIOP**—Internet Inter-ORB Protocol errors • **Login**—Login errors • **NetBIOS**—NetBIOS errors • **Netshow**—NetShow errors • **Real Audio**—RealAudio errors • **RPC**—Remote Procedure Call protocol errors • **RPC portmap**—Remote Procedure Call protocol portmap service errors • **RTSP**—Real-Time Streaming Protocol errors • **Shell**—Shell errors • **SIP**—Session Initiation Protocol errors • **SNMP**—Simple Network Management Protocol errors • **SQLNet**—SQLNet errors • **TFTP**—Trivial File Transfer Protocol errors • **Traceroute**—Traceroute errors

Table 70: show services stateful-firewall statistics Output Fields *(continued)*

Field Name	Field Description
Drop Flows	• **Maximum Ingress Drop flows allowed**--Maximum number of ingress flow drops allowed. • **Maximum Egress Drop flows allowed**--Maximum number of egress flow drops allowed. • **Current Ingress Drop flows**--Current number of ingress flow drops. • **Current Egress Drop flows**--Current number of egress flow drops. • **Ingress Drop Flow limit drops count**--Number of ingress flow drops due to maximum number of ingress flow drops being exceeded. • **Egress Drop Flow limit drops count**--Number of egress flow drops due to maximum number of egress flow drops being exceeded.

Sample Output

show services stateful-firewall statistics extensive

`user@host>` **show services stateful-firewall statistics extensive**

```
Interface: ms-1/3/0
  Service set: interface-svc-set
    New flows:
      Rule Accepts: 907, Rule Discards: 0, Rule Rejects: 0
    Existing flow types packet counters:
      Accepts: 3535, Drop: 0, Rejects: 0
    Haripinning counters:
      Slow Path Hairpinned Packets: 0, Fast Path Hairpinned Packets: 0
    Drops:
      IP option: 0, TCP SYN defense: 0
      NAT ports exhausted: 0, Sessions dropped due to subscriber flow limit: 0
    Errors:
      IP: 0, TCP: 0
      UDP: 0, ICMP: 0
      Non-IP packets: 0, ALG: 0
    IP errors:
      IP packet length inconsistencies: 0
      Minimum IP header length check failures: 0
      Reassembled packet exceeds maximum IP length: 0
      Illegal source address: 0
      Illegal destination address: 0
```

```
  TTL zero errors: 0, Illegal IP protocol number (0 or 255): 0
  Land attack: 0
  Non-IPv4 packets: 0, Bad checksum: 0
  Illegal IP fragment length: 0
  IP fragment overlap: 0
  IP fragment reassembly timeout: 0
  IP fragment limit exceeded:0
  Unknown: 0
TCP errors:
  TCP header length inconsistencies: 0
  Source or destination port number is zero: 0
  Illegal sequence number and flags combination: 0
  SYN attack (multiple SYN messages seen for the same flow): 0
  First packet not a SYN message: 0
  TCP port scan (TCP handshake, RST seen from server for SYN): 0
  Bad SYN cookie response: 0
  TCP reconstructor sequence number error: 0
  TCP reconstructor retransmissions: 0
  TCP partially opened connection timeout (SYN): 0
  TCP partially opened connection timeout (SYN-ACK): 0
  TCP partially closed connection reuse: 0
  TCP 3-way error - client sent SYN+ACK: 0
  TCP 3-way error - server sent ACK: 0
  TCP 3-way error - SYN seq number retransmission mismatch: 0
  TCP 3-way error - RST seq number mismatch: 0
  TCP 3-way error - FIN received: 0
  TCP 3-way error - invalid flags (PSH, URG, ECE, CWR): 0
  TCP 3-way error - SYN recvd but no client flows: 0
  TCP 3-way error - first packet SYN+ACK: 0
  TCP 3-way error - first packet FIN+ACK: 0
  TCP 3-way error - first packet FIN: 0
  TCP 3-way error - first packet RST: 0
  TCP 3-way error - first packet ACK: 0
  TCP 3-way error - first packet invalid flags (PSH, URG, ECE, CWR): 0
  TCP Close error - no final ACK: 0
  TCP Resumed Flow: 0
UDP errors:
  IP data length less than minimum UDP header length (8 bytes): 0
  Source or destination port is zero: 0
  UDP port scan (ICMP error seen for UDP flow): 0
ICMP errors:
  IP data length less than minimum ICMP header length (8 bytes): 0
  ICMP error length inconsistencies: 0
  Duplicate ping sequence number: 0
```

```
      Mismatched ping  sequence number: 0
      No matching flow: 0
    ALG errors:
      BOOTP: 0, DCE-RPC: 0, DCE-RPC portmap: 0
      DNS: 0, Exec: 0, FTP: 0
      H323: 0, ICMP: 0, IIOP: 0
      Login: 0, NetBIOS: 0, Netshow: 0
      Real Audio: 0, RPC: 0, RPC portmap: 0
      RTSP: 0, Shell: 0, SIP: 0
      SNMP: 0, SQLNet: 0, TFTP: 0
      Traceroute: 0
    Drop Flows:
      Maximum Ingress Drop flows allowed: 20
      Maximum Egress Drop flows allowed: 20
      Current Ingress Drop flows: 0
      Current Egress Drop flows: 0
      Ingress Drop Flow limit drops count: 0
      Egress Drop Flow limit drops count: 0
```

```
**If max-drop-flows is not configured, the following is shown**
    Drop Flows:
      Maximum Ingress Drop flows allowed: Default
      Maximum Egress Drop flows allowed: Default
```

show services stateful-firewall statistics application-protocol sip

Syntax

```
show services stateful-firewall application-protocol sip
```

Release Information

Command introduced in Junos OS Release 7.4.

Description

Display stateful firewall Session Initiation Protocol (SIP) statistics.

Options

This command has no options.

Required Privilege Level

view

List of Sample Output

show services stateful-firewall statistics application-protocol-sip on page 815

Output Fields

Table 71 on page 813 lists the output fields for the **show services stateful-firewall statistics application-protocol-sip** command. Output fields are listed in the approximate order in which they appear.

Table 71: show services stateful-firewall statistics application-protocol-sip Output Fields

Field Name	Field Description
Interface	Name of an adaptive services interface.
Service set	Name of the service set flow.
ALG	Name of the application-layer gateway.
Active SIP call count	Number of active SIP calls.
Active SIP registration count	Number of active SIP registrations.
REGISTER	Number of new, invalid, and retransmitted register requests sent to the SIP registrar.
INVITE	Number of new, invalid, and retransmitted invite messages sent by user agent clients.
ReINVITE	Number of new, invalid, and retransmitted reinvite messages sent by user agent clients.

Table 71: show services stateful-firewall statistics application-protocol-sip Output Fields *(continued)*

Field Name	Field Description
ACK	Number of new, invalid, and retransmitted ACK messages received (in response to a SIP Call Invite message).
BYE	Number of new, invalid, and retransmitted requests to terminate SIP dialogues.
CANCEL	Number of new, invalid, and retransmitted SIP request cancellations.
SUBSCRIBE	Number of new, invalid, and retransmitted SIP requests to subscribe for event notifications.
NOTIFY	Number of new, invalid, and retransmitted event notifications in SIP dialogues.
OPTIONS	Number of new, invalid, and retransmitted requests to query SIP capabilities.
INFO	Number of new, invalid, and retransmitted requests carrying application-level information.
UPDATE	Number of new, invalid, and retransmitted SIP dialogue updates.
REFER	Number of new, invalid, and retransmitted requests to the recipient to contact a third party.
Provisional responses	Number of new, invalid, and retransmitted responses from the user agent server to indicate the progress of a SIP transaction.
OK responses to INVITEs	OK responses sent from the user agent clients to user agent servers in response to Invite messages. The server can then return an ACK message.
OK responses to non-INVITES	OK responses to SIP messages other than an Invite message.
Redirection responses	Responses from the user agent server to a user agent client requesting the client to contact a different SIP uniform resource identifier (URI).
Request failure responses	Responses that indicate a definite failure from a particular server. The client must not retry the same request without modification after receiving this response.
Server failure responses	Responses that indicate a server failure.
Global failure responses	Responses that indicate a server has definitive information about a particular user, not just the particular instance indicated in the Request URI.
Invalid responses	Responses that are invalid.

Table 71: show services stateful-firewall statistics application-protocol-sip Output Fields *(continued)*

Field Name	Field Description
Response (all) retransmits	Retransmissions of all responses.
Parser	Syntax errors, content errors, and unknown methods counted by the message parser.

Sample Output

show services stateful-firewall statistics application-protocol-sip

`user@host>` **show services stateful-firewall statistics application-protocol sip**

```
Interface: sp-0/3/0
  Service set: test_sip_777, ALG: SIP
  Active SIP call count: 0, Active SIP registration count: 1
                   New      Invalid    Retransmit
    REGISTER         2
    INVITE           1                        0
    ReINVITE         1
    ACK              1           0            0
    BYE              0           0
    CANCEL           0           0
    SUBSCRIBE        0           0
    NOTIFY           0           0
    OPTIONS          0           0
    INFO             0           0
    UPDATE           0           0
    REFER            0           0
    Provisional responses (18x): 1, OK responses to INVITEs: 2
    OK responses to non-INVITEs: 2, Redirection (3xx) responses: 0
    Request failure (4xx) responses: 0, Server failure (5xx) responses: 0
    Global failure (6xx) responses: 0, Invalid responses: 0
    Response (all) retransmits: 0
    Parser:
      Syntax errors: 0, Content errors: 0, Unknown methods: 0
  Service set: test_sip_888, ALG: SIP
  Active SIP call count: 0, Active SIP registration count: 1
                   New      Invalid    Retransmit
    REGISTER         2
    INVITE           0                        0
```

```
ReINVITE          0
ACK               0            0             0
BYE               0            0
CANCEL            0            0
SUBSCRIBE         0            0
NOTIFY            0            0
OPTIONS           0            0
INFO              0            0
UPDATE            0            0
REFER             0            0
Provisional responses (18x): 0, OK responses to INVITEs: 0
OK responses to non-INVITEs: 2, Redirection (3xx) responses: 0
Request failure (4xx) responses: 0, Server failure (5xx) responses: 0
Global failure (6xx) responses: 0, Invalid responses: 0
Response (all) retransmits: 0
Parser:
  Syntax errors: 0, Content errors: 0, Unknown methods: 0
```

show services subscriber analysis

Syntax

```
show services subscriber analysis
<interface interface-name>
```

Release Information

Statement introduced in Junos OS Release 17.1 on MX Series MS-MPC.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display information about the number of active subscribers on the services PIC.

Options

none—Display standard information about all active subscribers on the PIC.

interface *interface-name*—(Optional) Display information about the specified interface.

Required Privilege Level

view

List of Sample Output

show services subscriber analysis interface on page 818

Output Fields

Table 72 on page 817 lists the output fields for the **show services subscriber analysis** command. Output fields are listed in the approximate order in which they appear.

Table 72: show services subscriber analysis Output Fields

Field Name	Field Description
Services PIC Name	Name of an adaptive services interface.
Subscriber Analysis Statistics:	
Total Subscribers Active	Total number of subscribers currently active on the service PIC.
Created Subscribers per Second	Rate at which subscribers are currently being created on the service PIC.
Deleted Subscribers per Second	Rate at which subscribers are currently being deleted on the service PIC.

Table 72: show services subscriber analysis Output Fields *(continued)*

Field Name	Field Description
Peak Total Subscribers Active	Highest number of subscribers that were active during the lifetime of the service PIC.
Peak Created Subscribers per Second	Highest rate at which subscribers were being created during the lifetime of the service PIC.
Peak Deleted Subscribers per Second	Highest rate at which subscribers were being deleted during the lifetime of the service PIC.
Number of Samples	Number of samples during the current sampling period lifetime.
Subscriber Rate Distribution(sec)	
Subscriber Operation: Creation	Number of sampling intervals during which a number of subscribers in the indicated range were created during the current sampling period.
Subscriber Operation: Deletion	Number of sampling intervals during which a number of subscribers in the indicated range were deleted during the current sampling period.

Sample Output

show services subscriber analysis interface

`user@host>` **show services subscriber analysis interface ms-5/1/0**

```
Services PIC Name:    ms-5/1/0

Subscriber Analysis Statistics:

  Total Subscribers Active              :0
  Created Subscribers per Second        :0
  Deleted Subscribers per Second        :0
  Peak Total Subscribers Active         :0
  Peak Created Subscribers per Second   :0
  Peak Deleted Subscribers per Second   :0

Subscriber Rate Data:
  Number of Samples: 3916
```

```
Subscriber Rate Distribution(sec)

Subscriber Operation :Creation

   400000+            :0
   350001  - 400000   :0
   300001  - 350000   :0
   250001  - 300000   :0
   200001  - 250000   :0
   160001  - 200000   :0
   150001  - 160000   :0
    50001  - 150000   :0
    40001  -  50000   :0
    30001  -  40000   :0
    20001  -  30000   :0
    10001  -  20000   :0
     1001  -  10000   :0
        1  -   1000   :0
                  0   :3916


Subscriber Operation :Deletion

   400000+            :0
   350001  - 400000   :0
   300001  - 350000   :0
   250001  - 300000   :0
   200001  - 250000   :0
   160001  - 200000   :0
   150001  - 160000   :0
    50001  - 150000   :0
    40001  -  50000   :0
    30001  -  40000   :0
    20001  -  30000   :0
    10001  -  20000   :0
     1001  -  10000   :0
        1  -   1000   :0
                  0   :3916
```

show services tcp-log

Syntax

```
show services tcp-log
```

Release Information

Command introduced in Junos OS Release 19.3R2 for Next Gen Services on MX Series.

Description

Display the specified TCP log.

Required Privilege Level

RELATED DOCUMENTATION

Sample Output

show services tcp-log

`user@host>` **show services tcp-log**

```
user@hst> show services tcp-log log1
Interface: vms-1/0/0

State: Reconnect-In-Progress
    5.5.5.1 -> 70.0.0.2 : 514
```

show services traffic-load-balance statistics

Syntax

```
show services traffic-load-balance statistics
<extensive>
<group group-name>
<instance instance-name>
<num-instances number>
<real-service real-service-name>
<summary>
<virtual-service virtual-service-name>
```

Release Information

Statement introduced in Junos OS Release 16.1 on MX Series.
num-instances option added in Junos OS Release 16.1R6 and 18.2R1 on MX Series.
Support added in Junos OS 19.3R2 for Next Gen Services with the MX-SPC3 services card.

Description

The basic form of the command displays the list of real servers associated with this group and traffic statistics, including packet count and byte count

Options

none—Display information about the load-balancing statistics in brief.

extensive—(Optional) Display extensive information about the traffic load-balancing statistics.

group *group-name*—(Optional) Display load-balancing statistics for a specified group of load-balancer servers.

instance *instance-name*—(Optional) Display load-balancing statistics for a specific traffic load balancer (TLB) instance.

num-instances *number*—(Optional) Display load-balancing statistics for a specified number of TLB instances.

real-service *real-service-name*—(Optional) Display load-balancing statistics for a specified load balancer serve.

summary—(Optional) Display summary information about the traffic load-balancing statistics.

virtual-service *virtual-service-name*—(Optional) Display load-balancing statistics for a specified TLB virtual service.

Required Privilege Level

view

List of Sample Output

show services traffic-load-balance statistics on page 829
show services traffic-load-balance statistics extensive on page 830
show services traffic-load-balance statistics summary on page 834

Output Fields

Table 73 on page 822 lists the output fields for the **show services traffic-load-balance statistics** command. Output fields are listed in the approximate order in which they appear.

Table 73: show services traffic-load-balance statistics Output Fields

Field Name	Field Description	Level of Output
Traffic load balance instance name	Name of the traffic load balancer (TLB) instance that contains the load-distribution-related configuration settings.	All levels
Multi services interface name	Name of the services interface used for the TLB instance to provide one-to-one redundancy for server health monitoring. For MS-MPC services card, this is the name of the aggregated multiservices (AMS) interface or “ms-slot/pic/port”. For Next Gen Services and the MX-SPC3 services card, this is the name of the VMS interface or “vms-slot/pic/port”.	All levels
Interface state	Inter-process communications (IPC) status between the TLB daemon (traffic-dird) and the health checking daemon (net-monitord). • **DOWN** • **UP**	All levels
Interface type	Logical interface type.	All levels
Route hold timer	Time that the programmed VIP routes are kept intact after connectivity between traffic-dird and net-monitord daemons is lost. If connectivity is not reestablished within this time, all the VIP routes are withdrawn.	All levels
Traffic load balance virtual svc name	Name of the virtual service for the TLB instance. The virtual service provides an address that is associated with the group of servers to which traffic is directed.	none **extensive**
Virtual service	Name of the virtual service for the TLB instance. The virtual service provides an address that is associated with the group of servers to which traffic is directed.	**summary**

Table 73: show services traffic-load-balance statistics Output Fields *(continued)*

Field Name	Field Description	Level of Output
Routing instance name	Name of the routing instance used for the virtual service.	none **extensive**
IP address	IP address of the virtual service.	none **extensive**
Address	IP address of the virtual service.	**summary**
Sts	Operational state of the virtual service.	**summary**
Packet Sent	Number of packets originating from the clients that the TLB instance virtual service processes for load balancing to next-hop servers.	**summary**
Byte Sent	Number of bytes originating from the clients that the TLB instance virtual service processes for load balancing to next-hop servers.	**summary**
Packet Recv	Number of packets returning from the next-hop servers that the TLB instance virtual service processes and forwards to the clients.	**summary**
Byte Recv	Number of bytes returning from the next-hop servers that the TLB instance virtual service processes and forwards to the clients.	**summary**
Virtual service mode	Virtual service processing mode. • **layer-2-direct-server-return**—Virtual service is in transparent mode with Layer 2 direct server return (DSR) • **direct-server-return**—Virtual service is in transparent mode with Layer 3 direct server return (DSR) • **translated**—Virtual service is in translated mode.	none **extensive**
Traffic load balance group name	Server group name used for the virtual service.	none **extensive**
Health check interface subunit	Number of the subunit of the multiservice interface used for health checking.	none **extensive**
Traffic load balance group down count	Number of times the status of the TLB server group was down.	**extensive**

Table 73: show services traffic-load-balance statistics Output Fields *(continued)*

Field Name	Field Description	Level of Output
Protocol	Virtual service protocol, either tcp or udp. In translated mode, packets destined to the virtual service IP address+port number+protocol are load balanced and then replaced by the real service IP address and server listening port number.	none **extensive**
Port Number	Virtual service port number. In translated mode, packets destined to the virtual service IP address+port number+protocol are load balanced and then replaced by the real service IP address and server listening port number.	none **extensive**
Server Listening Port Number	Real service port number that replaces the virtual service port number. In translated mode, packets destined to the virtual service IP address+port number+protocol are load balanced and then replaced by the real service IP address and server listening port number.	none **extensive**
Demux Nexthop index	Index number of the demultiplexing next hop for the virtual service. Index number is unique for a VIP, routing-instance, and protocol combination. The demultiplexing next hop is responsible for port-based demultiplexing of traffic to the load-balancing next hop for session distribution.	none **extensive**
DFW client-id	Client connection identifier assigned to the TLB daemon (traffic-dird) by the firewall daemon (dfwd) when the daemons are successfully connected.	**extensive**
Traffic load balance group warmup time	Time, in seconds, that passes after the traffic-dird daemon comes up until the traffic-dird programs the distribution table on the Packet Forwarding Engine.	**extensive**
Traffic load balance group auto-rejoin	Indicates whether the option that allows a server to rejoin the group automatically when it comes up is enabled or not.	**extensive**
Route metric	Routing metric assigned to the virtual service. A lower metric makes a route more preferred.	**extensive**
Virtual service down count	Number of times the status of the virtual service was down.	**extensive**
Traffic load balance hash method	Hash key parameter used for load balancing. Hash keys supported in the ingress direction are protocol, source IP address, and destination IP address.	**extensive**

Table 73: show services traffic-load-balance statistics Output Fields *(continued)*

Field Name	Field Description	Level of Output
Nexthop index	Index number of the next-hop for the virtual service. A group of servers function as a pool for next-hop session distribution.	none **extensive**
Up time	Period of time for which the virtual service is up, in the format *number-of-days hh:mm:ss*.	none **extensive**
Real Server Up count	Starting in Junos OS Release 16.1R6 and 18.2R1, number of real servers that are up for the specified virtual service or server group.	none
Real Server Down count	Starting in Junos OS Release 16.1R6 and 18.2R1, number of real servers that are down for the specified virtual service or server group.	none
Total packet sent count	Number of packets originating from the clients that the TLB instance virtual service processes for load balancing to next-hop servers.	none **extensive**
Total byte sent count	Number of bytes originating from the clients that the TLB instance virtual service processes for load balancing to next-hop servers.	none **extensive**
Total packet received count	Number of packets returning from the next-hop servers that the TLB instance virtual service processes and forwards to the clients.	none **extensive**
Total byte received count	Number of bytes returning from the next-hop servers that the TLB instance virtual service processes and forwards to the clients.	none **extensive**
Network monitoring profile count	Number of network monitoring profiles that are used to monitor the health of servers used in TLB session distribution.	**extensive**
Active real service count	Number of real services that are functional and active.	**extensive**
Total real service count	Total number of real services in different states.	**extensive**
Network monitoring profile index	Unique index number associated with the network monitoring profile. Network monitoring profiles are used to monitor the health of servers used in TLB session distribution.	**extensive**

Table 73: show services traffic-load-balance statistics Output Fields *(continued)*

Field Name	Field Description	Level of Output
Network monitoring profile name	Name configured for the network monitoring profile.	**extensive**
Probe type	Probe type used to examine the health of servers. TLB supports ICMP, TCP, and HTTP health check probes to monitor the health of servers in a group.	**extensive**
Probe interval	Frequency, in number of seconds, at which health check probes are sent.	**extensive**
Probe failure retry count	Number of failure retries, after which the real service is tagged as down.	**extensive**
Probe recovery retry count	Number of successful retries after which the real service is tagged as up.	**extensive**
Real service	Name of the TLB server (also referred to as real service). The name is the identifier for a server to which sessions can be distributed using the server distribution table in conjunction with the session distribution API.	none
Address	IP address of the configured real service.	none
Sts	Operational state of the TLB server.	none
Packet Sent	Number of packets originating from the clients that the TLB instance virtual service sends to the real service.	none
Byte Sent	Number of bytes originating from the clients that the TLB instance virtual service sends to the real service next-hop server.	none
Packet Recv	Number of packets returning from the real service next-hop server that the TLB instance virtual service processes and forwards to the clients.	none
Byte Recv	Number of bytes returning from the real service next-hop server that the TLB instance virtual service processes and forwards to the clients.	none
Traffic load balance real svc name	Name of the real service used for traffic load-balancing.	**extensive**

Table 73: show services traffic-load-balance statistics Output Fields *(continued)*

Field Name	Field Description	Level of Output
Routing instance name	Name of the routing instance on which the real service is configured.	**extensive**
IP address	IP address of the configured real service.	**extensive**
Traffic load balance group name	Name of the server group for real service.	**extensive**
Admin state	Administrative state of the real service, such as **Up** or **Down**.	**extensive**
Oper state	Operational state of the real service, such as **Up** or **Down**.	**extensive**
Network monitoring probe up count	Number of probes for which the status of the server whose health is checked is observed to be up. If a server group is configured for dual health check, a real service is declared to be UP only if both health-check probes are simultaneously UP; otherwise a real service declared to be DOWN.	**extensive**
Network monitoring probe down count	Number of probes for which the status of the server whose health is checked is observed to be down.	**extensive**
Total rejoin event count	Number of events that caused a server that was previously down and later operational to rejoin a group of real services for load-balancing.	**extensive**
Total up event count	Number of TLB events that identified a virtual service or real service to be up.	**extensive**
Total down event count	Number of TLB events that identified a virtual service or real service to be down.	**extensive**
Real Service packet sent count	Number of packets originating from the clients that the TLB instance virtual service sends to the real service.	**extensive**
Real Service byte sent count	Number of bytes originating from the clients that the TLB instance virtual service sends to the real service next-hop server.	**extensive**

Table 73: show services traffic-load-balance statistics Output Fields *(continued)*

Field Name	Field Description	Level of Output
Real Service packet received count	Number of packets returning from the real service next-hop server that the TLB instance virtual service processes and forwards to the clients.	**extensive**
Real Service byte received count	Number of bytes returning from the real service next-hop server that the TLB instance virtual service processes and forwards to the clients.	**extensive**
Total probe sent	Number of health-monitoring probes sent from the TLB health check daemon.	**extensive**
Total probe success	Number of health-monitoring probes sent from the TLB health check daemon that were successful.	**extensive**
Total probe fail	Number of health-monitoring probes attempted to be sent from the TLB health check daemon that failed.	**extensive**
Total probe sent fail	Number of health-monitoring probes attempted to be sent from the TLB health check daemon that were unsuccessfully initiated.	**extensive**
Probe state	Status of the health-check probe, such as **Up** or **Down**.	**extensive**
Probe sent	Number of health-check probe requests transmitted from the TLB health check daemon.	**extensive**
Probe success	Number of successful health-check probe requests transmitted from the TLB health check daemon.	**extensive**
Probe fail	Number of failed health-check probe requests transmitted from the TLB health check daemon.	**extensive**
Probe sent failed	Number of times the TLB health check daemon was unable to initiate transmission of a extensive health-check probe.	**extensive**
Probe consecutive success	Number of health-check probe requests transmitted from the TLB health check daemon that were consecutively successful.	**extensive**
Probe consecutive fail	Number of health-check probe requests transmitted from the TLB health check daemon that failed for two successive times.	**extensive**

Sample Output

show services traffic-load-balance statistics

```
user@host> show services traffic-load-balance statistics
```

```
Traffic load balance instance name    :  lb1
Multi services interface name         :  ms-3/0/0
Interface state                       :  UP
Interface type                        :  Multi services
Route hold timer                      :  180
Active real service count             :  0
Total real service count              : 100
Traffic load balance virtual svc name :  v1
IP address                            :  0.0.0.0
Virtual service mode                  :  Layer-2 based Direct Server Return mode
Routing instance name                 :  internal-client-vrf
Traffic load balance group name       :  g1
Health check interface subunit        :  40
Demux Nexthop index                   :  N/A
Nexthop index                         :  840
Up time                               :  2d 19:09
Real Server Up count                  :  1
Real Server Down count                :  1
Total packet sent count               :  0
Total byte sent count                 :  0
Real service   Address       Sts  Packet Sent Byte Sent Packet Recv Byte Recv
r11            203.0.113.11    UP   0           0         0           0
r10            203.0.113.10    UP   0           0         0           0


Traffic load balance virtual svc name :  v2
IP address                            :  192.0.2.11
Virtual service mode                  :  Translate mode
Routing instance name                 :  msp-tproxy-forwarding1
Traffic load balance group name       :  g2
Health check interface subunit        :  50
Protocol                              :  tcp
Port number                           :  8080
Server Listening Port Number          :  8084
Demux Nexthop index                   :  536
Nexthop index                         :  539
Up time                               :  2d 19:06
Total packet sent count               :  0
Total byte sent count                 :  0
```

```
Total packet received count           :  0
Total byte received count             :  0
Real service     Address      Sts  Packet Sent  Byte Sent  Packet Recv  Byte Recv
r12              203.0.113.12   UP   0            0          0            0

r13              203.0.113.13   UP   0            0          0            0
```

show services traffic-load-balance statistics extensive

user@host> **show services traffic-load-balance statistics extensive**

```
Traffic Load Balance General Information
    DFW client-id                     :  39

Traffic load balance instance name    :  lb1
Multi services interface name         :  ms-3/0/0
Interface state                       :  UP
Interface type                        :  Multi services
Route hold timer                      :  180
Active real service count             :  0
Total real service count              : 100
Traffic load balance virtual svc name :  v1
IP address                            :  0.0.0.0
Virtual service mode                  :  Layer-2 based Direct Server Return mode
Routing instance name                 :  internal-client-vrf
Traffic load balance group name       :  g1
Traffic load balance group warmup time:  15
Traffic load balance group auto-rejoin:  TRUE
Health check interface subunit        :  40
Traffic load balance group down count :  1
Route metric                          :  1
Virtual service down count            :  1
Traffic load balance hash method      :  source
Network monitoring profile count      :  1
Active real service count             :  2
Total real service count              :  2
Demux Nexthop index                   :  N/A
Nexthop index                         :  840
Up time                               :  2d 19:09
Total packet sent count               :  0
Total byte sent count                 :  0
Total packet received count           :  0
Total byte received count             :  0
```

```
Network monitoring profile index      :  1
Network monitoring profile name       :  prof1
Probe type                            :  ICMP
Probe interval                        :  5
Probe failure retry count             :  5
Probe recovery retry count            :  3

Traffic load balance real svc name    :  r11
Routing instance name                 :  server-vrf10
IP address                            :  203.0.113.11
Traffic load balance group name       :  g1
Admin state                           :  UP
Oper state                            :  UP
Network monitoring probe up count     :  1
Network monitoring probe down count   :  0
Total rejoin event count              :  0
Total up event count                  :  1
Total down event count                :  0
Real Service packet sent count                :  0
Real Service byte sent count                  :  0
Total probe sent                      :  47939
Total probe success                   :  47918
Total probe fail                      :  21
Total probe sent failed               :  0
Network monitoring profile index      :  1
Network monitoring profile name       :  prof1
Probe type                            :  ICMP
Probe state                           :  UP
Probe sent                            :  47939
Probe success                         :  47918
Probe fail                            :  21
Probe sent failed                     :  0
Probe consecutive success             :  10090
Probe consecutive fail                :  0

Traffic load balance real svc name    :  r10
Routing instance name                 :  server-vrf10
IP address                            :  203.0.113.10
Traffic load balance group name       :  g1
Admin state                           :  UP
Oper state                            :  UP
Network monitoring probe up count     :  1
Network monitoring probe down count   :  0
Total rejoin event count              :  0
```

```
Total up event count                  :  1
Total down event count                :  0
Real Service packet sent count                :  0
Real Service byte sent count                  :  0
Total probe sent                      :  47939
Total probe success                   :  47917
Total probe fail                      :  22
Total probe sent failed               :  0
Network monitoring profile index      :  1
Network monitoring profile name       :  prof1
Probe type                            :  ICMP
Probe state                           :  UP
Probe sent                            :  47939
Probe success                         :  47917
Probe fail                            :  22
Probe sent failed                     :  0
Probe consecutive success             :  10090
Probe consecutive fail                :  0

Traffic load balance virtual svc name :  v2
IP address                            :  192.0.2.11
Virtual service mode                  :  Translate mode
Routing instance name                 :  msp-tproxy-forwarding1
Traffic load balance group name       :  g2
Traffic load balance group warmup time:  15
Traffic load balance group auto-rejoin:  TRUE
Health check interface subunit        :  50
Traffic load balance group down count :  1
Protocol                              :  tcp
Port number                           :  8080
Server Listening Port Number          :  8084
Route metric                          :  1
Virtual service down count            :  1
Traffic load balance hash method      :  source-destination
Network monitoring profile count      :  1
Active real service count             :  2
Total real service count              :  2
Demux Nexthop index                   :  536
Nexthop index                         :  539
Up time                               :  2d 19:07
Total packet sent count               :  0
Total byte sent count                 :  0
Total packet received count           :  0
Total byte received count             :  0
```

```
Network monitoring profile index      :  1
Network monitoring profile name       :  prof1
Probe type                            :  ICMP
Probe interval                        :  5
Probe failure retry count             :  5
Probe recovery retry count            :  3

Traffic load balance real svc name    :  r12
Routing instance name                 :  server-vrf10
IP address                            :  203.0.113.12
Traffic load balance group name       :  g2
Admin state                           :  UP
Oper state                            :  UP
Network monitoring probe up count     :  1
Network monitoring probe down count   :  0
Total rejoin event count              :  0
Total up event count                  :  1
Total down event count                :  0
Real Service packet sent count        :  0
Real Service byte sent count          :  0
Real Service packet received count    :  0
Real Service byte received count      :  0
Total probe sent                      :  47939
Total probe success                   :  47916
Total probe fail                      :  23
Total probe sent failed               :  0
Network monitoring profile index      :  1
Network monitoring profile name       :  prof1
Probe type                            :  ICMP
Probe state                           :  UP
Probe sent                            :  47939
Probe success                         :  47916
Probe fail                            :  23
Probe sent failed                     :  0
Probe consecutive success             :  10089
Probe consecutive fail                :  0

Traffic load balance real svc name    :  r13
Routing instance name                 :  server-vrf10
IP address                            :  203.0.113.13
Traffic load balance group name       :  g2
Admin state                           :  UP
Oper state                            :  UP
Network monitoring probe up count     :  1
```

```
Network monitoring probe down count   :  0
Total rejoin event count              :  0
Total up event count                  :  1
Total down event count                :  0
Real Service packet sent count               :  0
Real Service byte sent count                 :  0
Real Service packet received count           :  0
Real Service byte received count             :  0
Total probe sent                      :  47939
Total probe success                   :  47910
Total probe fail                      :  29
Total probe sent failed               :  0
Network monitoring profile index      :  1
Network monitoring profile name       :  prof1
Probe type                            :  ICMP
Probe state                           :  UP
Probe sent                            :  47939
Probe success                         :  47910
Probe fail                            :  29
Probe sent failed                     :  0
Probe consecutive success             :  6283
Probe consecutive fail                :  0
```

show services traffic-load-balance statistics summary

user@host> **show services traffic-load-balance statistics summary**

```
Traffic load balance instance name    :  tlb_sdg
Multi services interface name         :  ms-8/3/0
Interface state                       :  UP
Interface type                        :  Multi services
Route hold timer                      :  180
Active real service count             :  0
Total real service count              : 100
Virtual service     Address       Sts Packet Sent Byte Sent   Packet Recv Byte
Recv
DNS-VIP1-TCP       198.51.100.1   Up  13182260    709736171   11951566    732469940

DNS-VIP1-UDP       198.51.100.1   Up  2683203     163675383   2683101     262943898

HTTP-80-ADDRESS-VIP 203.0.113.156  Up  363080548   25152313876 282072340
280409712450
HTTP-8080-ADDR-VIP  203.0.113.157  Up  363198700   25318638843 282030640
280388777065
```

```
Secure-Ent-443-VIP  203.0.113.158  Up  30561467    3012763619  28007583
3992807922
Simple-Ent-80-VIP   203.0.113.159  Up  155857682   11558785554 89649255
79217609518

Traffic load balance instance name    :  tlb_sdg_v6
Multi services interface name         :  ms-8/3/0
Interface state                       :  UP
Interface type                        :  Multi services
Route hold timer                      :  180
Virtual service  Address           Sts Packet Sent Byte Sent   Packet Recv Byte
Recv
DNS-VIP1-TCP-V6  2001:db8:a::300     Up  25118146    1829085032  24172053
2088425092
DNS-VIP1-UDP-V6  2001:db8:a::300     Up  1318497     108116747   1319249
386274267
HTTP-80-ADDR-VIP-V6 2001:db8:a::100  Up  368696950   33051271152 282178604
287789935055
HTTP-8080-ADD-VIP-V6 2001:db8:a::100 Up  368797597   33217998028 281989122
287768684085
Sec-Ent-443-VIP-V6 2001:db8:a::200   Up  0662649     3622545250  28080924
4531356641
```

show services web-filter dns-resolution profile

Syntax

```
show services web-filter dns-resolution profile profile-name <template template-name>
<fpc-slot fpc-slot pic-slot pic-slot>
```

Release Information

Command introduced in Junos OS Release 18.3R1.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display URL filter domain name system (DNS) resolution information.

URL filtering resolves the blacklisted domains. The total number of domains are divided into chunks of 50 domains per chunk. The **filter term** in the command output is the name of a chunk.

Options

fpc-slot *fpc-slot* pic-slot *pic-slot*—(Optional) Specify the FPC and PIC for which you want URL filter information displayed.

profile *profile-name*—Specify the profile for which you want URL filter information displayed.

template *template-name*—(Optional) Specify the template for which you want URL filter information displayed.

Required Privilege Level

view

RELATED DOCUMENTATION

- show services web-filter dns-resolution-statistics profile template | **840**
- show services web-filter statistics profile | **851**
- *Configuring URL Filtering*

List of Sample Output

show services web-filter dns-resolution profile on page 837

Output Fields

Table 74 on page 837 lists the output fields for the **show services web-filter dns-resolution profile** command. Output fields are listed in the approximate order in which they appear.

Table 74: show services web-filter dns-resolution profile Output Fields

Field Name	Field Description
Profile	Name of profile.
Template	Name of template.
Filter Term	Name of the domains chunk. All domains are divided into chunks of 50 domains per chunk.
IPv4 Address Count	The number of IPv4 addresses resolved for all domains under the filter term.
IPv6 Address Count	The number of IPv6 addresses resolved for all domains under the filter term.
Domain Name	Name of domain.
IPv4 Records	Listing of IPv4 addresses.
IPv6 Records	Listing of IPv6 addresses.

Sample Output

show services web-filter dns-resolution profile

`user@host>` **show services web-filter dns-resolution profile p1**

```
URL filtering DNS resolution:
Profile: p1
Template: t1

 1). Filter Term: URLF_t1_0004

      IPv4 Address Count: 20
      IPv6 Address Count: 20

    1 ). Domain Name: www.example.com

          IPv4 Records:
             31.13.77.36
             31.13.76.68
```

```
        IPv6 Records:
           2a03:2880:f122:83:face:b00c:0:25de
           2a03:2880:f111:83:face:b00c:0:25de

2 ). Domain Name: www.youtube.com

        IPv4 Records:
           216.58.193.78
           216.58.194.206

        IPv6 Records:
           2607:f8b0:400a:800::200e
           2607:f8b0:4005:809::200e

3 ). Domain Name: www.netflix.com

        IPv4 Records:
           50.112.200.248
           52.10.96.2
           52.25.242.211
           52.39.87.182
           52.38.44.92
           52.36.125.176
           52.40.2.42
           52.42.184.64
           52.5.80.199
           52.206.203.18
           52.5.231.14
           52.21.94.89
           52.71.118.87
           52.201.133.109
           52.71.122.233
           52.203.136.33

        IPv6 Records:
           2620:108:700f::342a:b840
           2620:108:700f::3644:fc64
           2620:108:700f::3459:2ce1
           2620:108:700f::3459:c025
           2620:108:700f::3459:f556
           2620:108:700f::3459:c5c5
           2620:108:700f::3644:c2a0
           2620:108:700f::342a:df11
```

```
2406:da00:ff00::3404:d29c
2406:da00:ff00::3415:a86e
2406:da00:ff00::3415:fda4
2406:da00:ff00::3414:91d2
2406:da00:ff00::3403:73dd
2406:da00:ff00::22c7:d016
2406:da00:ff00::3400:290b
2406:da00:ff00::3213:c65f
```

show services web-filter dns-resolution-statistics profile template

Syntax

```
show services web-filter dns-resolution-statistics profile profile-name template template-name
(extensive | summary)
```

Release Information

Command introduced in Junos OS Release 18.3R1.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display URL filter domain name system (DNS) resolution statistics.

Options

(extensive | summary)—Specify the level of detail of information you want displayed.

profile *profile-name*—Specify the profile for which you want URL filter information displayed.

template *template-name*—Specify the template for which you want URL filter information displayed.

Required Privilege Level

view

RELATED DOCUMENTATION

- show services web-filter dns-resolution profile | **836**
- show services web-filter statistics profile | **851**
- *Configuring URL Filtering*

List of Sample Output

show services web-filter dns-resolution-statistics profile template summary on page 842
show services web-filter dns-resolution-statistics profile template extensive on page 843

Output Fields

Table 75 on page 841 lists the output fields for the **show services web-filter dns-resolution-statistics profile template** command. Output fields are listed in the approximate order in which they appear.

Table 75: show services web-filter dns-resolution-statistics profile template Output Fields

Field Name	Field Description	Level of Detail
Profile	Name of profile.	all
Template	Name of template.	all
DNS start time	Start time of the DNS resolution.	**summary**
Next DNS start time	Start time of the next DNS resolution.	**summary**
Number of resolved A addresses	Number of resolved IPv4 addresses.	**summary**
Number of resolved AAAA addresses	Number of resolved IPv6 addresses.	**summary**
Number of unresolved A addresses	Number of unresolved IPv4 addresses.	**summary**
Number of unresolved AAAA addresses	Number of unresolved IPv6 addresses.	**summary**
Number of resolved A domains	Number of resolved IPv4 domains.	**summary**
Number of resolved AAAA domains	Number of resolved IPv6 domains.	**summary**
Number of unresolved A domains	Number of unresolved IPv4 domains.	**summary**
Number of unresolved AAAA domains	Number of unresolved IPv6 domains.	**summary**
Number of requests sent	Number of DNS requests sent.	**summary**
Number of responses received	Number of DNS responses received.	**summary**
Domain Name	Name of domain.	**extensive**

Table 75: show services web-filter dns-resolution-statistics profile template Output Fields *(continued)*

Field Name	Field Description	Level of Detail
IPv4 Address information	IPv4 address information includes the following fields: • **DNS server IP**—IPv4 address of DNS server. • **Req Sent**—Number of DNS requests sent. • **Resp Received**—Number of DNS responses received. • **DNS retries**—Number of times no DNS response was received and so retried.	**extensive**
IPv6 Address information	IPv6 address information includes the following fields: • **DNS server IP**—IPv6 address of DNS server. • **Req Sent**—Number of DNS requests sent. • **Resp Received**—Number of DNS responses received. • **DNS retries**—Number of times no DNS response was received and so retried.	**extensive**

Sample Output

show services web-filter dns-resolution-statistics profile template summary

`user@host>` **show services web-filter dns-resolution-statistics profile1 template t1 summary**

```
URL filtering DNS resolution statistics:
Profile: p1
Template: t1

     DNS start time                     : May 01 16:40:24 PDT
     Next DNS start time                : May 01 17:40:24 PDT
     Number of resolved A domains       : 114
```

```
     Number of resolved AAAA domains     : 114
     Number of unresolved A domains      : 0
     Number of unresolved AAAA domains   : 0
     Number of requests sent             : 246
     Number of responses received        : 228
```

show services web-filter dns-resolution-statistics profile template extensive

user@host> **show services web-filter dns-resolution-statistics profile p1 template t1 extensive**

```
URL filtering DNS resolution statistics:
Profile: p1
Template: t1

     1) Domain Name:    www.facebook.com

         IPv4 Address information:
              DNS server IP     8.8.8.8
              Req Sent          20
              Resp Received     20
              DNS retries       0

         IPv4 Address information:
              DNS server IP     172.29.131.60
              Req Sent          21
              Resp Received     20
              DNS retries       0

         IPv6 Address information:
              DNS server IP     8.8.8.8
              Req Sent          25
              Resp Received     20
              DNS retries       0

         IPv6 Address information:
              DNS server IP     172.29.131.60
              Req Sent          24
              Resp Received     20
              DNS retries       0
     2) Domain Name:    www.youtube.com

         IPv4 Address information:
              DNS server IP     8.8.8.8
              Req Sent          21
```

```
          Resp Received     20
          DNS retries       0

     IPv4 Address information:
          DNS server IP     172.29.131.60
          Req Sent          21
          Resp Received     20
          DNS retries       0

     IPv6 Address information:
          DNS server IP     8.8.8.8
          Req Sent          21
          Resp Received     20
          DNS retries       0

     IPv6 Address information:
          DNS server IP     172.29.131.60
          Req Sent          21
          Resp Received     20
          DNS retries       0
3) Domain Name:    www.netflix.com

     IPv4 Address information:
          DNS server IP     8.8.8.8
          Req Sent          21
          Resp Received     20
          DNS retries       0

     IPv4 Address information:
          DNS server IP     172.29.131.60
          Req Sent          21
          Resp Received     20
          DNS retries       0

     IPv6 Address information:
          DNS server IP     8.8.8.8
          Req Sent          21
          Resp Received     20
          DNS retries       0

     IPv6 Address information:
          DNS server IP     172.29.131.60
          Req Sent          21
```

```
            Resp Received     20
            DNS retries       0
```

show services web-filter secintel-policy status profile

Syntax

```
show services web-filter secintel-policy status profile profile-name
```

Release Information

Command introduced before Junos OS Release 18.4.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display the IPv4 and IPv6 count per threat level received from the C&C feed from the Policy Enforcer. It also displays the per threat level count of the number of terms used in the implicit filter.

Options

profile-name— Name of the profile

Required Privilege Level

view

RELATED DOCUMENTATION

security-intelligence | 481

List of Sample Output

show services web-filter secintel-policy status profile on page 846

Sample Output

show services web-filter secintel-policy status profile

`user@host>` **show services web-filter secintel-policy status profile**

```
URL Filtering SecIntel Policy Status:
Profile     : Profile1
C DB File : /var/db/url-filterd/urlf_si_cc_db.txt
Policy State: Ready
DB File Change Time : Tue Nov 27 11:01:10 2018
DB File Load Time   : Tue Nov 27 11:01:38 2018
```

```
C Prefix Count    : IPv4: 11093      IPv6: 5
Filters:
Threat level   Action       v4 Term Count    IPv4        v6 Term Count   IPv6

1              ACCEPT       23            1129         1               2
2              ACCEPT       11            1444         0               0
3              ACCEPT       6             996          0               0
4              ACCEPT       7             564          0               0
5              ACCEPT       7             451          0               0
6              ACCEPT       4             126          0               0
7              LOG          5             175          0               0
8              DROP AND LOG 4             396          1               1
9              ACCEPT       2             164          0               0
10             ACCEPT       33            5601         1               2
```

show services web-filter statistics dns-filter-template

Syntax

```
show services web-filter statistics dns-filter-template template-name
```

Release Information

Description

Display statistics for DNS request filtering and URL filtering for the specified filter profile.

Options

dns-filter-template *template-name*—(Optional) Display statistics for the specified DNS filter template.

Required Privilege Level

view

RELATED DOCUMENTATION

DNS Request Filtering for Blacklisted Website Domains | 189

Configuring URL Filtering

List of Sample Output

show services web-filter statistics dns-filter-template on page 849

Output Fields

Table 76 on page 848 lists the output fields for the **show services web-filter statistics profile** command. Output fields are listed in the approximate order in which they appear.

Table 76: show services web-filter statistics profile Output Fields

Field Name	Field Description
UDP DNS	Number of UDP DNS requests, responses, and log only responses for DNS request filtering for queries of types A, AAAA, MX, CNAME, SRV, TXT, and MISC.
TCP DNS	Number of TCP DNS requests, responses, and log only responses for DNS request filtering for queries of types A, AAAA, MX, CNAME, SRV, TXT, and MISC.

Sample Output

show services web-filter statistics dns-filter-template

`user@host>` **show services web-filter statistics dns-filter-template DNS_CUSTOMER-A**

```
       DNS filtering counters:


UDP DNS A req count                        : 0
UDP DNS A resp count                       : 0
UDP DNS A log only count                   : 0
UDP DNS AAAA req count                     : 0
UDP DNS AAAA resp count                    : 0
UDP DNS AAAA log only count                : 0
UDP DNS MX req count                       : 0
UDP DNS MX resp count                      : 0
UDP DNS MX log only count                  : 0
UDP DNS CNAME req count                    : 0
UDP DNS CNAME resp count                   : 0
UDP DNS CNAME log only count               : 0
UDP DNS SRV req count                      : 0
UDP DNS SRV resp count                     : 0
UDP DNS SRV resp count                     : 0

UDP DNS SRV resp count                     : 0
+ UDP DNS SRV Resp No Err count   : 0
+ UDP DNS SRV Resp Resp Refused Err count   : 0
UDP DNS SRV log only count                 : 0
UDP DNS TXT req count                      : 0
UDP DNS TXT resp count                     : 0
UDP DNS TXT log only count                 : 0
+ UDP DNS TXT Resp No Err count   : 0
+ UDP DNS TXT Resp Resp Refused Err count   : 0
UDP DNS ANY req count                      : 0
UDP DNS ANY resp count                     : 0
UDP DNS ANY log only count                 : 0
UDP DNS MISC req count                     : 0
UDP DNS MISC log only count                : 0
TCP DNS A req count                        : 0
TCP DNS A resp count                       : 0
TCP DNS A log only count                   : 0
TCP DNS AAAA req count                     : 0
TCP DNS AAAA resp count                    : 0
TCP DNS AAAA log only count                : 0
```

```
TCP DNS MX req count                        : 0
TCP DNS MX resp count                       : 0
TCP DNS MX log only count                   : 0
TCP DNS CNAME req count                     : 0
TCP DNS CNAME resp count                    : 0
TCP DNS CNAME log only count                : 0
TCP DNS SRV req count                       : 0
TCP DNS SRV resp count                      : 0
TCP DNS SRV log only count                  : 0
+ TCP DNS SRV Resp No Err count   : 0
+ TCP DNS SRV Resp Resp Refused Err count   : 0

TCP DNS TXT req count                       : 0
TCP DNS TXT resp count                      : 0
TCP DNS TXT log only count                  : 0
+ TCP DNS SRV Resp No Err count   : 0
+ TCP DNS SRV Resp Resp Refused Err count   : 0

TCP DNS ANY req count                       : 0
TCP DNS ANY resp count                      : 0
TCP DNS ANY log only count                  : 0
TCP DNS MISC req count                      : 0
TCP DNS MISC log only count                 : 0
```

show services web-filter statistics profile

Syntax

```
show services web-filter statistics profile profile-name
<dns-filter-template template-name>
<dns-filter-term term-name>
<fpc-slot fpc-slot pic-slot pic-slot>
<url-filter-template template-name>
```

Release Information

Command introduced in Junos OS Release 18.3R1.
Support added in Junos OS Release 19.3R2 for Next Gen Services on MX Series routers MX240, MX480 and MX960 with the MX-SPC3 services card.

Description

Display statistics for DNS request filtering and URL filtering for the specified filter profile.

Options

dns-filter-template *template-name*—(Optional) Display statistics for the specified DNS filter template.

dns-filter-term *term-name*—(Optional) Display statistics for the specified term in the DNS filter template.

fpc-slot *fpc-slot* pic-slot *pic-slot*—(Optional) Display statistics for the specified services PIC.

profile *profile-name*—Display statistics for the specified filter profile.

url-filter-template *template-name*—(Optional) Display statistics for the specified URL filter template.

Required Privilege Level

view

RELATED DOCUMENTATION

> DNS Request Filtering for Blacklisted Website Domains | 189
>
> *Configuring URL Filtering*

List of Sample Output

show services web-filter statistics profile dns-filter-template on page 853
show services web-filter statistics profile on page 854

Output Fields

Table 76 on page 848 lists the output fields for the **show services web-filter statistics profile** command. Output fields are listed in the approximate order in which they appear.

Table 77: show services web-filter statistics profile Output Fields

Field Name	Field Description
UDP Counters	Number of UDP DNS requests, responses, and log only responses for DNS request filtering for queries of types A, AAAA, MX, CNAME, SRV, TXT, and MISC.
TCP Counters	Number of TCP DNS requests, responses, and log only responses for DNS request filtering for queries of types A, AAAA, MX, CNAME, SRV, TXT, and MISC.
Accept	Action counters for accepted packets for URL filtering.
Custom page	Action counters for custom page sent to recipient for URL filtering.
Http scode	Action counters for HTTP status code response for URL filtering.
Redirect url	Action counters for redirect URL response for URL filtering.
TCP reset	Action counters for TCP reset for URL filtering. Connection is closed.
Bypass session count	Number of sessions not blocked by URL filtering because the match criteria was not met for URL filtering.
IPV4 Disable IP Blocking	Action counters for IPv4 packets that were accepted because filtering is disabled for HTTP traffic that contains an embedded IP address belonging to a blacklisted domain name in the URL filter database.
IPV6 Disable IP Blocking	Action counters for IPv6 packets that were accepted because filtering is disabled for HTTP traffic that contains an embedded IP address belonging to a blacklisted domain name in the URL filter database.
session count	The session of activity that a user with a unique IP address spends on a website during a specified period of time for URL filtering. A session, in this case, would be the packets going to the service PIC from the Packet Forwarding Engine and then back to the service PIC.
uplink packet count	Number of packets going from the Packet Forwarding Engine to the service PIC for URL filtering.
uplink bytes	Number of bytes passing uplink for URL filtering.
downlink packet count	Number of packets going from the service PIC to the service Packet Forwarding Engine for URL filtering.
downlink bytes	Number of bytes passing downlink for URL filtering.

Table 77: show services web-filter statistics profile Output Fields *(continued)*

Field Name	Field Description
UDP DNS	Number of UDP DNS requests, responses, and log only responses for DNS request filtering for queries of types A, AAAA, MX, CNAME, SRV, TXT, and MISC.
TCP DNS	Number of TCP DNS requests, responses, and log only responses for DNS request filtering for queries of types A, AAAA, MX, CNAME, SRV, TXT, and MISC.

Sample Output

show services web-filter statistics profile dns-filter-template

`user@host>` **show services web-filter statistics profile pdns dns-filter-template tdns**

```
Query   Requests        Responses       Log
Type                                    only

UDP Counters:

 A      0               0               0
 AAAA   0               0               0
 MX     0               0               0
 CNAME  0               0               0
 SRV    0               0               0
 TXT    0               0               0
 MISC   0               0               0

TCP Counters:

 A      0               0               0
 AAAA   0               0               0
 MX     0               0               0
 CNAME  0               0               0
 SRV    0               0               0
 TXT    0               0               0
 MISC   0               0               0
```

Sample Output

show services web-filter statistics profile

`user@host>` **show services web-filter statistics profile Profile1**

```
URL filtering action counters:


    Accept session count                : 0
    Accept uplink packet count          : 0
    Accept uplink bytes                 : 0
    Accept downlink packet count        : 0
    Accept downlink bytes               : 0

    Custom page session count           : 0
    Custom page uplink packet count     : 0
    Custom page uplink bytes            : 0
    Custom page downlink packet count   : 0
    Custom page downlink bytes          : 0

    Http scode session count            : 0
    Http scode uplink packet count      : 0
    Http scode uplink bytes             : 0
    Http scode dowlink packet count     : 0
    Http scode downlink bytes           : 0

    Redirect url session count          : 0
    Redirect url uplink packet count    : 0
    Redirect url uplink bytes           : 0
    Redirect url downlink packet count  : 0
    Redirect url downlink bytes         : 0

    Tcp reset session count             : 0
    Tcp reset uplink packet count       : 0
    Tcp reset uplink bytes              : 0
    Tcp reset downlink packet count     : 0
    Tcp reset downlink bytes            : 0

    Bypass session count                : 0

    IPV4 Disable IP Blocking Sessions          : 0
    IPV4 Disable IP Blocking uplink packets    : 0
    IPV4 Disable IP Blocking uplink bytes      : 0
    IPV4 Disable IP Blocking downlink packets  : 0
```

```
IPV4 Disable IP Blocking downlink bytes    : 0
IPV6 Disable IP Blocking Sessions          : 0
IPV6 Disable IP Blocking uplink packets    : 0
IPV6 Disable IP Blocking uplink bytes      : 0
IPV6 Disable IP Blocking downlink packets  : 0
IPV6 Disable IP Blocking downlink bytes    : 0

DNS filtering counters:

UDP DNS A req count                        : 0
UDP DNS A resp count                       : 0
UDP DNS A log only count                   : 0
UDP DNS AAAA req count                     : 0
UDP DNS AAAA resp count                    : 0
UDP DNS AAAA log only count                : 0
UDP DNS MX req count                       : 0
UDP DNS MX resp count                      : 0
UDP DNS MX log only count                  : 0
UDP DNS CNAME req count                    : 0
UDP DNS CNAME resp count                   : 0
UDP DNS CNAME log only count               : 0
UDP DNS SRV req count                      : 0
UDP DNS SRV resp count                     : 0
UDP DNS SRV log only count                 : 0
UDP DNS TXT req count                      : 0
UDP DNS TXT resp count                     : 0
UDP DNS TXT log only count                 : 0
UDP DNS ANY req count                      : 0
UDP DNS ANY resp count                     : 0
UDP DNS ANY log only count                 : 0
UDP DNS MISC req count                     : 0
UDP DNS MISC log only count                : 0
TCP DNS A req count                        : 0
TCP DNS A resp count                       : 0
TCP DNS A log only count                   : 0
TCP DNS AAAA req count                     : 0
TCP DNS AAAA resp count                    : 0
TCP DNS AAAA log only count                : 0
TCP DNS MX req count                       : 0
TCP DNS MX resp count                      : 0
TCP DNS MX log only count                  : 0
TCP DNS CNAME req count                    : 0
TCP DNS CNAME resp count                   : 0
TCP DNS CNAME log only count               : 0
```

```
TCP DNS SRV req count                    : 0
TCP DNS SRV resp count                   : 0
TCP DNS SRV log only count               : 0
TCP DNS TXT req count                    : 0
TCP DNS TXT resp count                   : 0
TCP DNS TXT log only count               : 0
TCP DNS ANY req count                    : 0
TCP DNS ANY resp count                   : 0
TCP DNS ANY log only count               : 0
TCP DNS MISC req count                   : 0
TCP DNS MISC log only count              : 0
```