Junos® OS

Application Security Feature Guide for Security Devices

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About the Documentation

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- Using the Examples in This Manual on page xix
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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/.

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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; }
```


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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 xxi 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 xxii 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*
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.	

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Table 2: Text and Syntax Conventions (continued)

Convention	Description	Examples
GUI Conventions		
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**.

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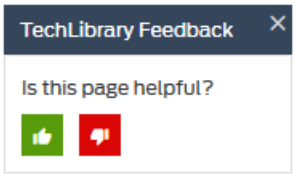
We encourage you to provide feedback so that we can improve our documentation. You can use either of the following methods:

- 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:



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- 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/.

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- 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/.

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CHAPTER 1

Overview

- Understanding Application Security on page 25

Understanding Application Security

Web-based applications are changing the dynamics of security. Previously, specific applications were associated with specific protocols and ports, making policy enforcement at the host level relatively straightforward. Web applications that can be accessed from anywhere create challenge for network administrators to effectively manage traffic flows and access to data while delivering the security and network services.

An individual can connect to the network using multiple devices simultaneously, making it impractical to identify a user, an application, or a device by a group of statically allocated IP addresses and port numbers.

Applications such as instant messaging, peer-to-peer file sharing, Webmail, social networking, and IP voice/video collaboration evade security mechanisms by changing communications ports and protocols, or by tunneling within other commonly used services (for example, HTTP or HTTPS). Organizations need control over the applications and traffic on their networks to protect their assets against attacks and manage bandwidth.

Juniper Networks' AppSecure is a suite of application-aware security services for the Juniper Networks' SRX Series Services Gateways to delivers security services to provide visibility and control over the types of applications traversing in the networks. AppSecure uses a sophisticated classification engine to accurately identify applications regardless of port or protocol, including nested applications that reside within trusted network services.

- Application identification (AppID)- Recognizes traffic at different network layers using characteristics other than port number. Once the application is determined, AppSecure service modules can be configured to monitor and control traffic for tracking, prioritization, access control, detection, and prevention based on the application ID of the traffic.
- Application Tracking (AppTrack)—Tracks and reports applications passing through the device.
- Application Firewall (AppFW)—Implements an application firewall using application-based rules.

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- Application Quality of Service (AppQoS)—Provides quality-of-service prioritization based on application awareness.
- Advanced policy-based routing (APBR)— Classifies session based on applications and applies the configured rules to reroute the traffic.
- SSL Proxy—Provides visibility of encrypted traffic to allow deep packet inspection (DPI).

AppSecure works with additional content security through integrated unified threat management (UTM), intrusion prevention systems (IPS), and Juniper Networks Sky Advanced Threat Prevention (Sky ATP) on the SRX Series for deeper protection against malware, spam, phishing, and application exploits.

Benefits of Application Security

- Helps you identify application traffic traversing your network regardless of port, protocol, and encryption, thereby providing greater visibility to control network traffic.
- Enables you to control network traffic by setting and enforcing security policies based on accurate application information.
- Provides context and clarity to strengthen network protection.
- Provides protection against common evasion techniques.

Related Documentation

- Understanding Application Identification Techniques on page 27Understanding Application Identification Techniques on page 27

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CHAPTER 2

Application Identification

- Application Identification on page 27
- Predefined Application Signatures for Application Identification on page 38
- Custom Application Signatures for Application Identification on page 63
- Predefined and Custom Application Groups for Application Identification on page 72
- Application Identification Support for Unified Policies on page 78

Application Identification

Application Identification enables you to see the applications on your network and learn how they work, their behavioral characteristics, and their relative risk. Using several different identification mechanisms, App ID detects the applications on your network regardless of the port, protocol, and encryption (TLS/SSL or SSH) or other evasive tactics used. For more information, see the following topics:

- Understanding Application Identification Techniques on page 27
- Understanding the Junos OS Application Identification Database on page 30
- Disabling and Reenabling Junos OS Application Identification on page 31
- Understanding the Application System Cache on page 31
- Enabling or Disabling Application System Cache for Application Services on page 32
- Verifying Application System Cache Statistics on page 34
- Onbox Application Identification Statistics on page 35
- Understanding Jumbo Frames Support for Junos OS Application Identification Services on page 36
- Improving the Application Traffic Throughput on page 36

Understanding Application Identification Techniques

Historically, firewalls have used the IP address and port numbers as a way of enforcing policies. That strategy is based on the assumption that users connect to the network from fixed locations and access particular resources using specific port numbers.

Today, wireless networking and mobile devices require a different strategy. The way in which devices connect to the network changes rapidly. An individual can connect to the

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network using multiple devices simultaneously. It is no longer practical to identify a user, application, or device by a group of statically allocated IP addresses and port numbers.

This topic includes the following section:

- Junos OS Next-Generation Application Identification on page 28
- Benefits of Application Identification on page 28
- Application Signature Mapping on page 29
- Application Identification Match Sequence on page 29

Junos OS Next-Generation Application Identification

Next-generation application identification builds on the legacy application identification functionality and provides more effective detection capabilities for evasive applications such as Skype, BitTorrent, and Tor.

Junos OS application identification recognizes Web-based and other applications and protocols at different network layers using characteristics other than port number. Applications are identified by using a protocol bundle containing application signatures and parsing information. The identification is based on protocol parsing and decoding and session management.

The detection mechanism has its own data feed and constructs to identify applications.

The following features are supported in application identification:

- Support for protocols and applications, including video streaming, peer-to-peer communication, social networking, and messaging
- Identification of services within applications
- Ability to distinguish actions launched within an application (such as login, browse, chat, and file transfer)
- Support for all versions of protocols and application decoders and dynamic updates of decoders
- Support for encrypted and compressed traffic and most complex tunneling protocols
- Ability to identify all protocols from Layer 3 to Layer 7 and above Layer 7

Benefits of Application Identification

- Provides granular control over applications, including video streaming, peer-to-peer communication, social networking, and messaging. It also identifies services, port usage, underlying technology, and behavioral characteristics within applications. This visibility enables you to block evasive applications inline at the SRX Series firewall.
- Identifies applications and allows, blocks, or limits applications— regardless of port or protocol, including applications known for using evasive techniques to avoid identification. This identification helps organizations control the types of traffic allowed to enter and exit the network.

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Application Signature Mapping

Application signature mapping is a precise method of identifying the application that issued traffic on the network. Signature mapping operates at Layer 7 and inspects the actual content of the payload.

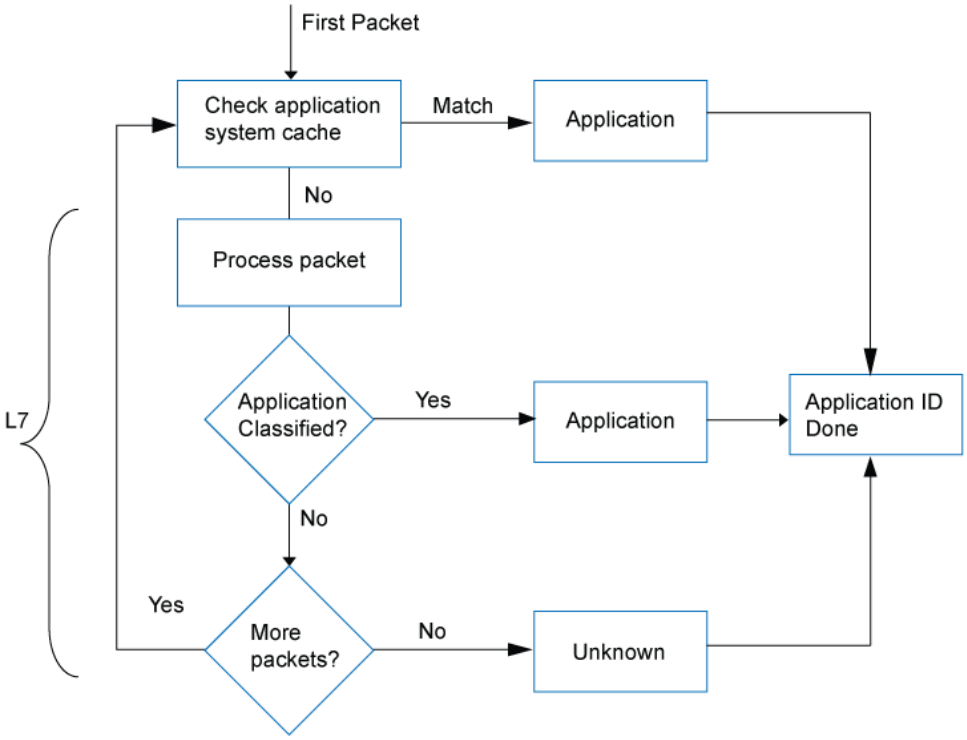
Applications are identified by using a downloadable protocol bundle. Application signatures and parsing information of the first few packets are compared to the content of the database. If the payload contains the same information as an entry in the database, the application of the traffic is identified as the application mapped to that database entry.

Juniper Networks provides a predefined application identification database that contains entries for a comprehensive set of known applications, such as FTP and DNS, and applications that operate over the HTTP protocol, such as Facebook, Kazaa, and many instant messaging programs. A signature subscription allows you to download the database from Juniper Networks and regularly update the content as new predefined signatures are added.

Application Identification Match Sequence

Figure 1 on page 29 shows the sequence in which mapping techniques are applied and how the application is determined.

Figure 1: Mapping Sequence



In application identification, every packet in the flow passes through the application identification engine for processing until the application is identified. Application bindings are saved in the application system cache (ASC) to expedite future identification process.

Application signatures identify an application based on protocol grammar analysis in the first few packets of a session. If the application identification engine has not yet identified the application, it passes the packets and waits for more data.

The application identification module matches applications for both client-to-server and server-to-client sessions.

Once the application is determined, AppSecure service modules can be configured to monitor and control traffic for tracking, prioritization, access control, detection, and prevention based on the application ID of the traffic.

- Application Tracking (AppTrack)— Tracks and reports applications passing through the device.
- Intrusion Detection and Prevention (IDP)— Applies appropriate attack objects to applications running on nonstandard ports. Application identification improves IDP performance by narrowing the scope of attack signatures for applications without decoders.
- Application Firewall (AppFW)— Implements an application firewall using application-based rules.
- Application Quality of Service (AppQoS)— Provides quality-of-service prioritization based on application awareness.
- Advanced policy-based routing (APBR)— Classifies session based on applications and applies the configured rules to reroute the traffic.
- Application Quality of Experience (AppQoE)— Monitors the performance of applications, and based on the score, selects the best possible link for that application traffic.

See Also

- Understanding Application Tracking on page 104
- Application Firewall Overview on page 85
- Understanding Application Quality of Service (AppQoS) on page 118

Understanding the Junos OS Application Identification Database

A predefined signature database is available on the Juniper Networks Security Engineering website. This database includes a library of application signatures.

The predefined signature package provides identification criteria for known application signatures and is updated periodically.

Whenever new applications are added, the protocol bundle is updated and generated for all relevant platforms. It is packaged together with other application signature files. This package will be available for download through the security download website.

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A subscription service allows you to regularly download the latest signatures for up-to-date coverage without having to create entries for your own use.

Application identification is enabled by default and is automatically turned on when you configure Intrusion Detection and Prevention (IDP), AppFW, AppQoS, or AppTrack.

NOTE: **Updates to the Junos OS predefined application signature package are authorized by a separately licensed subscription service. You must install the application identification application signature update license key on your device to download and install the signature database updates provided by Juniper Networks. When your license key expires, you can continue to use the locally stored application signature package contents but you cannot update the package.**

See Also

- Understanding the Junos OS Application Package Installation on page 39
- *Understanding IDP Application Identification*

Disabling and Reenabling Junos OS Application Identification

Application identification is enabled by default. You can disable application identification with the CLI.

To disable application identification:

```
user@host# set services application-identification no-application-identification
```

If you want to reenable application identification, delete the configuration statement that specifies disabling of application identification:

```
user@host# delete services application-identification no-application-identification
```

If you are finished configuring the device, commit the configuration.

To verify the configuration, enter the **show services application-identification** command.

See Also

- Understanding Application Identification Techniques on page 27
- Understanding the Junos OS Application Identification Database on page 30

Understanding the Application System Cache

Application system cache (ASC) saves the mapping between an application type and the corresponding destination IP address, destination port, protocol type, and service. Once an application is identified, its information is saved in the ASC so that only a matching entry is required to identify an application running on a particular system, thereby expediting the identification process.

By default, the ASC saves the mapping information for 3600 seconds. However, you can configure the cache timeout value by using the CLI.

You can use the **[edit services application-identification application-system-cache-timeout]** command to change the timeout value for the application system cache entries. The timeout value can be configured from 0 through 1,000,000 seconds. The ASC session might expire after 1000,000 seconds.

ASC entries expire after the configured ASC timeout. ASC entries are not refreshed even when there are cache hits (matching entry in ASC found) during the timeout period.

NOTE: When you configure a new custom application signature or modify an existing custom signature, all the existing application system cache entries for predefined and custom applications will be cleared.

NOTE: When you delete or disable a custom application signature, and the configuration commit fails, the application system cache (ASC) entry is not cleared completely; instead, a base application in the path of custom application will be reported in ASC.

See Also

- Enabling or Disabling Application Groups in Junos OS Application Identification on page 77

Enabling or Disabling Application System Cache for Application Services

Starting in Junos OS Release 18.2R1, the default behavior of the ASC is changed as follows:

- Security services including security policies, application firewall (AppFW), application tracking (AppTrack), application quality of service (AppQoS), Juniper Sky ATP, IDP, and UTM do not use the ASC by default.
- Miscellaneous services including advanced policy-based routing (APBR) use the ASC for application identification by default.

NOTE: The change in the default behavior of the ASC affects the legacy AppFW functionality. With the ASC disabled by default for the security services starting in Junos OS Release 18.2 onward, AppFW will not use the entries present in the ASC.

You can revert to the ASC behavior as in Junos OS releases before Release 18.2 by using the **set services application-identification application-system-cache security-services** command.

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CAUTION: The SRX Series device might become susceptible to application evasion techniques if the ASC is enabled for security services. We recommend that you enable the ASC only when the performance of the device in its default configuration (disabled for security services) is not sufficient for your specific use case.

Use the following commands to enable or disable the ASC:

- Enable the ASC for security services:

```
user@host# set services application-identification application-system-cache
  security-services
```

- Disable the ASC for miscellaneous services:

```
user@host# set services application-identification application-system-cache
  no-miscellaneous-services
```

- Disable the enabled ASC for security services:

```
user@host# delete services application-identification application-system-cache
  security-services
```

- Enable the disabled ASC for miscellaneous services:

```
user@host# delete services application-identification application-system-cache
  no-miscellaneous-services
```

You can use the **show services application-identification application-system-cache** command to verify the status of the ASC.

The following sample output provides the status of the ASC:

user@host>show services application-identification application-system-cache

```
Application System Cache Configurations:
  application-cache: on
    Cache lookup for security-services: off
    Cache lookup for miscellaneous-services: on
  cache-entry-timeout: 3600 seconds
```

In releases before Junos OS Release 18.2R1, application caching is enabled by default. You can manually disable it by using the CLI.

```
user@host# set services application-identification no-application-system-cache
```

See Also

- Understanding Application Identification Techniques on page 27
- Verifying Application System Cache Statistics on page 34
- Understanding the Junos OS Application Identification Database on page 30

Verifying Application System Cache Statistics

Purpose Verify the application system cache (ASC) statistics.

NOTE: **The application system cache will display the cache for application identification applications.**

Action From CLI operation mode, enter the **show services application-identification application-system-cache** command.

Sample Output

```
user@host> show services application-identification application-system-cache
application-cache: on
  nested-application-cache: on
  cache-unknown-result: on
  cache-entry-timeout: 3600 seconds
```

Meaning The output shows a summary of the ASC statistics information. Verify the following information:

- IP address—Displays the destination address.
- Port—Displays the destination port on the server.
- Protocol—Displays the protocol type on the destination port.
- Application—Displays the name of the application identified on the destination port.

NOTE: **On for SRX300, SRX320, SRX340, SRX345, SRX550M, and SRX1500 devices, when there are a large number of ASC entries (10,000 or more), and the entries are to be listed in the output for the command show services application-identification application-system-cache, a CLI session timeout occurs.**

See Also

- Understanding Application Identification Techniques on page 27
- Enabling or Disabling Application System Cache for Application Services on page 32

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Onbox Application Identification Statistics

Application Identification services provide statistical information per session. These statistics provide customers with an application usage profile. The Onbox Application Identification Statistics feature adds application-level statistics to the AppSecure suite. Application statistics allow an administrator to access cumulative statistics as well as statistics accumulated over user-defined intervals.

With this feature, the administrator can clear the statistics and configure the interval values while maintaining bytes and session count statistics. Because the statistics count occurs at session close event time, the byte and session counts are not updated until the session closes. SRX Series devices support a history of eight intervals that an administrator can use to display application session and byte counts.

If application grouping is supported in your configuration of Junos OS, then the Onbox Application Identification Statistic feature supports onbox per-group matching statistics. The statistics are maintained for predefined groups only.

Reinstalling an application signature package will not clear the application statistics. If the application is disabled, there will not be any traffic for that application, but the application is still maintained in the statistics. It does not matter if you are reinstalling a predefined application, because applications are tracked according to application type. For predefined group statistics, reinstalling a security package will not clear the statistics. However, any changes to group memberships are updated. For example, junos:web might have 50 applications in the current release and 60 applications following an upgrade. Applications that are deleted and application groups that are renamed are handled in the same way as applications that are added.

The Application Identification module maintains a 64-bit session counters for each application on each Services Processing Unit (SPU). The counter increments when a session is identified as a particular application. Another set of 64-bit counters aggregates the total bytes per application on the SPU. Counters for unspecified applications are also maintained. Statistics from multiple SPUs for both sessions and bytes are aggregated on the Routing Engine and presented to the users.

Individual SPUs have interval timers to roll over statistics per *interval* time. To configure the interval for statistics collection, use the **set services application-identification statistics interval *time*** command. Whenever the Routing Engine queries for the required interval, the corresponding statistics are fetched from each SPU, aggregated in the Routing Engine and presented to the user.

Use the **clear services application-identification statistics** to clear all application statistics such as cumulative, interval, applications, and application groups.

Use the **clear services application-identification counter** command to reset the counters manually. Counters reset automatically when a device is upgraded or rebooted, when flowd restarts, or when there is a change in the interval timer.

Use the **set services application-identification application-system-cache-timeout value** to specify the timeout value in seconds for the application system cache entries.

Starting from Junos OS Release 15.1X49-D120, on all SRX Series devices, the default time interval for application identification statistics collection time is changed from 1 minute to 1440 minutes.

Configuring IMAP Cache Size

Internet Message Access Protocol (IMAP) is an Internet standard protocol used by e-mail clients for e-mail storage and retrieval services. IMAP cache is used for protocol parsing and context generation. It stores parsing related information of an email.

Starting from Junos OS Release 15.1X49-D120, you can configure to limit the maximum number of entries in the IMAP cache and specify the timeout value for the entries in the cache.

You can use the following commands to modify the settings for IMAP cache:

set services application-identification imap-cache imap-cache-size *size*

set services application-identification imap-cache imap-cache-timeout *time in seconds*

Example:

```
[edit]
user@host# set services application-identification imap-cache imap-cache-size 50000
```

In this example, the IMAP cache size is configured to store 50,000 entries.

```
[edit]
user@host# set services application-identification imap-cache-timeout 600
```

In this example, time out period is configured to 600 seconds during which a cache entry remains in IMAP cache.

See Also

- Understanding Application Identification Techniques on page 27

Understanding Jumbo Frames Support for Junos OS Application Identification Services

Application identification support the larger jumbo frame size of 9192 bytes. Although jumbo frames are enabled by default, you can adjust the maximum transmission unit (MTU) size by using the [**set interfaces**] command. CPU overhead can be reduced while processing jumbo frames.

See Also

- *Understanding Jumbo Frames Support for Ethernet Interfaces*

Improving the Application Traffic Throughput

The application traffic throughput can be improved by setting the deep packet inspection (DPI) in performance mode with default packet inspection limit as two packets, including both client-to-server and server-to-client directions. By default, performance mode is disabled on SRX Series devices.

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To improve the application traffic throughput:

1. Enable the DPI performance mode.

```
[edit]
user@host# set services application-identification enable-performance-mode
```

2. (Optional) You can set the maximum packet threshold for DPI performance mode, including both client-to-server and server-to-client directions.

   You can set the packet inspection limit from 1 through 100.

```
[edit]
user@host# set services application-identification enable-performance-mode
  max-packet-threshold value
```

3. Commit the configuration.

```
[edit]
user@host# commit
```

Use the **show services application-identification status** command to display detailed information about application identification status.

show services application-identification status (DPI Performance Mode Enabled)

```
user@host> show services application-identification status
pic: 2/1

Application Identification
Status                            Enabled
Sessions under app detection      0
Engine Version                    4.18.2-24.006 (build date Jul 30 2014)
Max TCP session packet memory     30000
Force packet plugin               Disabled
Force stream plugin               Disabled
DPI Performance mode:             Enabled
Statistics collection interval    1 (in minutes)

Application System Cache
Status                            Enabled
Negative cache status             Disabled
Max Number of entries in cache    262144
Cache timeout                     3600 (in seconds)

Protocol Bundle
Download Server                 https://signatures.juniper.net/cgi-bin/index.cgi
AutoUpdate                        Disabled
Slot 1:
Application package version       2399
Status                            Active
Version                           1.40.0-26.006 (build date May 1 2014)
Sessions                          0
Slot 2
```

```
Application package version       0
Status                            Free
Version
Sessions                          0
```

The DPI Performance mode field displays whether the DPI performance mode is enabled or not. This field is displayed in the CLI command output only if the performance mode is enabled.

If you want to set DPI to default accuracy mode and disable the performance mode, delete the configuration statement that specifies enabling of the performance mode:

To disable the performance mode:

1. Delete the performance mode.

```
[edit]
user@host# delete services application-identification enable-performance-mode
```

2. Commit the configuration.

```
[edit]
user@host# commit
```

See Also

- enable-performance-mode on page 335

Release History Table

Release	Description
15.1X49-D120	Starting from Junos OS Release 15.1X49-D120, you can configure to limit the maximum number of entries in the IMAP cache and specify the timeout value for the entries in the cache.

Related Documentation

- Understanding Application Security on page 25
- Predefined Application Signatures for Application Identification on page 38
- Custom Application Signatures for Application Identification on page 63
- Predefined and Custom Application Groups for Application Identification on page 72

Predefined Application Signatures for Application Identification

Predefined application signature package is a dynamically loadable module that provides application classification functionality and associated protocol attributes. It is hosted

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on an external server and can be downloaded as a package and installed on the device. For more information, see the following topics:

- Understanding the Junos OS Application Package Installation on page 39
- Installing and Verifying Licenses for an Application Signature Package on page 42
- Downloading and Installing the Junos OS Application Signature Package Manually on page 44
- Downloading and Installing the Junos OS Application Signature Package As Part of the IDP Security Package on page 47
- Downloading Junos OS Application Signature Package from A Proxy Server on page 50
- Example: Scheduling the Application Signature Package Updates on page 53
- Scheduling the Application Signature Package Updates As Part of the IDP Security Package on page 55
- Example: Downloading and Installing the Application Identification Package in Chassis Cluster Mode on page 58
- Verifying the Junos OS Application Identification Extracted Application Package on page 61
- Uninstalling the Junos OS Application Identification Application Package on page 62

Understanding the Junos OS Application Package Installation

Juniper Networks regularly updates the predefined application signature package database and makes it available to subscribers on the Juniper Networks website. This package includes signature definitions of known application objects that can be used to identify applications for tracking, firewall policies, quality-of-service prioritization, and Intrusion Detection and Prevention (IDP). The database contains application objects such as FTP, DNS, Facebook, Kazaa, and many instant messenger programs.

You need to download and install the application signature package before configuring application services. The application signature package is included in the IDP installation directly and does not need to be downloaded separately.

- If you have IDP enabled and plan to use application identification, you can continue to run the IDP signature database download. To download the IDP signature database, run the following command: **request security idp security-package download**. The application package download can be performed manually or automatically. See "Downloading and Installing the Junos OS Application Signature Package As Part of the IDP Security Package" on page 47.

  NOTE: **If you have an IDP-enabled device and plan to use application identification, we recommend that you download only the IDP signature database. This will avoid having two versions of the application database, which could become out of sync.**

- If you do not have IDP enabled and plan to use application identification, you can run the following commands: **request services application-identification download** and

request services application-identification install. These commands will download the application signature database and install it on the device.

You can perform the download manually or automatically. When you download the extracted package manually, you can change the download URL.

After downloading and installing the application signature package, use CLI commands to download and install database updates, and view summary and detailed application information.

See "Downloading and Installing the Junos OS Application Signature Package Manually" on page 44 or "Example: Scheduling the Application Signature Package Updates" on page 53.

NOTE: The Junos OS application signature package update is a separately licensed subscription service. You must install the application signature package update license key on your device to download and install the signature database updates provided by Juniper Networks. If your license key expires, you can continue to use the locally stored application signature package content but you cannot update the data.

NOTE: Starting from Junos OS Release 15.1X49-D50 and Junos OS Release 17.3, when you upgrade or downgrade an application signature package, an error message is displayed if there is any mismatch of application IDs (unique ID number of an application signature) between proto bundles and these applications are configured in AppFW and AppQoS rules.

Example:

```
Please resolve following references and try it again
[edit class-of-service application-traffic-control rule-sets RS8 rule
 1 match application junos:CCPROXY]
```

As a workaround, disable the AppFW and AppQoS rules before upgrading or downgrading an application signature package. You can reenable AppFW and AppQoS rules once the upgrade or downgrade procedure is complete.

NOTE: On all SRX Series devices, J-Web pages for AppSecure Services are preliminary. We recommend using the CLI for configuration of AppSecure features.

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NOTE: This feature requires a license. To understand more about Junos OS application signature package, see, Installing and Verifying Licenses for an Application Signature Package. Please refer to the Juniper Licensing Guide for general information about License Management. Please refer to the product Data Sheets at SRX Series Services Gateways for details, or contact your Juniper Account Team or Juniper Partner.

Upgrading to Next-Generation Application Identification

Starting from Junos OS Release 12.1X47-D10, next-generation application identification is supported. You must install Junos OS Release 12.1X47-D10 to migrate from existing, or legacy, application identification to next-generation application identification.

SRX Series devices installed with Junos OS builds with legacy application identification include legacy application identification security packages. When you upgrade these devices with Junos OS Release 12.1X47-D10, the next-generation application identification security package is installed along with the default protocol bundle. The device is automatically upgraded to next-generation application identification.

NOTE:

- The next-generation application identification security package introduces incremental updates to the legacy application identification package. You are not required to remove or uninstall any existing applications.
- Applications supported in previous releases (Junos OS Release 12.1X46 or prior) might have new aliases or alternative names in the new version. So existing configurations using such application work in Junos OS Release 12.1X47; however, related logs and other information will use the new name. You can use the **show services application-identification application detail** ***new-application-name*** command to get the details of the applications.
- When you upgrade Junos OS, you can include the **validate** or **no-validate** options with the **request system software add** command. Because the existing features, which are not part of next-generation application identification, are deprecated, incompatibility issues are not seen.
- Next-generation application identification eliminates the generation of new nested applications and treats existing nested applications as normal applications. In addition, next-generation application identification does not support custom applications or custom application groups. Existing configurations involving any nested applications, custom applications, or custom application groups are ignored with warning messages.

See Also

- Understanding the Junos OS Application Identification Database on page 30
- *Understanding the IDP Signature Database*

- Downloading and Installing the Junos OS Application Signature Package Manually on page 44
- Downloading and Installing the Junos OS Application Signature Package As Part of the IDP Security Package on page 47
- Example: Scheduling the Application Signature Package Updates on page 53

Installing and Verifying Licenses for an Application Signature Package

The Junos OS application signature package update is a separately licensed subscription service. You must install the application signature package update license key on your device to download and install the signature database updates provided by Juniper Networks. If your license key expires, you can continue to use the locally stored application signature package content.

Licensing is usually ordered when the device is purchased, and this information is bound to the chassis serial number. These instructions assume that you already have the license. If you did not order the license during the purchase of the device, contact your account team or Juniper customer care for assistance. For more information, refer to the Knowledge Base article KB9731 at https://kb.juniper.net/InfoCenter/index?page=home.

NOTE: Starting from Junos OS 15.1X49-D30 and Junos OS Release 17.3R1, on SRX1500 devices, AppSecure is part of Junos Software Enhanced (JSE) software license package. There is no separate license key for AppSecure is available. You must use JSE software license on your device to download and install the AppID signature database updates, or to use other AppSecure features such as AppFW, AppQoS, and AppTrack.

NOTE: Starting from Junos OS 15.1X49-D30 and Junos OS Release 17.3R1, on SRX300, SRX320, SRX340, and SRX345 devices, AppSecure is part of Junos Software Enhanced (JSE) software license package. There is no separate license key for AppSecure is available. You must use JSE software license on your device to download and install the AppID signature database updates, or to use other AppSecure features such as AppFW, AppQoS, and AppTrack.

NOTE: Starting from 15.1X49-D65 and Junos OS Release 17.3R1, on SRX4100, and SRX4200 devices, AppSecure is part of Junos Software Enhanced (JSE) license package. There is no separate license key for AppSecure is available. You must use JSE software license on your device to download and install the AppID signature database updates, or to use other AppSecure features such as AppFW, AppQoS, and AppTrack.

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NOTE: Starting from Junos OS Release 17.4R1, on SRX4600, AppSecure is part of Junos Software Enhanced (JSE) software license package. There is no separate license key for AppSecure is available. You must use JSE software license on your device to download and install the AppID signature database updates, or to use other AppSecure features such as AppFW, AppQoS, and AppTrack.

NOTE: Junos Software Base (JSB) package does not include application signatures. Please refer to the product Data Sheets at SRX Series Services Gateways for details, or contact your Juniper Account Team or Juniper Partner.

You can install the license on the SRX Series device using either the automatic method or manual method as follows:

- Install your license automatically on the device.

  To install or update your license automatically, your device must be connected to the Internet .

  user@host> **request system license update**

  ```
  Trying to update license keys from https://ae1.juniper.net, use 'show system
  license' to check status.
  ```

- Install the licenses manually on the device.

  user@host> **request system license add terminal**

  ```
  [Type ^D at a new line to end input,
   enter blank line between each license key]
  ```

  Paste the license key and press Enter to continue.

- Verify the license is installed on your device.

  Use the **show system license command** command to view license usage, as shown in the following example:

  ```
  License usage:
                                  Licenses     Licenses    Licenses    Expiry
    Feature name                      used    installed      needed
    logical-system                       4            1           3    permanent


   License identifier: JUNOSXXXXXX
    License version: 2
    Valid for device: AA4XXXX005
    Features:
  ```

```
appid-sig        - APPID Signature
  date-based, 2014-02-17 08:00:00 GMT-8 - 2015-02-11 08:00:00 GMT-8
```

The output sample is truncated to display only license usage details.

See Also

- *Adding New Licenses (CLI Procedure)*

Downloading and Installing the Junos OS Application Signature Package Manually

This example shows how to download the application signature package, create a policy, and identify it as the active policy.

- Requirements on page 44
- Overview on page 44
- Configuration on page 44
- Verification on page 46

Requirements

Before you begin:

- Ensure that your SRX Series device has a connection to the Internet to download security package updates.

  NOTE: **DNS must be set up because you need to resolve the name of the update server.**

- Ensure that you have installed the application identification feature license.

This example uses the following hardware and software components:

- An SRX Series device
- Junos OS Release 12.1X47-D10

Overview

Juniper Networks regularly updates the predefined application signature package database and makes it available on the Juniper Networks website. This package includes application objects that can be used in Intrusion Detection and Prevention (IDP), application firewall policy, and AppTrack to match traffic.

Configuration

CLI Quick Configuration

CLI quick configuration is not available for this example because manual intervention is required during the configuration.

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Downloading and Installing Application Identification

Step-by-Step Procedure

1. Download the application package.

```
user@host> request services application-identification download
```

```
Please use command "request services application-identification download
status" to check status
```

Download retrieves the application package from the Juniper Networks security website https://signatures.juniper.net/cgi-bin/index.cgi.

You can also download a specific version of the application package or download the application package from the specific location by using the following options:

- To download a specific version of the application package:

```
user@host>request services application-identification download version
  version-number
```

- To change the download URL for the application package from configuration mode:

```
[edit]
user@host# set services application-identification download url URL or File Path
```

NOTE: If you change the download URL and you want to keep that change, make sure you commit the configuration.

2. Check the download status.

```
user@host>request services application-identification download status
```

```
Application package 2345 is downloaded successfully
```

NOTE: You can also use the system log to view the result of the download.

3. Install the application package.

```
user@host>request services application-identification install
```

```
Please use command "request services application-identification install
status" to check status and use command "request services
application-identification proto-bundle-status" to check protocol bundle
status
```

The application package is installed in the application signature database on the device.

4. Check the installation status of the application package.

   The command output displays information about the downloaded and installed versions of the application package and protocol bundle.

   - To view the installation status:

     user@host>**request services application-identification install status**

     ```
     Install application package 2345 succeed
     ```

   - To view the protocol bundle status:

     user@host>**request services application-identification proto-bundle-status**

     ```
     Protocol Bundle Version (1.30.4-22.005 (build date Jan 17 2014)) and
     application secpack version (2345) is loaded and activated.
     ```

NOTE: It is possible that an application signature was removed from the newer version of an application signature database. If this signature is used in an existing application firewall policy on your device, the installation of the new database will fail. An installation status message identifies the signature that is no longer valid. To update the database successfully, remove all references to the deleted signature from your existing policies and groups, and rerun the install command.

Verification

Confirm that the configuration is working properly.

Verifying the Application Identification Status

Purpose Verify that the application identification configuration is working properly.

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Action From operational mode, enter the **show services application-identification status** command.

```
pic: 1/0

Application Identification
 Status                             Enabled
 Sessions under app detection       0
 Engine Version                     4.18.1-20 (build date Jan 25 2014)
 Max TCP session packet memory      30000
 Max C2S bytes                      1024
 Max S2C bytes                      0
 Force packet plugin                Disabled
 Force stream plugin                Disabled
 Statistics collection interval     1 (in minutes)

Application System Cache
 Status                             Enabled
 Negative cache status              Disabled
 Max Number of entries in cache     131072
 Cache timeout in seconds           3600

Protocol Bundle
 Download Server                https://services.netscreen.com/cgi-bin/index.cgi

 AutoUpdate                         Enabled
Slot 1:
 Status                             Active
 Version                            1.30.4-22.005 (build date Jan 17 2014)
 Sessions                           0
Slot 2
 Status                             Free
```

Meaning The **Status: Enabled** field shows that application identification is enabled on the device.

See Also

- Understanding the Junos OS Application Package Installation on page 39
- Example: Scheduling the Application Signature Package Updates on page 53
- Verifying the Junos OS Application Identification Extracted Application Package on page 61
- Uninstalling the Junos OS Application Identification Application Package on page 62

Downloading and Installing the Junos OS Application Signature Package As Part of the IDP Security Package

You can download and install application signatures through intrusion detection and prevention (IDP) security packages.

This example shows how to enhance security by downloading and installing the IDP signatures and application signature package. In this case, both IDP signature pack and application signature pack are downloaded with a single command.

- Requirements on page 48
- Overview on page 48
- Configuration on page 48
- Verification on page 50

Requirements

Before you begin:

- Ensure that your SRX Series device has a connection to the Internet to download security package updates.

  NOTE: **DNS must be set up because you need to resolve the name of the update server.**

- Ensure that you have installed the application identification feature license.

This example uses the following hardware and software components:

- An SRX Series device
- Junos OS Release 12.1X47-D10

Overview

In this example, you download and install the signature database from the Juniper Networks website.

Configuration

Downloading and Installing the Signature Database

CLI Quick Configuration

CLI quick configuration is not available for this example because manual intervention is required during the configuration.

Step-by-Step Procedure

To download and install application signatures:

1. Download the signature database.

```
[edit]
user@host# run request security idp security-package download
```

```
Will be processed in async mode. Check the status using the status checking
 CLI
```


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NOTE: Downloading the database might take some time depending on the database size and the speed of your Internet connection.

2. Check the security package download status.

```
[edit]
user@host# run request security idp security-package download status
```

```
Done;Successfully downloaded
from(https://services.netscreen.com/cgi-bin/index.cgi).
Version info:2230(Mon Feb  4 19:40:13 2013 GMT-8, Detector=12.6.160121210)
```

3. Install the attack database.

```
[edit]
user@host# run request security idp security-package install
```

```
Will be processed in async mode. Check the status using the status checking
 CLI
```

NOTE: Installing the attack database might take some time depending on the security database size.

4. Check the attack database install status. The command output displays information about the downloaded and installed versions of the attack database.

```
[edit]
user@host# run request security idp security-package install status
```

```
Done;Attack DB update : successful - [UpdateNumber=2230,ExportDate=Mon Feb
 4 19:40:13 2013 GMT-8,Detector=12.6.160121210]
Updating control-plane with new detector : successful
Updating data-plane with new attack or detector : successful
```

5. Confirm your IDP security package version.

```
[edit]
user@host# run show security idp security-package-version
```

```
Attack database version:2230(Mon Feb  4 19:40:13 2013 GMT-8)
  Detector version :12.6.160121210
  Policy template version :2230
```

6. Confirm your application identification package version.

```
[edit]
user@host# run show services application-identification version
```

```
Application package version: 1884
```

Verification

Confirm that the application signature package is being updated properly.

Verifying application signature package

Purpose Verify the services application identification version.

Action From operational mode, enter the **show services application-identification version** command.

```
user@host> show services application-identification version
```

```
Application package version: 1884
```

Meaning The sample output shows that the services application identification version is 1884.

See Also

- *request security idp security-package install*
- *request security idp security-package download*
- *Updating the IDP Signature Database Overview*
- *Understanding the IDP Signature Database*

Downloading Junos OS Application Signature Package from A Proxy Server

This example shows how to create a proxy profile and use it for downloading the application signature package from a proxy server.

- Requirements on page 51
- Overview on page 51
- Configuration on page 52
- Verification on page 52

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Requirements

This example uses the following hardware and software components:

- Valid application identification feature license installed on an SRX Series device.
- SRX Series device with Junos OS Release 18.3R1 or later. This configuration example is tested for Junos OS Release 18.3R1.

Overview

You must download and install the application signature package that is hosted on an external server on the SRX Series device. Starting from Junos OS Release 18.3R1, you can download the application signature package using a proxy server.

To enable downloading signature package from the proxy server:

1. Configure a profile with host and port details of the proxy server using the **set services proxy profile** command.
2. Use the **set services application-identification download proxy-profile** ***profile-name*** command to connect to the proxy server and download the application signature package.

When you download the signature package, the request is routed through the proxy host to the actual server hosting the signature package. The proxy host relays the response back from the actual host. The download retrieves the application package from the Juniper Networks security website https://signatures.juniper.net/cgi-bin/index.cgi.

NOTE: **Support for the proxy profile configuration is available for only HTTP connections.**

In this example, you create a proxy profile, and refer the profile when you download the application signature package from the external host. Table 3 on page 51 provides the details of the parameters used in this example.

Table 3: Proxy Profile Configuration Parameters

Parameter	Name
Profile Name	Profile-1
IP address of the proxy server	5.0.0.1
Port number of the proxy server	3128

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Configuration

Create a proxy profile and apply it for downloading the application package through the proxy server.

1. Create a proxy profile for protocol HTTP.

```
user@host# set services proxy profile Profile-1 protocol http
```

2. Specify the IP address of the proxy server.

```
user@host# set services proxy profile Profile-1 protocol http host 5.0.0.1
```

3. Specify the port number used by the proxy server.

```
user@host# set services proxy profile Profile-1 protocol http port 3128
```

4. Download the application package from the proxy host.

```
user@host# set services application-identification download proxy-profile Profile-1
```

You can disable the proxy server for downloading application signature package when not required.

- Disable the proxy server for application signature download.

```
user@host# delete services application-identification download proxy-profile p1
```

Verification

Verifying Application Signature Download Through the Proxy Server

Purpose Display the details for the application signature package download through a proxy server.

Action From operational mode, enter the **show services application-identification status** command.

```
Application Identification
 Status                            Enabled
 Sessions under app detection      0
 Max TCP session packet memory     0
 Force packet plugin               Disabled
 Force stream plugin               Disabled
 DPI Performance mode:             Enabled
 Statistics collection interval    1440 (in minutes)

Application System Cache
```


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```
 Status                            Enabled
  Cache lookup security-services   Enabled
  Cache lookup miscellaneous-services Enabled
 Max Number of entries in cache    131072
 Cache timeout                     3600 (in seconds)

Protocol Bundle
 Download Server                https://signatures.juniper.net/cgi-bin/index.cgi

 AutoUpdate                        Disabled

Proxy Details
 Proxy Profile                     Profile-1
 Proxy Address                     http://5.0.0.1:3128
Slot 1:
 Application package version       3058
 Status                            Active
 PB Version                        1.340.0-57.005 (build date Apr 19 2018)
 Engine version                    4.20.0-91 (build date Feb 27 2018)
 Sessions                          0
```

Meaning In the command output, you can find the proxy profile details in **Proxy Profile** and **Proxy Address** fields.

Verifying Application Signature Download Status

Purpose Check the application package download status.

Action From operational mode, enter the **request services application-identification download status** command.

user@host> request services application-identification download status

```
Application package 3058 is downloaded successfully
```

Meaning The command displays the application signature package download status.

Example: Scheduling the Application Signature Package Updates

This example shows how to set up automatic updates of the predefined application signature package.

- Requirements on page 54
- Overview on page 54
- Configuration on page 54
- Verification on page 55

Requirements

Before you begin:

- Ensure that your SRX Series device has a connection to the Internet to download security package updates.

  NOTE: **DNS must be set up because you need to resolve the name of the update server.**

- Ensure that you have installed the application identification feature license.

Overview

In this example, you want to download the current version of the application signature package periodically. The download should start at 11:59 PM on December 10. To maintain the most current information, you want to update the package automatically every 2 days from your company's intranet site.

Configuration

GUI Step-by-Step Procedure

To set up the automatic download and periodic update with the J-Web interface:

1. Enter **Configure>Security>AppSecure Settings** to display the Applications Signature page.

2. Click **Global Settings**.

3. Click the **Download Scheduler** tab, and modify the following fields:
   - URL: **https://signatures.juniper.net/cgi-bin/index.cgi**
   - Enable Schedule Update: Select the check box.
   - Interval: **48**
4. Click **Reset Setting** to clear the existing start time, enter the new start time in MM-DD.hh:mm format, and click **OK**.
   - Start Time: **12-10.23:59**
5. Click **Commit Options>Commit** to commit your changes.

6. Click **Check Status** to monitor the progress of an active download or update, or to check the outcome of the latest update.

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Step-by-Step Procedure

To use the CLI to automatically update the Junos OS application signature package:

1. Specify the URL for the security package. The security package includes the detector and the latest attack objects and groups. The following statement specifies https://signatures.juniper.net/cgi-bin/index.cgi as the URL for downloading signature database updates:

```
[edit]
user@host# set services application-identification download url
   https://signatures.juniper.net/cgi-bin/index.cgi
```

2. Specify the time and interval for download. The following statement sets the interval as 48 hours and the start time as 11:59 pm on December 10:

```
[edit]
user@host# set services application-identification download automatic interval 48
   start-time 12-10.23:59
```

3. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

To verify that the application signature package is being updated properly, enter the **show services application-identification version** command. Review the version number and details for the latest update.

See Also

- Understanding the Junos OS Application Package Installation on page 39
- Downloading and Installing the Junos OS Application Signature Package Manually on page 44
- Verifying the Junos OS Application Identification Extracted Application Package on page 61

Scheduling the Application Signature Package Updates As Part of the IDP Security Package

The configuration instructions in this example describe how to setup automatic updates of application identification signature package (part of IDP security package) at a specified date and time.

- Requirements on page 56
- Overview on page 56
- Configuration on page 56
- Verification on page 57

Requirements

Before you begin:

- Ensure that your SRX Series device has a connection to the Internet to download security package updates.

  NOTE: **DNS must be set up because you need to resolve the name of the update server.**

- Ensure that you have installed the application identification feature license.

Overview

In this example, you want to download the current version of the application signature package periodically. The download should start at 11:59 PM on December 10. To maintain the most current information, you want to update the package automatically every 2 days from your company's intranet site.

Configuration

GUI Step-by-Step Procedure

To set up the automatic download and periodic update with the J-Web interface:

1. Enter **Configure>Security>IDP>Signature Updates** to display the Security IDP Signature Configuration page.

2. Click **Download Settings** and modify the URL: **https://signatures.juniper.net/cgi-bin/index.cgi**

3. Click the **Auto Download Settings** tab, and modify the following fields:
   - Interval: **48**
   - Start Time: **2013-12-10.23:59:55**
   - Enable Schedule Update: Select the check box.
4. Click **Reset Setting** to clear the existing fields, enter the new values. Click **OK**.
5. Click **Commit Options>Commit** to commit your changes.

6. Click **Check Status** to monitor the progress of an active download or update, or to check the outcome of the latest update.

Step-by-Step Procedure

To use the CLI to automatically update the Junos OS application signature package:

1. Specify the URL for the security package. The security package includes the detector and the latest attack objects and groups. The following statement specifies

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https://signatures.juniper.net/cgi-bin/index.cgi as the URL for downloading signature database updates:

```
[edit]
user@host# set security idp security-package url
  https://signatures.juniper.net/cgi-bin/index.cgi
```

2. Specify the time and interval for download. The following statement sets the interval as 48 hours and the start time as 11:55 pm on December 10, 2013:

```
[edit]
user@host# set security idp security-package automatic interval 48 start-time
  2013-12-10.23:55:55
```

3. Enable an automatic download and update of the security package.

```
[edit]
user@host# set security idp security-package automatic enable
```

4. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

Confirm that the application signature package is being updated properly.

Verifying application signature package

Purpose Verify services application identification version

Action From operational mode, enter the **show services application-identification version** command.

```
user@host> show services application-identification version
```

```
Application package version: 1884
```

Meaning The sample output shows that, the services application identification version is 1884.

See Also

- Understanding the Junos OS Application Package Installation on page 39
- Downloading and Installing the Junos OS Application Signature Package Manually on page 44

- Verifying the Junos OS Application Identification Extracted Application Package on page 61

Example: Downloading and Installing the Application Identification Package in Chassis Cluster Mode

This example shows how to download and install the application signature package database to a device operating in chassis cluster mode.

- Requirements on page 58
- Overview on page 58
- Downloading and Installing the Application Identification Package on page 59

Requirements

Before you begin:

- Set the chassis cluster node ID and cluster ID. See *Example: Setting the Node ID and Cluster ID for SRX Series Devices in a Chassis Cluster* .
- Ensure that your SRX Series device has a connection to the Internet to download security package updates.

  NOTE: **DNS must be set up because you need to resolve the name of the update server.**

- Ensure that you have installed application identification feature license.

Overview

If you use application identification, you can download the predefined application signature package database. Juniper Networks regularly updates the database and makes it available on the Juniper Networks website. This package includes application objects that can be used to match traffic in IDP, application firewall policies, and application tracking. For more details, see "Understanding the Junos OS Application Package Installation" on page 39.

When you download the application identification security package on a device operating in chassis cluster mode, the security package is downloaded to the primary node and then synchronized to the secondary node.

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Downloading and Installing the Application Identification Package

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *CLI User Guide*.

To download and install an application package:

1. Download the application package on the primary node.

   {primary:node0}[edit]

   user@host> request services application-identification download

   ```
   Please use command "request services application-identification download status"
    to check status
   ```

2. Check the application package download status.

   {primary:node0}[edit]

   user@host> request services application-identification download status

   On a successful download, the following message is displayed

   ```
   Application package 2345 is downloaded successfully
   ```

   The application package is installed in the application signature database on the primary node, and application identification files are synchronized on the primary and secondary nodes.

3. Update the application package using **install** command.

   {primary:node0}[edit]

   user@host> request services application-identification install

   ```
   node0:
   --------------------------------------------------------------------------
   Please use command "request services application-identification install status"
    to check status and use command "request services application-identification
    proto-bundle-status" to check protocol bundle status
   ```

   ```
   node1:
   --------------------------------------------------------------------------
   Please use command "request services application-identification install status"
    to check status and use command "request services application-identification
    proto-bundle-status" to check protocol bundle status
   ```

4. Check the application package update status. The command output displays information about the downloaded and installed versions of the application package.

   {primary:node0}[edit]

user@host> request services application-identification install status

```
node0:
--------------------------------------------------------------------------
Install application package 2345 succeed
```

```
node1:
--------------------------------------------------------------------------
Install application package 2345 succeed
```

NOTE: It is possible that an application signature is removed from the new version of an application signature database. If this signature is used in an existing application firewall policy on your device, the installation of the new database will fail. An installation status message identifies the signature that is no longer valid. To update the database successfully, remove all references to the deleted signature from your existing policies and groups, and rerun the install command.

NOTE: While downloading the application signature package on the primary node, sometimes, due to unexpected failover, the primary node might not able to download the application signature package completely. As a workaround, you must delete the /var/db/appid/sec-download/.apppack_state and restart the device.

To uninstall an application package:

1. Uninstall the application package using **uninstall** command.

   {primary:node0}[edit]

   user@host> request services application-identification uninstall

```
node0:
--------------------------------------------------------------------------
Please use command "request services application-identification uninstall
status" to check status and use command "request services
application-identification proto-bundle-status" to check protocol bundle status
node1:
--------------------------------------------------------------------------
Please use command "request services application-identification uninstall
status" to check status and use command "request services
application-identification proto-bundle-status" to check protocol bundle status
```

2. Check the uninstall status of the application package.

   {primary:node0}[edit]

   user@host> request services application-identification uninstall status

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```
node0:
--------------------------------------------------------------------------
Uninstall application package 2345 succeed
```

```
node1:
--------------------------------------------------------------------------
Uninstall application package 2345 succeed
```

3. Check the uninstall status of protocol bundle:

```
user@host>request services application-identification proto-bundle-status
```

```
Protocol Bundle Version (1.30.4-22.005 (build date Jan 17 2014)) and application
 secpack version (2345) is unloaded and deactivated
```

See Also

- Understanding the Junos OS Application Package Installation on page 39
- Verifying the Junos OS Application Identification Extracted Application Package on page 61

Verifying the Junos OS Application Identification Extracted Application Package

Purpose After successful download and installation of the application package, use the following commands to view the predefined application signature package content.

Action

- View the current version of the application package:

```
show services application-identification version
```

```
Application package version: 1608
```

- View the current status of the application package:

```
show services application-identification status
```

```
pic: 1/0

Application Identification
 Status                            Enabled
 Sessions under app detection      0
 Engine Version                    4.18.1-20 (build date Jan 25 2014)
 Max TCP session packet memory     30000
 Max C2S bytes                     1024
 Max S2C bytes                     0
 Force packet plugin               Disabled
 Force stream plugin               Disabled
 Statistics collection interval    1 (in minutes)

Application System Cache
```

```
 Status                             Enabled
 Negative cache status              Disabled
 Max Number of entries in cache     131072
 Cache timeout in seconds           3600

Protocol Bundle
 Download Server
https://services.netscreen.com/cgi-bin/index.cgi
 AutoUpdate                         Enabled
Slot 1:
 Status                             Active
 Version                            1.30.4-22.005 (build date Jan 17 2014)
 Sessions                           0
Slot 2
 Status                             Free
```

See Also

- Understanding the Junos OS Application Package Installation on page 39
- Downloading and Installing the Junos OS Application Signature Package Manually on page 44

Uninstalling the Junos OS Application Identification Application Package

You can uninstall the predefined application package. The uninstall operation will fail if there are any active security policies referenced in the predefined application signatures in the Junos OS configuration

To uninstall application package:

1. Uninstall the application package:

   user@host> **request services application-identification uninstall**

   ```
   Please use command "request services application-identification uninstall
   status" to check status and use command "request services
   application-identification proto-bundle-status" to check protocol bundle status
   ```

2. Check the uninstall operation status of the application package. The command output displays information about the uninstall status of the application package and protocol bundle.

   - Check the uninstall status:

     user@host>**request services application-identification uninstall status**

     ```
     Uninstall application package 2345 succeed
     ```

   - Check the uninstall status of protocol bundle:

     user@host>**request services application-identification proto-bundle-status**

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```
Protocol Bundle Version (1.30.4-22.005 (build date Jan 17 2014)) and
application secpack version (2345) is unloaded and deactivated
```

The application package and protocol bundle are uninstalled on the device. To reinstall application identification, you need to download application package and reinstall it again.

See Also

- request services application-identification uninstall on page 469
- request services application-identification uninstall status on page 470

Release History Table

Release	Description
17.4R1	Starting from Junos OS Release 17.4R1, on SRX4600, AppSecure is part of Junos Software Enhanced (JSE) software license package.
15.1X49-D65	Starting from 15.1X49-D65 and Junos OS Release 17.3R1, on SRX4100, and SRX4200 devices, AppSecure is part of Junos Software Enhanced (JSE) license package.
15.1X49-D40	Starting from Junos OS 15.1X49-D30 and Junos OS Release 17.3R1, on SRX300, SRX320, SRX340, and SRX345 devices, AppSecure is part of Junos Software Enhanced (JSE) software license package.
15.1X49-D30	Starting from Junos OS 15.1X49-D30 and Junos OS Release 17.3R1, on SRX1500 devices, AppSecure is part of Junos Software Enhanced (JSE) software license package.
12.1X47-D10	Starting from Junos OS Release 12.1X47-D10, next-generation application identification is supported.

Related Documentation

- Application Identification on page 27
- Custom Application Signatures for Application Identification on page 63
- Predefined and Custom Application Groups for Application Identification on page 72

Custom Application Signatures for Application Identification

User-defined custom application signatures can also be used to identify the application regardless of the protocol and port being used. You can create custom signatures using hostnames, IP address ranges, and ports, which allows you to track traffic to specific destinations. For more information, see the following topics:

- Understanding Junos OS Application Identification Custom Application Signatures on page 64
- Example: Configuring Junos OS Application Identification Custom Application Signatures on page 66

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Understanding Junos OS Application Identification Custom Application Signatures

Application identification supports user-defined custom application signatures and signature groups. Custom application signatures are unique to your environment and are not part of the predefined application package. You must install application signature package on your device to use custom signatures. When the custom signatures are configured, you cannot uninstall the application signature package.

Custom application signatures are required:

- To control traffic particular to an environment
- To bring visibility for unknown or unclassified applications by developing custom applications.
- To identify applications over Layer 7 and transiting or temporary applications, and to achieve further granularity of known applications
- To perform QoS for your specific application

You can create custom application signatures using CLI by specifying a name, protocol, port where the application runs, and match criteria. For more details, see "Example: Configuring Junos OS Application Identification Custom Application Signatures" on page 66.

CAUTION: **We recommend that only advanced Junos OS users attempt to customize application signatures.**

You can view application signatures and application signature groups by using the **show services application-identification application** and **show services application-identification group** commands.

NOTE: **The following features are not supported:**

- **Prioritizing custom signatures over a specific predefined custom signature**
- **Complete Perl Compatible Regular Expressions (PCRE)-based character set, and unicode-based characters**
- **Enforcing of order among members in Layer 7-based signatures**
- **The wildcard address for address-based signatures (Layer 3 and Layer 4)**

Unlike predefined signatures and groups, custom application signatures and groups are saved in the configuration hierarchy, not in the predefined application signature database. Custom application signatures and signature groups are located in the **[services application-identification]** hierarchy.

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SRX Series devices support the following types of custom signatures:

- ICMP-Based Mapping on page 65
- Address-Based Mapping on page 65
- IP Protocol-Based Mapping on page 66
- Layer 7-Based Signatures on page 66

ICMP-Based Mapping

The ICMP mapping technique maps standard ICMP message types and optional codes to a unique application name. This mapping technique lets you differentiate between various types of ICMP messages.

NOTE: IDP works only with TCP or UDP traffic. ICMP mapping, therefore, does not apply to IDP and cannot support IDP features such as custom attacks.

NOTE: The ICMP mapping technique used for mapping standard ICMP message types and optional codes are not supported for ICMPv6 traffic.

Address-Based Mapping

Layer 3 and Layer 4 address mapping defines an application by the IP address and optional port range of the traffic.

To ensure adequate security, use address mapping when the configuration of your private network predicts application traffic to or from trusted servers. Address mapping provides efficiency and accuracy in handling traffic from a known application.

Layer 3 and Layer 4 address-based custom applications, you can match the IP address and port range to destination IP address and port. When both IP address and port are configured, both should match destination tuples (IP address and port range) of the packet.

Consider a Session Initiation Protocol (SIP) server that initiates sessions from its known port 5060. Because all traffic from this IP address and port is generated by only the SIP application, the SIP application can be mapped to the server's IP address and port 5060 for application identification. In this way, all traffic with this IP address and port is identified as SIP application traffic.

NOTE: When you configure an address-based application and a TCP/UDP stream-based application, and a session matches both applications, the TCP/UDP stream-based application is reported as application and address-based application is reported as extended application.

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IP Protocol-Based Mapping

Standard IP protocol numbers can map an application to IP traffic. As with address mapping, to ensure adequate security, use IP protocol mapping only in your private network for trusted servers.

NOTE: IDP works only with TCP or UDP traffic. IP protocol mapping, therefore, does not apply to IDP and cannot support IDP features such as custom attacks.

Layer 7-Based Signatures

Layer 7 custom signatures define an application running over TCP or UDP or Layer 7 applications. Layer 7-based custom application signatures are required for the identification of multiple applications running on the same Layer 7 protocols. For example, applications such as Facebook and Yahoo Messenger can both run over HTTP, but there is a need to identify them as two different applications running on the same Layer 7 protocol.

Layer 7-based custom application signatures detect applications based on the patterns in HTTP contexts. However, some HTTP sessions are encrypted in SSL, also called Transport Layer Security (TLS). Application identification can also extract the server name information or the server certification from the TLS or SSL sessions. It can also detect patterns in TCP or UDP payload in Layer 7 applications.

Example: Configuring Junos OS Application Identification Custom Application Signatures

This example shows how to configure custom application signatures for Junos OS application identification.

CAUTION: We recommend that only advanced Junos OS users attempt to customize application signatures.

- Requirements on page 66
- Overview on page 67
- Configuration on page 67
- Verification on page 71

Requirements

Before you begin:

- Ensure that the SRX Series device with application signature package installed. See "Downloading and Installing the Junos OS Application Signature Package Manually" on page 44 or "Downloading and Installing the Junos OS Application Signature Package As Part of the IDP Security Package" on page 47.

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- The SRX Series device must be running Junos OS Release 15.1X49-D40 or later.

Overview

Application identification supports custom application signatures to detect applications as they pass through the device. When you configure custom signatures, make sure that your signatures are unique.

In this example, you create custom application signatures for applications based on ICMP, IP protocol, IP address, and Layer 7.

For information about specify context for matching application, see context (Application Identification).

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

HTTP Context-Based Custom Signatures

```
set services application-identification application mycustom-http over HTTP signature
    s1 member m01 context http-header-host
set services application-identification application mycustom-http over HTTP signature
    s1 member m01 pattern .*agent1.*
set services application-identification application mycustom-http over HTTP signature
    s1 member m01 direction client-to-server
```

SSL Context-Based Custom Signatures

```
set services application-identification application mycustom-ssl over SSL signature s1
    member m01 context ssl-server-name
set services application-identification application mycustom-ssl over SSL signature s1
    member m01 pattern "example\.com"
set services application-identification application mycustom-ssl over SSL signature s1
    member m01 direction client-to-server
```

TCP Stream-Based Custom Signatures

```
set services application-identification application mycustom-tcp over TCP signature s1
    member m01 context stream
set services application-identification application mycustom-tcp over TCP signature s1
    member m01 pattern "1234567890123456789012345678 90"
set services application-identification application mycustom-tcp over TCP signature s1
    member m01 direction client-to-server
```

ICMP-Based

```
set services application-identification application MY-ICMP icmp-mapping type 100
set services application-identification application MY-ICMP icmp-mapping code 1
```

Layer 3/Layer 4 Address-Based

```
set services application-identification application My-ADDRESS address-mapping
    ADDR-SAMPLE filter ip 192.0.2.1/24
```

```
set services application-identification application My-ADDRESS address-mapping
    ADDR-SAMPLE filter port-range udp 5000-6000
```

IP Protocol-Based

```
set services application-identification application MY-IGMP ip-protocol-mapping protocol
    2
```

Step-by-Step Procedure

The following examples require you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *CLI User Guide*.

To configure HTTP context-based custom signatures:

1. Configure an application based on HTTP context. Define an application signature to match the pattern, a unique application signature identifier, application signature member identifier, and set the context to be matched.

```
[edit services application-identification]
user@host# set application mycustom-http over HTTP signature s1 member m01
    context http-header-host
```

2. Configure a pattern to match the context.

```
[edit services application-identification]
user@host# set application mycustom-http over HTTP signature s1 member m01
    pattern .*agent1.*
```

3. Configure the connection direction of the packets to apply pattern matching.

```
[edit services application-identification]
user@host# set application mycustom-http over HTTP signature s1 member m01
    direction client-to-server
```

Step-by-Step Procedure

To configure SSL context-based custom signatures:

1. Configure an application based on SSL. Define an application signature to match the pattern, a unique application signature identifier, application signature member identifier, and set the context to be matched.

```
[edit services application-identification]
user@host# set application mycustom-ssl over SSL signature s1 member m01
    context ssl-server-name
```

2. Configure a pattern to match the context.

```
[edit services application-identification]
user@host# set application mycustom-ssl over SSL signature s1 member m01
    pattern "example\.com"
```


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3. Configure the connection direction of the packets to apply pattern matching.

```
[edit services application-identification]
user@host# set application mycustom-ssl over SSL signature s1 member m01
   direction client-to-server
```

Step-by-Step Procedure

To configure TCP stream-based custom signatures:

1. Configure an application based on TCP. Define an application signature to match the pattern, a unique application signature identifier, application signature member identifier, and set the context to be matched.

```
[edit services application-identification]
user@host# set application mycustom-tcp over TCP signature s1 member m01
   context stream
```

2. Configure a pattern to match the context.

```
[edit services application-identification]
user@host# set application mycustom-tcp over TCP signature s1 member m01
   pattern ""1234567890123456789012345678 90"
```

3. Configure the connection direction of the packets to apply pattern matching.

```
[edit services application-identification]
user@host# set application mycustom-tcp over TCP signature s1 member m01
   direction client-to-server
```

Step-by-Step Procedure

To configure ICMP-based custom applications signatures:

1. Define the type of ICMP mapping. The type field identifies the ICMP message.

```
[edit services application-identification]
user@host# set application MY-ICMP icmp-mapping type 100
```

2. Define the code for ICMP mapping. The code field provides further information about the associated type field.

```
[edit services application-identification]
user@host# set application MY-ICMP icmp-mapping code 1
```

Step-by-Step Procedure

To configure Layer 3 or Layer 4 address-based custom applications signatures:

1. Configure the application to match the specified IP address.

```
[edit services application-identification]
user@host# set application My-ADDRESS address-mapping ADDR-SAMPLE filter
   ip 192.0.2.1/24
```

2. Configure the port range for TCP or UDP.

```
[edit services application-identification]
user@host# set application My-ADDRESS address-mapping ADDR-SAMPLE filter
   port-range udp 5000-6000
```

NOTE: You must provide the appropriate port range and specified IP address to configure address-based custom application signatures.

Step-by-Step Procedure

To configure IP protocol mapping-based custom application signatures:

- Specify the IP protocol value for an application to match.

```
[edit services application-identification]
user@host# set application MY-IGMP ip-protocol-mapping protocol 2
```

Results

From configuration mode, confirm your configuration by entering the **show services application-identification** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show services application-identification
```

```
download {
   url https://services.netscreen.com/cgi-bin/index.cgi;
}
application MY-ICMP {
   icmp-mapping {
      type 100;
      code 1;
   }
}
application MY-IGMP {
   ip-protocol-mapping {
      protocol 2;
   }
}
application My-ADDRESS {
   address-mapping ADDR-SAMPLE {
      filter {
         ip 192.0.2.1/24;
```


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```
            port-range {
                udp 5000-6000;
            }
        }
    }
}
application mycustom-http {
    over HTTP {
        signature s1 {
            member m01 {
                context http-header-host;
                pattern ".*agent1.*;";
                direction client-to-server;
            }
        }
    }
}
application mycustom-ssl {
    over SSL {
        signature s1 {
            member m01 {
                context ssl-server-name;
                pattern "example\.com";
                direction client-to-server;
            }
        }
    }
}
application mycustom-tcp {
    over TCP {
        signature s1 {
            member m01 {
                context stream;
                pattern 1234567890123456789012390123456 7;
                direction client-to-server;
            }
        }
    }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Verifying the Custom Application Definitions

Purpose Display predefined and custom application signatures and settings that are configured on your device. Note that predefined application signature names use the prefix “junos:”

Action From configuration mode, enter the **show services application-identification application detail *name*** command.

See show services application-identification application

See Also

- Understanding the Junos OS Application Package Installation on page 39
- Customizing Application Groups for Junos OS Application Identification on page 72

Related Documentation

- Application Identification on page 27
- Predefined Application Signatures for Application Identification on page 38
- Predefined and Custom Application Groups for Application Identification on page 72

Predefined and Custom Application Groups for Application Identification

You can define an application group for both predefined applications, as well as custom applications. An application group contains applications that need similar treatment when defining a security policy. For more information, see the following topics:

- Customizing Application Groups for Junos OS Application Identification on page 72
- Example: Configuring a Custom Application Group for Junos OS Application Identification for Simplified Management on page 73
- Enabling or Disabling Application Groups in Junos OS Application Identification on page 77

Customizing Application Groups for Junos OS Application Identification

In Junos OS, application identification allows you to group applications in policies. Applications can be grouped under predefined and custom application groups. The entire predefined application group can be downloaded as part of the IDP or application identification security package. You can create custom application groups with a set of similar applications for consistent reuse when defining policies.

Application group support associates related applications under a single name for simplified, consistent reuse when using any application services.

The hierarchy of application groups resembles a tree structure with associated applications as the leaf nodes. The group *any* refers to the root node. The group *unassigned* is always situated one level from the root and initially contains all applications. When a group is defined, applications are assigned from the unassigned group to the new group. When a group is deleted, its applications are moved back to the unassigned group.

All predefined application groups have the prefix “junos“ in the application group name to prevent naming conflicts with custom application groups. You cannot modify the list of applications within a predefined application group. However, you can copy a predefined application group to use it as a template for creating a custom application group.

To customize a predefined application group, you must first disable the predefined group. Note that a disabled predefined application group remains disabled after an application database update. You can then use the operational command **request services application-identification group** to copy the disabled predefined application group. The copied group is placed in the configuration file, and the prefix “junos” is changed to “my”.

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At this point, you can modify the list of applications in “my” application group and rename the group with a unique name.

To reassign an application from one custom group to another, you must remove the application from its current custom application group, and then reassign it to the other.

NOTE: Starting in Junos OS Release 18.2R2 and Junos OS Release 18.4R1, encrypted applications such as HTTP, SMTP, IMAP and POP3 over SSL are identified as junos:HTTPS, junos:SMTPS, junos:IMAPS, and junos:POP3S in Junos OS predefined applications and application sets.

For example: If you configure a security policy to allow or deny HTTPS traffic, you must specify application matching criteria as junos:HTTPS.

In previous Junos OS Releases, both HTTP and encrypted HTTP (HTTPS) applications can be configured using a same application matching criteria as junos:HTTP.

See Also

- Understanding the Junos OS Application Identification Database on page 30

Example: Configuring a Custom Application Group for Junos OS Application Identification for Simplified Management

This example shows how to configure custom application groups for Junos OS application identification for consistent reuse when defining policies.

- Requirements on page 73
- Overview on page 73
- Configuration on page 74

Requirements

Before you begin, install an entire signature database from an IDP or an application identification security package. See “Downloading and Installing the Junos OS Application Signature Package Manually” on page 44 or “Downloading and Installing the Junos OS Application Signature Package As Part of the IDP Security Package” on page 47.

Overview

In this example, you define applications for an application group, delete an application from an application group, and include an application group within another application group.

In Junos OS, application identification allows you to group applications in policies. Applications can be grouped under predefined and custom application groups. The entire predefined application group can be downloaded as part of the IDP or application identification security package. You can create custom application groups with a set of similar applications for consistent reuse when defining policies.

NOTE: You cannot modify the applications defined in a predefined application group. However, you can copy a predefined application group using the operational command **request services application-identification group** ***group-name*** **copy** to create a custom application group and modify the list of applications. For more information, see request services application-identification group.

Configuration

- Configuring Junos OS Application Identification User-Defined Application Groups on page 74
- Deleting an Application from a User-Defined Application Group on page 75
- Creating Child Application Groups for an Application Group on page 76

Configuring Junos OS Application Identification User-Defined Application Groups

CLI Quick Configuration

To quickly configure this section of the example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set services application-identification application-group my_web
set services application-identification application-group my_web applications junos:HTTP
set services application-identification application-group my_web applications junos:FTP
set services application-identification application-group my_web applications
   junos:AMAZON
set services application-identification application-group my_web applications
   junos:GOPHER
set services application-identification application-group my_peer
set services application-identification application-group my_peer applications
   junos:BITTORRENT
set services application-identification application-group my_peer applications
   junos:BITTORRENT-APPLICATION
set services application-identification application-group my_peer applications
   junos:BITTORRENT-WEB-CLIENT
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure a custom application group for application identification:

1. Set the name of your custom application group.

```
[edit services application-identification]
user@host# set application-group my_web
```


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2. Add the list of applications that you want to include in your custom application group.

```
[edit services application-identification]
user@host# set application-group my_web applications junos:HTTP
user@host# set application-group my_web applications junos:FTP
user@host# set application-group my_web applications junos:GOPHER
user@host# set application-group my_web applications junos:AMAZON
```

3. Set the name of a second custom application group.

```
[edit services application-identification]
user@host# set application-group my_peer
```

4. Add the list of applications that you want to include in the group.

```
[edit services application-identification]
user@host# set application-group my_peer applications junos:BITTORRENT
user@host# set application-group my_peer applications
   junos:BITTORRENT-APPLICATION
user@host# set application-group my_peer applications
   junos:BITTORRENT-WEB-CLIENT
```

Results From configuration mode, confirm your configuration by entering the **show services application-identification group** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show services application-identification application-group my_web
   applications {
      junos:HTTP;
      junos:FTP;
      junos:GOPHER;
      junos:AMAZON
   }
user@host# show services application-identification application-group my_peer
   applications {
      junos:BITTORRENT;
      junos:BITTORRENT-APPLICATION;
      junos:BITTORRENT-WEB-CLIENT;
   }
```

If you are done configuring the device, enter **commit** from configuration mode.

Deleting an Application from a User-Defined Application Group

CLI Quick Configuration To quickly configure this section of the example, copy the following command, paste them into a text file, remove any line breaks, change any details necessary to match your

network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
[edit]
delete services application-identification application-group my_web applications
   junos:AMAZON
```

Step-by-Step Procedure

To delete an application from a custom application group:

- Delete an application from a custom application group.

```
[edit services application-identification]
user@host# delete application-group my_web applications junos:AMAZON
```

Results

From configuration mode, confirm your configuration by entering the **show services application-identification application group detail** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show services application-identification group detail
   application group my_web {
      junos:HTTP;
      junos:FTP;
      junos:GOPHER;
   }
```

If you are done configuring the device, enter **commit** from configuration mode.

Creating Child Application Groups for an Application Group

CLI Quick Configuration

To quickly configure this section of the example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set services application-identification application-group p2p
set services application-identification application-group p2p application-groups my_web
set services application-identification application-group p2p application-groups my_peer
```

Step-by-Step Procedure

To configure child application groups for a custom application group:

1. Set the name of the custom application group in which you are configuring the child application groups.

```
[edit services application-identification]
user@host# set application-group p2p
```


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2. Add the child application groups.

```
[edit services application-identification]
user@host# set application-group p2p application-groups my_web
uer@host# set application-group p2p application-groups my_peer
```

Results From configuration mode, confirm your configuration by entering the **show services application-identification application-group** ***application-group-name*** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show services application-identification application-group p2p
  applications-groups {
    my_web;
    my_peer;
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

See Also

- Understanding Junos OS Application Identification Custom Application Signatures on page 64

Enabling or Disabling Application Groups in Junos OS Application Identification

All application groups are enabled by default. Predefined application groups are enabled at installation.

- For predefined application groups, you can disable and reenable a group using the **request services application-identification group** command. You cannot delete a predefined signature or signature group.
  - To disable a predefined application group:

```
user@host> request services application-identification group disable
  predefined-application-group-name
```

NOTE: Make sure to commit the configuration changes or roll back the configuration when you are attempting to enable a disabled application or an application group. Uncommitted changes might result in configuration failure.

  - To reenable a disabled predefined application group:

```
user@host> request services application-identification group enable
  predefined-application-group-name
```

See Also

- Understanding the Application System Cache on page 31

Related Documentation

- Application Identification on page 27
- Predefined Application Signatures for Application Identification on page 38
- Understanding Junos OS Application Identification Custom Application Signatures on page 64

Application Identification Support for Unified Policies

- Understanding Unified Policies on SRX Series Devices on page 78
- Understanding How Unified Policies Use AppID Information on page 79
- Enabling or Disabling Application System Cache for Application Services on page 82

Understanding Unified Policies on SRX Series Devices

With the growing popularity of Web applications, and because of the shift from traditional, full client-based applications to the Web, more and more traffic is being transmitted over HTTP. Applications such as instant messaging, peer-to-peer file sharing, Webmail, social networking, and IP voice and video collaboration evade security mechanisms by changing communication ports and protocols. Managing changes in the application behavior requires constant modification to the security rules, and maintenance of the security policy rules poses a major challenge. To handle such changes in application behavior, you need security policies to manage dynamic applications.

As a response to this challenge, starting in Junos OS Release 18.2R1, Juniper Networks SRX Series Services Gateways and vSRX support *unified policies*, allowing granular control and enforcement of dynamic Layer 7 applications within the security policy. Unified policies are security policies that enable you to use dynamic applications as part of the existing 5-tuple or 6-tuple (5-tuple with user firewall) match conditions to detect application changes over time.

A unified policy leverages the application identity information determined from the application identification (AppID) module. After a particular application is identified, an action such as permit, deny, reject, or redirect is applied to the traffic according to the policy configured on the device.

Any traffic denied or rejected by the security policy based on Layer 3 or Layer 4 criteria is dropped immediately. Traffic permitted by the security policy is further assessed at Layer 7 based on its AppID information.

AppID is enabled when you configure a security policy with dynamic applications or when you enable any services such as application policy-based routing (APBR), application

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tracking (Apptrack), application quality of service (AppQoS), application firewall (AppFW), IDP, or Juniper Sky ATP in the security policy.

Benefits of Unified Policy

- Simplifies application-based security policy management at Layer 7.
- Enables your device to adapt to the dynamic traffic changes in the network.
- Provides greater control and extensibility to manage dynamic applications traffic than a traditional security policy.

Understanding How Unified Policies Use AppID Information

Accurate traffic classification is essential for network security in cloud and data center architectures. Identifying and classifying different types of application traffic (transacted on HTTP) is also a challenge as Web applications include documents, data, images, and audio and video files.

AppID detects the applications on your network regardless of the port, protocol, and encryption (TLS/SSL or SSH) or other evasive tactics. It uses deep packet inspection (DPI) techniques, a signature database, and well-known addresses and ports to identify applications. AppID provides the information such as dynamic application classification, default protocol and port of an application. For any application that is included in the dependent list of another application, AppID provides the information of dependent application.

A unified policy leverages the information from AppID to match the application and take action as specified in the policy. In a unified policy configuration, you can use a predefined dynamic application (from the application identification signature package) or a user-defined custom application as match condition.

Understanding Dependent Dynamic Application Identification

A dependent application list includes applications over which a dynamic application can be identified. For example, the dependent application list for Facebook comprises HTTP2 and SSL.

The default protocol and port of a dynamic application includes the protocol and port defined for that application. If the protocol and port for that application is not defined, then the list of default protocols and ports of its dependent applications is considered.

For example, the Facebook-Access application depends on applications such as HTTP, SSL, and HTTP2. Therefore, the default protocol and ports of these dependent applications are considered for the Facebook-Access application.

NOTE: **The dependent application list and protocol and port mapping of an application might change during runtime whenever a new application signature pack is installed or a custom application configuration changes. AppID provides these details to the security policy.**

Dynamic Application Classification States

During the application identification process, DPI processes every packet and classifies it into one of the following states until the application is finally identified:

- Pre-match—Before an application is identified by the DPI.
- Transaction final—For dynamic applications, one transaction is complete, but identification of the application is not final. Applications over Layer 7 can keep changing with each transaction because they have dependent applications. For example, Facebook applications have dependent applications such as HTTP, SSL, and so on.
- Final match—A matched application over Layer 7 is considered as the final match according to the configured maximum number of transactions. That is, the match is considered as final only after the maximum number of transactions are complete.

Before identifying the final application, the policy cannot be matched precisely. A potential policy list is made available, and the traffic is permitted using the potential policy from the list. After the application is identified, the final policy is applied to the session. Policy actions such as permit, deny, reject, or redirect are applied to the traffic as specified in the policy rules.

Application classification is not terminated for applications that are transaction-based, such as Facebook. To terminate the classification for such applications, you can choose to consider the results from multiple transactions as the final classification.

Configuring Transactions Limit For Application Identification

You can configure the maximum number of transactions before concluding the final results for identifying an application using the **set services application-identification maximum-transactions *transactions-number*** statement. When you configure the maximum number of transactions, DPI is not terminated until the configured number of transactions are completed.

Example:

```
user@host# set services application-identification maximum-transactions 5
```

You can configure a transaction number from 0 through 25. By default, five transactions are considered.

If you set the transaction count as 0, the transaction does not terminate the DPI. The final match for the application might not be available; and the final security policy is not applied.

Table 4 on page 81 shows the different states of application identification classification when the maximum transaction is set as five. Note that the values in the table are for example and are not actual values. The exact transaction might vary depending on the traffic pattern.

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Table 4: Application Identification Transactions Example

Scenario	Application Identified	Application Identification State	Transactions
First packet of the session	None	Pre-match	0
Intermediate application	SSL	Pre-match	1
Intermediate application identified in decrypted payload	HTTP	Pre-match	2
Intermediate application identified	FACEBOOK-ACCESS	Pre-match	3
Intermediate application identified	FACEBOOK-CHAT	Final Transaction (Transaction =1)	4
Final application identified	FACEBOOK-MAIL	Final Match (Transaction = 2)	4

NOTE: **In unified policies, configuring dynamic applications that can be identified based on Layer 3 or Layer 4 information (except ICMP-based applications) is not supported. Instead, you can use the junos-defaults group that contains predefined values for Layer 3 and Layer 4 based applications.**

High Availability Support for Application Identification for Unified Policies

When an application is identified, its classification information is saved in the application system cache (ASC).

When an SRX Series device is operating in chassis cluster mode, the information saved in the ASC is synchronized between the primary node and the secondary node.

In case of dynamic application classification, per session application classification information from the DPI is synchronized with the secondary node when the application classification is final.

During a failover, the application classification information on the secondary node is in either of the following states:

- Application not identified
- Final application identified

After a failover, the application classification information that is available in the new primary node is considered as the final match. The same information is synchronized with the new secondary node as the classification does not proceed further after a failover. The example in Table 2 Table 5 on page 82 shows application classification status in a chassis cluster setup.

Table 5: Application Classification Status in a Chassis Cluster Setup

Application Identification Status	Chassis Cluster Node	Before Failover	After Failover	Details
Final application is identified. Identified application: SSL:Facebook	Primary node	Identified application: SSL:Facebook	Identified application: SSL:Facebook	No change after failover because complete application classification is synchronized to the secondary node.
	Secondary node	Identified application: SSL:Facebook	Identified application: SSL:Facebook	
Final application is not identified. (Partial application is identified.) Identified application: SSL	Primary node	Identified application: SSL	Identified application: APP-INVALID	Application identification does not proceed further after a failover.
	Secondary node	Identified application: not available	Identified application: APP-INVALID	
Final application is not identified. (Partial application is identified)	Primary node	Identified application: not available	Identified application: APP-INVALID	In this case, a failover occurred after the first packet inspection, and no application is identified. Application identification does not proceed further after a failover.
	Secondary node	Identified application: not available	Identified application: APP-INVALID	

Enabling or Disabling Application System Cache for Application Services

Starting in Junos OS Release 18.2R1, the default behavior of the ASC is changed as follows:

- Security services including security policies, application firewall (AppFW), application tracking (AppTrack), application quality of service (AppQoS), Juniper Sky ATP, IDP, and UTM do not use the ASC by default.
- Miscellaneous services including advanced policy-based routing (APBR) use the ASC for application identification by default.

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NOTE: The change in the default behavior of the ASC affects the legacy AppFW functionality. With the ASC disabled by default for the security services starting in Junos OS Release 18.2 onward, AppFW will not use the entries present in the ASC.

You can revert to the ASC behavior as in Junos OS releases before Release 18.2 by using the **set services application-identification application-system-cache security-services** command.

CAUTION: The SRX Series device might become susceptible to application evasion techniques if the ASC is enabled for security services. We recommend that you enable the ASC only when the performance of the device in its default configuration (disabled for security services) is not sufficient for your specific use case.

Use the following commands to enable or disable the ASC:

- Enable the ASC for security services:

  user@host# set services application-identification application-system-cache security-services

- Disable the ASC for miscellaneous services:

  user@host# set services application-identification application-system-cache no-miscellaneous-services

- Disable the enabled ASC for security services:

  user@host# delete services application-identification application-system-cache security-services

- Enable the disabled ASC for miscellaneous services:

  user@host# delete services application-identification application-system-cache no-miscellaneous-services

You can use the **show services application-identification application-system-cache** command to verify the status of the ASC.

The following sample output provides the status of the ASC:

user@host>show services application-identification application-system-cache

```
Application System Cache Configurations:
  application-cache: on
    Cache lookup for security-services: off
    Cache lookup for miscellaneous-services: on
  cache-entry-timeout: 3600 seconds
```

In releases before Junos OS Release 18.2R1, application caching is enabled by default. You can manually disable it by using the CLI.

```
user@host# set services application-identification no-application-system-cache
```

See Also

- Understanding Application Identification Techniques on page 27
- Verifying Application System Cache Statistics on page 34
- Understanding the Junos OS Application Identification Database on page 30

Related Documentation

- Application Identification on page 27

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CHAPTER 3

Application Services Modules

- Application Firewall on page 85
- Application Tracking on page 104
- Application QoS on page 117
- Advanced Policy-Based Routing on page 139
- Application Quality of Experience on page 173
- Application-Based Multipath Routing on page 205

Application Firewall

Application Firewall (AppFW) refers to the ability to take the results from the App ID engine and leverage them to make an informed decision to permit, deny/ reject, or redirect the traffic. For more information, see the following topics:

- Application Firewall Overview on page 85
- Application Firewall Support with Unified Policies on SRX Series Devices on page 91
- Example: Configuring Application Firewall Rule Sets Within a Security Policy on page 92
- Example: Configuring an Application Group for Application Firewall on page 96
- Example: Configuring Application Firewall When SSL Proxy Is Enabled on page 100

Application Firewall Overview

Traditionally, applications like HTTP, SMTP, and DNS use well-known standard ports and are easily controlled by a stateful firewall. However, it is possible to run these applications on any port as long as the client and server are using the same protocol as the well-known ports.

Evasive applications could remain undetected with a standard firewall that functions at Layer 3 or Layer 4 by transmitting other protocols over these well-known ports that are usually open by a firewall. AppFW enforces protocol and policy control at Layer 7. It inspects the actual content of the payload and ensures that it conforms to the policy, rather than identifying the application based on Layer 3 and Layer 4 information.

Additionally, with the growing popularity of Web applications and the shift from traditional full client-based applications to the Web, more and more traffic is being transmitted over HTTP. An application firewall identifies not only HTTP but also any application

running on top of it, letting you properly enforce policies. For example, an application firewall rule could block HTTP traffic from Facebook but allow Web access to HTTP traffic from MS Outlook.

A security administrator implements an application firewall by performing the following tasks:

- Define one or more application firewall rule sets.
- Create rules for each rule set that permit, reject, or deny traffic based on the application ID.
- Configure a security policy to invoke the application firewall service and specify the rule set to be applied to permitted traffic.

This topic includes the following sections:

- Benefit of Application Firewall on page 86
- Understanding Application Firewall Rule Sets on page 86
- Configuring an Application Firewall Within a Security Policy on page 87
- Application Group Support for Application Firewall on page 88
- Redirecting Users on page 88
- Session Logging for Application Firewalls on page 89
- Application Firewall Support in Chassis Cluster on page 90

Benefit of Application Firewall

- Controls access to high-risk applications based on user-defined policies.

Understanding Application Firewall Rule Sets

An application firewall permits, rejects, or denies traffic based on the application of the traffic. The firewall consists of one or more rule sets with rules that specify match criteria, including dynamic applications, and the action to be taken for matching traffic.

An application firewall rule set consists of:

- The name of the rule set
- One or more rules
- A single default rule

Each rule defines dynamic applications to permit, reject, or deny. Each rule consists of:

- The name of the rule
- A list of dynamic applications to be used as match criteria
- The action to take for any traffic that matches one of the specified applications
  - Reject—Notify the client, drop the traffic, close the session, and log the event.
  - Deny—Drop the traffic, close the session, and log the event.

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- Permit—Permit the traffic.

The default rule defines the action to be taken for any traffic that does not match one of the rules. An application firewall rule set must contain a default rule.

There is no limit to the number of dynamic applications in a rule or to the number of rules in a rule set. However, there is a limit to the overall number of rule sets and rules.

The junos:UNKNOWN keyword is reserved for unknown dynamic applications. In the following cases, the application ID is set to junos:UNKNOWN:

- The traffic does not match an application signature in the database.
- The system encounters an error when identifying the application.
- The session fails over to another device.

Traffic with an application ID of junos:UNKNOWN matches a rule with a dynamic application of junos:UNKNOWN. If there is no rule defined for junos:UNKNOWN, the default rule is applied.

Configuring an Application Firewall Within a Security Policy

An application firewall is invoked using the **then permit** statement of the security policy.

Any traffic denied or rejected by the security policy based on Layer 3 or Layer 4 criteria is dropped immediately. Traffic permitted by the security policy is further assessed by the application firewall at Layer 7 based on its application ID.

The following sample policy, outbound-traffic, permits matching HTTP traffic, and invokes application services and an application firewall. The rule set, unknown-traffic, permits, denies, or rejects, traffic based on its match criteria.

```
[edit security policies from-zone trust to-zone untrust outbound-traffic]
user@host# set match source-address 192.0.2.1
user@host# set match destination-address 198.51.100.1
user@host# set match application junos-http
user@host# set then permit application-services application-firewall rule-set
  unknown-traffic
```

Traffic is processed in the following sequence:

1. Match the zone pair specified in the policy.
2. When specified, match the source and destination IP addresses, ports, and application type.
3. Apply the security policy action to matching traffic.
   - Reject—Notify the client, drop the traffic, and log the event.
   - Deny—Drop the traffic, and log the event.
   - Permit—Open a session, log the event, and apply services as specified.
     - Invoke application services to retrieve the application ID for the traffic.

- Apply the specified application firewall rule set.

NOTE: All IP fragmented packets received on the SRX Series device must be reassembled before forwarding.

Application Group Support for Application Firewall

Application group support associates related applications under a single name for simplified, consistent reuse when using any application services. As the predefined signature database changes, the content of a predefined application group can be modified to include new signatures without affecting existing firewall rules. When you define application firewall rules, you can specify dynamic application groups as match criteria.

NOTE: An application group can contain applications and groups simultaneously. It is possible to assign one application to multiple groups. There is no limit to the number of dynamic application groups contained in one rule.

For information on creating or listing application groups, see "Customizing Application Groups for Junos OS Application Identification" on page 72.

NOTE: On all SRX Series devices, when ALG is enabled, application identification includes the ALG result to identify the application of the control sessions. Application firewall permits ALG data sessions whenever control sessions are permitted. If the control session is denied, there will be no data sessions. When ALG is disabled, application identification relies on its signatures to identify the application of the control and data sessions. If a signature match is not found, the application is considered unknown. Application firewall handles applications based on the application identification result.

Redirecting Users

Although drop and reject actions are logged, application firewall does not notify clients when either action is taken. Clients are not aware that the webpage is not available and might keep trying to access the page. To provide an explanation for the action or to redirect the client to an informative webpage, use the **block-message** option with the **reject** or **deny** action in an application firewall rule.

```
...
then reject block-message
```


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When traffic is rejected by the application firewall rule, a splash screen with the following default message is displayed to the user:

> *user-name*, Application Firewall has blocked your request to application *application-name* at *dst-ip:dst-port* accessed from *src-ip:src-port*.

To help the user fully understand which request has been rejected or denied, the default message includes traffic-specific details, such as the username, application, and address information.

You can customize the redirect action by including additional text on the splash screen or by specifying a URL to which the user is redirected. To customize the block message, define the type and content in a block message profile defined in the rule set:

```
[edit security application-firewall profile deny-profile-1]
set block-message type custom-redirect-url content http://abc.company.com/information
```

The block message profile is identified for the rule set, and applied to one or more of the rules using the **block-message** option.

```
[edit security application-firewall rule-sets application-firewall-3]
set profile deny-profile-1
set rule redirect-on-deny
set match dynamic-application [junos:KAZAA junos:EDONKEY junos:YMSG]
set then deny block-message
```

In this example, any traffic matching one of the specified dynamic applications is denied, and the block message defined for rule set, deny-profile-1, is applied. Based on the profile for deny-profile-1, the user is redirected to the URL http://abc.company.com/information for further details.

Session Logging for Application Firewalls

With security policies, the permit action of the matched policy rule creates a session and logs a session create message. A reject or deny action logs a reject or deny message, but does not create a session.

When an application firewall is implemented, the permit action of the security policy creates a session before the application firewall rules are applied. If the dynamic application have been retrieved from the cache, this information is added to the session create message. If the application is in the process of being identified, the dynamic application fields specify UNKNOWN.

If traffic is rejected or denied by the application firewall, application firewall also closes the session. The reject or deny message actions are logged with the reason field containing one of the following phrases:

- **appfw deny** or **appfw deny redirect**
- **appfw reject** or **appfw reject redirect**

- **policy deny**
- **policy reject**

Application Firewall Support in Chassis Cluster

When the application ID is not identified during failover sessions, the ID is considered an unknown application ID. During this session, the traffic is processed based on the action defined in a rule specified for unknown. If there is no rule defined for unknown, then the default rule is applied.

NOTE: When an SRX Series device is operating in chassis cluster mode and application identification is enabled, pre-match state application IDs are not synced to other node. If there are any failover sessions, which were still under classification, will not have any application IDs assigned. This could result in application statistics and counters mismatch.

When the application ID is identified before sessions fail over, the same action taken before the failover is effective after the failover. The application firewall action taken before and after the failover depends on the application ID state, as shown in Table 6 on page 90.

Table 6: Application Firewall Actions

Before Failover		After Failover	
Application ID State	Application Firewall Action	Application ID State	Application Firewall Action
Success	Deny	Success	Deny
Success	Permit	Success	Permit
Pending	—	UNKNOWN	Action based on the rule defined for unknown application

NOTE: In-service software upgrade (unified ISSU) is not supported due to lack of chassis cluster infrastructure support. Thus, the failover event is controlled through the application firewall policy by allowing or denying the unknown dynamic applications.

See Also

- *Understanding Security Policy Elements*
- *Security Policies Overview*
- *Understanding Security Policy Rules*

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Application Firewall Support with Unified Policies on SRX Series Devices

Starting in Junos OS Release 18.2R1, SRX Series devices and vSRX instances support unified policies, allowing granular control and enforcement of Layer 7 dynamic applications within the traditional security policy.

Unified policies leverage the application identity information from the application identification (AppID) service to permit, deny, reject, or redirect the traffic.

NOTE: **Starting in Junos OS Release 18.2R1 Application Firewall (AppFW) functionality is deprecated— rather than immediately removed—to provide backward compatibility and an opportunity to bring your configuration into compliance with the new configuration. As a part of this change, the [edit security application-firewall] hierarchy and all the configuration options under this hierarchy are deprecated.**

Unified policies using the new matching condition *dynamic application* facilitate the same functionality of an AppFW configuration. When you configure a unified policy with a dynamic application as the matching condition, the configuration eliminates the additional steps involved in an AppFW configuration, which invoke the AppFW service in a security policy.

A unified policy configuration handles all application firewall functionality and simplifies the task of configuring a firewall policy to permit or block application traffic from the network.

If you have configured a traditional security policy (configured using a 5-tuple matching condition) and a unified policy (configured using a 6-tuple matching condition), the traditional security policy matches the traffic first, before the unified policy.

Unified Policies with Traditional Application Firewall Configurations

When using AppFW after upgrading to the Junos OS Release 18.2R1 and later, note the following changes:

- An existing traditional security policie is considered to be a unified policy with a dynamic application that is configured as none.
- Configuring a traditional AppFW policy and a unified policy with a dynamic application as the matching condition in the same security policy is not supported.
- All existing AppFW related CLI statements and commands are deprecated.
- If you are downgrading from Junos OS Release 18.2R1 to any earlier versions of Junos OS, you must delete all unified policies to avoid a commit check failure after a downgrade.

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You can configure security policies using dynamic applications as the match conditions. If you have configured AppFW and if the security policy with the dynamic application is also configured and applied, the following error message is displayed:

```
Traditional AppFW and dynamic-application can't be applied to same policy
```

See Also

- Application Identification Support for Unified Policies on page 78

Example: Configuring Application Firewall Rule Sets Within a Security Policy

This example shows how to configure application firewall rule sets within the security policy.

- Requirements on page 92
- Overview on page 92
- Configuration on page 93
- Verification on page 95

Requirements

- Create zones. See *Example: Creating Security Zones*.
- Configure an address book with addresses for the policy. See *Example: Configuring Address Books and Address Sets*.

Overview

In Junos OS, the security policies provide firewall security functionality by enforcing rules for the traffic so that traffic passing through the device is permitted or denied based on the action defined in the rules. The application firewall support in the policies provides additional security control for dynamic applications.

The application firewall is defined by a collection of rule sets. These rule sets can be defined independently and shared across network security policies. A rule set defines the rules that match the application ID detected, based on the application signature.

This configuration example shows how to:

- Permit or deny selected traffic from the untrust zone to the trust zone, based on the application firewall rule sets defined with the rules matching the dynamic applications.

NOTE: On all SRX Series devices, J-Web pages for AppSecure Services are preliminary. We recommend using CLI for configuration of AppSecure features.

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Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set security policies from-zone untrust to-zone trust policy policy1 match source-address
  198.51.100.1
set security policies from-zone untrust to-zone trust policy policy1 match
  destination-address 192.0.2.1
set security policies from-zone untrust to-zone trust policy policy1 match application
  junos-http
set security policies from-zone untrust to-zone trust policy policy1 then permit
  application-services application-firewall rule-set rs1
set security policies from-zone untrust to-zone trust policy policy2 match source-address
  198.51.100.1
set security policies from-zone untrust to-zone trust policy policy2 match
  destination-address 192.0.2.1
set security policies from-zone untrust to-zone trust policy policy2 match application any
set security policies from-zone untrust to-zone trust policy policy2 then permit
  application-services application-firewall rule-set rs2
set security application-firewall rule-sets rs1 rule r1 match dynamic-application
  [junos:KAZAA junos:EDONKEY junos:YMSG]
set security application-firewall rule-sets rs1 rule r1 then deny
set security application-firewall rule-sets rs1 default-rule permit
set security application-firewall rule-sets rs2 rule r1 match dynamic-application
  [junos:FACEBOOK-ACCESS junos:GOOGLETALK junos:MEEBOME junos:UNKNOWN]
set security application-firewall rule-sets rs2 rule r1 then permit
set security application-firewall rule-sets rs2 default-rule deny
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *CLI User Guide*.

To configure two security policies with application firewall rule sets that permit or deny traffic from different dynamic applications:

1. Configure a policy to process the traffic that goes to the HTTP static ports with the application firewall rule set rs1.

```
[edit security policies from-zone untrust to-zone trust policy policy1]
user@host# set match source-address 198.51.100.1
user@host# set match destination-address 192.0.2.1
user@host# set match application junos-http
user@host# set then permit application-services application-firewall rule-set rs1
```

2. Configure another policy to process any traffic that does not go to the HTTP static ports with the application firewall rule set rs2.

```
[edit security policies from-zone untrust to-zone trust policy policy2]
user@host# set match source-address 198.51.100.1
```

```
user@host# set match destination-address 192.0.2.1
user@host# set match application any
user@host# set then permit application-services application-firewall rule-set rs2
```

3. Define the application firewall rule set rs1 to deny traffic from selected dynamic applications.

```
[edit security application-firewall rule-sets rs1]
user@host# set rule r1 match dynamic-application [junos:KAZAA junos:EDONKEY
   junos:YMSG]
user@host# set rule r1 then deny
user@host# set default-rule permit
```

4. Define the application firewall rule set rs2 to permit traffic from selected dynamic applications.

```
[edit security application-firewall rule-sets rs2]
user@host# set rule r1 match dynamic-application [junos:FACEBOOK-ACCESS
   junos:GOOGLETALK junos:MEEBOME junos:UNKNOWN]
user@host# set rule r1 then permit
user@host# set default-rule deny
```

Results From configuration mode, confirm your configuration by entering the **show security policies** and **show security application-firewall** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show security policies
   from-zone untrust to-zone trust {
      policy 1 {
         match {
            source-address 198.51.100.1;
            destination-address 192.0.2.1;
            application junos-http;
         }
         then {
            permit {
               application-services {
                  application-firewall {
                     rule-set rs1;
                  }
               }
            }
         }
      }
      policy 2 {
         match {
            source-address 198.51.100.1;
```

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```
            destination-address 192.0.2.1;
            application any;
          }
          then {
            permit {
              application-services {
                application-firewall {
                  rule-set rs2;
                }
              }
            }
          }
        }
      }
    }
  user@host# show security application-firewall
    rule-sets rs1 {
      rule r1 {
        match {
          dynamic-application [junos:KAZAA junos:EDONKEY junos:YMSG];
        }
        then {
          deny;
        }
      }
      default-rule {
        permit;
      }
    }
    rule-sets rs2 {
      rule r1 {
        match {
          dynamic-application [junos:FACEBOOK-ACCESS junos:GOOGLETALK
            junos:MEEBOME junos:UNKNOWN];
        }
        then {
          permit;
        }
      }
      default-rule {
        deny;
      }
    }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

To confirm that the configuration is working properly, perform these tasks:

- Verifying Application Firewall Configuration on page 95

Verifying Application Firewall Configuration

Purpose Verify information about application firewall support enabled under the security policy.

Action To verify the security policy configuration enabled with application firewall, enter the **show security policies** and **show security policies detail** commands. To verify all the application firewall rule sets configured on the device, enter the **show security application-firewall rule-set all** command.

Meaning The output displays information about application firewall enabled policies configured on the system. Verify the following information.

- Rule set
- Rules
- Match criteria

See Also
- *Security Policies Configuration Overview*
- *Example: Configuring a Security Policy to Permit or Deny All Traffic*

Example: Configuring an Application Group for Application Firewall

With application identification, multiple applications can be configured in a dynamic application groups for consistent reuse. AppFW rules permit and deny traffic by specifying application names, dynamic application group names, or both. By using predefined application groups, AppFW rules require no updating when new applications are added to common groups.

NOTE: **The application group is managed by the application identification module.**

This example shows how to configure application groups within the application firewall rule set.

- Requirements on page 96
- Overview on page 96
- Configuration on page 97
- Verification on page 99

Requirements

Before you begin:

- Create zones. See *Example: Creating Security Zones*.

Overview

The following example configures network policies to control outbound traffic from the trust zone to the untrust zone. All traffic permitted by the policy is processed further with the specified application firewall. The application firewall denies outbound traffic from

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unknown applications. Outbound Google Talk traffic is allowed, but all other known social networking traffic is denied. All other traffic is permitted.

The junos:GOOGLETALK application is included in the predefined group junos:social-networking. To allow junos:GOOGLETALK traffic and deny the rest of the group, the rule permitting junos:GOOGLETALK traffic must come before the rule denying traffic from the rest of the applications in the group.

This configuration example shows how to:

- Configure dynamic application groups in an application firewall.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set security application-firewall rule-sets social-network rule google-rule match
   dynamic-application junos:GOOGLETALK
set security application-firewall rule-sets social-network rule google-rule then permit
set security application-firewall rule-sets social-network rule denied-sites match
   dynamic-application-groups junos:social-networking
set security application-firewall rule-sets social-network rule denied-sites match
   dynamic-application junos:UNKNOWN
set security application-firewall rule-sets social-network rule denied-sites then deny
set security application-firewall rule-sets social-network default-rule permit
set security policies from-zone trust to-zone untrust policy outbound-traffic
set security policies from-zone trust to-zone untrust policy outbound-traffic match
   source-address any
set security policies from-zone trust to-zone untrust policy outbound-traffic match
   destination-address any
set security policies from-zone trust to-zone untrust policy outbound-traffic match
   application junos:HTTP
set security policies from-zone trust to-zone untrust policy outbound-traffic then permit
   application-services application-firewall rule-set social-network
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see Using the CLI Editor in Configuration Mode.

To configure application firewall rule-sets and security policies for outbound traffic:

1. Create the rule-set social-network.

```
[edit]
user@host# set security application-firewall rule-sets social-network
```

2. Define a rule to permit Google-Talk traffic.

```
[edit security application-firewall rule-sets social-network]
user@host# set rule google-rule match dynamic-application junos:GOOGLETALK
user@host# set rule google-rule then permit
```

3. Define a second rule that denies all other social-networking traffic and traffic from an unknown application.

```
[edit security application-firewall rule-sets social-network]
user@host# set rule denied-sites match dynamic-application-groups
   junos:social-networking
user@host# set rule denied-sites match dynamic-application junos:UNKNOWN
user@host# set rule denied-sites then deny
```

Note that rule sequence is important. If the rules google-rule and denied-sites are reversed, GOOGLETALK traffic would never be permitted. The denied-sites rule would shadow google-rule.

4. Define the default-rule that permits all other traffic.

```
[edit security application-firewall rule-sets social-network]
user@host# user@host# set default-rule permit
```

5. Configure the outbound-traffic policy to apply the social-network rule-set to all outbound traffic.

```
[edit security policies from-zone trust to-zone untrust policy outbound-traffic]
user@host# set match source-address any
user@host# set match destination-address any
user@host# set match application junos:HTTP
user@host# set then permit application-services application-firewall rule-set
   social-network
```

Results From configuration mode, confirm your configuration by entering the **show security application-firewall** and **show security policies** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
[edit]
user@host# show security application-firewall
...
rule-sets social-network {
   rule google-rule {
      match {
         dynamic-application junos:GOOGLETALK;
      }
   }
      then {
         permit ;
```

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```
      }
   rule denied-sites {
      match {
         dynamic-application-groups junos:social-networking
         dynamic-application junos:UNKNOWN;
      }
      then {
         deny ;
      }
   }
   default-rule {
      permit;
   }
}
...
```

```
[edit]
user@host# show security policies
from-zone untrust to-zone trust {
   ...
   policy outbound-traffic {
      match {
         source-address any;
         destination-address any;
         application junos-http;
      }
      then {
         permit {
            application-services {
               application-firewall {
                  rule-set social-network
               }
            }
         }
      }
   }
   ...
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Verifying Application Firewall Configuration

Purpose Verify information about application grouping support under the application firewall policy.

Action

- To verify the application firewall policy configuration enabled with application grouping, from the operational mode, enter the **show security policies** and **show security policies detail** commands.

- To verify all the application firewall rule sets configured on the device, from the operational mode, enter the **show security application-firewall rule-set all** command.
- To verify the list of applications defined within the application group, from the operational mode, enter the **show services application-identification application-group *application-group-name*** command.

See Also

- *Security Policies Configuration Overview*
- Customizing Application Groups for Junos OS Application Identification on page 72

Example: Configuring Application Firewall When SSL Proxy Is Enabled

NOTE: **If none of the services (AppFW, IDP, or AppTrack) are configured, then SSL proxy services are bypassed even if an SSL proxy profile is attached to a firewall policy.**

This example describes how AppFW supports this AppID functionality when SSL proxy is enabled.

- Requirements on page 100
- Overview on page 100
- Configuration on page 100

Requirements

Before you begin:

- Create zones. See *Example: Creating Security Zones*.
- Configure an address book with addresses for the policy. See *Example: Configuring Address Books and Address Sets*.
- Create an application (or application set) that indicates that the policy applies to traffic of that type. See *Example: Configuring Security Policy Applications and Application Sets*.
- Create a SSL proxy profile that enables SSL proxy by means of a policy. See "Configuring SSL Forward Proxy" on page 234.

Overview

This example shows how to verify the functionality of AppFW when SSL proxy is enabled and a different action, deny or permit, is performed on plain text and encrypted traffic.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

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```
set security policies from-zone Z_1 to-zone Z_2 policy policy1 match source-address any
set security policies from-zone Z_1 to-zone Z_2 policy policy1 match destination-address
   any
set security policies from-zone Z_1 to-zone Z_2 policy policy1 match application junos-https
set security policies from-zone Z_1 to-zone Z_2 policy policy1 then permit
   application-services application-firewall rule-set appfw-rs-1
set security policies from-zone Z_1 to-zone Z_2 policy policy1 then permit
   application-services ssl-proxy profile-name ssl-profile-1
set security policies from-zone Z_1 to-zone Z_2 policy policy2 match source-address any
set security policies from-zone Z_1 to-zone Z_2 policy policy2 match destination-address
   any
set security policies from-zone Z_1 to-zone Z_2 policy policy2 match application junos-http
set security policies from-zone Z_1 to-zone Z_2 policy policy2 then permit
   application-services application-firewall rule-set appfw-rs-2
set security application-firewall rule-sets appfw-rs-1 rule rule1 match dynamic-application
   [junos:ORACLE]
user@host# set security application-firewall rule-sets appfw-rs-1 rule rule1 then permit
user@host# set security application-firewall rule-sets appfw-rs-1 default-rule deny
user@host# set security application-firewall rule-sets appfw-rs-2 rule rule1 match
   dynamic-application [junos:HULU]
user@host# set security application-firewall rule-sets appfw-rs-2 rule rule1 then deny
user@host# set security application-firewall rule-sets appfw-rs-2 default-rule permit
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *CLI User Guide*.

In this example, you configure two security policies with AppFW rule sets that permit or deny traffic from plain text or encrypted traffic:

- Allow the encrypted version of Oracle and deny any other encrypted traffic.
- Allow all HTTP traffic, except Hulu.

1. Configure a policy to process the traffic with AppFW rule set appfw-rs-1 and SSL proxy profile ssl-profile-1.

```
[edit security policies from-zone Z_1 to-zone Z_2 policy policy1
user@host# set match source-address any
user@host# set match destination-address any
user@host# set match application junos-https
user@host# set then permit application-services application-firewall rule-set
   appfw-rs-1
user@host# set then permit application-services ssl-proxy profile-name ssl-profile-1
```

2. Configure another policy with rule set appfw-rs-2.

```
[edit security policies from-zone Z_1 to-zone Z_2 policy policy2
user@host# set match source-address any
user@host# set match destination-address any
user@host# set match application junos-http
user@host# set then permit application-services application-firewall rule-set
   appfw-rs-2
```

3. Define the AppFW rule set appfw-rs-1 to permit an encrypted version of Oracle and to deny any other encrypted traffic.

```
[edit security application-firewall rule-sets appfw-rs1]
user@host# set rule rule1 match dynamic-application [junos:ORACLE]
user@host# set rule rule1 then permit
user@host# set default-rule deny
```

4. Define the AppFW rule set appfw-rs-2 to allow all plain text traffic except Hulu.

```
[edit security application-firewall rule-sets appfw-rs2]
user@host# set rule rule1 match dynamic-application [junos:HULU]
user@host# set rule rule1 then deny
user@host# set default-rule permit
```

Results From configuration mode, confirm your configuration by entering the **show security policies** and **show security application-firewall** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

If you are done configuring the device, enter **commit** from configuration mode.

NOTE: For **application junos-https**, SSL proxy detects an SSL session based on the dynamic application identified for that session. If you know any webservers that are running nonstandard ports, you can use a custom Junos OS application to identify the application. However, if the webservers are not known, for example on the Internet, use **application any**. Non-SSL sessions that come across the policy rule are ignored by SSL proxy. A syslog SSL_PROXY_SESSION_IGNORE is sent out for these sessions. Juniper Networks recommends that you use application “any” with caution because this can result in a lot of traffic, incurring initial SSL proxy processing and thereby impacting performance.

Verifying Application Firewall In an SSL Proxy Enabled Policy

Purpose Verify that the application is configured correctly when SSL proxy is enabled in a policy.

Action From operational mode, enter the **show security policies** command.

The following output shows the options for the **show security flow session** command.

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```
user@host> show security flow session ?
```

```
   Possible completions:
    <[Enter]>            Execute this command
    application          Application protocol name
    application-firewall Show application-firewall sessions
    application-firewall-rule-set  Show application firewall sessions matching
rule-set name
    brief                Show brief output (default)
    destination-port     Destination port (1..65535)
    destination-prefix   Destination IP prefix or address
    dynamic-application  Dynamic application name
    extensive            Show detailed output
+   encrypted            Show encrypted traffic
    family               Show session by family
    idp                  Show idp sessions
    interface            Name of incoming or outgoing interface
    nat                  Show sessions with network address translation
    protocol             IP protocol number
    resource-manager     Show sessions with resource manager
    session-identifier   Show session with specified session identifier
    source-port          Source port (1..65535)
    source-prefix        Source IP prefix or address
    summary              Show output summary
    tunnel               Show tunnel sessions
     |                    Pipe through a command
```

To display SSL encrypted UNKNOWN sessions, use the **show security flow session application-firewall dynamic-application junos:SSL extensive** command.

To display all HTTPS sessions, use the **show security flow session application-firewall dynamic-application junos:HTTP encrypted extensive** command.

See Also

- SSL Proxy Overview on page 221
- Application Security Services with SSL Proxy Overview on page 271

Release History Table

Release	Description
18.2R1	Starting in Junos OS Release 18.2R1 Application Firewall (AppFW) functionality is deprecated— rather than immediately removed—to provide backward compatibility and an opportunity to bring your configuration into compliance with the new configuration. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated.

Related Documentation

- Application Identification on page 27
- Application Tracking on page 104
- Application QoS on page 117

- Advanced Policy-Based Routing on page 139
- SSL Proxy on page 221

Application Tracking

Application tracking (AppTrack) is a logging and reporting tool that can be used to share information for application visibility. AppTrack sends log messages through syslog providing application activity update messages. For more information, see the following topics:

- Understanding Application Tracking on page 104
- Example: Configuring Application Tracking on page 109
- Example: Configuring Application Tracking When SSL Proxy Is Enabled on page 115
- Disabling Application Tracking on page 116

Understanding Application Tracking

AppTrack, an application tracking tool, provides statistics for analyzing bandwidth usage of your network. When enabled, AppTrack collects byte, packet, and duration statistics for application flows in the specified zone. By default, when each session closes, AppTrack generates a message that provides the byte and packet counts and duration of the session, and sends it to the host device. Juniper Secure Analytics (formally known as STRM) retrieves the data and provides flow-based application visibility.

AppTrack messages are similar to session logs and use syslog or structured syslog formats. The message also includes an application field for the session. If AppTrack identifies a custom-defined application and returns an appropriate name, the custom application name is included in the log message. (If the application identification process fails or has not yet completed when an update message is triggered, the message specifies **none** in the application field.)

AppTrack supports both IPv4 and IPv6 addressing. Related messages display addresses in the appropriate IPv4 or IPv6 format.

User identity details such as user name and user role have been added to the AppTrack session create, session close, and volume update logs. These fields will contain the user name and role associated with the policy match. The logging of user name and roles is enabled only for security policies that provide UAC enforcement. For security policies without UAC enforcement, the user name and user role fields are displayed as N/A. The user name is displayed as unauthenticated user and user role is displayed as N/A, if the device cannot retrieve information for that session because there is no authentication table entry for that session or because logging of this information is disabled. The user role field in the log contains the list of all the roles performed by the user if match criteria is specific, authenticated user, or any, and the user name field in the log contains the correct user name. The user role field in the log will contain N/A if the match criteria and the user name field in the log contain unauthenticated user or unknown user.

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If you enable AppTrack for a zone and specify a **session-update-interval** time, whenever a packet is received, AppTrack checks whether the time since the start of the session or since the last update is greater than the update interval. If so, AppTrack updates the counts and sends an update message to the host. If a short-lived session starts and ends within the update interval, AppTrack generates a message only at session close.

When you want the initial update message to be sent earlier than the specified update interval, use the **first-update-interval**. The **first-update-interval** lets you enter a shorter interval for the first update only. Alternatively, you can generate the initial update message at session start by using the **first-update** option.

The close message updates the statistics for the last time and provides an explanation for the session closure. The following codes are used:

TCP RST—RST received from either end.

TCP FIN—FIN received from either end.

Response received—Response received for a packet request (such as **icmp req-reply**).

ICMP error—ICMP error received (such as **dest unreachable**).

Aged out—Session aged out.

ALG—ALG closed the session.

IDP—IDP closed the session.

Parent closed—Parent session closed.

CLI—Session cleared by a CLI statement.

Policy delete—Policy marked for deletion.

- Benefits of Application Tracking on page 105
- Application Tracking Log Messages Fields on page 105

Benefits of Application Tracking

- Provides visibility into the types of applications traversing through an SRX Series device.
- Enables you to gain insight into permitted applications and the risk they might pose.
- Assists in managing bandwidth, reports active users and applications.

Application Tracking Log Messages Fields

Starting from Junos OS Release 15.1X49-D100, AppTrack session create, session close, and volume update logs include a new field called *destination interface*. You can use the **destination interface** field to see which egress interface is selected for the session when a advanced policy-based routing (APBR) is applied to that session and AppTrack is enabled and configured within any logical system.

Starting from Junos OS Release 15.1X49-D100, a new AppTrack log for route update is added to include APBR profile, rule, and routing instance details. When APBR is applied to a session, the new log is generated and the AppTrack session counter is updated to indicate the number of times a new route update log is generated. The AppTrack session close log is also updated to include APBR profile, rule, and routing instance details.

Starting from Junos OS Release 17.4R1, AppTrack session create, session close, and volume update logs include the new fields **category** and **subcategory**. These fields provide general information about the application attributes. For example, the **category** field specifies the technology of the application (web, infrastructure) and **subcategory** field specifies the subcategory of the application (for example, social networking, news, and advertisements).

Because category and subcategory are not applicable for a custom application, the AppTrack log messages present the category as **custom application** and the subcategory as **N/A**.

For unknown applications, both category and subcategories are logged as **N/A**.

Examples of the log messages in structured syslog format:

APPTRACK_SESSION_CREATE user@host.1.1.1.2.129 source-address="4.0.0.1" source-port="48873" destination-address="5.0.0.1" destination-port="80" service-name="junos-http" application="UNKNOWN" nested-application="UNKNOWN" nat-source-address="4.0.0.1" nat-source-port="48873" nat-destination-address="5.0.0.1" nat-destination-port="80" src-nat-rule-name="N/A" dst-nat-rule-name="N/A" protocol-id="6" policy-name="permit-all" source-zone-name="trust" destination-zone-name="untrust" session-id-32="32" username="user1" roles="DEPT1" encrypted="UNKNOWN" destination-interface-name=”ge-0/0/0” category=”N/A” sub-category=”N/A”]

APPTRACK_SESSION_CLOSE [junos@2636.1.1.1.2.129 reason="TCP CLIENT RST" source-address="4.0.0.1" source-port="48873" destination-address="5.0.0.1" destination-port="80" service-name="junos-http" application="HTTP" nested-application="UNKNOWN" nat-source-address="4.0.0.1" nat-source-port="48873" nat-destination-address="5.0.0.1" nat-destination-port="80" src-nat-rule-name="N/A" dst-nat-rule-name="N/A" protocol-id="6" policy-name="permit-all" source-zone-name="trust" destination-zone-name="untrust" session-id-32="32" packets-from-client="5" bytes-from-client="392" packets-from-server="3" bytes-from-server="646" elapsed-time="3" username="user1" roles="DEPT1" encrypted="No" routing-instance=“default” destination-interface-name=”st0.0” category=” Web” sub-category=”N/A”]

APPTRACK_SESSION_VOL_UPDATE [user@host.1.1.1.2.129 source-address="4.0.0.1" source-port="33040" destination-address="5.0.0.1" destination-port="80" service-name="junos-http" application="HTTP" nested-application="FACEBOOK-SOCIALRSS" nat-source-address="4.0.0.1" nat-source-port="33040" nat-destination-address="5.0.0.1" nat-destination-port="80" src-nat-rule-name="N/A" dst-nat-rule-name="N/A" protocol-id="6" policy-name="permit-all" source-zone-name="trust" destination-zone-name="untrust"

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```
session-id-32="28" packets-from-client="371" bytes-from-client="19592"
packets-from-server="584" bytes-from-server="686432" elapsed-time="60"
username="user1" roles="DEPT1" encrypted="No" destination-interface-name=”st0.0”
category=” Web” sub-category=”Social-Networking”]
```

```
APPTRACK_SESSION_ROUTE_UPDATE [user@host.1.1.1.2.129 source-address="4.0.0.1"
source-port="33040" destination-address="5.0.0.1" destination-port="80"
service-name="junos-http" application="HTTP"
nested-application="FACEBOOK-SOCIALRSS" nat-source-address="4.0.0.1"
nat-source-port="33040" nat-destination-address="5.0.0.1" nat-destination-port="80"
src-nat-rule-name="N/A" dst-nat-rule-name="N/A" protocol-id="6"
policy-name="permit-all" source-zone-name="trust" destination-zone-name="untrust"
session-id-32="28" username="user1" roles="DEPT1" encrypted="No" profile-name=”pf1”
rule-name=”facebook1” routing-instance=”instance1” destination-interface-name=”st0.0”
category=”Web” sub-category=”Social-Networking”]
```

Starting in Junos OS Release 18.4R1 and Junos OS Release 18.3R2, in the APPTRACK_SESSION_ROUTE_UPDATE log, the **encrypted** field displays the value as **N/A** as shown in the following sample:

```
APPTRACK_SESSION_ROUTE_UPDATE [junos@2636.1.1.1.2.129 source-address="4.0.0.1"
source-port="251" destination-address="5.0.0.1" destination-port="250"
service-name="None" application="HTTP" nested-application="UNKNOWN"
nat-source-address="4.0.0.1" nat-source-port="251" nat-destination-address="5.0.0.1"
nat-destination-port="250" src-nat-rule-name="N/A" dst-nat-rule-name="N/A"
protocol-id="6" policy-name="1" source-zone-name="trust"
destination-zone-name="untrust" session-id-32="866" username="N/A" roles="N/A"
encrypted="N/A" profile-name="profile1" rule-name="rule1" routing-instance="RI1"
destination-interface-name="ge-0/0/2.0" category="Web" subcategory="N/A"
apbr-policy-name="sla1" webfilter-category="N/A"]
```

Starting in Junos OS Release 18.4R1, in the APPTRACK_SESSION_CLOSE and APPTRACK_SESSION_CLOSE_LS log includes the multipath rule name as shown in the following sample:

```
2018-10-25T01:00:18.179-07:00 multihome-spoke RT_FLOW - APPTRACK_SESSION_CLOSE
[junos@2636.1.1.1.2.129 reason="idle Timeout" source-address="19.0.0.2"
source-port="34880" destination-address="9.0.0.2" destination-port="80"
service-name="junos-http" application="HTTP" nested-application="GOOGLE-GEN"
nat-source-address="19.0.0.2" nat-source-port="34880"
nat-destination-address="9.0.0.2" nat-destination-port="80" src-nat-rule-name="N/A"
dst-nat-rule-name="N/A" protocol-id="6" policy-name="1" source-zone-name="trust"
destination-zone-name="untrust1" session-id-32="9625" packets-from-client="347"
bytes-from-client="18199" packets-from-server="388" bytes-from-server="131928"
elapsed-time="411" username="N/A" roles="N/A" encrypted="No" profile-name="apbr1"
rule-name="rule1" routing-instance="TC1_VPN" destination-interface-name="gr-0/0/0.4"
uplink-incoming-interface-name="" uplink-tx-bytes="0" uplink-rx-bytes="0"
multipath-rule-name="multi1"]
```

Starting from Junos OS Release 18.2R1, AppTrack session close logs include new fields to record the packet bytes transmitted and received through the uplink interfaces. The packet bytes transmitted and received through the uplink interfaces are reported by **uplink-tx-bytes**, **uplink-rx-bytes**, and **uplink-incoming-interface-name** fields.

Example:

APPTRACK_SESSION_CLOSE [user@host.1.1.1.2.137 reason="TCP FIN" source-address="4.0.0.1" source-port="40297" destination-address="5.0.0.1" destination-port="110" service-name="junos-pop3" application="POP3" nested-application="UNKNOWN" nat-source-address="4.0.0.1" nat-source-port="40297" nat-destination-address="5.0.0.1" nat-destination-port="110" src-nat-rule-name="N/A" dst-nat-rule-name="N/A" protocol-id="6" policy-name="permit-all" source-zone-name="UNTRUST" destination-zone-name="TRUST" session-id-32="81" packets-from-client="7" bytes-from-client="1959" packets-from-server="6" bytes-from-server="68643" elapsed-time="130" username="N/A" roles="N/A" encrypted="No" profile-name="”pf1” rule-name="”facebook1” routing-instance="”instance1” destination-interface-name="gr-0/0/0.0" uplink-tx-bytes="1959" uplink-rx-bytes="68643" uplink-incoming-interface-name="gr-0/0/0.0"]

A new syslog message **RT_FLOW_NEXTHOP_CHANGE** is generated whenever there is a change in the route or in the next-hop on the APBR and AppTrack enabled sessions.

Starting from Junos OS Release 18.2R1, new application tracking messages are added for AppQoE (application quality of experience).. The new Apptrack messages provide information such as active and passive metric report, switching of application traffic path as shown in the following samples:

APPQOE_BEST_PATH_SELECTED [junos@2636.1.1.1.2.129 source-address="20.1.1.1" source-port="47335" destination-address="151.101.9.67" destination-port="443" apbr-profile="apbrProf1" apbr-rule="rule1" application="HTTP" nested-application="CNN" group-name="N/A" service-name="junos-https" protocol-id="6" source-zone-name="trust" destination-zone-name="untrust" session-id-32="611" username="N/A" roles="N/A" routing-instance="ri3" destination-interface-name="gr-0/0/0.2" ip-dscp="0" sla-rule="SLA1" elapsed-time="2" bytes-from-client="675" bytes-from-server="0" packets-from-client="7" packets-from-server="0" previous-interface="gr-0/0/0.2" active-probe-params="PP1" destination-group-name="p1"]

APPQOE_PASSIVE_SLA_METRIC_REPORT [junos@2636.1.1.1.2.129 source-address="20.1.1.1" source-port="47335" destination-address="151.101.9.67" destination-port="443" apbr-profile="apbrProf1" apbr-rule="rule1" application="HTTP" nested-application="CNN" group-name="N/A" service-name="junos-https" protocol-id="6" source-zone-name="trust" destination-zone-name="untrust" session-id-32="611" username="N/A" roles="N/A" routing-instance="ri3" destination-interface-name="gr-0/0/0.2" ip-dscp="0" sla-rule="SLA1" ingress-jitter="0" egress-jitter="0" rtt-jitter="0" rtt="0" pkt-loss="0" bytes-from-client="1073" bytes-from-server="6011" packets-from-client="12" packets-from-server="13" monitoring-time="990" active-probe-params="PP1" destination-group-name="p1"]

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APPQOE_SLA_METRIC_VIOLATION [junos@2636.1.1.1.2.129 source-address="20.1.1.1" source-port="35264" destination-address="151.101.193.67" destination-port="443" apbr-profile="apbrProf1" apbr-rule="rule1" application="HTTP" nested-application="CNN" group-name="N/A" service-name="junos-https" protocol-id="6" source-zone-name="trust" destination-zone-name="untrust" session-id-32="614" username="N/A" roles="N/A" routing-instance="ri3" destination-interface-name="gr-0/0/0.2" ip-dscp="0" sla-rule="SLA1" ingress-jitter="104" egress-jitter="7" rtt-jitter="97" rtt="1142" pkt-loss="0" target-jitter-type="2" target-jitter="20000" target-rtt="500" target-pkt-loss="1" violation-reason="1" jitter-violation-count="0" pkt-loss-violation-count="0" rtt-violation-count="1" violation-duration="0" bytes-from-client="2476" bytes-from-server="163993" packets-from-client="48" packets-from-server="150" monitoring-time="948" active-probe-params="PP1" destination-group-name="p1"]

APPQOE_ACTIVE_SLA_METRIC_REPORT [junos@2636.1.1.1.2.129 source-address="6.1.1.2" source-port="36051" destination-address="6.1.1.1" destination-port="36050" application="UDP" protocol-id="17" destination-zone-name="untrust" routing-instance="ri3" destination-interface-name="gr-0/0/0.3" ip-dscp="128" ingress-jitter="26" egress-jitter="31" rtt-jitter="8" rtt="2383" pkt-loss="0" bytes-from-client="870240" bytes-from-server="425280" packets-from-client="4440" packets-from-server="4430" monitoring-time="30" active-probe-params="PP1" destination-group-name="p1"]

See Also

- Example: Configuring Application Tracking on page 109
- Disabling AppTrack on page 31
- Understanding Application Identification Techniques on page 27

Example: Configuring Application Tracking

This example shows how to configure the AppTrack tracking tool so you can analyze the bandwidth usage of your network.

- Requirements on page 109
- Overview on page 110
- Configuration on page 110
- Verification on page 112

Requirements

Before you configure AppTrack, ensure that you have downloaded the application signature package, installed it, and verified that the application identification configuration is working properly. See "Downloading and Installing the Junos OS Application Signature Package Manually" on page 44 or "Downloading and Installing the Junos OS Application Signature Package As Part of the IDP Security Package" on page 47. Use the **show services application-identification status** command to verify the status.

Overview

Application identification is enabled by default and is automatically turned on when you configure the AppTrack, AppFW, or IDP service. The Juniper Secure Analytics (JSA) retrieves the data and provides flow-based application visibility. STRM includes the support for AppTrack Reporting and includes several predefined search templates and reports.

Configuration

This example shows how to enable application tracking for the security zone named trust. The first log message is to be generated when the session starts, and update messages should be sent every 4 minutes after that. A final message should be sent at session end.

The example also shows how to add the remote syslog device configuration to receive AppTrack log messages in sd-syslog format. The source IP address that is used when exporting security logs is 192.0.2.1, and the security logs are sent to the host located at address 192.0.2.2.

NOTE: On all SRX Series devices, J-Web pages for AppSecure Services are preliminary. We recommend using CLI for configuration of AppSecure features.

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

NOTE: Changing the **session-update-interval** and the **first-update-interval** is not necessary in most situations. The commands are included in this example to demonstrate their use.

```
user@host# set security log mode stream
user@host# set security log format sd-syslog
user@host# set security log source-address 192.0.2.1
user@host# set security log stream app-track-logs host 192.0.2.2
user@host#set security zones security-zone trust application-tracking
user@host#set security application-tracking session-update-interval 4
user@host#set security application-tracking first-update
```

NOTE: On SRX5600, and SRX5800 devices, if the syslog configuration does not specify a destination port, the default destination port will be the syslog port. If you specify a destination port in the syslog configuration, then that port will be used instead.

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Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *CLI User Guide*.

To configure AppTrack:

1. Add the remote syslog device configuration to receive Apptrack messages in sd-syslog format.

```
[edit]
user@host# set security log mode stream
user@host# set security log format sd-syslog
user@host# set security log source-address 192.0.2.1
user@host# set security log stream app-track-logs host 192.0.2.2
```

2. Enable AppTrack for the security zone trust.

```
[edit]
user@host# set security zones security-zone trust application-tracking
```

3. (Optional) For this example, generate update messages every 4 minutes.

```
[edit]
user@host# set security application-tracking session-update-interval 4
```

The default interval between messages is 5 minutes. If a session starts and ends within this update interval, AppTrack generates one message at session close. However, if the session is long-lived, an update message is sent every 5 minutes. The **session-update-interval *minutes*** is configurable as shown in this step.

4. (Optional) For this example, generate the first message when the session starts.

```
[edit]
user@host# set security application-tracking first-update
```

By default, the first message is generated after the first session update interval elapses. To generate the first message at a different time than this, use the **first-update** option (generate the first message at session start) or the **first-update-interval *minutes*** option (generate the first message after the specified minutes). For example, enter the following command to generate the first message one minute after session start.

```
[edit]
user@host# set security application-tracking first-update-interval 1
```

NOTE: The **first-update** option and the **first-update-interval *minutes*** option are mutually exclusive. If you specify both, the **first-update-interval** value is ignored.

Once the first message has been generated, an update message is generated each time the session update interval is reached.

Results From configuration mode, confirm your configuration by entering the **show security** and **show security zones** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

For brevity, this **show** command output includes only the configuration that is relevant to this example. Any other configuration on the system has been replaced with ellipses (...).

```
[edit]
user@host# show security
```

```
...
application-tracking {
   first-update;
   session-update-interval 4;
}
log {
   mode stream;
   format sd-syslog;
   source-address192.0.2.2;
   stream app-track-logs {
      host {
         192.0.2.1;
      }
   }
}
...
```

```
[edit]
user@host# show security zones
...
security-zone trust {
   ...
   application-tracking;
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Use the JSA product on the remote logging device to view the AppTrack log messages.

To confirm that the configuration is working properly, you can also perform these tasks on the SRX Series device:

- Reviewing AppTrack Statistics on page 113
- Verifying AppTrack Counter Values on page 113

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- Verifying Security Flow Session Statistics on page 113
- Verifying Application System Cache Statistics on page 114
- Verifying the Status of Application Identification Counter Values on page 114

Reviewing AppTrack Statistics

Purpose Review AppTrack statistics to view characteristics of the traffic being tracked.

Action From operational mode, enter the **show services application-identification statistics applications** command.

```
user@host> show services application-identification statistics applications
```

```
Last Reset: 2012-02-14 21:23:45 UTC

Application    Sessions              Bytes    Encrypted
HTTP                  1               2291          Yes
HTTP                  1                942           No
SSL                   1               2291          Yes
unknown               1                100           No
unknown               1                100          Yes
```

NOTE: For more information on the **show services application-identification statistics applications** command, see show services application-identification statistics applications.

Verifying AppTrack Counter Values

Purpose View the AppTrack counters periodically to monitor logging activity.

Action From operational mode, enter the **show security application-tracking counters** command.

```
user@host> show security application-tracking counters
```

```
AVT counters:                  Value
 Session create messages            1
 Session close messages             1
 Session volume updates             0
 Failed messages                    0
```

Verifying Security Flow Session Statistics

Purpose Compare byte and packet counts in logged messages with the session statistics from the **show security flow session** command output.

Action From operational mode, enter the **show security flow session** command.

```
user@host> show security flow session
```

```
Flow Sessions on FPC6 PIC0:

Session ID: 120000044, Policy name: policy-in-out/4, Timeout: 1796, Valid
In: 192.0.2.1/24 --> 198.51.100.0/21;tcp, If: ge-0/0/0.0, Pkts: 22, Bytes: 1032
Out: 198.51.100.0/24 --> 192.0.2.1//39075;tcp, If: ge-0/0/1.0, Pkts: 24, Bytes:
1442

Valid sessions: 1
Pending sessions: 0
Invalidated sessions: 0
Sessions in other states: 0
Total sessions: 1
```

Byte and packet totals in the session statistics should approximate the counts logged by AppTrack but might not be exactly the same. AppTrack counts only incoming bytes and packets. System-generated packets are not included in the total, and dropped packets are not deducted.

Verifying Application System Cache Statistics

Purpose Compare cache statistics such as IP address, port, protocol, and service for an application from the **show services application-identification application-system-cache** command output.

Action From operational mode, enter the **show services application-identification application-system-cache** command.

Verifying the Status of Application Identification Counter Values

Purpose Compare session statistics for application identification counter values from the **show services application-identification counter** command output.

Action From operational mode, enter the **show services application-identification counter** command.

See Also

- *Configuring Off-Box Binary Security Log Files*
- *Understanding On-Box Logging and Reporting*
- *log (Security Policies)*

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Example: Configuring Application Tracking When SSL Proxy Is Enabled

This example describes how AppTrack supports AppID functionality when SSL proxy is enabled.

- Requirements on page 115
- Overview on page 115
- Configuration on page 115

Requirements

Before you begin:

- Create zones. See *Example: Creating Security Zones*.
- Create an SSL proxy profile that enables SSL proxy by means of a policy. See "Configuring SSL Forward Proxy" on page 234.

Overview

You can configure AppTrack either in the to or from zones. This example shows how to configure AppTrack in a to zone in a policy rule when SSL proxy is enabled.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set security zones security-zone Z_1 application-tracking
set security policies from-zone Z_1 to-zone Z_2 policy policy1 match source-address any
set security policies from-zone Z_1 to-zone Z_2 policy policy1 match destination-address
   any
set security policies from-zone Z_1 to-zone Z_2 policy policy1 then permit
   application-services ssl-proxy profile-name ssl-profile-1
set security policies from-zone Z_1 to-zone Z_2 policy policy1 then permit
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

In this example, you configure application tracking and permit application services in an SSL proxy profile configuration.

1. Configure application tracking in a to-zone (you can also configure using a from-zone).

```
[edit security policies]
user@host# set security zones security-zone Z_1 application-tracking
```

2. Configure SSL proxy profile.

```
[edit security policies from-zone Z_1 to-zone Z_2 policy policy1]
set match source-address any
set match destination-address any
set match application junos-https
set then permit application-services ssl-proxy profile-name ssl-profile-1
set then permit
```

Results From configuration mode, confirm your configuration by entering the **show security policies** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
from-zone Z_1 to-zone Z_2 {
   policy policy1 {
      match {
         source-address any;
         destination-address any;
      }
      then {
         permit {
            application-services {
               ssl-proxy {
                  profile-name ssl-profile-1;
               }
            }
         }
      }
   }
}
```

NOTE: Verify that the configuration is working properly. Verification in AppTrack works similarly to verification in AppFW. See the verification section of "Example: Configuring Application Firewall When SSL Proxy Is Enabled" on page 100.

See Also

- SSL Proxy Overview on page 221
- Application Security Services with SSL Proxy Overview on page 271

Disabling Application Tracking

Application tracking is enabled by default. You can disable application tracking without deleting the zone configuration.

To disable application tracking:

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```
user@host# set security application-tracking disable
```

If application tracking has been previously disabled and you want to reenable it, delete the configuration statement that specifies disabling of application tracking:

```
user@host# delete security application-tracking disable
```

If you are finished configuring the device, commit the configuration.

To verify the configuration, enter the **show security application-tracking** command.

Release History Table

Release	Description
18.2R1	Starting from Junos OS Release 18.2R1, AppTrack session close logs include new fields to record the packet bytes transmitted and received through the uplink interfaces.
18.2R1	Starting from Junos OS Release 18.2R1, new application tracking messages are added for AppQoE (application quality of experience).
17.4R1	Starting from Junos OS Release 17.4R1, AppTrack session create, session close, and volume update logs include the new fields **category** and **subcategory**
15.1X49-D100	Starting from Junos OS Release 15.1X49-D100, AppTrack session create, session close, and volume update logs include a new field called *destination interface*.
15.1X49-D100	Starting from Junos OS Release 15.1X49-D100, a new AppTrack log for route update is added to include APBR profile, rule, and routing instance details.

Related Documentation

- Application Identification on page 27
- Application Firewall on page 85
- Application QoS on page 117
- Advanced Policy-Based Routing on page 139
- SSL Proxy on page 221

Application QoS

AppQoS enable you to identify and control access to specific applications and provides the granularity of the stateful firewall rule base to match and enforce quality of service (QoS) at the application layer. For more information, see the following topics:

- Understanding Application Quality of Service (AppQoS) on page 118
- Example: Configuring Application Quality of Service on page 124

- Application Quality of Service Support for Unified Policies on page 130
- Example: Configuring Application Quality of Service with Unified Policy on page 136

Understanding Application Quality of Service (AppQoS)

The application quality of service (AppQoS) feature expands the capability of Junos OS class of service (CoS) to include marking DSCP values based on Layer-7 application types, honoring application-based traffic through loss priority settings, and controlling transfer rates on egress PICs based on Layer-7 application types.

There are four ways to mark DSCP values on SRX Series devices:

- IDP attack action-based DSCP rewriters
- Layer 7 application-based DSCP rewriters
- ALG-based DSCP rewriters
- Firewall filter-based DSCP rewriters

IDP remarking is conducted at the ingress port based on IDP rules. Application remarking is conducted at the egress port based on application rules. Interface-based remarking also occurs at the egress port based on firewall filter rules. (See the *Class of Service Feature Guide for Security Devices* for a detailed description of Junos OS CoS features.)

The remarking decisions of these three rewriters can be different. If a packet triggers all three, the method that takes precedence is based on how deep into the packet content the match is conducted. IDP remarking has precedence over application remarking which has precedence over interface-based remarking.

If a packet triggers both AppQoS and ALG-based DSCP rewriters, then AppQoS takes precedence over ALG-based DSCP rewriters.

The AppQoS DSCP rewriter conveys a packet's quality of service through both the forwarding class and a loss priority. The AppQoS rate-limiting parameters control the transmission speed and volume for its associated queues.

- Benefit of Application QoS on page 118
- Unique Forwarding Classes and Queue Assignments on page 119
- Application-Aware DSCP Code-Point and Loss Priority Settings on page 119
- Rate Limiters and Profiles on page 121
- Rate-Limiter Assignment on page 122
- Rate-Limiter Action on page 124
- AppQoS Security Policy Configuration on page 124

Benefit of Application QoS

AppQoS provides the ability to prioritize and meter the application traffic to provide better service to business-critical or high-priority application traffic.

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Unique Forwarding Classes and Queue Assignments

The forwarding class provides three functions:

- Groups packets with like characteristics
- Assigns output queues
- Resolves conflicts with existing Junos OS firewall filter-based rewriters

Unique forwarding class names protect AppQoS remarking from being overwritten by interface-based rewrite rules. A firewall filter-based rewriter remarks a packet's DSCP value if the packet's forwarding class matches a class defined specifically for this rewriter. If the packet's forwarding class does not match any of the firewall filter-based rewriter's classes, the DSCP value is not remarked. To protect AppQoS values from being overwritten, therefore, use forwarding class names that are unknown to the firewall filter-based rewriter.

Each forwarding class is assigned to an egress queue that provides the appropriate degree of enhanced or standard processing. Many forwarding classes can be assigned to a single queue. Therefore, any queues defined for the device can be used by IDP, AppQoS, and firewall filter-based rewriters. It is the forwarding class name, not the queue, that distinguishes the transmission priority. (See the *Class of Service Feature Guide for Security Devices* for information about configuring queues and schedulers.)

For SRX1400, SRX3400, SRX3600, SRX5600, and SRX5800 devices, the AppQoS forwarding class names and queue assignments are defined with the **class-of-service** CLI configuration command:

```
[edit class-of-service]
user@host# forwarding-classes class forwarding-class-name queue-num queue-number
```

For SRX100, SRX210, SRX220, SRX240, SRX550, SRX300, SRX320, SRX340, SRX345,SRX550M, SRX650, SRX1500, SRX4100, SRX4200, and SRX4600 devices and vSRX instances, the AppQoS forwarding class names and queue assignments are defined with the **class-of-service** CLI configuration command:

```
[edit class-of-service]
user@host# forwarding-classes queue queue-number forwarding-class-name
```

Application-Aware DSCP Code-Point and Loss Priority Settings

For AppQoS, traffic is grouped based on rules that associate a defined forwarding class with selected applications. The match criteria for the rule includes one or more applications. When traffic from a matching application encounters the rule, the rule action sets the forwarding class, and remarks the DSCP value and loss priority to values appropriate for the application.

A Differentiated Services (DiffServ) code point (DSCP) value is specified in the rule either by a 6-bit bitmap value or by a user-defined or default alias. Table 7 on page 120 provides a list of Junos OS default DSCP alias names and bitmap values.

Table 7: Standard CoS Aliases and Bit Values

Alias	Bit Value
ef	101110
af11	001010
af12	001100
af13	001110
af21	010010
af22	010100
af23	010110
af31	011010
af32	011100
af33	011110
af41	100010
af42	100100
af43	100110
be	000000
cs1	001000
cs2	010000
cs3	011000
cs4	100000
cs5	101000
nc1/cs6	110000
nc2/cs7	111000

See Default CoS Values and Aliases for more details.

The queue's scheduler uses the loss priority to control packet discard during periods of congestion by associating drop profiles with particular loss priority values. (See the *Class*

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of Service Feature Guide for Security Devices for information about configuring queues and schedulers.)

The rule applies a loss priority to the traffic groups. A high loss priority means a high probability that the packet could be dropped during a period of congestion. Four levels of loss priority are available:

- **high**
- **medium-high**
- **medium-low**
- **low**

The rule set is defined in the **class-of-service application-traffic-control** configuration command:

```
[edit class-of-service]
user@host# application-traffic-control rule-sets ruleset-name rule rule-name1 match
   application application-name application-name ...
user@host# application-traffic-control rule-sets ruleset-name rule rule-name1 match
   application-group application-group-name application-group-name ...
user@host# application-traffic-control rule-sets ruleset-name rule rule-name1 then
   forwarding-class fc-name
user@host# application-traffic-control rule-sets ruleset-name rule rule-name1 then
   dscp-code-point bitmap
user@host# application-traffic-control rule-sets ruleset-name rule rule-name1 then
   loss-priority loss-pri-value
```

Rate Limiters and Profiles

When congestion occurs, AppQoS implements rate limiting on all egress PICs on the device. If packets exceed the assigned limitations, they are dropped. *Rate limiters* maintain a consistent level of throughput and packet loss sensitivity for different classes of traffic. All egress PICs employ the same rate-limiting scheme.

The total bandwidth of a PIC is about 10 Gbps. Rate-limiter hardware for the PIC can provision up to 2 Gbps. Therefore, the upper bandwidth limit for rate limiting is 2^{31} bps.

A rate-limiter profile defines the limitations. It is a unique combination of **bandwidth-limit** and **burst-size-limit** specifications. The **bandwidth-limit** defines the maximum number of kilobits per second that can traverse the port. The **burst-size-limit** defines the maximum number of bytes that can traverse the port in a single burst. The **burst-size-limit** reduces starvation of lower priority traffic by ensuring a finite size for each burst.

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AppQoS allows up to 16 profiles and up to 1000 rate limiters per device. Multiple rate limiters can use the same profile. In the following example, five rate limiters are defined using two profiles:

Rate Limiter Name	Profile	
	bandwidth-limit	burst-size-limit
limiter-1	200	26000
limiter-2	200	26000
limiter-3	200	26000
limiter-4	400	52000
limiter-5	400	52000

Rate limiters are defined with the **class-of-service application-traffic-control** configuration command.

```
[edit class-of-service]
user@host# application-traffic-control rate-limiters rate-limiter-name bandwidth-limit
   value-in-Kbps burst-rate-limit value-in-bytes
```

Rate-Limiter Assignment

Rate limiters are applied in rules based on the application of the traffic. Two rate limiters are applied for each session: **client-to-server** and **server-to-client**. This usage allows traffic in each direction to be provisioned separately.

Different AppQoS rules within the same rule set can share a rate limiter. In this case, the applications of those rules share the same bandwidth. There are no limitations on the number of rules in one rule set that can assign the same rate limiter.

The following examples show how the rate limiters defined in the preceding section could be assigned. For instance, a rule set could reuse a rate limiter in several rules and in one or both flow directions:

- rule-set-1
  - rule-1A
    - client-to-server limiter-1
    - server-to-client limiter-1
  - rule-1B
    - client-to-server limiter-1

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    - server-to-client limiter-1

If the same profiles are needed in several rule sets, a sufficient number of rate limiters needs to be defined specifying the same **bandwidth-limit** and **burst-size-limit**. The two rule sets in the following example implement the same profiles by assigning different, but comparable, rate limiters.

- rule-set-2
  - rule-2A
    - client-to-server limiter-2
    - server-to-client limiter-2
  - rule-2B
    - client-to-server limiter-2
    - server-to-client limiter-4
- rule-set-3
  - rule-3A
    - client-to-server limiter-3
    - server-to-client limiter-3
  - rule-3B
    - client-to-server limiter-3
    - server-to-client limiter-5

A rate limiter is applied using the **class-of-service application-traffic-control rule-sets** command in the same way that a forwarding class, DSCP value, and loss priority are set.

```
[edit class-of-service]
user@host# application-traffic-control rule-sets rule-set-name rule rule-name1 then
   rate-limit client-to-server rate-limiter1 server-to-client rate-limiter2
```

If AppQoS and firewall filter-based rate limiting are both implemented on the egress PIC, both are taken into consideration. AppQoS rate limiting is considered first. Firewall filter-based rate limiting occurs after that.

NOTE: If packets are dropped from a PIC, the SRX Series device does not send notifications to the client or the server. The upper-level applications on the client and the server devices are responsible for retransmission and error handling.

Rate-Limiter Action

Based on the type of SRX Series device, AppQoS rules can be configured with different rate-limiter actions:

- Discard
  - When this option is selected, the out-of-profile packets are just dropped.
  - This is the default action type and need not be configured.
  - This option is supported on all SRX Series devices.
- Loss-priority-high
  - When this option is selected , it elevates the loss priority to maximum. In other words, it is a delayed drop; that is, the discard decision is taken at the egress output queue level. If there is no congestion, it allows the traffic even with maximum loss priority. But if congestion occurs, it drop these maximum loss priority packets first.
  - This option must be configured within the AppQoS rule (to override the default action) using the following command:

    ```
    [edit]
    user@host# set class-of-service application-traffic-control rule-sets rset-01 rule r1
      then rate-limit loss-priority-high
    ```

  - This option is supported only on for SRX300, SRX320, SRX340, SRX345 devices.

AppQoS Security Policy Configuration

The AppQoS rule set can be implemented in an existing policy or a specific application policy.

```
[edit]
user@host# security policies from-zone zone-name to-zone zone-name
[edit security policies from-zone zone-name to-zone zone-name]
user@host# policy policy-name match source-address IP-address
user@host# policy policy-name match destination-address IP-address
user@host# policy policy-name match application application-name application-name
user@host# policy policy-name then permit application-services application-traffic-control
  rule-set app-rule-set-name
```

See Also

- *Understanding Class of Service*

Example: Configuring Application Quality of Service

This example shows how to enable AppQoS prioritization and rate limiting within a policy.

- Requirements on page 125
- Overview on page 125

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- Configuration on page 125
- Verification on page 128

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, AppQoS is implemented so that FTP applications are restricted to a level below the specified throughput while other applications are transmitted at a more conventional speed and loss priority level.

NOTE: **On all SRX Series devices, J-Web pages for AppSecure Services are preliminary. We recommend using CLI for configuration of AppSecure features.**

Configuration

Step-by-Step Procedure

To configure an AppQoS implementation:

1. Define one or more forwarding classes dedicated to AppQoS marking. In this example, a single forwarding class, my-app-fc, is defined and assigned to queue 0.

   For SRX1400, SRX3400, SRX3600, SRX5600, and SRX5800 devices, use the following command:

   ```
   [edit]
   user@host# set class-of-service forwarding-classes class my-app-fc queue-num
     0
   ```

   For SRX100, SRX210, SRX220, SRX240, SRX550, SRX300, SRX320, SRX340, SRX345, SRX550M, SRX650, and SRX1500 devices, use the following command:

   ```
   [edit]
   user@host# set class-of-service forwarding-classes queue-num 0 my-app-fc
   ```

2. Define rate limiters. In this example, two rate limiters are defined.

   NOTE: **For SRX5400, SRX5600, and SRX5800 devices, you can define up to 1000 rate limiters for a device, but only 16 profiles (unique bandwidth-limit and burst-size-limit combinations).**

   - test-r1 with a bandwidth of 100 Kbps and a burst limit of 13,000 bytes
   - test-r2 with a bandwidth of 200 Kbps and a burst limit of 26,000 bytes

```
[edit]
user@host# set class-of-service application-traffic-control rate-limiters test-rl
   bandwidth-limit 100
user@host# set class-of-service application-traffic-control rate-limiters test-rl
   burst-size-limit 13000
user@host# set class-of-service application-traffic-control rate-limiters test-r2
   bandwidth-limit 200
user@host# set class-of-service application-traffic-control rate-limiters test-r2
   burst-size-limit 26000
```

3. Define AppQos rules and application match criteria. For this example, rule 0 in rule set ftp-test1 is applied to junos:FTP packets.

```
[edit]
user@host# set class-of-service application-traffic-control rule-sets ftp-test1 rule
   0 match application junos:FTP
```

4. Define the action for rule 0 when it encounters a junos:FTP packet. In this example, when a match is made, the packet is marked with the forwarding class my-app-fc, the DSCP value of af22, and a loss priority of low.

```
[edit]
user@host# set class-of-service application-traffic-control rule-sets ftp-test1 rule
   0 then forwarding-class my-app-fc
user@host# set class-of-service application-traffic-control rule-sets ftp-test1 rule
   0 then dscp-code-point af22
user@host# set class-of-service application-traffic-control rule-sets ftp-test1 rule
   0 then loss-priority low
```

5. Assign rate limiters for rule 0 to traffic in each direction. In this case, the rate limiter test-r1 is set in both directions.

NOTE: Rate limiter test-r1 can be assigned to one or both traffic directions in rule 0. It could also be assigned in other rules within rule set ftp-test1. However, once test-r1 is assigned to rule set ftp-test1, it cannot be assigned in any other rule set.

```
[edit]
user@host# set class-of-service application-traffic-control rule-sets ftp-test1 rule
   0 then rate-limit client-to-server test-r1
user@host# set class-of-service application-traffic-control rule-sets ftp-test1 rule
   0 then rate-limit server-to-client test-r1
```

6. Log the AppQoS event whenever this action is triggered:

```
[edit]
```


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```
user@host# set class-of-service application-traffic-control rule-sets ftp-test1 rule
   0 then log
```

7. Define other rules to handle application packets that did not match the previous rule. In this example, a second and final rule applies to all remaining applications.

```
[edit]
user@host# set class-of-service application-traffic-control rule-sets ftp-test1 rule
   1 match application-any
```

8. Assign rate limiters for the second rule. In this example, any traffic that is not from FTP is assigned rate limiter test-r2 in both directions.

```
[edit]
user@host# set class-of-service application-traffic-control rule-sets ftp-test1 rule
   1 then rate-limit client-to-server test-r2
user@host# set class-of-service application-traffic-control rule-sets ftp-test1 rule
   1 then rate-limit server-to-client test-r2
user@host# set class-of-service application-traffic-control rule-sets ftp-test1 rule
   1 then log
```

9. Add the AppQoS implementation to a policy. In this example, policy p1 applies the rule set ftp-test1 to all traffic from the trust zone to the untrust zone.

```
[edit]
user@host# set security policies from-zone trust to-zone untrust policy p1
[edit security policies from-zone trust to-zone untrust policy p1]
user@host# set match source-address any
user@host# set match destination-address any
user@host# set match application any
user@host# set then permit application-services application-traffic-control rule-set
   ftp-test1
```

Results From configuration mode, confirm your policy configuration by entering the **show security policies** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

For brevity, this **show** command output includes only the configuration that is relevant to this example. Any other configuration on the system has been replaced with ellipses (...).

```
...
policy p1 {
   match {
      source-address any;
      destination-address any;
      application any;
   }
```

```
    then {
      permit {
        application-services {
          application-traffic-control {
            rule-set ftp-test1
          }
        }
      }
    }
  }
  ...
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying Flow Session Configuration on page 128
- Verifying Session Statistics on page 129
- Verifying Rate-Limiter Statistics on page 129
- Verifying Rule Statistics on page 130

Verifying Flow Session Configuration

Purpose Verify that AppQoS is enabled.

Action From operational mode, enter the **show security flow session application-traffic-control extensive** command.

```
user@host> show security flow session application-traffic-control extensive
  Session ID: 3729, Status: Normal, State: Active
  Flag: 0x40
  Policy name: p1
  Source NAT pool: Null
  Dynamic application: junos:FTP
  Application traffic control rule-set: ftp-test1, Rule: rule0
  Maximum timeout: 300, Current timeout: 276
  Session State: Valid
  Start time: 18292, Duration: 603536
     In: 192.0.2.1/1 --> 203.0.113.0/1;pim,
      Interface: reth1.0,
      Session token: 0x1c0, Flag: 0x0x21
      Route: 0x0, Gateway: 192.0.2.4, Tunnel: 0
      Port sequence: 0, FIN sequence: 0,
      FIN state: 0,
      Pkts: 21043, Bytes: 1136322
     Out: 203.0.113.0/1 --> 192.0.2.0/1;pim,
      Interface: .local..0,
      Session token: 0x80, Flag: 0x0x30
      Route: 0xfffd0000, Gateway: 192.0.2.0, Tunnel: 0
      Port sequence: 0, FIN sequence: 0,
```

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```
     FIN state: 0,
     Pkts: 0, Bytes: 0
```

Meaning The entry for application traffic control identifies the rule set and rule of the current session.

Verifying Session Statistics

Purpose Verify that AppQoS session statistics are being accumulated at each egress node.

Action From operational mode, enter the **show class-of-service application-traffic-control counter** command.

```
user@host> show class-of-service application-traffic-control counter
pic: 2/1
  Counter type                                            Value
  Sessions processed                                      300
  Sessions marked                                         200
  Sessions honored                                        0
  Sessions rate limited                                   100
  Client-to-server flows rate limited                     100
  Server-to-client flows rate limited                     100

pic: 2/0
  Counter type                                            Value
  Sessions processed                                      400
  Sessions marked                                         300
  Sessions honored                                        0
  Sessions rate limited                                   200
  Client-to-server flows rate limited                     200
  Server-to-client flows rate limited                     200
```

Meaning The AppQoS statistics are maintained only if application-traffic-control service is enabled. The number of sessions processed, marked, and honored show that sessions are being directed based on configured AppQoS features. The rate-limiting statistics count the number of directional session flows that have been rate limited.

Verifying Rate-Limiter Statistics

Purpose Verify that bandwidth is being limited as expected when the FTP application is encountered.

Action From operational mode, enter the **show class-of-service application-traffic-control statistics rate-limiter** command.

```
user@host> show class-of-service application-traffic-control statistics
rate-limiter
pic: 2/1
  Ruleset    Application  Client-to-server Rate(kbps)  Server-to-client Rate(kbps)

  ftp-test1     HTTP      test-r2           200       test-r2          200
  ftp-test1     HTTP      test-r2           200       test-r2          200
  ftp-test1     FTP       test-r1           100       test-r1          100
```

Meaning Real-time application bandwidth-limit information for each PIC is displayed by rule set. This command provides an indication of the applications being rate limited and the profile being applied.

Verifying Rule Statistics

Purpose Verify that the rule matches the rule statistics.

Action From operational mode, enter the **show class-of-service application-traffic-control statistics rule** command.

```
user@host>show class-of-service application-traffic-control statistics rule
pic: 2/1
  Ruleset          Rule           Hits
  ftp-test1        0              100
  ftp-test1        1              200
  ...

pic: 2/0
  Ruleset          Rule           Hits
  ftp-test1        0              100
  ftp-test1        1              200
```

Meaning This command provides information on the number of (session) hits for a rule under each rule set.

See Also

- *CoS Device Configuration Overview*

Application Quality of Service Support for Unified Policies

Starting in Junos OS Release 18.2R1, SRX Series devices and vSRX instances support unified policies, allowing granular control and enforcement of dynamic Layer 7 applications within the traditional security policy.

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Unified policies are the security policies that enable you to use dynamic applications as part of the existing 5-tuple or 6-tuple (5-tuple with a user firewall) match conditions to detect application changes over time.

Application quality of service (AppQoS) is supported when the SRX Series device is configured with unified policies. You can configure a default AppQoS rule set to manage unified policy conflicts if multiple security policies match the traffic.

AppQoS rule sets are included in the unified policy to implement application-aware quality-of-service control. You can configure a rule set with rules under the **application-traffic-control** option, and attach the AppQoS rule set to a unified security policy as an application service. If the traffic matches the specified dynamic application and the policy action is permit, the application-aware quality of service is applied.

Note the following AppQoS functionality in unified policies:

- Upgrading from traditional security policy to a unified policy—In a unified policy, when you configure the **dynamic-application** option as **none**, the AppQoS rule set is applied during the security policy match and the AppQoS looks for the corresponding rule for the identified traffic. This is the same behavior for AppQoS functionality in Junos OS releases prior to Release 18.2R1.
- AppQoS rule with a unified policy—In the application traffic control configuration, the AppQoS rule set is configured with the match condition as **application-any** and in the unified policy, a specific dynamic application is used as the match condition, then, the AppQoS functionality works according to the rule in the unified policy.

Understanding Default Application Quality of Service Rule Set for Unified Policies

You can configure an AppQoS default rule set to manage security policy conflicts.

The initial policy lookup phase occurs prior to identifying a dynamic application. If there are multiple policies present in the potential policy list that contain different AppQoS rule sets, then the SRX Series device applies the default AppQoS rule set until a more explicit match has occurred.

You can set an AppQoS as a default AppQoS rule set under the **edit security ngfw** hierarchy level. The default AppQoS rule set is leveraged from one of the existing AppQoS rule sets, which are configured under the **[edit class-of-service application-traffic-control]** hierarchy level.

Table 8 on page 132 summarizes the usage of the default AppQoS rule set under different scenarios in a unified policy.

Table 8: AppQoS Rule Set Usage in Unified Policies

Application Identification Status	AppQoS Rule Set Usage	Action
No security policy conflict.	The AppQoS rule set under the [**edit class-of-service application-traffic-control**] hierarchy is applied when the traffic matches the security policy.	AppQoS is applied as in the AppQoS rule set.
Security policy conflict and conflicting polices have distinct AppQoS rule sets.	The default AppQoS rule set is not configured or is not found.	Session is ignored because the default AppQoS profile is not configured. As a result, even if the final matched policy in the policy conflict scenario has an AppQoS rule set, this rule set is not applied. We recommend configuring a default AppQoS rule set to manage security policy conflicts.
	The default AppQoS rule set is configured.	AppQoS is applied as in the default AppQoS rule set.
Final application is identified	The matching security policy has an AppQoS rule set, which is same as the default AppQoS rule set.	AppQoS is applied as in the default AppQoS rule set.
	The matching security policy does not have an AppQoS rule set.	Default AppQoS rule set is not applied and AppQoS is not applied for the session.
	The Matching security policy has an AppQoS rule set different from the default AppQoS rule set, which is already applied.	Default AppQoS rule set remains as the default AppQoS rule set.

When a default AppQoS rule set is applied on the traffic and the final security policy has a different AppQoS rule set, in such cases switching from the default AppQoS rule set to the AppQoS rule set in the final security policy is not supported.

Default Application Quality of Service Rule Set In Different Scenarios

The following links are to examples that discuss the default AppQoS rule sets in different scenarios:

- No Policy Conflict—All Policies Have the Same AppQoS Rule Set on page 133
- No Policy Conflict—All Policies Have the Same AppQoS Rule Set and the Final Policy Has No AppQoS Rule Set on page 133
- Policy Conflict—No AppQoS Rule Set is Configured for the Final Policy on page 134
- Policy Conflict—Default AppQoS Rule Set and a Different AppQoS Rule Set for the Final Policy on page 134

Table 9 on page 133 shows different AppQoS rule sets that are configured for unified policies with dynamic applications as the match condition.

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Table 9: Different AppQoS Rule Sets in Unified Policies

Security Policy	Source Zone	Source IP Address	Destination Zone	Destination IP Address	Port Number	Protocol	Dynamic Application	Service	AppQoS Rule Set
Policy-P1	S1	50.1.1.1	D1	Any	Any	Any	Facebook	AppQoS	AppQoS-1
Policy-P2	S1	50.1.1.1	D1	Any	Any	Any	Google	AppQoS	AppQoS-2
Policy-P3	S1	50.1.1.1	D1	Any	Any	Any	YouTube	AppQoS	AppQoS-3

In this example, any AppQoS rule sets (AppQoS-1, AppQoS-2, AppQoS-3) can be configured as a default AppQoS rule set under the **[security ngfw]** hierarchy level. It is not necessary for a default rule set to be part of a security policy configuration. Any AppQoS rule set under the **[edit class-of-service application-traffic-control]** hierarchy level can be assigned as the default AppQoS rule set.

No Policy Conflict—All Policies Have the Same AppQoS Rule Set

All matching policies have the same AppQoS rule set as shown in Table 10 on page 133.

Table 10: All Matching Policies Have Same AppQoS Rule Sets

Security Policy	Source Zone	Source IP Address	Destination Zone	Destination IP Address	Port Number	Protocol	Dynamic Application	Service	AppQoS Rule Set
Policy-P1	S1	Any	D1	Any	Any	Any	Facebook	AppQoS	AppQoS-1
Policy-P2	S1	Any	D1	Any	Any	Any	Google	AppQoS	AppQoS-1

In this scenario, the policies Policy-P1 and Policy-P2 have the same AppQoS rule set; that is, AppQoS-1. The rule set AppQoS-1 is applied. Policy-P3 is not configured in this scenario.

If you have configured the rule set AppQoS-2 as the default rule set, it is not applied. That's because there is no conflict in the AppQoS rule sets in the conflicted policies (Policy-P1 and Policy-P2).

No Policy Conflict—All Policies Have the Same AppQoS Rule Set and the Final Policy Has No AppQoS Rule Set

All matching policies have the same AppQoS rule set as shown in Table 11 on page 133 and the final policy has no AppQoS rule set.

Table 11: All Matching Policies Have Same AppQoS Rule Sets and the Final Policy Has No AppQoS Rule Set

Security Policy	Source Zone	Source IP Address	Destination Zone	Destination IP Address	Port Number	Protocol	Dynamic Application	Service	AppQoS Rule Set
Policy-P1	S1	Any	D1	Any	Any	Any	Facebook	AppQoS	AppQoS-1
Policy-P2	S1	Any	D1	Any	Any	Any	Google	AppQoS	AppQoS-1

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Table 11: All Matching Policies Have Same AppQoS Rule Sets and the Final Policy Has No AppQoS Rule Set (continued)

Security Policy	Source Zone	Source IP Address	Destination Zone	Destination IP Address	Port Number	Protocol	Dynamic Application	Service	AppQoS Rule Set
Policy-P3	S1	50.1.1.1	D1	Any	Any	Any	YouTube	Other	None

In this scenario, both Policy-P1 and Policy-P2 have the same AppQoS rule set, that is, AppQoS-1. In this case, the rule set AppQoS-1 is applied.

When the final policy Policy-P3 is matched, AppQoS ignores the session, because the AppQoS rule set is not configured for Policy-P3.

If the final security policy does not have any AppQoS rule set, then AppQoS is not applied on the traffic. All AppQoS settings that are applied in the prematch stage are reverted to the original values.

Policy Conflict—No AppQoS Rule Set is Configured for the Final Policy

The default AppQoS rule set (in this scenario AppQoS-1) is applied during the potential policy match as shown in Table 12 on page 134. The final policy Policy-P3 has no AppQoS rule set.

Table 12: Matching Policies Have Different AppQoS Rule Sets and the Final Policy Has No AppQoS Rule Set

Security Policy	Source Zone	Source IP Address	Destination Zone	Destination IP Address	Port Number	Protocol	Dynamic Application	Service	AppQoS Rule Set
Policy-P1	S1	50.1.1.1	D1	Any	Any	Any	Facebook	AppQoS	AppQoS-1
Policy-P2	S1	50.1.1.1	D1	Any	Any	Any	Google	AppQoS	AppQoS-2
Policy-P3	S1	50.1.1.1	D1	Any	Any	Any	YouTube	Other	NA

AppQoS ignores the session if the final matching policy Policy-P3 is applied.

If the final security policy does not have any AppQoS rule set, then AppQoS is not applied on the traffic. In this case, all AppQoS settings that are applied in the prematch stage are reverted to the original values.

Policy Conflict—Default AppQoS Rule Set and a Different AppQoS Rule Set for the Final Policy

The rule set AppQoS-1 is configured as a default rule set and is applied when the final application is not yet identified. The final policy Policy-P3 has a different AppQoS rule set (AppQoS-3) as shown in Table 13 on page 135.

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Table 13: Different AppQoS Rule Set for the Final Policy

Security Policy	Source Zone	Source IP Address	Destination Zone	Destination IP Address	Port Number	Protocol	Dynamic Application	Service	AppQoS Rule Set
Policy-P1	S1	50.1.1.1	D1	Any	Any	Any	Facebook	AppQoS	AppQoS-1
Policy-P2	S1	50.1.1.1	D1	Any	Any	Any	Google	AppQoS	AppQoS-2
Policy-P3	S1	50.1.1.1	D1	Any	Any	Any	YouTube	AppQoS	AppQoS-3

When the final application is identified, the policy Policy-P3 is matched and applied. In this case, the rule set AppQoS-3 is not applied. Instead the rule set AppQoS-1 is applied as the default rule set and remains as the default rule set.

Limitation of AppQoS with Unified Policies

When a security policy is applied to the matching traffic, the AppQoS rule set is applied to the permitted traffic. If the security policy and the applied AppQoS rule set have different dynamic applications, then a conflict might occur as shown in the following example:

```
user@host# set class-of-service application-traffic-control rule-sets AQ2 rule 1 match
  application junos:GOOGLE
user@host# set class-of-service application-traffic-control rule-sets AQ2 rule 1 then
  forwarding-class network-control
user@host# set class-of-service application-traffic-control rule-sets AQ2 rule 1 then
  dscp-code-point 110001
user@host# set class-of-service application-traffic-control rule-sets AQ2 rule 1 then
  loss-priority high
```

```
user@host# set security policies from-zone trust to-zone untrust policy 1 match
  source-address any
user@host# set security policies from-zone trust to-zone untrust policy 1 match
  destination-address any
user@host# set security policies from-zone trust to-zone untrust policy 1 match
  application any
user@host# set security policies from-zone trust to-zone untrust policy 1 match
  dynamic-application junos:FTP
user@host# set security policies from-zone trust to-zone untrust policy 1 then permit
  application-services application-traffic-control rule-set AQ2
```

In this example, the application traffic control rule is configured for junos:GOOGLE and the security policy match condition for the dynamic application is junos: FTP. In such cases, conflicts might occur when the final policy is applied.

See Also

- Application Identification Support for Unified Policies on page 78

Example: Configuring Application Quality of Service with Unified Policy

This example shows how to enable application quality of service (AppQoS) within a unified policy to provide prioritization and rate limiting for the traffic.

- Requirements on page 136
- Overview on page 136
- Configuration on page 136
- Verification on page 138

Requirements

This example uses the following hardware and software components:

- SRX Series device running Junos OS Release 18.2R1 and later. This configuration example is tested for Junos OS Release 18.2R1.

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you configure an AppQoS rule set and invoke AppQoS as an application service in the security policy for the Facebook application.

You define a default AppQoS rule set under the [**edit security ngfw**] hierarchy level to manage security policy conflicts, if any.

Configuration

Step-by-Step Procedure

To configure AppQoS with a unified policy:

1. Define an AppQoS rule set.

```
[edit]
user@host# set class-of-service application-traffic-control rule-sets RS1 rule 1
   match application junos:FACEBOOK-APP
user@host# set class-of-service application-traffic-control rule-sets RS1 rule 1 then
   forwarding-class fc-appqos loss-priority medium-low dscp-code-point 101110 log
user@host# set class-of-service application-traffic-control rule-sets RS1 rule 1 then
   rate-limit client-to-server Ratelimit1
user@host# set class-of-service application-traffic-control rate-limiters Ratelimit1
   bandwidth-limit 1000
```

2. Configure a default AppQoS rule set. Select the rule set **RS1** that is created under the application traffic control as the default AppQoS rule set.

```
[edit]
user@host# set security ngfw default-profile application-traffic-control rule-set
   RS1
```


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3. Associate the class-of-service rule set to the unified policy.

```
[edit]
user@host# set security policies from-zone untrust to-zone trust policy from_internet
   match source-address any
user@host# set security policies from-zone untrust to-zone trust policy from_internet
   match destination-address any
user@host# set security policies from-zone untrust to-zone trust policy from_internet
   match application any
user@host# set security policies from-zone untrust to-zone trust policy from_internet
   match dynamic-application junos:FACEBOOK-APP
user@host# set security policies from-zone untrust to-zone trust policy from_internet
   then permit application-services application-traffic-control rule-set RS1
```

Results From configuration mode, confirm your policy configuration by entering the **show security policies** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

For brevity, this **show** command output includes only the configuration that is relevant to this example. Any other configuration on the system has been replaced with ellipses (...).

```
...
policies {
   from-zone trust to-zone untrust {
      policy permit-all {
         match {
            source-address any;
            destination-address any;
            application any;
            dynamic-application junos:FACEBOOK-APP;
         }
         then {
            permit {
               application-services {
                  application-traffic-control {
                     rule-set RS1;
                  }
               }
            }
         }
      }
   }
}
...
```

```
ngfw {
   default-profile {
      application-traffic-control {
         rule-set RS1;
      }
   }
```

```
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying Flow Session Configuration on page 138
- Verifying Rule Statistics on page 138

Verifying Flow Session Configuration

Purpose Display AppQoS session statistics.

Action From operational mode, enter the **show class-of-service application-traffic-control counter** command.

Sample Output

```
pic: 0/0
  Counter type                                                    Value
 Sessions processed                                               2
 Sessions marked                                                  1
 Sessions honored                                                 1
 Sessions rate limited                                            1
 Client-to-server flows rate limited                              0
 Server-to-client flows rate limited                              1
 Session default ruleset hit                      1
 Session ignored no default ruleset                               1
```

Meaning The output displays the number of sessions processed, marked, and honored. The rate-limiting statistics count the number of directional session flows that have been rate limited.

Verifying Rule Statistics

Purpose Display the AppQoS rule statistics.

Action From operational mode, enter the **show class-of-service application-traffic-control statistics rule** command.

user@host>show class-of-service application-traffic-control statistics rule

```
pic: 0/0
 Ruleset                        Rule                            Hits
 RS1                            1                               1
```


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Meaning The output provides information on the number of sessions matched for the rule under each AppQoS rule set.

See Also

- ngfw on page 363

Related Documentation

- Application Identification on page 27
- Application Firewall on page 85
- Application Tracking on page 104
- Advanced Policy-Based Routing on page 139

Advanced Policy-Based Routing

Advanced policy-based routing (APBR) also known as application-based routing, a new addition to Juniper Networks suite, provides the ability to forward traffic based on applications. For more information, see the following topics:

- Understanding Advanced Policy-Based Routing on page 139
- Example: Configuring Advanced Policy-Based Routing for Application-Aware Traffic Management Solution on page 146
- Configuring Advanced Policy-Based Routing Policies on page 153
- Example: Configuring Advanced Policy-Based Routing Policies on page 155
- Understanding URL Category-Based Routing on page 160
- Example: Configuring URL Category-Based Routing on page 162

Understanding Advanced Policy-Based Routing

The relentless growth of voice, data, and video traffic and applications traversing on the network requires that networks recognize traffic types to effectively prioritize, segregate, and route traffic without compromising performance or availability.

Starting with Junos OS Release 15.1X49-D60, SRX Series Services Gateways support advanced policy-based routing (APBR) to address these challenges.

This topic includes the following sections:

- Application Identification on page 140
- Filter-Based Forwarding or Policy-Based Routing (PBR) on page 140
- Advanced Policy-Based Routing on page 140
- Benefits of APBR on page 141
- Understanding How APBR Works on page 141
- Advanced Policy-Based Routing Midstream Support on page 142
- Advanced Policy-Based Routing Options For Streamlining Traffic Handling on page 144

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- Use Case on page 145
- Limitations on page 146

Application Identification

SRX Series devices support application identification (AppID) using deep packet inspection (DPI) technology. Junos OS application identification recognizes Web-based and other applications and protocols at different network layers using characteristics other than port number. Applications are identified by using a protocol bundle containing application signatures and parsing information. The identification is based on protocol parsing and decoding and session management. An application system cache (ASC) is maintained, where the applications identified are cached based on server (destination) IP address and port and logical system identification.

ASC saves the mapping between an application type and the corresponding destination IP address, destination port, protocol type, and service. Once an application is identified, its information is saved in the ASC so that only one matching entry is required for an application running on a particular system. When the cache entry is present and it is valid, the identified application is picked from cache, thereby expediting the identification process.

Filter-Based Forwarding or Policy-Based Routing (PBR)

SRX Series devices support filter-based forwarding, also known as policy-based routing (PBR), in which data packets are forwarded and routed based on the defined policies or filters. PBR includes a mechanism for selectively applying policies based on access list, packet size, or other criteria and routing the packets on user-defined routes.

When a device receives a packet, it routes the packets based on the information present in the packet header such as destination port, source IP address, and incoming interfaces. While processing an incoming packet, the device performs a routing table lookup to find the appropriate interface that leads to the destination address.

However, in some cases, you might need to forward the packet based on other criteria. In filter-based forwarding, you must create a filter that will match the type of traffic that you are going to direct to a different next hop. You can define matching criteria such as IP address, port, protocol, TCP flags, and much more. Once you have defined your term to include the match criteria, the action will be to send the traffic to an appropriate route and corresponding interface.

For example, perhaps you want to offer services to your customers, and the services reside on different servers. You can use filter-based forwarding to send traffic to the servers by applying a match condition in the packet header such as destination port, source IP address, and incoming interfaces, and send the packets to a certain outgoing interface that is associated with the appropriate server.

Advanced Policy-Based Routing

Advanced policy-based routing is a type of session-based, application-aware routing. This mechanism combines the policy-based routing and application-aware traffic management solution. APBR implies classifying the flows based on applications' attributes

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and applying filters based on these attributes to redirect the traffic. The flow-classifying mechanism is based on packets representing the application in use.

APBR implements:

- Deep packet inspection and pattern-matching capabilities of AppID to identify application traffic or a user session within an application
- Lookup in ASC for application type and the corresponding destination IP address, destination port, protocol type, and service for a matching rule

If a matching rule is found, the traffic is directed to an appropriate route and the corresponding interface or device.

Benefits of APBR

- Enables you to define the routing behavior based on applications.
- Provides more flexible traffic-handling capabilities and offers granular control for forwarding packets based on application attributes.

Understanding How APBR Works

The following steps are involved in APBR:

- Create an APBR profile (also referred to as an application profile in this document) that will match the type of traffic that you are going to direct to a different next hop. The profile includes multiple rules. Each rule can contain multiple applications or application groups. If the application matches any of the application or application groups of a rule in a profile, the application profile rule is considered as a match.
- Associate a routing instance with the application profile rule. When the traffic on the ingress zone and interface matches an application profile, the associated static route and next hop defined in the routing instance is used to route the traffic for the particular session.
- Associate the application profile to the ingress traffic The application profile can be attached to a security zone or it can be attached to a specific logical or physical interface associated with the security zone. If the application profile is applied to a security zone, then all interfaces belonging to that zone are attached to the application profile by default unless a specific configuration already exists for that interface.

Figure 2 on page 142 shows the sequence in which APBR techniques are applied.

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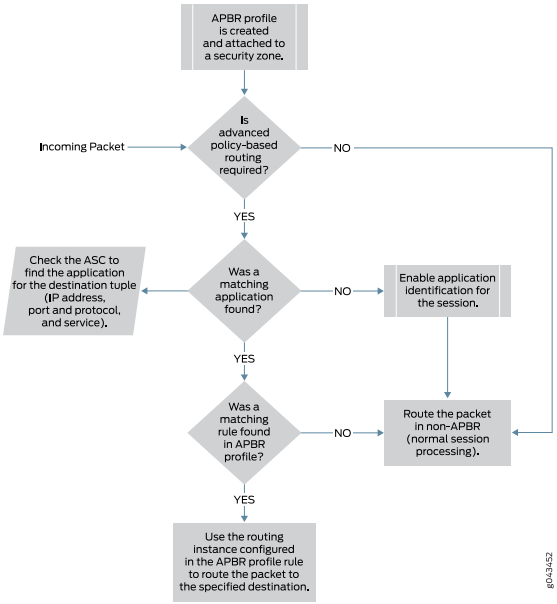
Figure 2: APBR Flow Diagram



1. APBR evaluates the packets based on incoming interface to determine if the session is candidate for application-based routing. If the traffic has not been flagged for application-based routing, it undergoes normal processing (non-APBR route).
2. If the session needs application-based routing, APBR queries the application system cache (ASC) module to get the application attributes details (IP address, destination port, protocol type, and service).

   If the ASC is found, it is further processed for a matching rule in the APBR profile (see Step 3). If the ASC is not found and the application signature is installed and ASC is enabled, application identification for the session is enabled so that ASC can be populated for use by subsequent sessions for the destination tuple.
3. APBR uses the application details to look for a matching rule in the APBR profile (application profile). If a matching rule is found, the traffic will be redirected to the specified routing instance for the route lookup.

Advanced Policy-Based Routing Midstream Support

Starting with Junos OS Release 15.1X49-D110 and Junos OS Release 17.4R1, SRX Series Services gateways support advanced policy-based routing (APBR) with an additional enhancement to apply the APBR in the middle of a session (which is also known as midstream support). With this enhancement, you can apply APBR for a non-cacheable application and also for the first session of the cacheable application. The enhancement provides more flexible traffic-handling capabilities that offer granular control for forwarding packets.

Figure 3 on page 143 shows the sequence in which APBR techniques with midstream support are applied.

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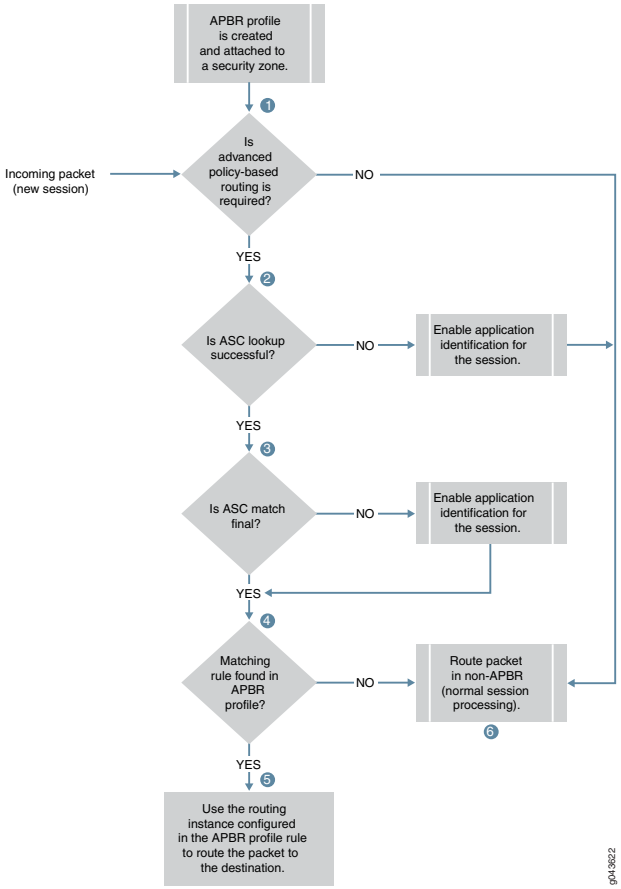
Figure 3: APBR with Midstream Support Flow Diagram



Step 1: APBR evaluates the packets based on incoming security zone to determine if the session is candidate for application-based routing. If this is first packet of the new session and traffic is not flagged for application-based routing, it undergoes normal processing (non-APBR route) step 6.

Step 2: If the session needs application-based routing, APBR queries the application system cache (ASC) module to get the application attributes details (IP address, destination port, protocol type, and service). If the ASC is found, it is further processed to determine if the application match using ASC is final (see Step 3). APBR could also identify applications using ALG for the data sessions. If the application is matched using the ALG it is considered as final match. If the final application has not been identified, the DPI engine is engaged for the session to identify the application. The existing session undergoes normal processing (non-APBR route) step 6.

Step 3: If an application has been identified, it is further processed for a matching rule in the APBR profile (see Step 4).

Step 4: APBR uses the application details to look for a matching rule in the APBR profile (application profile). If a matching rule is found, the traffic will be redirected

to the specified routing instance for the route lookup. If matching rule is not found, it undergoes normal processing (non-APBR route) (see step 6).

Step 5: Traffic is routed through the specified routing instance for the destination.
Step 6: Traffic traverses through a default route (non-APBR route) to the destination.

For a new session, when application cannot be identified based on first packet information the traffic traverses through a default route (non-APBR route) to the destination. At the same time, APBR is applied and the rest of the session packets passes through the route as per the rules defined in the APBR profile. This means that, APBR rules are applied as and when an application is identified by AppID. For first packet of session, always go through midstream re-routing case. That is, when the application is not yet identified, the traffic traverses through a default route (non-APBR route) to the destination. At the same time, application identification is enabled for that session. This continues still application signatures identify the application and APBR is applied and the rest of the session packets passes through the route as per the rules defined in the APBR profile. The traffic traverses through a non-APBR route till application signatures or ALG identify the application.

You can enable, AppTrack to inspect traffic and collect statistics for application flows in the specified zone. See "Understanding Application Tracking" on page 104 for more details.

Advanced Policy-Based Routing Options For Streamlining Traffic Handling

You can streamline the traffic handling with APBR by using the following options:

- **Limit route change**- Some sessions go through continuous classification in the middle of the session as application signatures identify the application. Whenever an application is identified by the application signatures, APBR is applied, and this results in a change in the route of the traffic. You can limit the number of times a route can change for a session by using the **max-route-change** option of the **tunables** statement.

  set security advance-policy-based-routing tunables max-route-change *value*

  ```
  [edit]
  set security advance-policy-based-routing tunables max-route-change 5
  ```

  In this example, you want to limit the number of route changes per session to 5. When there is a change in the route in the middle of the session, this count is reduced to 4. This process continues until the count reaches 0. After that, APBR is not applied in the middle of the session.

  If an identified application has an entry in the ASC, then, the count is not reduced for that session, because the session started with the specified route according to the APBR configuration.

- **Terminate session if APBR is bypassed**—You can terminate the session if there is a mismatch between zones when APBR is being applied in the middle of the session. When you want to apply APBR in the middle of a session, both new egress interface and existing egress interface must be part of the same zone. If you change the zone for an interface in the middle of a session, then, by default, APBR is not applied, and the traffic continues to traverse through the existing interface. To change this default

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behavior, you can terminate the session entirely, instead of allowing traffic to traverse through the same route bypassing APBR, by using the **drop-on-zone-mismatch** option of the **tunables** statement.

```
[edit]
set security advance-policy-based-routing tunables drop-on-zone-mismatch
```

- **Enable logging**—You can enable logging to record events that occur on the device, for instance, when APBR is bypassed because of a change in the zones for interfaces. You can use the **enable-logging** option of the **tunables** statement to configure the logging.

  ```
  [edit]
  set security advance-policy-based-routing tunables enable-logging
  ```

- **Enable reverse reroute**—For deployments that requires traffic symmetry for ECMP routes, and the incoming traffic needs to switch in the middle of session, the rerouting can be achieved using the option enable-reverse-reroute specific to a security zone as follows:

  Example:

  [edit]

  set security zones security-zone zone-name enable-reverse-reroute

  When the above configuration is enabled for a security zone, where an incoming packet arrives on an interface and has a different outgoing/return interface, a change in the interface is detected and triggers a reroute. A route lookup is performed for the reverse path, and the preference will be given to the interface on which the packet has arrived.

  Further processing stops for a particular session when a route lookup fails for the traffic on reverse path.

  Support for reverse rerouting is available starting in Junos OS Release 15.1X49-D130 and later releases.

Use Case

- When multiple ISP links are used:
  - APBR can be used for selecting high-bandwidth, low-latency links for important applications, when more than one link is available.
  - APBR can be used for creating a fallback link for important traffic in case of link failure. When multiple links are available, and the main link carrying the important application traffic suffers an outage, then the other link configured as the fallback link can be used to carry traffic.
  - APBR can be used for segregating the traffic for deep inspection or analysis. With this feature, you can classify the traffic based on applications that are required to

go through deep inspection and audit. If required, such traffic can be routed to a different device.

Limitations

APBR has the following limitations:

- Redirecting the route for the traffic depends on the presence of an entry in the application system cache (ASC). Routing will succeed only if the ASC lookup is successful. For the first session, when the ASC is not present for the traffic, the traffic traverses through a default route (non-APBR route) to the destination (this limitation is applicable only for the releases before Junos OS 15.1X49-D110).
- APBR does not work if an application signature package is not installed or application identification is not enabled.
- APBR does not work for Layer 3 and Layer 4 applications, because the Layer 3 and Layer 4 applications custom signatures are not maintained in the ASC.

APBR with midstream support has the following limitations:

- APBR works only for forward traffic.
- APBR does not work for data sessions initiated by an entity from the control session, such as active FTP.
- When using different NAT pools for source NAT and midstream APBR is applied, the source IP address of the session continues to be the same as the one with which the session has been using before applying the midstream APBR.
- APBR with midstream support works only when all egress interfaces are in the same zone. Because of this, only the forwarding and virtual routing and forwarding (VRF) routing instances can be used to avail APBR midstream support.

See Also

- Example: Configuring Advanced Policy-Based Routing for Application-Aware Traffic Management Solution on page 146

Example: Configuring Advanced Policy-Based Routing for Application-Aware Traffic Management Solution

This example shows how to configure APBR on an SRX Series device.

- Requirements on page 146
- Overview on page 147
- Configuration on page 149
- Verification on page 152

Requirements

This example uses the following hardware and software components:

- Valid application identification feature license installed on an SRX Series device.

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- SRX Series device with Junos OS Release 15.1X49-D60 or later. This configuration example is tested for Junos OS Release 15.1X49-D60.

Overview

In this example, you want to forward HTTP, social networking, and Yahoo traffic arriving at the trust zone to a specific device or interface as specified by the next-hop IP address.

When traffic arrives at the trust zone, it is matched by the APBR profile, and if a matching rule is found, the packets are forwarded to the static route and next hop as specified in the routing instance. The static route configured in the routing table is inserted into the forwarding table when the next-hop address is reachable. All traffic destined for the static route is transmitted to the next-hop address for transit to a specific device or interface.

Figure 4 on page 147 shows the topology used in this configuration example.

Figure 4: Topology For Advanced Policy-Based Routing (APBR)

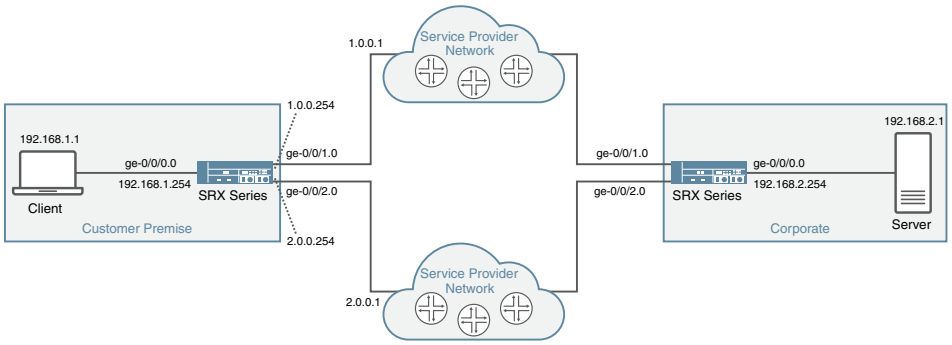

Table 14 on page 147 provides the details of the parameters used in this example.

Table 14: APBR Configuration Parameters

Parameter	Name	Description
Routing Instance	• Instance name—R1 • Instance type— forwarding • Static route— 1.0.0.254/8 • Next-hop— 1.0.0.1	Routing instance of type forwarding is used for forwarding the traffic. All the qualified traffic destined for the static route (example: 5.0.0.0/8) is forwarded to the next-hop device (example: with 7.0.0.1 address on its interface).
	• Instance name—R2 • Instance type— forwarding • Static route— 2.0.0.254/8 • Next-hop— 2.0.0.1	

Table 14: APBR Configuration Parameters (continued)

Parameter	Name	Description
RIB Group	apbr_group	Name of the routing information base (RIB) (also known as routing table) group. This RIB group is configured to import interface route entries from inet.0, RI1.inet.0, RI2.inet.0, and RI3.inet.0.
APBR Profile	profile-1	Name of the APBR profile. This profile matches applications and application groups and redirects the matching traffic to the specified routing instance (example: R1) for the route lookup. The profile includes multiple rules.
Rule	• Rule name—ruleApp1 • matching application—junos:HTTP • Associated routing instance—R1 • rule name—ruleApp2 • matching application—junos:web:social-networking • Routing instance— R2	Define the rules for the APBR profile. Associate the rule with one or more than one application (example: for HTTP) or application groups. If the application matches any of the application or application groups of a rule in a profile, the application profile rule is considered as a match and the traffic will be redirected to the routing instance (example: R1) for the route lookup.
Zone	trust	Specify the source zone to which the APBR profile can be applied.

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NOTE:
To use the APBR for redirecting the traffic based on applications, importing interface routes might be required from one routing instance to another routing instance. You can use one of the following mechanisms:

- RIB groups to import interface routes
- Routing policy to import interface routes

When you use routing policy to import interface routes, it might cause management local routes (using fxp0) to leak to non-default routing instance, if the appropriate action is not used for the routing policy. When devices are in chassis cluster mode, such scenarios might result in RG0 failover due to limitations. We recommend not configure fxp0 local route in the routing table of non-default routing instance. Following sample depicts a sample configuration of policy options. Note that the reject action helps in eliminating the routes that are not required. You can use specific routes to reject the fxp0 routes.

```
policy-statement statement-name {
   term 1 {
      from {
         instance master;
         route-filter route-filter-ip-address exact;
      }
      then accept;
   }
   then reject;
}
```

NOTE: APBR is used for routing the packets in a forward path. For return traffic to arrive over the same path, we recommend to configure the remote SRX Series device with ECMP configuration along with load balance routing policy as shown in the following sample configuration:

```
user@host> set routing-options static route ip-address next-hop ip-address
user@host> set routing-options static route ip-address next-hop ip-address
user@host> set policy-options policy-statement load-balance-policy then
   load-balance per-packet
user@host> set routing-options forwarding-table export load-balance-policy
```

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set routing-instances R1 instance-type forwarding
set routing-instances R1 routing-options static route 1.0.0.254/8 next-hop 1.0.0.1
set routing-instances R2 instance-type forwarding
set routing-instances R2 routing-options static route 2.0.0.254/8 next-hop 2.0.0.1
set routing-options interface-routes rib-group inet apbr_group
set routing-options rib-groups apbr_group import-rib inet.0
set routing-options rib-groups apbr_group import-rib RI1.inet.0
set routing-options rib-groups apbr_group import-rib RI2.inet.0
set security advance-policy-based-routing profile profile1 rule rule-app1 match
   dynamic-application junos:HTTP
set security advance-policy-based-routing profile profile1 rule rule-app1 then
   routing-instance R1
set security advance-policy-based-routing profile profile1 rule rule-app2 match
   dynamic-application-group junos:web:social-networking
set security advance-policy-based-routing profile profile1 rule rule-app2 then
   routing-instance R2
set security zones security-zone trust host-inbound-traffic system-services all
set security zones security-zone trust host-inbound-traffic protocols all
set security zones security-zone trust interfaces ge-0/0/1.0
set security zones security-zone trust interfaces ge-0/0/2.0
set security zones security-zone trust advance-policy-based-routing-profile profile1
```

Configuring Advanced Policy-Based Routing

Step-by-Step Procedure

To configure APBR:

1. Create routing instances.

```
[edit]
user@host# set routing-instances R1 instance-type forwarding
user@host# set routing-instances R1 routing-options static route 1.0.0.254/8
   next-hop 1.0.0.1
user@host# set routing-instances R2 instance-type forwarding
user@host# set routing-instances R2 routing-options static route 2.0.0.254/8
   next-hop 2.0.0.1
```

2. Group one or more routing tables to form a RIB group called apbr_group and import routes into the routing tables.

```
[edit]
set routing-options interface-routes rib-group inet apbr_group
set routing-options rib-groups apbr_group import-rib inet.0
set routing-options rib-groups apbr_group import-rib RI1.inet.0
set routing-options rib-groups apbr_group import-rib RI2.inet.0
```

3. Create the APBR profile and define the rules.

```
[edit]
user@host# set security advance-policy-based-routing profile profile1 rule rule-app1
   match dynamic-application junos:HTTP
user@host# set security advance-policy-based-routing profile profile1 rule rule-app1
   then routing-instance R1
```


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```
user@host# set security advance-policy-based-routing profile profile1 rule rule-app2
   match dynamic-application-group junos:web:social-networking
user@host# set security advance-policy-based-routing profile profile1 rule rule-app2
   then routing-instance R2
```

4. Apply the APBR profile to the security zone.

```
[edit]
user@host# set security zones security-zone trust host-inbound-traffic
   system-services all
user@host# set security zones security-zone trust host-inbound-traffic protocols
   all
user@host# set security zones security-zone trust interfaces ge-0/0/1.0
user@host# set security zones security-zone trust interfaces ge-0/0/2.0
user@host# set security zones security-zone trust
   advance-policy-based-routing-profile profile1
```

Results

From configuration mode, confirm your configuration by entering the **show routing-instances** and **show security zones** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show routing-instances
R1 {
   instance-type forwarding;
   routing-options {
      static {
         route 1.0.0.254/8 next-hop 1.0.0.1;
      }
   }
}
R2 {
   instance-type forwarding;
   routing-options {
      static {
         route 2.0.0.254/8 next-hop 2.0.0.1;
      }
   }
}
```

```
[edit]
user@host# show routing-options
interface-routes {
   rib-group inet apbr_group;
}
rib-groups {
   apbr_group {
      import-rib [ inet.0 RI1.inet.0 RI2.inet.0 ];
```

```
    }
}
```

```
[edit]
user@host# show security advance-policy-based-routing
profile profile1 {
    rule rule-app1 {
        match {
            dynamic-application junos:HTTP;
        }
        then {
            routing-instance R1;
        }
    }
    rule rule-app2 {
        match {
            dynamic-application-group junos:web:social-networking;
        }
        then {
            routing-instance R2;
        }
    }
}
```

```
[edit]
user@host# show security zones
security-zone trust {
    host-inbound-traffic {
        system-services {
            all;
        }
        protocols {
            all;
        }
    }
    interfaces {
        ge-0/0/1.0;
        ge-0/0/2.0;
    }
    advance-policy-based-routing-profile {
        profile1;
    }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Verifying Advanced Policy-Based Routing Statistics

Purpose Display the statistics for APBR such as the number of sessions processed for the application-based routing, number of times the APBR is applied for the session, and so on.

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Action From configuration mode, enter the **show security advance-policy-based-routing statistics** command.

```
Advance Profile Based Routing statistics:
  Session Processed:                    5529
  ASC Success:                          3113
  Rule match success:                   107
  Route  modified:                      107
  AppID Requested:                      2416
```

Meaning The command output displays the following details:

- Sessions processed for the application-based routing.
- The number of times the application traffic matches the APBR profile and APBR is applied for the session.
- The number of times AppID was consulted to identify application traffic.

See show security advance-policy-based-routing statistics for more details.

Verifying Advanced Policy-Based Routing

Purpose Display information about the sessions and packet flows active on the device, including detailed information about specific sessions.

Action From configuration mode, enter the **show security flow session** command to display information about all currently active security sessions on the device.

Meaning The command output displays the following details:

- All active sessions and packet flows on your device
- List of incoming and outgoing IP flows, including services
- Security attributes associated with a flow, for example, the policies that apply to traffic belonging to that flow
- Session timeout value, when the session became active, how long the session has been active, and if there is active traffic on the session

See Also

- Understanding Advanced Policy-Based Routing on page 139

Configuring Advanced Policy-Based Routing Policies

Starting in Junos OS Release 18.2R1, you can configure advanced policy-based routing (APBR) policies by defining source addresses, destination addresses, and applications

as match conditions; and after a successful match, the configured APBR profile is applied as an application services for the session. In the previous releases of Junos OS, an APBR profile could be attached to an incoming security zone of the ingress traffic, and the APBR was applied per security zone basis. Now, with support of APBR policies, you can apply different set of APBR rules on the traffic based on incoming security zone, source address, destination address and application

This enhancement provides more flexible traffic-handling capabilities that offer granular control for forwarding packets.

Supported match criteria includes source addresses, destination addresses, and applications. The applications can be used to support the matching condition based on protocol and Layer 4 ports.

If one or more APBR policy is configured for the security zone, then the policy is evaluated during session creating phase. The policy lookup is terminated once the policy, matching the session, is selected. After a successful match, the APBR profile configured with the APBR policy is used for the session.

How APBR Policy Works?

APBR policies are defined for a security zone. If there is one or more APBR policy associated with a zone, the session that is initiated from the security zone goes through the policy match.

The following sequences are involved in matching the traffic by an APBR policy and applying advanced policy-based routing to forward the traffic, based on the defined parameters/rules:

- When traffic arrives at the ingress zone, it is matched by the APBR policy rules. The policy match condition include the source address, destination address and application.
- When the traffic matches the security policy rules, the action of the APBR policy is applied to the traffic. You can enable APBR as an application service in the APBR policy action by specifying the APBR profile name.
- The APBR profile configuration incudes the set of rules that contains set of dynamic applications and dyamic application groups as match condition. The action part of those rules contain the routing instance through which traffic needs to be forwarded. The routing instance can include configuration of static routs or dynamic learned routes.
- All traffic destined for the static route is transmitted to the next-hop address for transit to a specific device or interface.

APBR policy rules are terminal, which means that once the traffic is matched by a policy, it is not processed further by the other policies.

If an APBR policy has the matching traffic and APBR profile does not have any traffic matching the rule, then the traffic matching the APBR policy traverses through a default routing-instance [inet0] to the destination.

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Legacy APBR Profile Support

Prior to the Junos OS Release 18.2R1, APBR profile was applied at security zone-level. With the support for APBR policy, APBR configuration at security-zone level is deprecated future, rather than being immediately removed in order to provide backward compatibility and a chance to bring your configuration into compliance with the new configuration.

However, if you have configured a zone-based APBR, and you attempt to add an APBR policy for the particular security zone, commit might fail. You must delete the zone-based configuration in order to configure the APBR policy for the zone. Similarly if an APBR policy is configured for a security zone, and you attempt to configure zone-based APBR, results in commit error.

Limitation

- When using specific address or address set in the APBR policy rule, we recommend to use the global address book. Because, zone specific rules might not be applicable for destination address, as the destination zone is not known at time of policy evaluation.
- Configuring APBR policy for the security zone junos-host zone is not supported.

Example: Configuring Advanced Policy-Based Routing Policies

This example shows how configure an APBR policy and apply the APBR profile on the session that matches the APBR policy rules.

- Requirements on page 155
- Overview on page 155
- Configuration on page 156
- Verification on page 159

Requirements

This example uses the following hardware and software components:

- Valid application identification feature license installed on an SRX Series device.
- SRX Series device with Junos OS Release 18.2R1 or later. This configuration example is tested on Junos OS Release 18.2R1.

Overview

In this example, you want to forward HTTP traffic arriving at the trust zone to a specific device or interface as specified by the next-hop IP address.

When traffic arrives at the trust zone, it is matched by the APBR policy. When the traffic matches the policy, the configured APBR rule is applied on the permitted traffic as application services. The packets are forwarded based on the APBR rule to the static route and next hop as specified in the routing instance. The static route configured in the routing table is inserted into the forwarding table when the next-hop address is reachable. All traffic destined for the static route is transmitted to the next-hop address for transit to a specific device or interface.

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In this example, you must complete the following configurations:

- Define routing instance and RIB group.
- Create an ABPR profile.
- Create a security zone.
- Create an APBR policy and attach the APBR profile to it.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set routing-instances R1 instance-type forwarding
set routing-instances R1 routing-options static route 5.0.0.0/24 next-hop 3.0.0.2
set routing-options interface-routes rib-group inet fbf-group
set routing-options rib-groups fbf-group import-rib inet.0
set routing-options rib-groups fbf-group import-rib RI1.inet.0
set security advance-policy-based-routing profile profile1 rule rule-app1 match
   dynamic-application junos:HTTP
set security advance-policy-based-routing profile profile1 rule rule-app1 then
   routing-instance R1
set security zones security-zone trust host-inbound-traffic system-services all
set security zones security-zone trust host-inbound-traffic protocols all
set security zones security-zone trust interfaces ge-0/0/1.0
set security advance-policy-based-routing from-zone trust policy SLA1 match
   source-address any
set security advance-policy-based-routing from-zone trust policy SLA1 match
   destination-address any
set security advance-policy-based-routing from-zone trust policy SLA1 match application
   any
set security advance-policy-based-routing from-zone trust policy SLA1 then
   application-services advance-policy-based-routing-profile profile1
```

Configuring Advanced Policy-Based Routing

Step-by-Step Procedure

To apply APBR on the traffic matching the APBR policy:

1. Create routing instances.

```
[edit]
user@host# set routing-instances R1 instance-type forwarding
user@host# set routing-instances R1 routing-options static route 5.0.0.0/24
   next-hop 3.0.0.2
```

2. Group one or more routing tables to form a RIB group called apbr_group and import routes into the routing tables.

```
[edit]
```


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```
user@host# set routing-options interface-routes rib-group inet fbf-group
user@host# set routing-options rib-groups fbf-group import-rib inet.0
user@host# set routing-options rib-groups fbf-group import-rib RI1.inet.0
```

3. Create the APBR profile and define the rules.

```
[edit]
user@host# set security advance-policy-based-routing profile profile1 rule rule-app1
   match dynamic-application junos:HTTP
user@host# set security advance-policy-based-routing profile profile1 rule rule-app1
   then routing-instance R1
```

4. Create a security zone.

```
[edit]
user@host# set security zones security-zone trust host-inbound-traffic
   system-services all
user@host# set security zones security-zone trust host-inbound-traffic protocols
   all
user@host# set security zones security-zone trust interfaces ge-0/0/1.0
```

5. Create an APBR policy and apply the APBR profile to the security zone.

```
[edit]
user@host# set security advance-policy-based-routing from-zone trust policy SLA1
   match source-address any
user@host# set security advance-policy-based-routing from-zone trust policy SLA1
   match destination-address any
user@host# set security advance-policy-based-routing from-zone trust policy SLA1
   match application any
user@host# set security advance-policy-based-routing from-zone trust policy SLA1
   then application-services advance-policy-based-routing-profile profile1
```

Results

From configuration mode, confirm your configuration by entering the **show routing-instances** and **show security zones** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show routing-instances
R1 {
   instance-type forwarding;
   routing-options {
      static {
         route 5.0.0.0/24 next-hop 3.0.0.2;
      }
   }
```

```
}
```

```
[edit]
user@host# show routing-options
interface-routes {
   rib-group inet fbf_group;
}
rib-groups {
   fbf_group {
      import-rib [ inet.0 RI1.inet.0];
   }
}
```

```
[edit]
user@host# show security advance-policy-based-routing
from-zone trust {
   policy SLA1 {
      match {
         source-address any;
         destination-address any;
         application any;
      }
      then {
         application-services {
            advanced-policy-based-routing-profile profile1;
         }
      }
   }
}
profile profile1 {
   rule rule-app1 {
      match {
         dynamic-application junos:HTTP;
      }
      then {
         routing-instance R1;
      }
   }
}
```

```
[edit]
user@host# show security zones
security-zone trust {
   host-inbound-traffic {
      system-services {
         all;
      }
      protocols {
         all;
      }
   }
   interfaces {
      ge-0/0/1.0;
```


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```
    }
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Verifying Advanced Policy-Based Routing Statistics

Purpose Display the statistics for APBR such as the number of sessions processed for the application-based routing, number of times the APBR is applied for the session, and so on.

Action From configuration mode, enter the **show security advance-policy-based-routing statistics** command.

```
Sessions Processed                      18994
  AppID cache hits                        18994
  AppID requested                         0
  Rule matches                            0
  Route changed on cache hits             0
  Route changed midstream                 0
  Zone mismatch                           0
  Drop on zone mismatch                   0
  Next hop not found                      0
```

Meaning The command output displays the following details:

- Sessions processed for the application-based routing.
- The number of times the application traffic matches the APBR profile and APBR is applied for the session.
- The number of times AppID was consulted to identify application traffic.

See show security advance-policy-based-routing statistics for more details.

Verifying APBR Policy Configuration

Purpose Display information about the APBR policy, associated APBR profile and to display information about the APBR policy hit count.

Action From configuration mode, enter the **show security advanced-policy-based-routing** command.

user@host> show security advanced-policy-based-routing policy-name SLA1

```
From zone: trust
  Policy: SLA1, State: enabled, Index: 7, Sequence number: 1
    Source addresses: any
    Destination addresses: any
    Applications: any
    APBR profile: profile1
```

From configuration mode, enter the **show security advanced-policy-based-routing hit-count** command.

user@host> show security advanced-policy-based-routing hit-count

```
Logical system: root-logical-system
 Index   From zone        Name           Hit count
 1       trust           SLA1          3
 2       trust           SLA2          0
 3       trust           SLA1          0

Number of policy: 3
```

Meaning The command output displays the following details:

- Details such as status of the policy, associated APBR profile.
- Display the utility rate of policies according to the number of hits they receive.

See Also
- Understanding Advanced Policy-Based Routing on page 139

Understanding URL Category-Based Routing

Starting in Junos OS Release 18.3 R1, URL category-based routing is supported on SRX Series devices and vSRX instances. URL category-based routing enables you to use URL categories as match criteria in an APBR profile. The URL categories are based on the destination server IP address, and the category identification is leveraged from the Enhanced Web Filtering (EWF) and local Web filtering results obtained from the unified threat management (UTM) module.

URL category-based routing enables you to identify and selectively route Web traffic (HTTP and HTTPS) to a specified destination.

Web filtering classifies websites into the categories according to host, URL, or IP address, and performs the filtering based on those categories. You can configure APBR profiles by specifying a URL category as the match condition in the rule. The APBR profile rule matches the traffic with specified match criteria, and after a successful match, the

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configured APBR profile is applied as the application service for the session. For example, suppose you want to route all the traffic belonging to a specific website category, such as social media, through a specific next hop. In this case, you can create a new APBR profile with the list of URL categories such as Enhanced_Social_Web_Facebook, Enhanced_Social_Web_Linkedin, Enhanced_Social_Web_Twitter or Enhanced_Social_Web_Youtube or any other custom URL as match criteria in the policy. The traffic that matches one of the defined URL categories in the rule is forwarded using the routes of the specific routing instance.

When an APBR profile matches the traffic against the URL categories included in the rule, APBR queries the Web filtering module to get the URL category details. If the URL category is not available in the URL filtering cache, then the SRX Series device sends a request to the private cloud configured with Web filtering for the categorization details. If the traffic does not match any URL categories, the request is uncategorized, and the session undergoes normal processing (non-APBR route).

NOTE: **If the private cloud configured with EWF does not respond to the URL category request within an interval of 3 seconds, then the session undergoes normal processing (non-APBR route).**

Rule Processing in an APBR Profile

You can provide advanced policy-based routing by classifying the traffic based on applications' attributes and applying policies based on these attributes to redirect the traffic. To do this, you must define the APBR profile and associate it to a APBR policy. You can create an APBR profile to include multiple rules with either dynamic applications, application groups or both, or a URL category as match criteria. The rules configured in the APBR profile can include either of the following:

- One or more applications, dynamic applications, or application groups
- URL category (IP destination address)—EWF or local Web filtering.

In an APBR profile, rule lookup is performed for both the match criteria. If only one match criteria is available, the rule lookup is done based on the available match criteria.

The APBR profile includes the rules to match the traffic with applications or URL categories and the action to redirect the matching traffic to the specified routing instance for the route lookup.

In Junos OS Release18.3R1, the URL category match is done based on the destination IP address; because of this, URL category-based rule match is terminated at the first packet of the session. As a dynamic application might be identified in the middle of the session, the matching process for the dynamic application rules continues until the process of application identification is complete.

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Benefits of URL Category-Based Routing

- Using URL-based categories enables you to have granular control over Web traffic. The traffic belonging to specific categories of websites is redirected through different paths, and based on the category, it is subjected to further security processing, including SSL decryption for HTTPS traffic.
- Traffic-handling capabilities based on URL categories enable you to use different paths for selected websites. Using different paths results in better quality of experience (QoE) and also enables you to utilize the available bandwidth effectively.
- SD-WAN solutions can utilize URL category-based routing in addition to the dynamic application-based routing.
- URL category-based routing can be used for local Internet breakout solutions as it can work with source NAT configuration changes.

Limitations of URL Category-Based Routing

Using URL categories in an APBR profile has the following limitations:

- Only the destination IP address is used for the URL category identification in an APBR profile. URL categories based on the host, or on the URL or the SNI field are not supported.
- You can configure either a dynamic application or a URL category as the match condition in an APBR profile rule. Configuring a rule with both URL category and dynamic application results in a commit error.

Example: Configuring URL Category-Based Routing

This example shows you how to configure URL category-based routing.

- Requirements on page 162
- Overview on page 163
- Configuring URL Category-Based Routing by Using EWF on page 163
- Configuring URL-Based Routing by Using Local Web Filtering on page 167
- Verification on page 172

Requirements

This example uses the following hardware and software components:

- SRX Series device with Junos OS Release 18.3 R1 or later. This configuration example is tested on Junos OS Release 18.3 R1.
- Valid application identification feature license installed on the SRX Series device.
- The Enhanced Web Filtering (EWF) option requires you to purchase a Juniper Networks Web filtering license. No license is required for local Web filtering.

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Overview

This example shows how to configure APBR on your SRX Series device to forward social media traffic arriving at the trust zone to a specific device or to an interface using URL category-based routing.

When traffic arrives, it is matched by the APBR profile, and if a matching rule is found, the packets are forwarded to the static route and next-hop IP address as specified in the routing instance. The static route configured in the routing table is added to the forwarding table when the next-hop address is reachable. All traffic destined for the static route is transmitted to the next-hop address for transit to a specific device or to an interface.

In this example, you complete the following configurations:

- Enable either of the following types of Web filtering:
  - Enhanced Web Filtering (EWF)—When you enable EWF on the device, the EWF engine intercepts the HTTP and the HTTPS requests and categorizes the URL into one of the 95 or more predefined categories and also provides site reputation information. See "Configuring URL-Based Routing by Using Local Web Filtering" on page 167.
  - Local Web filtering—When you enable local Web filtering, you can configure custom URL categories with multiple URL lists and apply them to a UTM Web filtering profile with actions such as permit, permit and log, block, and quarantine. To use local Web filtering, you must create a Web filtering profile and ensure that category custom is part of the profile. See "Configuring URL Category-Based Routing by Using EWF" on page 163.
- Define the routing instances and the routing information base (RIB; also known as routing table group.)
- Define the APBR profile and associate it to an APBR policy.

Configuring URL Category-Based Routing by Using EWF

This section provides the steps to configure URL category-based routing using EWF. Table 15 on page 163 provides the details of the parameters used in this example.

Table 15: Configuration Parameters for URL Category-Based Routing Using EWF

Parameters	Name	Description
APBR profile	apbr-pr1	Name of the APBR profile.
APBR policy	p1	Name of the APBR policy.
Rule	• Rule name—rule rule-social-nw • Matching URL category—Enhanced_Facebook_Apps • Policy action—associate with routing instance RI1	Name of the APBR profile rule. The APBR profile rule matches the traffic to the defined URL categories and redirects the matching traffic to the specified routing instance (example: RI1) for the route lookup.

Table 15: Configuration Parameters for URL Category-Based Routing Using EWF (continued)

Parameters	Name	Description
Category	Enhanced_Social_Web_Facebook	Category defined in the APBR profile rule for matching the traffic.
Routing instance	• Instance name—RI1 • Instance type—forwarding • Static route—1.0.0.254/8 • Next-hop—1.0.0.1	Routing instance of type forwarding is used for forwarding the traffic. All the qualified traffic destined for the static route (with IP address 1.0.0.254/8) is forwarded to the next-hop device (with IP address 1.0.0.1).
RIB group	apbr_group	Name of the RIB group. The RIB group shares interface routes with the forwarding routing instances. To ensure that the next hop is resolvable, interface routes from the main routing table are shared through a RIB group with the routing tables specified in the routing instances.

To perform URL category-based routing using EWF, you must complete the following procedures:

- Enabling Enhanced Web Filtering on page 164
- Defining the Routing Instance and the RIB Group on page 165
- Configuring the APBR Profile on page 165
- Configuring the APBR Policy and Attaching the APBR Profile on page 166

Enabling Enhanced Web Filtering

Step-by-Step Procedure

To use URL categories as match criteria in an APBR profile, you must enable EWF in UTM.

NOTE: **The EWF option requires you to purchase a Juniper Networks Web filtering license. No license is required for local Web filtering.**

1. Enable EWF by specifying the Web filtering type as **juniper-enhanced**.

```
[edit]
user@host# set security utm feature-profile web-filtering type juniper-enhanced
```

2. Set the cache size as 500 and cache timeout as 1800 seconds for the configured EWF engine.

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```
[edit]
user@host# set security utm feature-profile web-filtering juniper-enhanced cache
   size 500
user@host# set security utm feature-profile web-filtering juniper-enhanced cache
   timeout 1800
```

For more information about EWF configuration, see Enhanced Web Filtering (EWF).

Defining the Routing Instance and the RIB Group

Step-by-Step Procedure

Define routing instance and the RIB group.

1. Create the routing instance to forward traffic to the different next hops. In this step, you configure the static route 1.0.0.254/8, and the next-hop address as 1.0.0.1.

```
[edit]
user@host#  set routing-instances RI1 instance-type forwarding
user@host#  set routing-instances RI1 routing-options static route 1.0.0.254/8
   next-hop 1.0.0.1
```

2. Create a RIB group.

```
[edit]
user@host# set routing-options interface-routes rib-group inet apbr_group
user@host# set routing-options rib-groups apbr_group import-rib inet.0
user@host# set routing-options rib-groups apbr_group import-rib RI1.inet.0
```

Interface routes from the main routing table (inet.0) are shared through a RIB group with the routing table specified in the routing instance RI1.inet.0.

Configuring the APBR Profile

Step-by-Step Procedure

Create a rule for the Facebook applications and forward the matching traffic to the routing instance RI1.

1. Create the APBR profile and define the match criteria for the URL category.

```
[edit]
user@host# set security advance-policy-based-routing profile apbr-pr1 rule
   rule-social-nw match category Enhanced_Social_Web_Facebook
```

The APBR profile rule matches the traffic to the defined URL category—that is, the Facebook application in this example.

2. Specify the action for the traffic matching the URL category.

```
[edit]
user@host# set security advance-policy-based-routing profile apbr-pr1 rule
   rule-social-nw then routing-instance RI1
```

In this step, you are specifying that the traffic that matches the apbr-pr1 rule is to be redirected to the routing instance RI1.

Configuring the APBR Policy and Attaching the APBR Profile

Step-by-Step Procedure

Associate the application profile to the APBR policy to enable URL category-based routing.

1. Define the APBR policy. Specify the policy match condition as **any** for the source address, destination address, and application.

```
[edit]
user@host# set security advance-policy-based-routing from-zone trust policy p1
   match source-address any
user@host# set security advance-policy-based-routing from-zone trust policy p1
   match destination-address any
user@host# set security advance-policy-based-routing from-zone trust policy p1
   match application any
```

   When traffic arrives, it is matched by the APBR policy rules.

2. Attach the APBR profile to the policy.

```
[edit]
user@host# set security advance-policy-based-routing from-zone trust policy p1
   then application-servicesadvance-policy-based-routing-profile apbr-pr1
```

   When the traffic matches the APBR policy (p1) rules, the APBR profile apbr-pr1 is applied to the traffic as the action of the APBR policy. The traffic that matches the Facebook application is redirected to the routing instance RI1 according to the APBR profile rule rule-social-nw.

Results

From configuration mode, confirm your configuration by entering the **show** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

[edit security]

```
user@host# show advance-policy-based-routing
profile apbr-pr1 {
   rule rule-social-nw {
      match {
         category Enhanced_Social_Web_Facebook;
      }
      then {
         routing-instance RI1;
      }
   }
}
from-zone trust {
```


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```
    policy p1 {
      match {
        source-address any;
        destination-address any;
        application any;
      }
      then {
        application-services {
          advance-policy-based-routing-profile apbr-pr1;
        }
      }
    }
}
```

[edit]

```
user@host# routing-options
interface-routes {
   rib-group inet apbr_group;
}
rib-groups {
   apbr_group {
      import-rib [ inet.0 RI1.inet.0 ];
   }
}
```

[edit]

```
user@host# show routing-instances
RRI1 {
   instance-type forwarding;
   routing-options {
      static {
         route 1.0.0.254/8 next-hop 1.0.0.1;
      }
   }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring URL-Based Routing by Using Local Web Filtering

This section provides the steps to configure URL category-based routing by using local Web filtering.

Table 16 on page 167 provides the details of the parameters used in this example.

Table 16: APBR Configuration Parameters for URL Category-Based Routing Using Local Web Filtering

Parameters	Name	Description
APBR profile	apbr-pr2	Name of the APBR profile.

Table 16: APBR Configuration Parameters for URL Category-Based Routing Using Local Web Filtering (continued)

Parameters	Name	Description
APBR policy	p2	Name of the APBR policy.
Rule	• Rule name—rule2 • Matching URL category—custom • Policy action—associate with routing instance RI2	Name of the APBR profile rule. The APBR profile rule matches the traffic to the defined URL categories and redirects the matching traffic to the specified routing instance (example: RI2) for the route lookup.
Custom Category (URL Pattern)	203.0.113.0 203.0.113.10	Category defined in the APBR profile rule for matching the traffic.
Routing instance	• Instance name—RI2 • Instance type—forwarding • Static route—5.0.0.10 • Next-hop—9.0.0.1	Routing instance of type forwarding is used for forwarding the traffic. All the qualified traffic destined for the static route (with IP address 5.0.0.10) is forwarded to the next-hop device (with IP address 9.0.0.1).
RIB group	apbr_group2	Name of the RIB group. The RIB group shares interface routes with the forwarding routing instances. To ensure that the next hop is resolvable, interface routes from the main routing table are shared through a RIB group with the routing tables specified in the routing instances.

To perform URL category-based routing using local Web filtering, you must complete the following procedures:

- Enabling Local Web Filtering on page 168
- Defining the Routing Instance and the RIB Group on page 169
- Configuring the APBR Profile on page 170
- Configuring APBR Policy and Attaching the APBR Profile on page 170

Enabling Local Web Filtering

Step-by-Step Procedure

To use URL categories as match criteria in an APBR profile, you must enable local Web filtering in UTM.

1. Enable local Web filtering by specifying the Web filtering type as **juniper-local**.

```
[edit]
user@host# set security utm feature-profile web-filtering type juniper-local
```

2. Create custom objects and URL pattern lists.

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```
[edit]
user@host# set security utm custom-objects url-pattern local1 value 203.0.113.0
user@host# set security utm custom-objects url-pattern local1 value 203.0.113.10
```

In this step, a pattern that matches the IP address 203.0.113.0 or 203.0.113.10 on HTTP is created.

3. Configure the custom URL category list.

```
user@host# set security utm custom-objects custom-url-category custom value
   local1
```

The URL category specified in this example is custom, where you can add URL lists. In this step, you are adding the URL list **local1**, which includes the patterns matching the addresses 203.0.113.1 and 203.0.113.10 that are created in step 2.

4. Configure a Web filtering profile.

```
user@host# set security utm feature-profile web-filtering juniper-local profile P1
   category custom action permit
```

A Web filtering profile includes a user-defined category with a permit action.

For more information about local Web filtering configuration, see Local Web Filtering.

Defining the Routing Instance and the RIB Group

Step-by-Step Procedure

Define the routing instance and the RIB group.

1. Create the routing instance to forward traffic to the different next hops. In this example, you configure the static route 5.0.0.0/10, using the next-hop address of 9.0.0.1.

```
[edit]
user@host#  set routing-instances RI2 instance-type forwarding
user@host#  set routing-instances RI2 routing-options static route 5.0.0.0/16
   next-hop 9.0.0.1
```

2. Create a RIB group.

```
[edit]
user@host# set routing-options interface-routes rib-group inet apbr_group2
user@host# set routing-options rib-groups apbr_group2 import-rib inet.0
user@host# set routing-options rib-groups apbr_group2 import-rib RI2.inet.0
```

Interface routes from the main routing table (inet.0) are shared through a RIB group with the routing table specified in the routing instance (RI2.inet.0).

Configuring the APBR Profile

Step-by-Step Procedure

Create a rule to forward the traffic matching the custom URL pattern to the routing instance RI2.

1. Create the APBR profile and define the match criteria for the URL category.

```
[edit]
user@host# set security advance-policy-based-routing profile apbr-pr2 rule rule2
   match category custom
```

The APBR profile rule matches the traffic to the defined custom URL category—that is, traffic with URL patterns matching the addresses 203.0.113.1 and 203.0.113.10 in this example.

2. Specify the action for the traffic matching the URL category.

```
[edit]
user@host# set security advance-policy-based-routing profile apbr-pr2 rule rule2
   then routing-instance RI2
```

In this step, you are specifying that the traffic that matches the rule is to be redirected to the routing instance RI2.

Configuring APBR Policy and Attaching the APBR Profile

Step-by-Step Procedure

Associate the APBR profile to the APBR policy to enable URL category-based routing.

1. Define the APBR policy. Specify the policy match condition as **any** for the source address, destination address, and application.

```
[edit]
user@host# set security advance-policy-based-routing from-zone trust policy p2
   match source-address any
user@host# set security advance-policy-based-routing from-zone trust policy p2
   match destination-address any
user@host# set security advance-policy-based-routing from-zone trust policy p2
   match application any
```

When traffic arrives, is matched by the APBR policy rules.

2. Attach the APBR profile to the policy.

```
[edit]
user@host# set security advance-policy-based-routing from-zone trust policy p2
   then application-services advance-policy-based-routing-profile apbr-pr2
```

When the traffic matches the APBR policy (p2) rules, the APBR profile apbr-pr2 is applied to the traffic as the action of the APBR policy. The traffic that matches the

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Facebook application is redirected to the routing instance RI2 according to the APBR profile rule rule2.

Results From configuration mode, confirm your configuration by entering the **show** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

[edit security]

```
user@host# show advance-policy-based-routing
profile apbr-pr2 {
   rule rule2 {
      match {
         category custom;
      }
      then {
         routing-instance RI2;
      }
   }
}
from-zone trust {
   policy p2 {
      match {
         source-address any;
         destination-address any;
         application any;
      }
      then {
         application-services {
            advance-policy-based-routing-profile apbr-pr2;
         }
      }
   }
}
```

[edit]

```
user@host# show routing-options
interface-routes {
   rib-group inet apbr_group2;
}
rib-groups {
   apbr_group2 {
      import-rib [ inet.0 RI2.inet.0 ];
   }
}
```

[edit]

```
user@host# show routing-instances
RI2 {
   instance-type forwarding;
```

```
    routing-options {
      static {
        route 5.0.0.0/10 next-hop 9.0.0.1;
      }
    }
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Verifying APBR Statistics

Purpose Display the statistics for APBR, such as the number of sessions processed for the application-based routing, the number of times the APBR is applied for the session, and so on.

Action From configuration mode, enter the **show security advance-policy-based-routing statistics** command.

user@host> show security advance-policy-based-routing statistics

```
Advance Profile Based Routing statistics:
  Session Processed:                    5529
  ASC Success:                          3113
  Rule match success:                   107
  Route  modified:                      107
  AppID Requested:                      2416
```

Meaning The command output displays the following details:

- Sessions processed for the application-based routing
- The number of times the presence of an entry in the application system cache (ASC) is found
- The number of times the application traffic matches the APBR profile and APBR is applied for the session
- The number of times application identification (AppID) was consulted to identify application traffic
- The number of times the APBR is applied for the session

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Release History Table

Release	Description
17.4	Starting with Junos OS Release 15.1X49-D110 and Junos OS Release 17.4R1, SRX Series Services gateways support advanced policy-based routing (APBR) with an additional enhancement to apply the APBR in the middle of a session (which is also known as midstream support)
15.1X49-D60	Starting with Junos OS Release 15.1X49-D60, SRX Series Services Gateways support advanced policy-based routing (APBR)
15.1X49-D123	Support for reverse rerouting is available starting in Junos OS Release 15.1X49-D130 and later releases.

Related Documentation

- Application Identification on page 27
- Application Firewall on page 85
- Application Tracking on page 104
- Application QoS on page 117

Application Quality of Experience

- Application Quality of Experience (AppQoE) on page 173
- Example: Application Quality of Experience (AppQoE) on page 180
- Understanding AppQoE Configuration Limits on page 196
- Understanding Application Path Selection Based on Link Preference and Priority on page 197
- Example: Configuring Link Preference and Priority for AppQoE on page 200

Application Quality of Experience (AppQoE)

This topic includes following sections:

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- Benefits of Application Quality of Experience on page 174
- Supported Use Cases on page 174
- Limitations on page 175
- Understanding Application Quality of Experience Terminology on page 175
- How Application Quality of Experience Works? on page 176
- How Application Quality of Experience Measures Application Performance on page 178
- Switching Application Traffic to An Alternate Path on page 179

Introduction to Application Quality of Experience

The relentless growth of cloud computing, mobility, and Web-based applications, requires that the network identify and control the traffic at the application level, and handle each

application type separately to provide quality of experience (QoE) for users. To ensure application-specific QoE (AppQoE), you need to effectively prioritize, segregate, and route application traffic without compromising performance or availability.

AppQoE utilizes (or employs) the capabilities of two application security services - application identification (AppID) and advanced policy-based routing (APBR). It uses AppID to identify specific applications in your network and advanced policy-based routing (APBR) to specify a path for certain traffic by associating SLA profiles to a routing instance on which the application traffic is sent as per APBR rules.

AppQoE monitors the performance of business- critical applications, and based on the score, selects the best possible link for that application traffic in order to meet performance requirements specified as in SLA (service-level agreement).

The presence of an SLA rule in the APBR configuration triggers the AppQoE functionality; If there are no SLA profiles available, the APBR functions without triggering AppQoE.

Supported SRX Series Devices

AppQoE is supported on vSRX instances, SRX300 line of devices, SRX550M, SRX1500, SRX4100, and SRX4200 devices.

You can configure an AppQoE SLA service between two SRX Series device endpoints (book-ended) and both SRX Series devices must have the same version of the Junos OS image.

You can configure vSRX instances, SRX300 line devices, SRX550M as spoke devices and SRX1500, SRX4100 and SRX4200 as hub devices.

Starting in Junos OS Release 15.1X49-D160, AppQoE is supported on SRX4100 and SRX4200 device when the device is operating in HA mode. You can configure the device to operate both in active/active and active/passive modes and deploy the device as spoke device in SD-WAN use cases.

Benefits of Application Quality of Experience

- Enables cost-effective QoE by providing real-time monitoring of application traffic to provide a consistent and predictable level of service.
- Increases customer retention and satisfaction by providing a guaranteed SLA for the delivery of the certain traffic (such as video traffic). AppQoE ensures that the approved traffic receives the appropriate priority, and bandwidth required to ensure the best quality of experience to the user.

Supported Use Cases

AppQoE finds use in the following network scenarios, among others:

- Networks with hub-and-spoke topology—In a hub-and-spoke configuration, the SRX Series devices at the branch officesand remote offices connect directly to a specific SRX device and do not form tunnels to other devices in the network. Communication between branch sites or remote offices is enabled through the configured VPN hubs.

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- Mesh networks—In a mesh configuration, an SRX Series device at the branch office or remote site is configured to connect directly to any other SRX Series device in the network that is also part of mesh.

Limitations

Implementation of AppQoE on SRX Series devices has the following limitations:

- All the different routes to the destination through different interfaces must have the same preference, weight, and metrics configured. All routes must be added as ECMP paths for the destination and must also be part of the same forwarding table.
- AppQoE SLA service only between two SRX Series devices endpoints (book-ended) are supported. End-to-end AppQoE SLA service is not supported.
- AppQoE can be applied only if all interfaces are part of the same zone.
- AppQoE cannot be applied for reverse traffic.
- AppQoE does not influence in change in the destination for a session.
- AppQoE does not support IPv6/UDP probe encapsulation, GRES, chassis cluster (ISSU, high-availability, dual CPE high availability, Z-mode high availability), and logical systems.
- AppQoE is not supported in multihoming scenarios.
- AppQoE does not support preferred path selection and transit virtual routing and forwarding (VRF) are not supported.
- AppQoE does not support passive probing on IPv6 data packets.
- An input firewall filter is required at the non-WAN interfaces to discard UDP packets with UDP destination port 36000.

Understanding Application Quality of Experience Terminology

This section includes some of the terminologies used in understanding about how AppQoE works.

- SLA rule—An SLA rule includes all required information to measure SLA and to identify whether any SLA violation has occurred or not. It contains the complete probe profiles, period at which profile need to be sent, preferred SLA configuration and so on.
- SLA options—By using SLA options, you can specify that applications be seamlessly diverted to the alternate path if the performance of the primary link is below acceptable levels as specified by the SLA.
- SLA metrics profile — Defines the SLA metrics requirements parameters, which are used by AppQoE to evaluate the SLA of the link. The metric profile includes parameters such as jitter, jitter type, packet loss, round trip delay and so on.
- SLA violations—To accomplish an SLA, AppQoE monitors the network for sources of failures or congestion. If the performance of a link is below acceptable levels as specified by the SLA, the situation is considered as an SLA violation and an alternate path is determined to select the best link that satisfies the SLA.

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- Active and passive probes—Active and passive probe measurements are used for an end-to-end analysis of the network. The data collected by active and passive probing is used for monitoring the network for sources of failures or congestion. If there is a violation detected for any application, the synthetic probe metrics are evaluated to determine the best link that satisfies the SLA.
- Overlay path—an overlay path includes the overlay links that are used to send the application traffic. Application or application groups are assigned to a particular overlay link based on the SLA metrics of that overlay link.
- Destination groups—A destination group is a group of multiple overlay paths terminating at a destination.

How Application Quality of Experience Works?

AppQoE utilizes AppID and APBR capabilities to identify specific applications/application groups and specify a path for certain traffic by associating SLA profiles to a routing instance on which the application traffic is sent as per APBR rules.

AppQoE monitors the performance of applications, and based on the score, selects the best possible link for that application traffic in order to meet performance requirements specified as in SLA (service-level agreement).

Identifying Applications or Application Groups

Following steps are involved in identifying applications or application groups:

1. Junos OS application identification identifies applications and once an application is identified, its information is saved in the application system cache (ASC).
2. APBR evaluates the packets based to determine if the session is candidate for application-based routing (advance policy-based routing). If this is first packet of the new session and traffic is not flagged for application-based routing, it undergoes normal processing (non-APBR route) to destination.
3. If the session needs application-based routing, APBR queries the ASC module to get the application attributes (IP address, destination port, protocol type, and service).
4. - If the application in ASC is found, traffic is further processed for a matching rule in the APBR profile.
    - If a matching rule is found, the traffic is redirected to the specified routing instance for the route lookup.
        - AppQoE checks whether an SLA is enabled for a session. If the session is a candidate for an SLA measurement, AppQoE initiates active and passive probes for performance measurements.
        - If SLA is not enabled for the session in the APBR rule, the AppQoE ignores that session and the default behavior of APBR is applied to those sessions—that is, traffic is routed through the specified routing instance for the destination.
    - If a matching rule is not found, traffic traverses through a default route (non-APBR route) to the destination.

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- If the application in is not found in ASC, APBR requests for deep inspection of the flow. that is, application signature package is installed and application identification for the session is enabled, so that ASC can be populated for use by subsequent sessions for APBR processing (see step 2).

Specifying Path for Applications or Application Groups

The following steps summarize how AppQoE specifies a path for the application traffic according to the SLA rules.

1. APBR uses the application details to look for a matching rule in the APBR profile (application profile). Traffic matching the applications and application groups, are forwarded to the static route and the next-hop address as specified in the routing instance.
2. An SLA rule attached to the APBR profile specifies parameters, that are required to measure the SLA and to identify whether any SLA violation has occurred or not.
3. The applications traffic is assigned to a particular overlay link based on the SLA metrics of that overlay link measured using active probing.
4. The SLA violation is determined through passive probing of live application/application group traffic. The best path/overlay link for the application/application group is determined through the path selection algorithm.

Application Traffic Path Selection

The following steps take place for routing data traffic from source to destination, specifically, to select the best path,

- For the first data packet of a flow (first path), if the application is already known (from the ASC lookup), then the best path for the application is searched in the database. If the application is not known or is new (from ASC lookup), then a random path or the default path is chosen. This path continues for the entire session. Later, after the application is detected by the DPI, the database is updated with the best path for the application.
- For the remaining data packet of a flow (fast path), if the application is not known initially, then the particular session continues on the same path. If the application is known initially, then AppQoE selects the best path for the application traffic.

When a new application is detected, the path selection mechanism attempts to find a path that satisfies all the SLA metrics. If no such path exists, then the next best path (based on number of metrics satisfied) is used. If there are more than one path that satisfies the metrics, a random path among the available paths is selected. The SLA violation is detected when any one of the metric is violated or none of the metrics meets the requirement, based on the profile configuration.

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How Application Quality of Experience Measures Application Performance

Application performance is determined by the following indicators:

- Latency—The amount of time physically required for media to travel depending on media length and distance that need to be covered
- RTT— A round-trip time required to travel from source to destination and vice versa.
- Packet loss—Packet loss reflects the number of packets lost per 100 of packets sent by a host.
- Jitter—Jitter is the difference in the latency from packet to packet. Ingress jitter, egress jitter, and two-way jitter can be specified for evaluating the performance of the link.

AppQoE monitors RTT, jitter, and packet loss on each link, and based on the score, seamlessly diverts applications to the alternate path if performance of the primary link is below acceptable levels as specified by SLA. Measurement and monitoring of application performance is done using active and passive probes to detect SLA violations and to select an alternate path for that particular application.

AppQoE collects real-time data by continuously monitoring application traffic and identifying network or device issues by:

- Monitoring the performance on all configured overlay links.
- Using passive probes (inline with the application datapath) and active probes (synthetic probes for specific application) to monitor the traffic performance for application or application group.
- Sending all collected performance metrics or metadata for analysis to a log collector.
- Comparing specified application against a specific performance metric and changing the path for the application traffic dynamically in case of an SLA violation.
- Supporting flexible SLA metric configuration for a given application or application group.

AppQoE measures the application SLA across multiple WAN links, and maps the application traffic to a path among the available links, that is, to the path that best serves the SLA requirement.

Application Performance Measurement by Using Active and Passive Probes

Active and passive probe measurements are the two approaches used for end-to-end analysis of the network.

- Active probe—Active probes measure the service quality of the application to provide an end-to-end measurement of the network performance.

  In active probing, custom packets are sent between spoke and hub points on all the multiple routes and the RTT, latency, jitter, and packet-loss are measured between the installed probe points. The active probes are sent periodically on all the active and passive links. A configured number of samples is collected and a running average for each such application's probe path is measured. If there is a violation detected for any

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application traffic, the probe metrics are evaluated to determine the best link that satisfies the SLA.

- Passive probe—Passive probes are installed on links within the network, and they monitor all the traffic that flows through those links.

  Passive probing monitors links for SLA violations on live data traffic. In a passive probe, the actual data packets are encapsulated in an IP/UDP probe header in the live traffic between the SRX Series book-ended points, and RTT, jitter and packet loss between the points of installation of the probes are measured to compute the service quality.

  If there is a violation detected for any application, the synthetic probe metrics are evaluated to determine the best link that satisfies the SLA.

NOTE: **Starting in Junos OS Release 18.3R1 and in Junos OS Release 15.1X49-D150, on all supported SRX Series devices and vSRX instances, in order to detect if a link or path is down by passive probes, a minimum of three probe requests and 100% packet loss must occur in a sampling period for a given session to trigger SLA violation.**

You can configure an SLA rule with active and passive probe parameters and associate the SLA rule with APBR profile. The APBR profile also includes a APBR rule. Rules are associated with one or more than one application or application groups and the traffic matching the rule is redirected to the routing instance

AppQoE triggers the probe requests to all probe paths of the application. Active and passive probes monitor the network for areas or points of failures or congestion.

AppQoE collects traffic class statistics for learned applications using active and passive probes and takes following actions:

1. Measure performance for SLA—The real-time metrics provided by probes are used to score service quality according to the SLA for an application and determine whether the application path does not meet SLA requirements. That is, if there is a violation detected for any application, the synthetic probe metrics are evaluated to determine the best alternate link for the application traffic that satisfies the SLA.
2. Reroute traffic—Switch the application traffic between the two links, that is, when one link has performance issues, the traffic is routed to the other link during the same session.

NOTE: **If the application's traffic can be reachable through multiple links, you must configure all the reachable paths as overlay paths and attach the overlay paths to application's SLA rule.**

Switching Application Traffic to An Alternate Path

You can enable or disable switching of the application traffic to another route (local to the device) during an SLA violation. When local route switching is enabled, switching of

the application traffic to an alternate route is enabled and the SLA monitoring and reporting functionality is also available. Even when the option for switching of the application traffic to an alternate path is disabled in the SLA rule configuration, AppQoE resolves SLA violations---for example, by switching the application traffic to a new path

When local route switching is disabled, only SLA monitoring and reporting functionality is available and switching of the application traffic to the different route because of an SLA violation is tuned off.

When an application traffic switches to an alternative path, there will be a short time period during which the application traffic cannot be switched again to another path in case of SLA violation. This time period helps to avoid flapping of the traffic across links.

Example: Application Quality of Experience (AppQoE)

This example shows how to configure AppQoE to provide quality of experience (QoE) by enabling real- time monitoring of the application traffic according to the specified SLA..

This example provides step-by-step procedures required for SRX Series devices to provide the quality-of-experience (QoE) service using AppQoE. In this configuration, devices in the network prioritize certain application traffic to enhance the user experience based on service-level agreement (SLA).

- Requirements on page 180
- Overview on page 180
- Configuring AppQoE on page 184
- Verify AppQoE Configuration on page 194

Requirements

- Valid application identification feature license installed on an SRX Series device.
- Appropriate security policies to enforce rules for the transit traffic, in terms of what traffic can pass through the device, and the actions that need to take place on the traffic as it passes through the device.
- Enable application tracking support enabled for the zone. See Application Tracking.
- Supported SRX Series device with Junos OS Release 18.2 and Junos OS Release 15.1X49-D150 or later. This configuration example is tested for Junos OS Release 18.2.

Overview

AppQoE monitors the performance of business-critical applications, and based on the score, selects the best possible link for that application traffic in order to meet performance requirements that are specified as in the SLA. To achieve this goal, AppQoE creates application-specific SLA rules and associates the SLA rules to an APBR profile and to a routing instance on which the application traffic will be sent.

AppQoE measures the application performance across multiple links by collecting real-time data by continuously monitoring application traffic and identifying any network

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or device issues by active and passive probing. Measured application data is used to determine whether the application path meets SLA requirements and whether an alternate path can be used to reroute the traffic to meet the SLA requirements.

Figure 5 on page 181 shows the topology used in this configuration example.

Figure 5: Topology for AppQoE Configuration

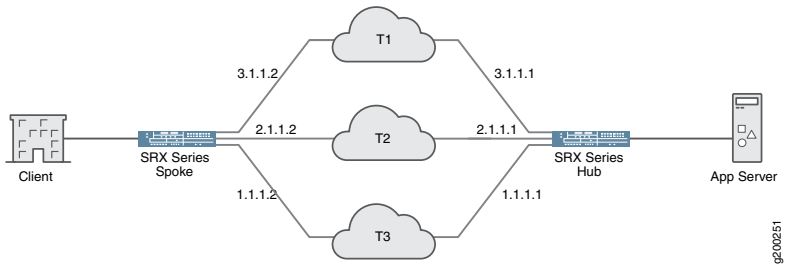

Table 17 on page 181 provides the details of the parameters used in this example.

Table 17: AppQoE Configuration Parameters

Parameter	Name	Description
APBR profile	apbr1	Name of the APBR profile. This profile matches applications and application groups and redirects the matching traffic to the specified routing instance for route lookup. The profile includes multiple rules.
APBR rule	rule-app1 rule-app2 rule-app2	Define the rules for the APBR profile. Associate the rule with one or more than one application (example: for HTTP, FTP, and SSH) or application groups.
Routing Instance	appqoe-vrf	Instance type as routing and forwarding (VRF) instance
RIB group	lanvrf	Name of the routing information base (RIB) (also known as routing table) group.
Define AppQoE as service	system-services=appqoe	Enable AppQoE as an individual service to allow host-inbound custom probe traffic that can reach the device for all the interfaces in a zone.

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Table 17: AppQoE Configuration Parameters (continued)

Parameter	Name	Description
SLA rule	• sla1 • sla2	Individual applications and application group must have an SLA rule attached. The SLA rule includes all required information to measure the SLA and to identify whether any SLA violation has occurred or not. It contains the complete probe profiles, time period at which profile need to be sent, preferred SLA configuration and so on. An SLA rule is associated with an APBR rule, which is matched to the application or application group.
SLA options	local-route-switch = enabled	Specify local route switch option. This option enables switching of application traffic to an alternate path if an SLA violation occurs.
SLA metrics profile	• metric1 • metric 2	Defines the performance metrics for delay round trip, one-way jitter or two-way jitter, and packet loss. AppQoE uses metrics profile to evaluate the SLA of the link.
Active probes	• probe1 • probe2	An active probe parameter configures the probe data information such as probe's data size, intervals between individual probes, and so on. Active probe will be initiated from the spoke device to the hub device on each of the overlay path.

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Table 17: AppQoE Configuration Parameters (continued)

Parameter	Name	Description
Overlay path	overlay-path1 Tunnel • Local IP addresses- 1.1.1.1 • Remote IP addresses- 2.1.1.1 Probe • Local IP addresses- 125.1.1.1 • Remote IP addresses- 125.1.1.10	Configuring an overlay path allows you to specify the destinations to which the active probe data needs to be sent. Overlay paths are configured for all overlay endpoints. Overlay path configuration includes two set of IP addresses: • Tunnel IP addresses–In this example, T1, T2, T3 are used as tunnels. Tunnel's start and end IP addresses must be mentioned. Tunnel IP addresses must be unique across individual overlay paths. end points • Probe IP addresses—Probe IP addresses are used as probes' start and end addresses to send over the corresponding tunnel paths. Probe IP addresses must be unique across individual overlay paths.
	path2 Tunnel • Local IP addresses- 100.0.0.1 • Remote IP addresses- 150.1.1.1 Probe • Local IP addresses- 25.1.1.1 • Remote IP addresses- 25.1.1.10	
	path3 Tunnel • Local IP addresses- 200.1.1.1 • Remote IP addresses- 250.1.1.1 Probe • Local IP addresses- 225.1.1.1 • Remote IP addresses-	
Destination Grouping	destination-path-group-1	You can group all the overlay paths terminating at the same destination under a destination group. In this example, you have a single destination—that is, hub device. So, all paths are configured under the same destination group and all the paths must be available in the routing instance specific for active probing.

Before you begin:

- When a traffic is identified for AppQoE, that traffic could be fragmented when the packet size exceeds the supported MTU value with the additional encapsulation of the probe header.

  To manage the fragmentation, we recommend you to configure the maximum segment size for TCP sessions for SRX Series devices using the following commands:

  ```
  [edit]
  user@hostset security flow tcp-mss ipsec-vpn mss 1200
  user@hostset security flow tcp-mss all-tcp mss 1350
  ```

- The passive probe packet carries actual source and destination IP address of the client packets. To allow the passive probe packets through the system, you must complete the following configuration:

  - Configure address-based custom applications signatures for UDP (port 36000). This configuration helps in identifying the application by AppID.

    ```
    [edit]
    user@hostset services application-identification application jun-appqoe priority high
    user@hostset services application-identification application jun-appqoe
      address-mapping addr1 filter port-range udp 36000
    ```

  - You must create an appropriate security policy and application firewall policy to support the above configuration.

NOTE: Passive probes generate application tracking log messages for session create and session delete. Once the custom signature identifies these packets, the message reports application as jun-appqoe.

Configuring AppQoE

Configure Advanced Policy-Based Routing (APBR)

Step-by-Step Procedure

Configure APBR profiles for HTTP, FTP, and SSH applications traffic.

1. Create routing instances.

   ```
   user@host# set routing-instances appqoe-vrf instance-type vrf
   user@host# set routing-instances appqoe-vrf routing-options static route 9.0.0.0/8
     next-hop [gr-0/0/0.0 gr-0/0/0.1 gr-0/0/0.2 ]
   user@host# set routing-instances appqoe-vrf routing-options static route 12.1.1.0/24
     next-hop 22.1.1.2
   user@host# set routing-instances appqoe-vrf routing-options static route 13.1.1.0/24
     next-hop 23.1.1.2
   user@host# set routing-instances appqoe-vrf routing-options static route 14.1.1.0/24
     next-hop 24.1.1.2
   ```


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2. Group one or more routing tables to form a RIB group and import routes into the routing tables.

```
user@host# set routing-options rib-groups lanvrf import-rib appqoe-vrf.inet.0 inet.0
```

3. Create the APBR profile and define the rules.

```
user@host# security advance-policy-based-routing profile apbr1 rule rule-app1
  match dynamic-application junos:HTTP
```

```
user@host# security advance-policy-based-routing profile apbr1 rule rule-app2
  match dynamic-application junos:FTP
```

```
user@host# security advance-policy-based-routing profile apbr1 rule rule-app2
  match dynamic-application junos:SSH
```

```
user@host# set security advance-policy-based-routing profile apbr1 rule rule-app1
  then routing-instance appqoe-vrf
```

```
user@host# set security advance-policy-based-routing profile apbr1 rule rule-app2
  then routing-instance appqoe-vrf
```

```
user@host# set security advance-policy-based-routing profile apbr1 rule rule-app3
  then routing-instance appqoe-vrf
```

4. Configure AppQoE as system service.

```
user@host# set security zones security-zone trust host-inbound-traffic
  system-services appqoe
```

5. Apply the APBR profile to the security zone.

```
user@host# set security zones security-zone trust host-inbound-traffic protocols
  all
```

```
user@host# set security zones security-zone trust
  advance-policy-based-routing-profile apbr1
```

Configuring Metrics Profile

Step-by-Step Procedure

1. Create the set of metrics which AppQoE uses to evaluate the SLA of the link.

```
user@host# set security advance-policy-based-routing metrics-profile metric1
  sla-threshold jitter 5000
```

```
user@host# set security advance-policy-based-routing metrics-profile metric1
   sla-threshold jitter-type two-way-jitter
```

```
user@host# set security advance-policy-based-routing metrics-profile metric1
   sla-threshold packet-loss 50
```

```
user@host# set security advance-policy-based-routing metrics-profile metric1
   sla-threshold match all
```

```
user@host# set security advance-policy-based-routing metrics-profile metric2
   sla-threshold delay-round-trip 4000
```

Configure Active Probe Parameters

Step-by-Step Procedure

Configure active probing to send custom packets between spoke device and hub device on all routes to measure RTT, jitter, and packet loss between the points.

1. Configure active probe parameter (probe1).

```
user@host# set security advance-policy-based-routing active-probe-params probe1
   settings data-fill deadbead
user@host# set security advance-policy-based-routing active-probe-params probe1
   settings data-size 100
user@host# set security advance-policy-based-routing active-probe-params probe1
   settings probe-interval 10
user@host# set security advance-policy-based-routing active-probe-params probe1
   settings probe-count 10
user@host# set security advance-policy-based-routing active-probe-params probe1
   settings burst-size 10
user@host# set security advance-policy-based-routing active-probe-params probe1
   settings enable-sla-export 600
```

2. Configuring active probe parameter (probe2).

```
user@host# set security advance-policy-based-routing active-probe-params probe2
   settings data-fill juniper
user@host# set security advance-policy-based-routing active-probe-params probe2
   settings data-size 256
user@host# set security advance-policy-based-routing active-probe-params probe2
   settings probe-interval 30
user@host# set security advance-policy-based-routing active-probe-params probe2
   settings probe-count 300
user@host# set security advance-policy-based-routing active-probe-params probe2
   settings enable-sla-export 600
```


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Configuring Overlay and Probe Paths

Step-by-Step Procedure

Configure an overlay setup, which includes setting up both tunnel path and probe path, between local and remote endpoint on both ends of the overlay (spoke device and hub devices).

1. Create overlay paths for the tunnel and probe (overlay-path1).

```
user@host# set security advance-policy-based-routing overlay-path overlay-path1
  tunnel-path local ip-address 1.1.1.2
```

```
user@host# set security advance-policy-based-routing overlay-path overlay-path1
  tunnel-path remote ip-address 1.1.1.1
```

```
user@host# set security advance-policy-based-routing overlay-path overlay-path1
  probe-path local ip-address 1.1.1.2
```

```
user@host# set security advance-policy-based-routing overlay-path overlay-path1
  probe-path remote ip-address 1.1.1.1
```

2. Create overlay paths for the tunnel and probe (overlay-path2).

```
user@host# set security advance-policy-based-routing overlay-path overlay-path2
  tunnel-path local ip-address 2.1.1.2
```

```
user@host# set security advance-policy-based-routing overlay-path overlay-path2
  tunnel-path remote ip-address 2.1.1.1
```

```
user@host# set security advance-policy-based-routing overlay-path overlay-path2
  probe-path local ip-address 2.1.1.2
```

```
user@host# set security advance-policy-based-routing overlay-path overlay-path2
  probe-path remote ip-address 2.1.1.1
```

3. Create overlay paths for the tunnel and probe (overlay-path3).

```
user@host# set security advance-policy-based-routing overlay-path overlay-path3
  tunnel-path local ip-address 3.1.1.2
```

```
user@host# set security advance-policy-based-routing overlay-path overlay-path3
  tunnel-path remote ip-address 3.1.1.1
```

```
user@host# set security advance-policy-based-routing overlay-path overlay-path3
  probe-path local ip-address 3.1.1.2
```

```
user@host# set security advance-policy-based-routing overlay-path overlay-path3
  probe-path remote ip-address 3.1.1.1
```

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4. Group all the overlay paths terminating at a destination. Because there is a single destination available—that is, the hub device— all paths must be configured under the same destination group. All paths must be available in the routing instance specific for active probing.

```
user@host# set security advance-policy-based-routing destination-path-group
    destination-path-group-1 probe-routing-instance R1-appqoe
```

```
user@host# set security advance-policy-based-routing destination-path-group
    destination-path-group-1 overlay-path overlay-path1
```

```
user@host# set security advance-policy-based-routing destination-path-group
    destination-path-group-1 overlay-path overlay-path2
```

```
user@host# set security advance-policy-based-routing destination-path-group
    destination-path-group-1 overlay-path overlay-path3
```

Configure SLA Rule

Step-by-Step Procedure

Configure an SLA rule to measure the SLA and to identify any SLA violation has occurred or not.

1. Configure the SLA rule, associate metrics profile, active probe parameter, and define passive probe parameters.

```
user@host# set security advance-policy-based-routing sla-rule sla1 switch-idle-time
    60
```

2. Define switch idle time for the SLA rule.

```
user@host# set security advance-policy-based-routing sla-rule sla1 metrics-profile
    metric1
```

3. Associate active probe parameter (probe1) to the SLA rule.

```
user@host# set security advance-policy-based-routing sla-rule sla1
    active-probe-params probe1
```

4. Define passive probe parameters.

```
user@host# set security advance-policy-based-routing sla-rule sla1
    passive-probe-params type book-ended
user@host# set security advance-policy-based-routing sla-rule sla1
    passive-probe-params violation-count 5
user@host# set security advance-policy-based-routing sla-rule sla1
    passive-probe-params sampling-percentage 25
user@host# set security advance-policy-based-routing sla-rule sla1
    passive-probe-params sampling-period 60000
```


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```
user@host# set security advance-policy-based-routing sla-rule sla1
   passive-probe-params sla-export-factor 60
```

Configure SLA Rule Setting with APBR

Step-by-Step Procedure

Associate an SLA rule to with the APBR profile.

1. Enable local route switching. This option enables switching of application traffic to an alternate path if an SLA violation occurs.

```
user@host# set security advance-policy-based-routing sla-options
   local-route-switch enabled
```

2. Configure SLA rule setting with APBR.

```
user@host# set security advance-policy-based-routing profile apbr1 rule rule-app1
   then sla-rule sla1
user@host# set security advance-policy-based-routing profile apbr1 rule rule-app2
   then sla-rule sla2
user@host# set security advance-policy-based-routing profile apbr1 rule rule-app3
   then sla-rule sla1
```

Configure AppQoE on Device Acting as Hub

Step-by-Step Procedure

1. Configure AppQoE as service. You must configure AppQoE as service for host inbound traffic for a desired zone.

```
user@host# set security zones security-zone zone1 host-inbound-traffic
   system-services appqoe
```

2. Configure the percentage of sessions selected for book-ended measurement (passive probing).

```
user@host# set security advance-policy-based-routing sla-rule sla1
   passive-probe-setting session-sampling-percentage 25
```

Results

From configuration mode, confirm your configuration by entering the show commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit security]
user@host# show advance-policy-based-routing
profile apbr1 {
   rule rule1 {
```

```
        match {
            dynamic-application [ junos:FTP junos:HTTP junos:SSH ];
        }
        then {
            routing-instance appqoe;
            sla-rule {
                sla_rule1;
            }
        }
    }
}
active-probe-params active_probes {
    settings {
        data-fill {
            deadbead;
        }
        data-size {
            100;
        }
        probe-interval {
            10;
        }
        probe-count {
            10;
        }
        burst-size {
            10;
        }
        enable-sla-export {
            600;
        }
    }
}
metrics-profile metrics_profile1 {
    sla-threshold {
        delay-round-trip {
            4000;
        }
        jitter {
            5000;
        }
        jitter-type {
            two-way-jitter;
        }
        packet-loss {
            50;
        }
        match {
            all;
        }
    }
}
overlay-path overlay-path1 {
    tunnel-path {
        local {
```


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```
            ip-address {
                1.1.1.2;
            }
        }
        remote {
            ip-address {
                1.1.1.1;
            }
        }
    }
    probe-path {
        local {
            ip-address {
                1.1.1.2;
            }
        }
        remote {
            ip-address {
                1.1.1.1;
            }
        }
    }
}
overlay-path overlay-path2 {
    tunnel-path {
        local {
            ip-address {
                2.1.1.2;
            }
        }
        remote {
            ip-address {
                2.1.1.1;
            }
        }
    }
    probe-path {
        local {
            ip-address {
                2.1.1.2;
            }
        }
        remote {
            ip-address {
                2.1.1.1;
            }
        }
    }
}
overlay-path overlay-path3 {
    tunnel-path {
        local {
            ip-address {
                3.1.1.2;
            }
```

```
        }
        remote {
            ip-address {
                3.1.1.1;
            }
        }
    }
    probe-path {
        local {
            ip-address {
                3.1.1.2;
            }
        }
        remote {
            ip-address {
                3.1.1.1;
            }
        }
    }
}
destination-path-group destination-path-group-1 {
    probe-routing-instance {
        abc;
    }
    overlay-path overlay-path1;
    overlay-path overlay-path2;
    overlay-path overlay-path3;
}
sla-rule sla_rule1 {
    switch-idle-time {
        60;
    }
    metrics-profile {
        metrics_profile1;
    }
    active-probe-params {
        active_probes;
    }
    passive-probe-params {
        sampling-percentage {
            25;
        }
        violation-count {
            3;
        }
        sampling-period {
            60000;
        }
        sla-export-factor {
            60;
        }
        type {
            book-ended;
        }
    }
```


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```
}
```

```
[edit routing-instances]
user@host# show appqoe-vrf
routing-options {
   static {
      route 9.0.0.0/8 next-hop [ gr-0/0/0.0 gr-0/0/0.1 gr-0/0/0.2 ];
      route 12.1.1.0/24 next-hop 22.1.1.2;
      route 13.1.1.0/24 next-hop 23.1.1.2;
      route 14.1.1.0/24 next-hop 24.1.1.2;
   }
}
```

```
[edit routing-options]
user@host# show
rib-groups {
   lanvrf {
      import-rib [ lan-vrf.inet.0 inet.0 ];
   }
}
forwarding-table {
   export load-balancing-policy;
}
```

```
[edit security advance-policy-based-routing profile apbr1}
user@host# show
rule rule1 {
   match {
      dynamic-application [ junos:FTP junos:HTTP junos:SSH ];
   }
   then {
      routing-instance appqoe-vrf;
      sla-rule {
         sla_rule1;
      }
   }
}
```

```
[edit security zones
user@host# show
security-zone trust {
   host-inbound-traffic {
      system-services {
         all;
      }
      protocols {
         all;
      }
   }
   interfaces {
      ge-0/0/5.0;
   }
   application-tracking;
```

```
    advance-policy-based-routing-profile {
      apbr1
    }
  }
```

Verify AppQoE Configuration

Verifying SLA Profile

Purpose Display the SLA version.

Action From operational mode, enter the **show security advance-policy-based-routing sla version** command.

user@host>show security advance-policy-based-routing sla version

```
SLA version: APPQOE.VERS.1.0.0.0
```

Meaning The command output displays the version of AppQoE. This information helps verify that the SLA version on both hub device and spoke device is same.

Verifying SLA Profile Status

Purpose Verify that the SLA is enabled on your device.

Action From operational mode, enter the **show security advance-policy-based-routing sla status** command.

user@host>show security advance-policy-based-routing sla status

```
Local Switching is enabled.
```

Meaning The command output confirms that local switching is enabled. That is, switching of the application traffic to another route (local to the device) during an SLA violations, is enabled.

When local route switching is enabled, switching of application traffic to other route is enabled and also SLA monitoring and reporting functionality is available. This configuration selects the best possible link for that application traffic in order to meet performance requirements as in the SLA.

Displaying SLA Statistics

Purpose Display the details of the SLA statistics based on APBR profile.

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Action From operational mode, enter the **show security advance-policy-based-routing sla statistics** command.

user@host>show security advance-policy-based-routing sla statistics

```
Advance Profile Based Routing SLA statistics:
    Passive Probe Statistics
        Passive Probe Session Processed  7040
          Possible Passive Probe Sessions  0
          Passive Probe Sessions Sampled   0
          Passive Probe Ongoing Sessions   0
          SLA violations                   0
Active Probe Statistics
          Active Probe Paths               0
          Active Probe Session             3
          Active Probes Sent               18360
          Active Probe Paths down          3
```

Meaning The command output displays the session details subjected to passive probe and active probe.

Display SLA Statistics for An Application

Purpose Display the details of the application traffic.

Action From operational mode, enter the **show security advance-policy-based-routing sla** command.

user@host> show security advance-policy-based-routing sla profile apbr-1 destination-group-name d1 status apbr1 application junos:HTTP

```
Application status:
  Num of SLA Violations       0
  Num of Path Switches        1
  Num of monitored sessions   0
  Num of sessions             0
```

user@host> show security advance-policy-based-routing sla profile apbr-1 application junos:HTTP destination-group-name d1

```
Application Details:
  Application Name            junos:HTTP
  Application ID              67
  APBR Profile Name           apbr1
  APBR Rule Name              rule1
  Application State           NO PATH SELECTED
  Path Switch Idle State      0
  Routing Instance Name       appqoe-vrf
  SLA Rule Name               sla1
  Active Probe Name           probe1
  Selected Tunnel Destination 0.0.0.0
SLA Metrics:
PKT-LOSS(%)     RTT(us)         2way-Jit(us)    Ing-Jit(us)     Egr-Jit(us)
  0               0               0               0               0
```

Meaning The command output samples help in understanding application details, APBR profile, SLA rule, application status, SLA violations occurred, number of times application traffic has switched route path, and monitored sessions.

Display Active Probe Statistics

Purpose Display active probe statistics.

Action From operational mode, enter the **show security advance-policy-based-routing sla active-probe-statistics** ***active-probe-params-name*** command.

user@host> show security advance-policy-based-routing sla active-probe-statistics active-probe-params-name probe1

```
Active Probe Statistics:
Src-IP          Dst-IP          PKT-LOSS(%)     RTT(us)         2way-Jit(us)
Ing-Jit(us)     Egr-Jit(us)
  3.1.1.2         3.1.1.1         0               2633            119
  86              55
  2.1.1.2         2.1.1.1         0               3647            58
  67              56
  1.1.1.2         1.1.1.1         0               4101            42
  61              53
```

Meaning The output shows RTT, jitter and packet-loss measured between the installed probe points.

Understanding AppQoE Configuration Limits

Starting in Junos OS Release 15.1X49-D160, AppQoE enforces the configuration limit for overlay paths, metric profiles, probe parameters, and SLA rules per profile when you configure application-specific SLA rules and associates the SLA rules to an APBR profile.

If you configure the parameters more than the allowed limit, error messages are displayed when you commit the configuration.

Examples of error messages:

NOTE: The following sample error messages are from the SRX4100 and SRX4200 device. The value of the configuration limit might not reflect exact number supported; the numbers might differ between the supported devices.

```
[edit security advance-policy-based-routing]
  'sla-rule sla0'
    Cannot configure more than 32 sla rules
error: configuration check-out failed
```

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```
[edit security advance-policy-based-routing]
  'overlay-path grep2'
    Cannot configure more than 2000 overlay paths
error: configuration check-out failed
```

```
[edit security advance-policy-based-routing]
  'metrics-profile m0'
    Max metrics for this system is 32
error: configuration check-out failed
```

```
[edit security advance-policy-based-routing]
  'active-probe-params pr0'
    Cannot configure more than 64 probe params
error: configuration check-out failed
```

Understanding Application Path Selection Based on Link Preference and Priority

One of the important requirements of a software-defined WAN (SD-WAN) is to measure the quality of underlay network paths and, based on the results, determine the best paths to use for the delivery of each packet.

Starting in Junos OS Release 15.1X49-D160, you can configure application-specific quality of experience (AppQoE) to select the application path based on the link priority and the link type when multiple paths that meet the SLA requirements are available.

You can select an MPLS or Internet link as the preferred path, assign the priority between 1 through 255 with a lower value indicating a more preferred link. A value of one (1) indicates highest priority. If there are multiple paths available, the path which has the highest priority is selected.

For example, If an MPLS path is selected for VoIP traffic and quality degradation occurs during a call because of jitter or packet loss, the packets are sent through another path (Internet) that meets SLA requirements. Now application traffic is sent through the Internet path and if the quality in the Internet path is degraded, the path is switched back to MPLS.

You can configure the link priority and link type of each underlay interface in an advanced policy-based routing (APBR) rule, and the same parameters are inherited by the corresponding overlay. An underlay interface in this case is the final outgoing interface in the routing topology for the overlay.

For example, in a network infrastructure, if the underlay is a fourth-generation (4G) LTE connection, then the dialer interface can be configured as the underlay interface for AppQoE. Similarly, if the underlay is a DSL connection, then the corresponding Point-to-Point Protocol over Ethernet (PPPoE) interface can be configured as the underlay interface for AppQoE.

Benefits of Application Path Preference and Priority

- Provides flexibility of selecting the best path for for application traffic.

- Enables routing of application traffic over the cost-effective connectivity option while ensuring SLA requirements (latency and jitter) are met.
- Supports dynamic path switching if the selected application path experiences a degradation in quality.

Path Selection Mechanism

Application traffic is routed through separate links based on the link preference as following:

- AppQoE path selection mechanism includes a list of best paths to a specific destination that meets the SLA requirements. From this list, AppQoE selects a path that matches the link preference configured by the user.
- If there are multiple such paths, the path that has the highest priority among them is selected.
- If there is no priority or link type preference configured, then a random path or the default path is selected.
- If no links that meet the SLA requirements are available, then the best available link in terms of the highest SLA score and link type preference, in case strict affinity is configured, is selected.
- If multiple links that meet the SLA requirements are available, then the one with the highest priority is selected.

Configuring Link Type and Link Priority for Application Path

You can configure the link type either as IP or MPLS and set the priority for the underlay links. Priority can be any value from the range of values (1-255) with a lower value indicating a more preferred link. A value of one (1) indicates highest priority.

The following steps summarize how to specify a path for the application traffic based on link preference:

- Define the link type (IP or MPLS) and link priority (1 through 255) for the underlay links in the APBR profile.
- Configure an APBR rule for one or more than one applications (example: for HTTP) or application groups.
- Associate the APBR rule with the APBR profile. Because the APBR rule is defined for an application or a group of applications, you can enforce the link preference at the application or application group level.
- Specify the link type preference as IP or as MPLS and specify the link-type affinity as strict in an SLA rule. If you do not specify the link-type affinity, the default affinity (loose) is selected. The SLA rule is attached to the APBR profile.

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NOTE: You can select an MPLS or Internet (IP) or Any link as the preferred path. If you do not select IP or MPLS, the preferred link type Any is selected when the link-type affinity is configured as the default link type affinity (loose). Configuring the link type as Any when the link type affinity is configured as strict is not supported.

- In the APBR profile, traffic matching the applications and application groups as per APBR rule, is forwarded to the static route and the next-hop address as specified in the routing instance. The application traffic is assigned to a particular path/link based on the configured link type and preference for underlay interfaces and the specified link-type affinity used in the SLA rule.

If you do not configure link preference in the SLA rule, then the default values for link type and link priority are considered.

Understanding Link-Type Affinity for the Preferred Link

You can configure the link-type affinity as strict for the preferred link type. For the strict affinity, the AppQoE ensures that the path selected is always of the preferred link type. The default link-type affinity is loose. When you do not configure the link-type affinity as strict, then the default value is applied. That is—if there are no SLA meeting links belonging to the preferred link type, then AppQoE selects a link outside the preferred link type that meets the SLA.

AppQoE specifies a path for the application traffic according to the configured link preference and link-type affinity.

The path selection mechanism checks if there are already assigned overlay links based on the SLA metrics of the application is available as follows:

- Yes—The best path for the application is searched for the database.
- No—The path selection mechanism attempts to find a path based on the link-type affinity, type, and priority:
  - Strict—If the link-type affinity is configured as strict, then a new set of overlay links that meet the defined link type is created. Among them, an overlay link with the highest SLA score is selected.

    If multiple links with the highest SLA score are available, then the link with highest priority is selected.
  - Default (loose)—If the link-type affinity is not configured as strict, then an overlay link with the highest SLA score is selected. If there are no links meeting the SLA requirements and belonging to the preferred link type available, then AppQoE selects a link outside of the preferred link type that meets the SLA requirements. However, path selection mechanism continues to check for a preferred link meeting the SLA requirements. Once the preferred link type meeting the SLA requirement is available, then the application traffic is switched back to that link.

    If there are multiple links with the highest priority, then a random link among them is selected.

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Limitation

In the middle of a session, switching from a link with a lower priority value that meets the SLA requirements to a link with a higher priority is not supported when the link with higher priority meets the SLA requirements.

Example: Configuring Link Preference and Priority for AppQoE

This example shows how to configure AppQoE to select the link based on the link priority and the link type when multiple links that meet the SLA requirements are available.

- Requirements on page 200
- Overview on page 200
- Configuration on page 203
- Verify AppQoE Configuration on page 205

Requirements

- Valid application identification feature license installed on an SRX Series device.
- Appropriate security policies to enforce rules for the transit traffic, in terms of what traffic can pass through the device, and the actions that need to take place on the traffic as it passes through the device.
- Application tracking support enabled for the zone. See Application Tracking.
- Supported SRX Series device with Junos OS Release 15.1X49-D160 or later. This configuration example is tested for Junos OS Release 15.1X49-D160.

Overview

Before you begin:

- Complete APBR profile configuration and define SLA rules. See Example: Application Quality of Experience (AppQoE).

You configure AppQoE to select the link based on the link priority and the link type. You can configure the link type either as IP or MPLS and set the priority for the underlay links. You can also configure the link-type affinity as strict for the preferred link type.

You can define the link type and priority for the underlay links in the SLA rule. The SLA rule is assigned to an APBR profile. Because the APBR rule is defined for an application or a group of applications, you can enforce the link preference at the application or application group level. The link preference configuration is applied for the application traffic matching the APBR rule.

Figure 6 on page 201 shows the topology used in this example.

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Figure 6: Topology for Configuring Link Type and Link Priority for Application Path

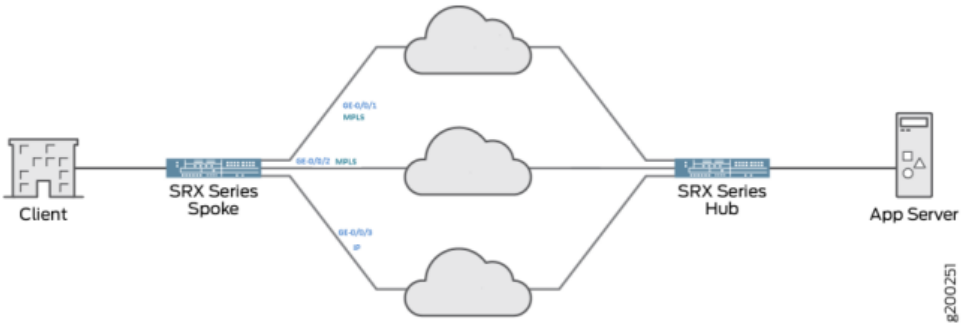

Table 18 on page 201 and Table 19 on page 201 provide the details of the parameters used in this example.

Table 18: AppQoE Configuration Parameters

Parameter	Name	Description
APBR profile	apbr1	Name of the APBR profile. This profile matches applications and application groups and redirects the matching traffic to the specified routing instance for route lookup. The profile includes multiple rules.
APBR rule	rule1	Define the rules for the APBR profile. Associate the rule with one or more than one application (example: for junos:HTTP, junos:SSH).
SLA rule	sla1	Individual applications and application group must have an SLA rule attached. An SLA rule is associated with an APBR rule, which is matched to the application or application group.
Link-type affinity	Strict	For strict affinity, AppQoE ensures that the path selected is always of the preferred link type.

Table 19: Link Preference Parameters for Underlay Interfaces

SLA Rule	Underlay Interfaces	Link Type	Priority
sla1	ge-0/0/1	MPLS	1
	ge-0/0/2	MPLS	2
	ge-0/0/3	IP	3

In this example, you configure the link ge-0/0/1 with link type as MPLS and priority as 1, ge-0/0/2 with link type as MPLS with priority 2, and ge-0/0/3 with link type as IP with priority 3. All the links have same the SLA score as defined in the SLA rule (sla1). For the SLA rule (sla1), configure the link type preference as MPLS.

The following examples show how the path selection mechanism selects the link based on preferred link and the link-type affinity. The topology used in this example is shown in Figure 7 on page 202 and the configured link type and link-type affinity is shown inTable 20 on page 202 .

Figure 7: Path Section Mechanism Example

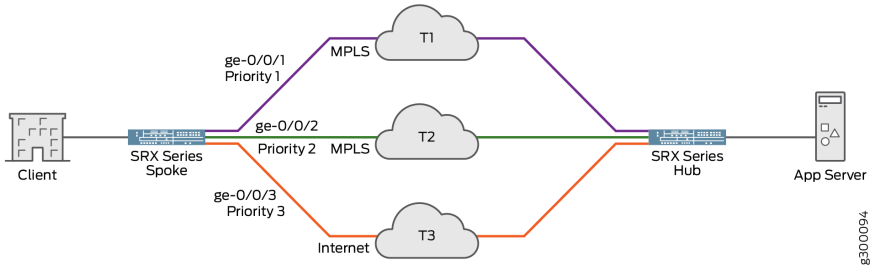

Table 20: Link Type and Priority Details

Links	Link Type	Priority
ge-0/0/1	MPLS	1
ge-0/0/2	MPLS	2
ge-0/0/3	IP	3

- Case 1: When preferred link type is configured as MPLS and link-type affinity is configured as loose (default option), the path selection mechanism details are provided in Table 21 on page 202.

Table 21: Case 1: Preferred Link Type is MPLS and Link-Type Affinity is Default (Loose)

Link Selected For Traffic	Change in Situation	Which Links are Eligible	Traffic Switched To	Explanation
ge-0/0/1	An SLA violation is reported in ge-0/0/1	ge-0/0/2 and ge-0/0/3	ge-0/0/2	Link ge-0/0/2 is selected because it has higher priority.
ge-0/0/2	An SLA violation is reported in ge-0/0/2	ge-0/0/3	ge-0/0/3	Link ge-0/0/3 is selected because it is only remaining eligible link meeting SLA requirements.
ge-0/0/3	SLA violation is cleared in ge-0/0/1	ge-0/0/3 and ge-0/0/1	ge-0/0/1	Traffic is switched back to preferred link ge-0/0/1 (MPLS) from the link ge-0/0/3 (IP).

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- Case 2: When the preferred link type is MPLS and link-type affinity configured as strict, the path selection mechanism details are provided in Table 22 on page 203.

Table 22: Case 2: Preferred Link Type is MPLS and Link-Type Affinity is Strict

Link Selected For Traffic	Change in Situation	Which Links are Eligible	Traffic Switched To	Explanation
ge-0/0/1	An SLA violation is reported in ge-0/0/1	ge-0/0/2 and ge-0/0/3	ge-0/0/2	Link ge-0/0/2 is selected because it is matching the link type preference MPLS.
ge-0/0/2	An SLA violation is reported in ge-0/0/2	ge-0/0/3	ge-0/0/2	Link ge-0/0/2 remains as the selected path. Because of the strict affinity, ge-0/0/3 (which has link type configured as IP) is not selected.

NOTE: When there are multiple interfaces meeting the SLA requirements are available, the path is selected based on link-type preference , and then link priority. If all links have the same link-type preference and priority, then a random selection of the link is done.

Configuration

Configure Link Preference and Priority

Step-by-Step Procedure

Configure AppQoE to select the link based on the link priority and the link type:

1. Create an APBR profile with three rules matching application HTTP and SSH with link type and preference for underlay interfaces.

```
user@host# set security advance-policy-based-routing underlay-interfaces interface
  ge-0/0/1 unit 0 link-type MPLS priority 1
```

```
user@host# set security advance-policy-based-routing underlay-interfaces interface
  ge-0/0/2 unit 0 link-type MPLS priority 2
```

```
user@host# set security advance-policy-based-routing underlay-interfaces interface
  ge-0/0/3 unit 0 link-type IP priority 3
```

2. Configure the SLA rule (sla1) with preferred link type as **MPLS** and link-type affinity as **strict**.

```
user@host# set security advance-policy-based-routing sla-rule sla1
  preferred-link-type MPLS
user@host# set security advance-policy-based-routing sla-rule sla1 link-type-affinity
  strict
```

3. Associate an SLA rule with the APBR profile.

```
user@host# set security advance-policy-based-routing profile apbr1 rule rule1 match
   dynamic-application junos:HTTP
```

```
user@host# set security advance-policy-based-routing profile apbr1 rule rule1 match
   dynamic-application junos:SSH
```

```
user@host# set security advance-policy-based-routing profile apbr1 rule rule1 then
   sla-rule sla1
```

Results

From configuration mode, confirm your configuration by entering the **show** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit security advance-policy-based-routing]
user@host# show
profile apbr1 {
   rule rule1 {
      match {
         dynamic-application [ junos:SSH junos:HTTP ];
      }
      then {
         routing-instance appqoe-vrf;
         sla-rule {
            sla1;
         }
      }
   }
}
underlay-interface ge-0/0/1 {
   unit 0 {
      link-type MPLS;
      priority 1;
   }
}
underlay-interface ge-0/0/2 {
   unit 0 {
      link-type MPLS;
      priority 2;
   }
}
underlay-interface ge-0/0/3 {
   unit 0 {
      link-type IP;
      priority 3;
   }
}
```

```
[edit security advance-policy-based-routing sla-rule sla1]
user@host# show
```


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```
{
   preferred-link-type MPLS;
   link-type-affinity strict;
}
```

Verify AppQoE Configuration

Displaying SLA Statistics

Purpose Display the details of the SLA statistics based on the APBR profile.

Action From operational mode, enter the **show security advance-policy-based-routing sla statistics** command.

user@host>show security advance-policy-based-routing sla statistics

```
Advance Profile Based Routing SLA statistics:
    Passive Probe Statistics
        Passive Probe Session Processed  766
          Possible Passive Probe Sessions  3
          Passive Probe Sessions Sampled   3
          Passive Probe Ongoing Sessions   0
          SLA violations                   79
Active Probe Statistics
          Active Probe Paths               0
          Active Probe Session             3
          Active Probes Sent               129399
          Active Probe Paths down          78
```

Meaning The command output displays the session details subjected to passive probe and active probe.

Related Documentation

- Advanced Policy-Based Routing on page 139
- Application Identification on page 27

Application-Based Multipath Routing

- Application-Based Multipath Routing Overview on page 205
- Example: Configuring Application-Based Multipath Routing on page 207

Application-Based Multipath Routing Overview

Traffic for video and voice are sensitive to packet loss, latency and jitter. Packet loss directly leads to degradation in the quality of voice and video calls. in voice or video calls.

To ensure timely delivery of these sensitive application traffic, application-based multipath routing (also referred as multipath routing in this document) is supported on SRX Series

devices to allow the sending device to create copies of packets, send each copy through two or more WAN links.

Multipath identifies two or more paths based on the SLA configuration and sends out a copy of the original traffic on all the identified paths.

On the other end, among the multiple copies of the packet received, the receiving device selects the first received packet and drops the subsequent ones. On the receiving device, while the copy of the packet is in progress, multipath calculates the jitter and packet loss for the combined links and then estimates the jitter and packet loss for the same traffic on individual links. You can compare the reduction in packet loss when combined links are used instead of individual links used for traffic.

Sending the multiple copies of the application traffic ensures that if there is a packet loss or delay, the other link might still deliver the packet to the endpoint.

Multipath routing leverages following functionality:

- Application identification details from Deep Packet Inspection(DPI)
- APBR functionality for packet forwarding feature
- AppQoE service for SLA association.

Supported Use Cases

- SD-WAN hub and spoke topology
- SD-WAN mesh topology

Limitations

- All the selected WAN links must be of ECMP paths for a destination.
- All the selected WAN interfaces which need to be a part of multipath routing sessions must belong to one single zone
- Multipath routing feature is supported only between two book-ended SRX Series devices.

Benefits of Multipath Routing

- Multipath support in SD-WAN uses case enhances application experience by reducing packet loss, faster delivery of the packet, and less jitter that results in better quality of service for the traffic especially for the voice and video traffic.

Understanding Workflow in Multipath Routing

The following sequences are involved in applying multipath routing:

- Junos OS application identification identifies applications and once an application is identified, its information is saved in the application system cache (ASC).
- Application policy-based routing (APBR) queries the application system cache (ASC) module to get the application attributes details.

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- APBR uses the application details to look for a matching rule in the APBR profile (application profile). If a matching rule is found, the traffic is redirected to the specified routing instance for the route lookup.
- AppQoE checks whether an SLA is enabled for a session. If the session is candidate for an SLA measurement, and if multipath routing is configured, then multipath routing is triggered.
- Based on the SLA rule, multipath routing obtains the underlay link types and corresponding overlays on which packet duplication needs to be performed. Multipath routing can be triggered based on the configuration of an SLA rule. When multipath routing is configured within an SLA rule for a specific application, AppQoE functionality is disabled for all sessions of that application matching the SLA rule.
- Based on the application traffic and the configured bandwidth limit, multipath identifies two or more paths and triggers a copy of the original traffic on all the identified paths. Multipath routing path selection is done on the overlay paths. The parameters to limit the bandwidth is based on the underlay link-speed and selection is based on link-type.
- On the receiving device, while the copy of the packet is in progress, multipath calculates the jitter and packet loss for the combined links and then estimates the jitter and packet-loss for same traffic on individual links.
- On the receiving device, multipath routing accepts packets of a session arriving through different links, maintain sequence of a packet arriving on different CoS queues, and drop any duplicates.

Multipath routing copies packets on all the links belonging to a rule till the bandwidth limit is reached. The bandwidth limit is calculated based on the least link speed identified for that rule. This is applicable for all the sessions for all the applications which match that multipath routing rule. Once the limit is reached, multipath routing stops copying of packets and starts a timer for a time period as configured in max-time-wait option in the multipath routing configuration. When the timer expires, it restarts the copying of the packets again.

Example: Configuring Application-Based Multipath Routing

This example shows how to configure multipath routing to provide quality of experience (QoE) by enabling real-time monitoring of the application traffic according to the specified SLA.

- Requirements on page 207
- Overview on page 208
- Configuration on page 209
- Verification on page 217

Requirements

- Valid application identification feature license installed on an SRX Series device.
- Appropriate security policies to enforce rules for the transit traffic, in terms of what traffic can pass through the device, and the actions that need to take place on the traffic as it passes through the device.

- Enable application tracking support enabled for the zone. See Application Tracking.
- Supported SRX Series device with Junos OS Release 15.1X49-D160 or later. This configuration example is tested for Junos OS Release 15.1X49-D160
- Ensure that following features are configured:
  - Application Identification
  - APBR
  - AppQoE
  - Link Preference and Priority for AppQoE

Overview

To ensure uninterrupted delivery of these sensitive application traffic, application-based multipath routing is supported on SRX Series devices to allow the sending device to create copies of packets, and send each copy through two WAN links to the destination.

Multipath routing identifies two paths based on the SLA configuration and creates duplicate copy of the application traffic and sends the traffic simultaneously on different physical paths. On the receiving device, while the copy of the packet is in progress, multipath routing estimates on the reduction in jitter, RTT and packet loss and analyzes the quality of service for routing the traffic to the best link to provide SLA to the end user. This also helps in estimation on the reduction in jitter, RTT and packet loss is done. If both the copies are received on the remote end, then the first received packet is considered, and drops the subsequent ones.

Table 23 on page 208 provides the details of the parameters used in this example.

Table 23: Configuration Parameters for Multipath Rule, SLA Rule, and APBR

Parameter	Options	Values
Multipath rule (multi1)	Number of paths	2
	bandwidth-limit	60
	Maximum time to wait	60
	Link type	MPLS, IP
	application	junos:YAHOO, junos:GOOGLE
	application-group	junos:web
SLA rule (sla1)	Associated multipath rule	multi1

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Table 23: Configuration Parameters for Multipath Rule, SLA Rule, and APBR (continued)

Parameter	Options	Values
APBR profile (apbr1)	Match applications	junos:YAHOO
	APBR rule	rule1
	SLA rule	sla1
	Underlay interface	ge-0/0/2 and ge-0/0/3 • Speed: 800 Mbps

In this example, you configure a multipath rules for junos:YAHOO and junos:GOOGLE application traffic. Then configure an SLA rule and associate multipath rules with multipath rule.

Next, associate the SLA rules with APBR rules created for the Yahoo application. APBR uses the application details to look for a matching rule in the APBR profile (application profile).

Multipath rule is applied on the traffic matching junos:YAHOO or junos:GOOGLE, and forwarded to and the next-hop address as specified in the routing instance.

Multipath routing obtains the underlay link types and corresponding overlays on which packet duplication is required based on the SLA rule. Based on the application traffic and the configured bandwidth limit, multipath identifies two or more paths and triggers a copy of the original traffic on all the identified paths.

When traffic reaches on receiving end, the receiving device accepts packets of a session arriving through different links, and maintains sequence of a packet arriving on different CoS queues and drops any duplicate packets.

NOTE: **Ensure that configuration is the same across the devices on both the sending-side and on the receiving-side device is such that devices can to act as both sender and a receiver.**

Configuration

Configure Multipath Rules for Application Traffic (Device Configured to Send Traffic)

Step-by-Step Procedure

Configure APBR profiles for different applications traffic and associate SLA rule and multipath rule.

1. Create routing instances.

```
user@host# set routing-instances TC1_VPN instance-type vrf
user@host# set routing-instances TC1_VPN route-distinguisher 150.0.0.1:101
user@host# set routing-instances TC1_VPN vrf-target target:100:101
```

```
user@host# set routing-instances TC1_VPN vrf-table-label
user@host# set routing-instances TC1_VPN routing-options static route 19.0.0.0/8
    next-table Default_VPN.inet.0
```

2. Group one or more routing tables to form a RIB group and import routes into the routing tables.

```
user@host# set routing-options rib-groups Default-VPN-to-TC1_VPN import-rib [
    Default_VPN.inet.0 TC1_VPN.inet.0 ]
```

3. Configure AppQoE as service. You must configure AppQoE as service for host inbound traffic for a desired zone.

```
user@host#  set security zones security-zone untrust1 host-inbound-traffic
    system-services appqoe
```

4. Create the APBR profile and define the rules.

```
user@host# set security advance-policy-based-routing profile apbr1 rule rule1 match
    dynamic-application junos:GOOGLE
user@host# set security advance-policy-based-routing profile apbr1 rule rule1 match
    dynamic-application junos:YAHOO
user@host# set security advance-policy-based-routing profile apbr1 rule rule1 match
    dynamic-application-group junos:web
user@host# set security advance-policy-based-routing profile apbr1 rule rule1 then
    routing-instance TC1_VPN
user@host# set security advance-policy-based-routing profile apbr1 rule rule1 then
    sla-rule sla1
```

5. Configure active probe parameters.

```
user@host# set security advance-policy-based-routing active-probe-params probe1
    settings data-fill juniper
user@host# set security advance-policy-based-routing active-probe-params probe1
    settings data-size 100
user@host# set security advance-policy-based-routing active-probe-params probe1
    settings probe-interval 30
user@host# set security advance-policy-based-routing active-probe-params probe1
    settings probe-count 30
user@host# set security advance-policy-based-routing active-probe-params probe1
    settings burst-size 1
user@host# set security advance-policy-based-routing active-probe-params probe1
    settings sla-export-interval 60
user@host# set security advance-policy-based-routing active-probe-params probe1
    settings dscp-code-points 000110
```

6. Configure metrics profile.

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```
user@host# set security advance-policy-based-routing metrics-profile metric1
   sla-threshold delay-round-trip 120000
user@host# set security advance-policy-based-routing metrics-profile metric1
   sla-threshold jitter 21000
user@host# set security advance-policy-based-routing metrics-profile metric1
   sla-threshold jitter-type egress-jitter
user@host# set security advance-policy-based-routing metrics-profile metric1
   sla-threshold packet-loss 2
```

7. Configure underlay interfaces.

   if link-type is not configured under the underlay interfaces option, the default link-type IP is used and default link-speed of 1000 Mbps is considered.

```
user@host# set security advance-policy-based-routing underlay-interface ge-0/0/2
   unit 0 link-type MPLS
user@host# set security advance-policy-based-routing underlay-interface ge-0/0/2
   unit 0 speed 800
user@host# set security advance-policy-based-routing underlay-interface ge-0/0/3
   unit 0 link-type MPLS
user@host# set security advance-policy-based-routing underlay-interface ge-0/0/3
   unit 0 speed 500
```

8. Configure overlay paths.

```
user@host# set security advance-policy-based-routing overlay-path overlay-path1
   tunnel-path local ip-address 40.1.1.2
user@host# set security advance-policy-based-routing overlay-path overlay-path1
   tunnel-path remote ip-address 40.1.1.1
user@host# set security advance-policy-based-routing overlay-path overlay-path1
   probe-path local ip-address 40.1.1.2
user@host# set security advance-policy-based-routing overlay-path overlay-path1
   probe-path remote ip-address 40.1.1.1
user@host# set security advance-policy-based-routing overlay-path overlay-path2
   tunnel-path local ip-address 41.1.1.2
user@host# set security advance-policy-based-routing overlay-path overlay-path2
   tunnel-path remote ip-address 41.1.1.1
user@host# set security advance-policy-based-routing overlay-path overlay-path2
   probe-path local ip-address 41.1.1.2
user@host# set security advance-policy-based-routing overlay-path overlay-path2
   probe-path remote ip-address 41.1.1.1
user@host# set security advance-policy-based-routing overlay-path overlay-path3
   tunnel-path local ip-address 42.1.1.2
user@host# set security advance-policy-based-routing overlay-path overlay-path3
   tunnel-path remote ip-address 42.1.1.1
user@host# set security advance-policy-based-routing overlay-path overlay-path3
   probe-path local ip-address 42.1.1.2
user@host# set security advance-policy-based-routing overlay-path overlay-path3
   probe-path remote ip-address 42.1.1.1
```

9. Configure destination path groups.

```
user@host# set security advance-policy-based-routing destination-path-group
   site1 probe-routing-instance transit
user@host# set security advance-policy-based-routing destination-path-group
   site1 overlay-path overlay-path1
user@host# set security advance-policy-based-routing destination-path-group
   site1 overlay-path overlay-path2
user@host# set security advance-policy-based-routing destination-path-group
   site1 overlay-path overlay-path3
```

10. Configure multipath rule.

```
user@host# set security advance-policy-based-routing multipath-rule multi1
   bandwidth-limit 60
user@host# set security advance-policy-based-routing multipath-rule multi1
   application junos:YAHOO
user@host# set security advance-policy-based-routing multipath-rule multi1
   application junos:GOOGLE
user@host# set security advance-policy-based-routing multipath-rule multi1
   application-group junos:web
user@host# set security advance-policy-based-routing multipath-rule multi1
   link-type MPLS
user@host# set security advance-policy-based-routing multipath-rule multi1
   link-type IP
user@host# set security advance-policy-based-routing multipath-rule multi1
   max-time-to-wait 30
user@host# set security advance-policy-based-routing multipath-rule multi1
   number-of-paths 2
```

11. Configure SLA rule.

```
user@host# set security advance-policy-based-routing sla-rule sla1 switch-idle-time
   40
user@host# set security advance-policy-based-routing sla-rule sla1 metrics-profile
   metric1
user@host# set security advance-policy-based-routing sla-rule sla1
   active-probe-params probe1
user@host# set security advance-policy-based-routing sla-rule sla1
   passive-probe-params sampling-percentage 25
user@host# set security advance-policy-based-routing sla-rule sla1
   passive-probe-params violation-count 2
user@host# set security advance-policy-based-routing sla-rule sla1
   passive-probe-params sampling-period 60000
user@host# set security advance-policy-based-routing sla-rule sla1
   passive-probe-params type book-ended
```

12. Associate an SLA rule to multipath rule.

```
user@host# set security advance-policy-based-routing sla-rule sla1 multipath-rule
   multi1
```


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Configure Multipath Rules for Application Traffic (Device Configured to Receive Traffic))

Step-by-Step Procedure

The variables configured in this step are the same for both the sending and receiving device.

1. Configure multipath rule on the receiving device.

```
user@host# set security advance-policy-based-routing multipath-rule multi1
   bandwidth-limit 60
user@host# set security advance-policy-based-routing multipath-rule multi1
   application junos:YAHOO
user@host# set security advance-policy-based-routing multipath-rule multi1
   application junos:GOOGLE
user@host# set security advance-policy-based-routing multipath-rule multi1
   application-group junos:web
user@host# set security advance-policy-based-routing multipath-rule multi1
   link-type MPLS
user@host# set security advance-policy-based-routing multipath-rule multi1
   link-type IP
```

Results

From configuration mode, confirm your configuration by entering the **show** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

Hub-side device multipath rule configuration

```
[edit security]
user@host# show advance-policy-based-routing multipath-rule multi1
multipath-rule multi1 {
   bandwidth-limit 60;
   application [ junos:YAHOO junos:GOOGLE ];
   application-group junos:web;
   link-type [ MPLS IP ];
   number-of-paths 2;
}
```

```
[edit security]
user@host# show advance-policy-based-routing
profile apbr1 {
   rule rule1 {
      match {
         dynamic-application [ junos:GOOGLE, junos:YAHOO ];
         dynamic-application-group [ junos:web ];
      }
      then {
         routing-instance TC1_VPN;
         sla-rule {
            sla1;
         }
      }
   }
```

```
}
active-probe-params probe1 {
   settings {
      data-fill {
         juniper;
      }
      data-size {
         100;
      }
      probe-interval {
         30;
      }
      probe-count {
         30;
      }
      burst-size {
         1;
      }
      sla-export-interval {
         60;
      }
      dscp-code-points {
         000110;
      }
   }
}
metrics-profile metric1 {
   sla-threshold {
      delay-round-trip {
         120000;
      }
      jitter {
         21000;
      }
      jitter-type {
         egress-jitter;
      }
      packet-loss {
         2;
      }
   }
}
underlay-interface ge-0/0/2 {
   unit 0 {
      link-type MPLS;
      speed 800;
   }
}
underlay-interface ge-0/0/3 {
   unit 0 {
      link-type MPLS;
      speed 500;
   }
}
overlay-path overlay-path1 {
```


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```
    tunnel-path {
        local {
            ip-address {
                40.1.1.2;
            }
        }
        remote {
            ip-address {
                40.1.1.1;
            }
        }
    }
    probe-path {
        local {
            ip-address {
                40.1.1.2;
            }
        }
        remote {
            ip-address {
                40.1.1.1;
            }
        }
    }
}
overlay-path overlay-path2 {
    tunnel-path {
        local {
            ip-address {
                41.1.1.2;
            }
        }
        remote {
            ip-address {
                41.1.1.1;
            }
        }
    }
    probe-path {
        local {
            ip-address {
                41.1.1.2;
            }
        }
        remote {
            ip-address {
                41.1.1.1;
            }
        }
    }
}
overlay-path overlay-path3 {
    tunnel-path {
        local {
            ip-address {
```

```
            42.1.1.2;
          }
        }
        remote {
          ip-address {
            42.1.1.1;
          }
        }
      }
      probe-path {
        local {
          ip-address {
            42.1.1.2;
          }
        }
        remote {
          ip-address {
            42.1.1.1;
          }
        }
      }
    }
    destination-path-group site1 {
      probe-routing-instance {
        transit;
      }
      overlay-path overlay-path1;
      overlay-path overlay-path2;
      overlay-path overlay-path3;
    }
    sla-rule sla1 {
      switch-idle-time {
        40;
      }
      metrics-profile {
        metric1;
      }
      active-probe-params {
        probe1;
      }
      passive-probe-params {
        sampling-percentage {
          25;
        }
        violation-count {
          2;
        }
        sampling-period {
          60000;
        }
        type {
          book-ended;
        }
      }
      multipath-rule {
```


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```
      multi1;
    }
  }
  multipath-rule multi1 {
    bandwidth-limit 60;
    application [ junos:YAHOO junos:GOOGLE ];
    application-group junos:web;
    link-type [ MPLS IP ];
    number-of-paths 2;
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Displaying Multipath Rule Status

Purpose Display the details of the multipath rule on the device configured to send traffic.

Action From operational mode, enter the **show security advance-policy-based-routing multipath rule** command.

user@host>show security advance-policy-based-routing multipath rule multi1

```
Multipath Rule Status:
  Multipath Rule Information:
    Multipath rule name                multi1
    Multipath rule type                Packet-Copy
    Multipath rule state               Active
    Configured number of paths         2
    Configured application groups      junos:web
    Configured applications            junos:GOOGLE, junos:YAHOO
  Path Group Information:
    Total path groups : 1
    Path-Group-Id  State               Avl-Num-Paths
    1              Active              3
  Sender Information:
    Statistics:
      Current Sessions                   0
      Ignored Sessions                   0
      Applications Matched               1
      Applications Switched              0
      Stopped due to Bandwidth Limit     0
      Packets in path inactive state     26
      Packets in path active state       2416
      Midstream Packets Ignored          0
      Total Packets Processed            2442
      Total Packets Copied               2442
    Status:
      Policy reference count             2383
      Credit Limit (Mbps)                480
      Policer Rate (Kbits per ms)        480
      Bandwidth Limit                    Not-Reached
      Maximum Wait Time (secs)           30
      Time to Reinforce (secs)           0
      Application Hit List               junos:YAHOO
```

```
    Path Groups Information:
      Total sender path groups : 1
      Path-Group-Id : 1, Cur-Num-Paths: 2
        Path Information:
          Dst-IP         Pkts-Sent       Link-type
          40.1.1.2       2416           IP
          41.1.1.2       2416           MPLS
        Cos Q Statistics:
          Total sender cos queues: 8
          COS-Q-Id       Pkts-Sent
          0              2416
          1              0
          2              0
          3              0
          4              0
          5              0
          6              0
          7              0
```

Meaning The command output displays the multipath rule details.

Display Multipath Rule Statistics for An Application

Purpose Display the details of the application traffic on the device configured to receive traffic

Action From operational mode, enter the **show security advance-policy-based-routing multipath rule *rule-name* application *application-name*** command.

user@host> show security advance-policy-based-routing multipath rule multi1 application junos:YAHOO

```
Multipath Rule Status:
  Multipath Rule Information:
    Multipath rule name                multi1
    Multipath rule type                Packet-Copy
    Multipath rule state               Active
    Configured number of paths         2
    Configured applications            junos:YAHOO
  Sender Information:
    Statistics:
      Current Sessions                   0
      Ignored Sessions                   1
      Applications Matched               1
      Applications Switched              0
      Stopped due to Bandwidth Limit     0
      Packets in path inactive state     0
      Packets in path active state       627
      Midstream Packets Ignored          0
      Total Packets Processed            627
      Total Packets Copied               627
```

Meaning The command output displays the multipath rule for the application.

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Displaying Multipath Rule Policies

Purpose Display the details of the multipath rule on the device configured to send traffic.

Action From operational mode, enter the **show security advance-policy-based-routing multipath rule** command.

user@host> show security advance-policy-based-routing multipath policy statistics application junos:YAHOO multipath-name multi1 profile apbr1 rule rule1 zone trust

```
Sender Information:
    Statistics:
      Current Sessions                  0
      Ignored Sessions                  0
      Applications Matched              1
      Applications Switched             0
      Stopped due to Bandwidth Limit    0
      Packets in path inactive state    26
      Packets in path active state      2416
      Less than Configured Paths        0
      Midstream Packets Ignored         0
      Total Packets Processed           2442
      Total Packets Copied              2442
```

Meaning The command output displays the details on the traffic handled with multipath rule applied.

Displaying Multipath Rule Status

Purpose Display the details of the multipath rule on the device configured to receive traffic

Action From operational mode, enter the **show security advance-policy-based-routing multipath rule** command.

user@host> show security advance-policy-based-routing multipath rule multi1

```
Multipath Rule Status:
  Multipath Rule Information:
    Multipath rule name               multi1
    Multipath rule type               Packet-Copy
    Multipath rule state              Active
    Configured number of paths        2
    Configured application groups     junos:web
    Configured applications           junos:GOOGLE, junos:YAHOO
  Path Group Information:
    Total path groups : 1
    Path-Group-Id  State              Avl-Num-Paths
    1              Active             3
  Receiver Information:
    Path Groups Information:
      Total receiver path groups : 1
      Path-Group-Id : 1, Avg-Pkt-Loss(%) : 0, Avg-Ingress-Jitter(us) : 171
        Path Information:
```

```
Dst-IP       Pkts-Rcvd     Pkt-Loss(%)    Ingress-Jitter(us)       Reduction-Pkt-Loss(%)    Reduction-Ingress-Jitter(us)

  40.1.1.1       2442            0                    165           0                                        -6

  41.1.1.1       2442            0                    158           0                                       -13


Cos Q Statistics:
          Total receiver cos queues: 8
          COS-Q-Id       Pkts-Rcvd      Out-Of-Seq-Drop
          0              4884           2442
          1              0              0
          2              0              0
          3              0              0
          4              0              0
          5              0              0
          6              0              0
          7              0              0
```

Meaning The command output displays the multipath rule details on receiving-side device.

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CHAPTER 4

SSL Proxy

- SSL Proxy on page 221

SSL Proxy

SSL proxy acts as an intermediary, performing SSL encryption and decryption between the client and the server. Better visibility into application usage can be made available when SSL forward proxy is enabled. For more information, see the following topics:

- SSL Proxy Overview on page 221
- Configuring SSL Forward Proxy on page 234
- SSL Reverse Proxy on page 247
- Configuring the SSL Reverse Proxy on page 251
- Enabling Debugging and Tracing for SSL Proxy on page 253
- SSL Proxy Support for Unified Policies on page 254
- Configuring Default SSL Proxy Profiles on page 258
- Example: Configuring Default SSL Proxy Profile for Unified Policy on page 259
- Configuring SSL Forward Proxy Certificate Chain on page 261
- Working with the Certificate Revocation Lists for SSL Proxy on page 269
- Application Security Services with SSL Proxy Overview on page 271
- SSL Performance Enhancements on page 271
- Data Loss Prevention (DLP) Using ICAP Service Redirect on page 272
- Example: Configuring ICAP Redirect Service on SRX Devices on page 274

SSL Proxy Overview

Secure Sockets Layer (SSL) is an application-level protocol that provides encryption technology for the Internet. SSL, also called Transport Layer Security (TLS), ensures the secure transmission of data between a client and a server through a combination of privacy, authentication, confidentiality, and data integrity. SSL relies on certificates and private-public key exchange pairs for this level of security.

Server authentication guards against fraudulent transmissions by enabling a Web browser to validate the identity of a webserver. Confidentiality mechanisms ensure that communications are private. SSL enforces confidentiality by encrypting data to prevent

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unauthorized users from eavesdropping on electronic communications. Finally, message integrity ensures that the contents of a communication have not been tampered with.

SSL proxy is transparent; that is, it performs SSL encryption and decryption between the client and the server.

Sharing server keys is sometimes not feasible or might not be available in certain circumstances, in which case the SSL traffic cannot be decrypted. SSL proxy addresses this problem by ensuring that it has the keys to encrypt and decrypt the payload:

- For the server, SSL proxy acts as a client—Because SSL proxy generates the shared pre-master key, it determines the keys to encrypt and decrypt.
- For the client, SSL proxy acts as a server—SSL proxy first authenticates the original server and replaces the public key in the original server certificate with a key that is known to it. It then generates a new certificate by replacing the original issuer of the certificate with its own identity and signs this new certificate with its own public key (provided as a part of the proxy profile configuration). When the client accepts such a certificate, it sends a shared pre-master key encrypted with the public key on the certificate. Because SSL proxy replaced the original key with its own key, it is able to receive the shared pre-master key. Decryption and encryption take place in each direction (client and server), and the keys are different for both encryption and decryption.

Figure 8 on page 223 shows how SSL proxy works on an encrypted payload. When Advanced Security services such as application firewall (AppFW), Intrusion Detection and Prevention (IDP),application tracking (AppTrack), UTM, and SkyATP is configured, the SSL proxy acts as an SSL server by terminating the SSL session from the client and establishing a new SSL session to the server. The SRX Series device decrypts and then reencrypts all SSL proxy traffic. SSL proxy uses the following:

- SSL-T-SSL terminator on the client side.
- SSL-I-SSL initiator on the server side.

IDP, AppFW, AppTracking, advanced policy-based routing (APBR), UTM, SkyATP, and ICAP service redirect can use the decrypted content from SSL proxy. If none of these services are configured, then SSL proxy services are bypassed even if an SSL proxy profile is attached to a firewall policy.

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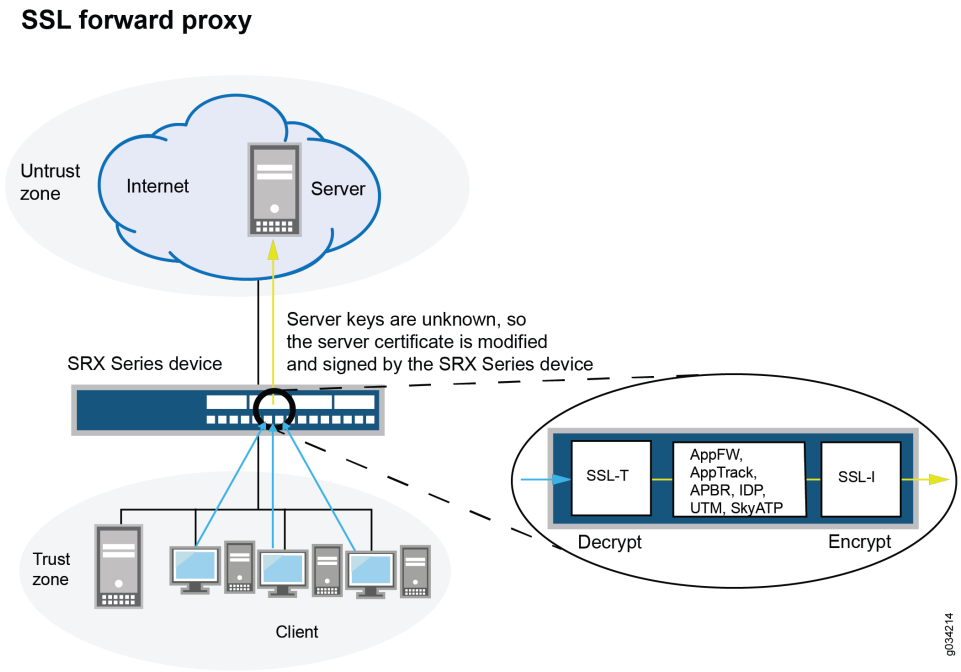
Figure 8: SSL Proxy on an Encrypted Payload



Benefits of SSL Proxy

- Decrypts SSL traffic to obtain granular application information and enable you to apply advanced security services protection and detect threats.
- Enforces the use of strong protocols and ciphers by the client and the server.
- Provides visibility and protection against threats embedded in SSL encrypted traffic.
- Controls what needs to be decrypted by using Selective SSL Proxy.

Perfect Forward Secrecy

Perfect Forward Secrecy (PFS) is a feature of specific key agreement protocols that provides assurances your session keys will not be compromised even if the private key of the server is compromised. By generating a unique session key for every session flow a user initiates, the compromise of a single session key will not affect any data other than that exchanged in the specific session protected by that particular key. For PFS to function, the key used to protect transmission of data must not be used to derive any additional keys, and if the key used to protect transmission of data was derived from some other keying material, that material must not be used to derive any further keys.

ECDHE stands for Elliptic Curve Diffie Hellman Ephemeral and is a key exchange mechanism based on elliptic curve cryptography. The ECDHE cipher suits are used to enable the PFS on SSL proxy.

ECDHE cipher suits provide the same level of security as the RSA with smaller keys. SSL proxy is targeted to support only ECDHE ciphers suites because they are less expensive computationally than DHE ciphers.

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Supported Key Size

Table 24 on page 224 provides the details of RSA keys supported on various SRX Series devices.

Table 24: Maximum Key Sizes Supported on SRX Series Devices

SRX Series Devices	Supported RSA Key Size
SRX340, SRX345, SRX550, SRX1500, SRX4100, SRX4200, SRX4600, SRX5400, SRX5600, SRX5800	512 bits, 1024 bits, 2048 bits, 4096 bits
SRX300, SRX320	512 bits, 1024 bits, 2048 bits

NOTE:

- Starting with Junos OS Release 15.1X49-D30 and Junos OS Release 17.3R1, server certificates of key size 4096 bits are supported. Prior to Junos OS Release 15.1X49-D30, server certificates with key size greater than 2048 bits were not supported because of cryptography hardware limitations.
- Starting in Junos OS Release 18.1R1, SSL proxy support is available on SRX300 and SRX320 devices. On SRX300 and SRX320 devices, server certificates with key size 4096 bits are not supported.

Supported Ciphers in Proxy Mode

An SSL cipher comprises encryption ciphers, an authentication method, and compression. Table 25 on page 224 displays a list of supported ciphers. NULL ciphers are excluded.

Table 25: Supported SSL Cipher List

SSL Cipher	Key Exchange Algorithm	Data Encryption	Message Integrity	Preferred Ciphers Category	Earliest Supported Release
ECDHE-ECDSA-AES-256-GCM-SHA384	ECDHE/DSA key exchange	256-bit AES/GCM	SHA384 hash	Strong	Junos OS Release 18.3R1
ECDHE-ECDSA-AES-128-GCM-SHA256	ECDHE/DSA key exchange	128-bit AES/GCM	SHA256 hash	Strong	Junos OS Release 18.3R1
ECDHE-ECDSA-AES-256-CBC-SHA384	ECDHE/DSA key exchange	256-bit AES/CBC	SHA384 hash	Strong	Junos OS Release 18.3R1
ECDHE-ECDSA-AES-128-CBC-SHA256	ECDHE/DSA key exchange	128-bit AES/CBC	SHA256 hash	Strong	Junos OS Release 18.3R1
ECDHE-ECDSA-AES-256-CBC-SHA	ECDHE/DSA key exchange	256-bit AES/CBC	SHA hash	Strong	Junos OS Release 18.3R1

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Table 25: Supported SSL Cipher List (continued)

SSL Cipher	Key Exchange Algorithm	Data Encryption	Message Integrity	Preferred Ciphers Category	Earliest Supported Release
ECDHE-ECDSA-AES-128-CBC-SHA	ECDHE/DSA key exchange	128-bit AES/CBC	SHA hash	Strong	Junos OS Release 18.3R1
ECDHE-ECDSA-3DES-EDE-CBC-SHA	ECDHE/DSA key exchange	3DES EDE/CBC	SHA hash	Strong	Junos OS Release 18.3R1
ECDHE-RSA-AES256-GCM-SHA384	ECDHE/RSA key exchange	256-bit AES/GCM	SHA384 hash	Strong	Junos OS Release 15.1X49-D10
ECDHE-RSA-AES256-CBC-SHA384	ECDHE/RSA key exchange	256-bit AES/CBC	SHA384 hash	Strong	Junos OS Release 15.1X49-D10
ECDHE-RSA-AES256-CBC-SHA	ECDHE/RSA key exchange	256-bit AES/CBC	SHA hash	Strong	Junos OS Release 15.1X49-D10
ECDHE-RSA-DES-CBC3-SHA	ECDHE/RSA key exchange	DES CBC	SHA hash	Medium	Junos OS Release 15.1X49-D10
ECDHE-RSA-AES128-GCM-SHA256	ECDHE/RSA key exchange	128-bit AES/GCM	SHA256 hash	Strong	Junos OS Release 15.1X49-D10
ECDHE-RSA-AES128-CBC-SHA256	ECDHE/RSA key exchange	128-bit AES/CBC	SHA256 hash	Strong	Junos OS Release 15.1X49-D10
ECDHE-RSA-AES128-CBC-SHA	ECDHE/RSA key exchange	128-bit AES/CBC	SHA hash	Strong	Junos OS Release 15.1X49-D10
RSA-AES256-GCM-SHA384	ECDHE/RSA key exchange	256-bit AES/GCM	SHA384 hash	Strong	Junos OS Release 15.1X49-D10
RSA-AES256-CBC-SHA256	ECDHE/RSA key exchange	256-bit AES/CBC	SHA256 hash	Strong	Junos OS Release 15.1X49-D10
RSA-AES128-GCM-SHA256	ECDHE/RSA key exchange	128-bit AES/GCM	SHA256 hash	Strong	Junos OS Release 15.1X49-D10
RSA-AES128-CBC-SHA256	ECDHE/RSA key exchange	128-bit AES/CBC	SHA256 hash	Medium	Junos OS Release 15.1X49-D10

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Table 25: Supported SSL Cipher List (continued)

SSL Cipher	Key Exchange Algorithm	Data Encryption	Message Integrity	Preferred Ciphers Category	Earliest Supported Release
RSA-RC4-128-MD5	RSA key exchange	128-bit RC4	Message Digest 5 (MD5) hash	Medium	Junos OS Release 12.1
RSA-RC4-128-SHA	RSA key exchange	128-bit RC4	Secure Hash Algorithm (SHA) hash	Medium	Junos OS Release 12.1
RSA-DES-CBC-SHA	RSA key exchange	DES CBC	SHA hash	Week	Junos OS Release 12.1
RSA-3DES-EDE-CBC-SHA	RSA key exchange	3DES EDE/CBC	SHA hash	Week	Junos OS Release 12.1
RSA-AES128-CBC-SHA	RSA key exchange	128-bit AES/CBC	SHA hash	Week	Junos OS Release 12.1
RSA-AES256-CBC-SHA	RSA key exchange	256-bit AES/CBC	SHA hash	Week	Junos OS Release 12.1
RSA-EXPORT-RC4-40-MD5	RSA-export	40-bit RC4	MD5 hash	Week	Junos OS Release 12.1
RSA-EXPORT-DES40-CBC-SHA	RSA-export	40-bit DES/CBC	SHA hash	Week	Junos OS Release 12.1
RSA-EXPORT-1024-DES-CBC-SHA	RSA 1024 bit export	DES/CBC	SHA hash	Week	Junos OS Release 12.1
RSA-EXPORT-1024-RC4-56-MD5	RSA 1024 bit export	56-bit RC4	MD5 hash	Week	Junos OS Release 12.1
RSA-EXPORT-1024-RC4-56-SHA	RSA 1024 bit export	56-bit RC4	SHA hash	Week	Junos OS Release 12.1

NOTE: Cipher suites that have “export” in the title are intended for use outside of the United States and might have encryption algorithms with limited key sizes.

Export ciphers are not enabled by default. You need to either configure the export ciphers to enable or install a domestic package.

NOTE: Supported SSL ciphers for HTTPS firewall authentication are RSA-3DES-EDE-CBC-SHA , RSA-AES-128-CBC-SHA, and RSA-AES-256-CBC-SHA.

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ECDSA Cipher Suite Support for SSL Proxy

Starting in Junos OS Release 18.3R1, ECDSA cipher suites are supported for SSL proxy. ECDSA is a version of the Digital Signature Algorithm (DSA) and is based on Elliptic-curve cryptography (ECC).

To support ECDSA ciphers, the device must include the certificates containing ECC-capable public keys. You can include the ECC certificate along with an existing RSA certificate in an SSL proxy profile. Having both ECC and RSA certificate allows you to perform ECC-based key exchange or RSA-based key exchange depending on the client and the server device's compatibility.

For example:

During an SSL handshake, ECDSA cipher can be used only when the server supports the ECC certificate. Otherwise, SSL proxy is done using RSA-based key exchange. If the SRX Series device has only ECC certificate (no RSA certificate), and the server supports only the RSA-based authentication, then the session is dropped with an error message.

You can include the ECDSA certificate option for the root CA (SSL forward proxy) and for the server certificate (SSL reverse proxy). For the server certificate, there is no restriction on the number of ECDSA or RSA certificate inclusion; however for the root CA, you can include one RSA certificate and one ECDSA certificate each.

NOTE:

- All ECDSA-based cipher suites provide Perfect Forward Secrecy (PFS) support.
- SSL forward proxy supports the Elliptic Curve Cryptography (ECC) certificate only with the Elliptic Prime Curve 256 bit (P-256).

A trusted CA certificate can either be an RSA-based certificate and an ECDSA-based certificate. All features supported on an RSA-based certificate such as certificate cache, certificate revocation list (CRL), certificate chain are supported on an ECDSA certificate.

Configuring Ciphers for SSL Proxy

You can configure the following ciphers for an SSL proxy profile:

- **Preferred Ciphers**—Preferred ciphers allow you to define an SSL cipher that can be used with acceptable key strength. Ciphers are divided in three categories depending on their key strength: strong, medium, or weak.
- **Custom Ciphers**—Custom ciphers allow you to define your own cipher list. If you do not want to use one of the three categories, you can select ciphers from each of the categories to form a custom cipher set. To configure custom ciphers, you must set **preferred-ciphers** to custom.

  The following example shows how to create a custom cipher. In this example, you set **preferred-cipher** to custom and add the cipher list (rsa-with-3des-ede-cbc-sha and rsa-with-aes-256-cbc-sha):

```
set services ssl proxy profile profile-name preferred-ciphers custom
set services ssl proxy profile profile-name custom-ciphers rsa-with-3des-ede-cbc-sha
set services ssl proxy profile profile-name custom-ciphers rsa-with-aes-256-cbc-sha
```

The following procedure shows how to configure a custom cipher for ECDSA ciphers.

NOTE: To configure and use ECDSA ciphers, you must include the certificates containing ECC-capable public keys on the device.

Configure ECDSA ciphers:

1. Load the ECDSA certificate (rootCA.pem) and the key (rootCA.key) into PKI, and use the ECDSA certificate as a server certificate for the SSL forward proxy.

   ```
   request security pki local-certificate load filename rootCA.pem key rootCA.key
     certificate-id rootCAEcds
   ```

   You can generate a root CA certificate or you can import your own trusted CA certificate and private and public keys into the SRX Series device. For details on root CA certificates, see Configuring a Root CA Certificate

2. Create an SSL proxy profile. You must configure either the Root CA or the server certificate in an SSL proxy profile.

   ```
   set services ssl proxy profile profile-name server-certificate rootCAEcds
   ```

   Or

   ```
   set services ssl proxy profile profile-name root-ca rootCAEcds
   ```

3. Enable preferred-cipher in the SSL proxy as a custom-cipher.

   ```
   set services ssl proxy profile profile-name preferred-ciphers custom
   ```

4. Attach a custom cipher (example: ecdhe-ecdsa-with-aes-256-cbc-sha384 and ecdhe-ecdsa-with-aes-128-cbc-sha256).

   ```
   set services ssl proxy profile profile-name custom-ciphers
     ecdhe-ecdsa-with-aes-256-cbc-sha384
   set services ssl proxy profile profile-name custom-ciphers
     ecdhe-ecdsa-with-aes-128-cbc-sha256
   ```

After performing the steps mentioned above, proceed with configuring the SSL proxy profile and applying the SSL proxy profile to a security policy.

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Supported SSL Protocols

The following SSL protocols are supported on SRX Series devices for SSL initiation and termination service:

- TLS version 1.0—Provides authentication and secure communications between communicating applications.
- TLS version 1.1—This enhanced version of TLS provides protection against cipher block chaining (CBC) attacks.
- TLS version 1.2 — This enhanced version of TLS provides improved flexibility for negotiation of cryptographic algorithms.

Starting with Junos OS Release 15.1X49-D30 and Junos OS Release 17.3R1, TLS version 1.1 and TLS version 1.2 protocols are supported on SRX Series devices along with TLS version 1.0.

Starting with Junos OS Release 15.1X49-D20 and Junos OS Release 17.3R1, the SSL protocol 3.0 (SSLv3) support is deprecated.

Server Authentication

Implicit trust between the client and the device (because the client accepts the certificate generated by the device) is an important aspect of SSL proxy. It is extremely important that server authentication is not compromised; however, in reality, self-signed certificates and certificates with anomalies are in abundance. Anomalies can include expired certificates, instances of common name not matching a domain name, and so forth. Server authentication is governed by setting the **ignore-server-auth-failure** option in the SSL proxy.

- By default, the **ignore-server-auth-failure** option is not defined as an action in the SSL proxy profile, and the following occurs:
  - If authentication succeeds, a new certificate is generated by replacing the keys and changing the issuer name to the issuer name that is configured in the root CA certificate in the proxy profile.
  - If authentication fails, the connection is dropped.
- If the **ignore-server-auth-failure** option is defined as an action in the SSL proxy profile, the following occurs:
  - If the certificate is self-signed, a new certificate is generated by replacing the keys only. The issuer name is not changed. This ensures that the client browser displays a warning that the certificate is not valid.
  - If the certificate has expired or if the common name does not match the domain name, a new certificate is generated by replacing the keys and changing the issuer name to SSL-PROXY: DUMMY_CERT:GENERATED DUE TO SRVR AUTH FAILURE. This ensures that the client browser displays a warning that the certificate is not valid.

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Trusted CA List

SSL proxy ensures secure transmission of data between a client and a server. Before establishing a secure connection, SSL proxy checks CA certificates to verify signatures on server certificates. For this reason, a reasonable list of trusted CA certificates is required to effectively authenticate servers.

Junos OS provides the following options for trusted CA certificates:

- Loading the default trusted CA list—Junos OS provides a default list of certificates that contains well-known trusted CA certificates similar to the default certificates used by most common browsers. Without these default certificates, browsers would not be able to validate the identity of most websites and would mark them as untrusted sites. Alternatively, you can download trusted CAs from a browser to an SRX Series device. See Knowledge Base Article KB23144.

  The Junos OS package contains the default CA certificates as a Privacy-Enhanced Mail (PEM) file (for example, trusted_CA.pem). After you download the package, you can easily load the default certificates on your system using the **request security pki ca-certificate ca-profile-group load ca-group-name ca-default filename default** command. You can use the default trusted CA bundle file embedded into Junos OS or you can download the latest CA bundle list from another 3rd party such as Mozilla (https://curl.haxx.se/docs/caextract.html). The list of trusted Certificate Authority can change over time so we recommend you to use the latest CA bundle.

  We recommend you load the default trusted CA list if you want to trust the same CA certificates as common browsers and avoid importing CA certificates manually.

  NOTE: **By default, Junos OS does not trust any CA certificate.**

- Importing the trusted CA list manually—You can import your own trusted CA certificates using the Public Key Infrastructure (PKI). The PKI helps verify and authenticate the validity of the trusted CA certificates. You create CA profile groups that include trusted CA certificates, then import the group on your device for server authentication.

- Ignoring server authentication—You can use the **ignore-server-auth-failure** option to ignore server authentication completely. In this case, SSL proxy ignores errors encountered during the server certificate verification process (such as CA signature verification failure, self-signed certificates, and certificate expiry).

  We do not recommend this option for authentication, because configuring it results in websites not being authenticated at all. However, you can use this option to effectively identify the root cause for dropped SSL sessions. See "Enabling Debugging and Tracing for SSL Proxy" on page 253.

Root CA

In a public key infrastructure (PKI) hierarchy, the root CA is at the top of the trust path. The root CA identifies the server certificate as a trusted certificate.

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Client Authentication

Currently, client authentication is not supported in SSL proxy. If a server requests client authentication, a warning is issued that a certificate is not available. The warning lets the server determine whether to continue or to exit.

Dynamic Resolution of Domain Names

The IP addresses associated with domain names are dynamic and can change at any time. Whenever a domain IP address changes, it is propagated to the SSL proxy configuration (similar to what is done in the firewall policy configuration).

Session Resumption

An SSL session refers to the set of parameters and encryption keys created by performing a full handshake. A connection is the conversation or active data transfer that occurs within the session. The computational overhead of a complete SSL handshake and generation of master keys is considerable. In short-lived sessions, the time taken for the SSL handshake can be more than the time for data transfer.

To improve throughput and still maintain an appropriate level of security, SSL session resumption provides a session caching mechanism so that session information, such as the pre-master secret key and agreed-upon ciphers, can be cached for both the client and server. The cached information is identified by a session ID. In subsequent connections both parties agree to use the session ID to retrieve the information rather than create a new pre-master secret key. Session resumption shortens the handshake process and accelerates SSL transactions.

Session Renegotiation

After a session is created and SSL tunnel transport has been established, a change in SSL parameters requires renegotiation. SSL proxy supports both secure (RFC 5746) and nonsecure (TLS v1.0, TLS v1.1, and TLS v1.2) renegotiation. When session resumption is enabled, session renegotiation is useful in the following situations:

- Cipher keys need to be refreshed after a prolonged SSL session.
- Stronger ciphers need to be applied for a more secure connection.

A change in an SSL proxy profile that modifies a certificate, cipher strength, or trusted CA list flushes cache entries when the modified policy is committed. When a session is resumed, the SSL parameters associated with its session ID are retrieved from the cache. If the SSL proxy profile is not altered, cache entries corresponding to that profile are not flushed and the session continues. If the cache has been flushed, however, a full handshake must be performed to establish the new SSL parameters. (There is no impact to non-SSL sessions.)

SSL Proxy Logs

When logging is enabled in an SSL proxy profile, SSL proxy can generate the messages shown in Table 26 on page 232.

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Table 26: SSL Proxy Logs

Syslog Type	Description
SSL_PROXY_SSL_SESSION_DROP	Logs generated when a session is dropped by SSL proxy.
SSL_PROXY_SSL_SESSION_ALLOW	Logs generated when a session is processed by SSL proxy even after encountering some minor errors.
SSL_PROXY_SESSION_IGNORE	Logs generated if non-SSL sessions are initially mistaken as SSL sessions.
SSL_PROXY_SESSION_WHITELIST	Logs generated when a session is whitelisted.
SSL_PROXY_ERROR	Logs used for reporting errors.
SSL_PROXY_WARNING	Logs used for reporting warnings.
SSL_PROXY_INFO	Logs used for reporting general information.

All logs contain similar information as shown in the following example (actual order of appearance):

```
logical-system-name, session-id, source-ip-address, source-port,
destination-ip-address,destination-port,
nat-source-ip-address, nat-source-port, nat-destination-ip-address,
nat-destination-port, proxy profile name, source-zone-name,
source-interface-name, destination-zone-name,destination-interface-name, message
```

The **message** field contains the reason for the log generation. One of three prefixes shown in Table 27 on page 232 identifies the source of the message. Other fields are descriptively labeled.

Table 27: SSL Proxy Log Prefixes

Prefix	Description
system	Logs generated due to errors related to the device or an action taken as part of the SSL proxy profile. Most logs fall into this category.
openssl error	Logs generated during the handshaking process if an error is detected by the openssl library.
certificate error	Logs generated during the handshaking process if an error is detected in the certificate (x509 related errors).

Sample logs:

```
Jun  1 05:11:13 4.0.0.254 junos-ssl-proxy: SSL_PROXY_SSL_SESSION_DROP: lsys:root
 23 < 203.0.113.1/35090->192.0.2.1/443>  NAT:< 203.0.113.1/35090->192.0.2.1/443>
ssl-inspect-profile  <untrust:ge-0/0/0.0->trust:ge-0/0/1.0> message:certificate
error: self signed certificate
```


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NOTE: These logs capture sessions that are dropped by SSL proxy, not sessions that are marked by other modules that also use SSL proxy services.

For SSL_PROXY_SESSION_WHITELIST messages, an additional **host** field is included after the **session-id** and contains the IP address of the server or domain that has been whitelisted.

```
Jun  1 05:25:36 4.0.0.254 junos-ssl-proxy: SSL_PROXY_SESSION_WHITELIST: lsys:root
 24 host:192.0.2.1/443<203.0.113.1/35090->192.0.2.1/443>  NAT:<
203.0.113.1/35090->192.0.2.1/443 > ssl-inspect-profile
<untrust:ge-0/0/0.0->trust:ge-0/0/1.0> message:system: session whitelisted
```

Leveraging Dynamic Application Identification

SSL proxy uses application identification services to dynamically detect if a particular session is SSL encrypted. SSL proxies are allowed only if a session is SSL encrypted. The following rules apply for a session:

- Session is marked **Encrypted=Yes** in the application system cache. If the session is marked **Encrypted=Yes**, it indicates that the final match from application identification for that session is SSL encrypted, and SSL proxy transitions to a state where proxy functionality can be initiated.
- Session is marked **Encrypted=No** in the application system cache. If a non-SSL entry is found in the application system cache, it indicates that the final match from application identification for that session is non-SSL and SSL proxy ignores the session.
- An entry is not found in the application system cache. This can happen on the first session, or when the application system cache has been cleaned or has expired. In such a scenario, SSL proxy cannot wait for the final match (requires traffic in both directions). In SSL proxy, traffic in reverse direction happens only if SSL proxy has initiated an SSL handshake. Initially, for such a scenario SSL proxy tries to leverage prematch or aggressive match results from application identification , and if the results indicate SSL, SSL proxy will go ahead with the handshake.
- Application identification fails due to resource constraints and other errors. Whenever the result from application identification is not available, SSL proxy will assume static port binding and will try to initiate SSL handshake on the session. This will succeed for actual SSL sessions, but it will result in dropped sessions for non SSL sessions.

Logical Systems Support

It is possible to enable SSL proxy on firewall policies that are configured using logical systems; however, note the following limitations:

- The “services” category is currently not supported in logical systems configuration. Because SSL proxy is under “services,” you cannot configure SSL proxy profiles on a per-logical-system basis.

- Because proxy profiles configured at a global level (within “services ssl proxy”) are visible across logical system configurations, it is possible to configure proxy profiles at a global level and then attach them to the firewall policies of one or more logical systems.

Limitations

NOTE: On SRX Series devices, for a particular session, the SSL proxy is only enabled if a relevant feature related to SSL traffic is also enabled. Features that are related to SSL traffic are IDP, application identification, application firewall, application tracking, advanced policy-based routing, UTM, SkyATP, and ICAP redirect service. If none of these features are active on a session, the SSL proxy bypasses the session and logs are not generated in this scenario.

NOTE: On all SRX Series devices, the current SSL proxy implementation has the following connectivity limitations:

- The SSLv3.0 protocol support is deprecated.
- The SSLv2 protocol is not supported. SSL sessions using SSLv2 are dropped.
- Only X.509v3 certificate is supported.
- Client authentication of SSL handshake is not supported.
- SSL sessions where client certificate authentication is mandatory are dropped.
- SSL sessions where renegotiation is requested are dropped.

See Also

- *Understanding Address Books*
- *Understanding Global Address Books*
- *Understanding Self-Signed Certificates*
- *Understanding Certificate Authority Profiles*

Configuring SSL Forward Proxy

SSL proxy works transparently between the client and the server. All requests from a client first go to the proxy server; the proxy server evaluates the request, and if the request is valid, forwards the request to the outbound side. Similarly, inbound requests are also evaluated by the proxy server. Both client and server interpret that they are communicating with each other; however, it is the SSL proxy that functions between the two. For release-specific support, see Feature Explorer

SSL proxies provide encryption and decryption by residing between the server and the client. Because SSL proxies are hidden from both the server and the client, secret keys

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are shared between the two to decrypt the SSL traffic. Proxies are known as *forward proxies* because proxy servers are used to hide any detailed information from the servers.

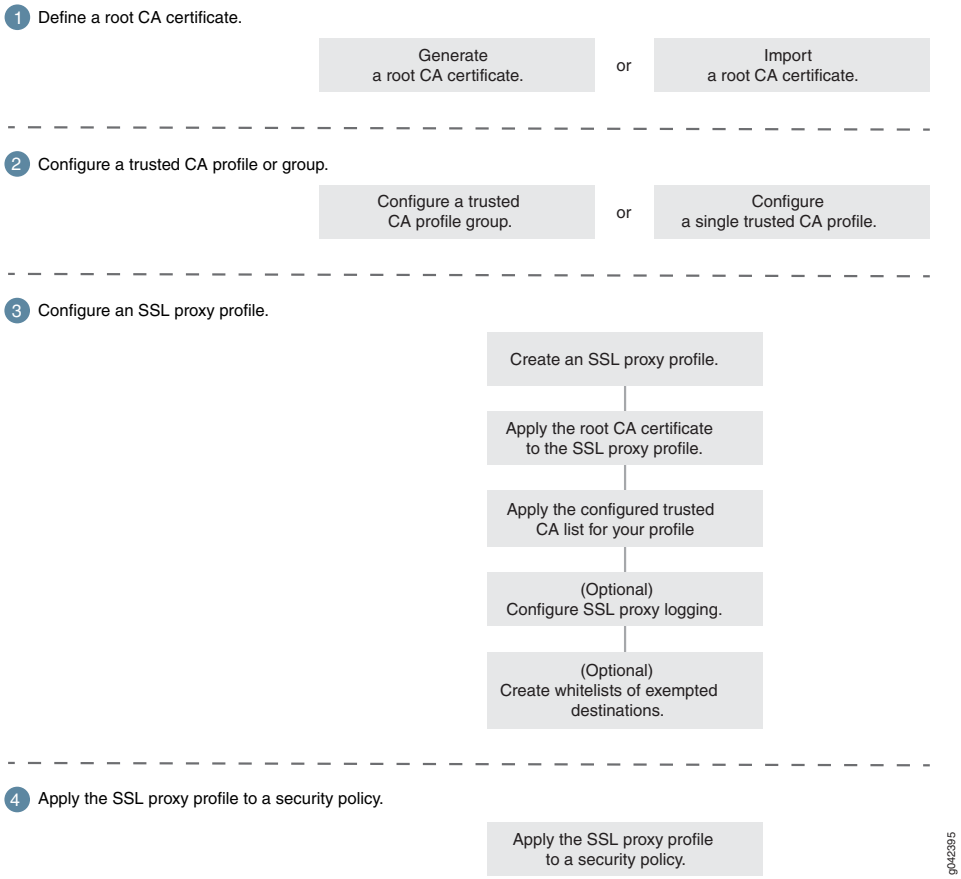
Integrity, confidentiality, and authenticity of traffic are validated through PKI, which includes digital certificates issued by the CA, certificate validity and expiration dates, details about the certificate owner and issuer, and security policies.

- SSL Proxy Configuration Overview on page 235
- Configuring a Root CA Certificate on page 236
- Configuring a CA Profile Group on page 238
- Configuring a Trusted CA Profile on page 239
- Importing a Root CA Certificate into a Browser on page 240
- Applying an SSL Proxy Profile to a Security Policy on page 241
- Creating a Whitelist of Exempted Destinations on page 242
- Configuring SSL Proxy Logging on page 245
- Exporting Certificates to a Specified Location on page 245
- Ignoring Server Authentication on page 246

SSL Proxy Configuration Overview

Figure 9 on page 236 displays an overview of how SSL proxy is configured. It includes some required steps, such as configuring the root CA certificate, loading a CA profile group, and applying an SSL proxy profile to a security policy, and some optional steps, such as creating whitelists and SSL proxy logging.

Figure 9: SSL Proxy Configuration Overview



Configuring a Root CA Certificate

A CA can issue multiple certificates in the form of a tree structure. A root certificate is the topmost certificate of the tree, the private key of which is used to *sign* other certificates. All certificates immediately below the root certificate inherit the signature or trustworthiness of the root certificate. This is somewhat like the *notarizing* of an identity.

You can configure a root CA certificate by first obtaining a root CA certificate (by either generating a self-signed one or importing one) and then applying it to an SSL proxy profile. There are two ways you can obtain a root CA certificate—by using the Junos OS CLI on an SRX Series device or by using OpenSSL on a UNIX device.

To generate a root CA certificate using the Junos OS CLI, follow these steps on an SRX Series device:

1. From operational mode, generate a PKI public/private key pair for a local digital certificate.

```
user@host>request security pki generate-key-pair certificate-id certificate-id size size
    type type
```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2. From operational mode, define a self-signed certificate. Specify certificate details such as the certificate identifier (generated in the previous step), a fully qualified domain name (FQDN) for the certificate, and an e-mail address of the entity owning the certificate. You can also specify other information such as the common name and the organization involved. By configuring the **add-ca-constraint** option, you make sure that the certificate can be used for signing other certificates.

```
user@host>request security pki local-certificate generate-self-signed certificate-id
  certificate-id domain-name domain-name subject subject email email-id
  add-ca-constraint
```

3. From configuration mode, apply the loaded certificate as root-ca in the SSL proxy profile.

```
[edit]
user@host# set services ssl proxy profile profile-name root-ca certificate-id
```

4. Import the root CA as a trusted CA into client browsers. This is required for the client browsers to trust the certificates signed by the SRX Series device. See "Importing a Root CA Certificate into a Browser" on page 240.

To generate a root CA certificate using OpenSSL, follow these steps on a UNIX device:

1. Create folders **keys** and **certs**.

```
mkdir /etc/pki/tls/keys
mkdir /etc/pki/tls/certs
```

2. Change to the **openssl** directory.

```
cd /etc/pki/tls
```

3. Create a CA certificate key. The following command creates an RSA key using the 3DES encryption named **ca.key** that is 2048 in length. You also need to enter a password that is used to encrypt the private key. This is critical to security if the key is lost because it will still be encrypted.

```
% openssl genrsa -des3 -out keys/ssl-proxy-ca.key 2048
```

4. Create a CA certificate based on the CA private key (created in the previous step). The expiration date for this certificate is 3 years or 1095 days. However, you can set it to a different value. When creating the certificate, you need to enter the password and the certificate information that includes distinguished name (DN), country name, and so forth.

```
% openssl req -new -x509 -days 1095 –key keys/ssl-proxy-ca.key -out
  certs/ssl-inspect-ca.cer
```

5. Import the CA private and public keys into the SRX Series device. Copy the **ca.key** and **ca.cer** keys to the **/var/tmp** directory on the SRX Series device. You can copy using SCP, or open the files and copy them into "vi" on the SRX Series device to create new files.

```
user@host> request security pki local-certificate load certificate-id ssl-inspect-ca key
  /var/tmp/ssl-inspect-ca.key filename /var/tmp/ssl-inspect-ca.cer passphrase
  password
```

6. From configuration mode, apply the loaded certificate as root-ca in the SSL proxy profile.

```
[edit]
user@host# set services ssl proxy profile ssl-inspect-profile root-ca ssl-inspect-ca
```

7. Import the root CA as a trusted CA into client browsers. This is required for the client browsers to trust the certificates signed by the SRX Series device. See "Importing a Root CA Certificate into a Browser" on page 240.

Configuring a CA Profile Group

The CA profile defines the certificate information to be used for authentication. It includes the public key that SSL proxy uses when generating a new certificate. Junos OS allows you to create a group of CA profiles and load multiple certificates in one action, view information about all certificates in a group, and delete unwanted CA groups.

You can load a group of CA profiles by obtaining a list of trusted CA certificates, defining a CA group, and attaching the CA group to the SSL proxy profile.

1. Obtain a list of trusted CA certificates by following one of these methods:

   - Junos OS provides a default list of trusted CA certificates that you can load on your system using the **default** command option. The Junos OS package contains the default CA certificates as a PEM file (for example, **trusted_CA.pem**). After you download the Junos OS package, the default certificates are available on your system.

     From operational mode, load the default trusted CA certificates (the group name identifies the CA profile group):

     ```
     user@host> request security pki ca-certificate ca-profile-group load ca-group-name
       group-name filename default
     ```

   - Alternatively, you can define your own list of trusted CA certificates and import them on your system. You get the list of trusted CAs in a single PEM file (for example **IE-all.pem**) and save the PEM file in a specific location (for example, **/var/tmp**). See Knowledge Base Article KB23144.

     From operational mode, load the trusted list to the device (the group name identifies the CA profile group):

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```
user@host> request security pki ca-certificate ca-profile-group load ca-group-name
  group-name filename /var/tmp/IE-all.pem
```

2. From configuration mode, attach the trusted CA or trusted CA group to the SSL proxy profile. You can attach all trusted CA or one trusted CA at a time:

   - To attach one CA profile group (the group name identifies the CA profile group):

     ```
     [edit]
     user@host# set services ssl proxy profile profile-name trusted-ca ca-name
     ```

   - To attach all CA profile groups:

     ```
     [edit]
     user@host# set services ssl proxy profile profile-name trusted-ca all
     ```

You can easily display information about all certificates in a CA profile group:

```
user@host> show security pki ca-certificates ca-profile-group group-name
```

You can delete a CA profile group. Remember that deleting a CA profile group deletes all certificates that belong to that group:

```
user@host> clear security pki ca-certificates ca-profile-group group-name
```

Configuring a Trusted CA Profile

Typically, you import a list of trusted CA certificates by creating a group of CA profiles. However, you can also configure a single CA profile (containing one or multiple certificates) and import it using PKI commands. This section shows you how to import a trusted CA certificate from your browser's certificate store into your SRX Series device. The certificate that is configured under the trusted CA is loaded using the PKI commands and is used for validating the server certificate chain.

1. From configuration mode, configure the CA profile used for loading the certificate.

   ```
   [edit]
   user@host# set security pki ca-profile profile-name ca-identity ca-identity
   ```

2. From operational mode, load the certificate using PKI commands.

   ```
   user@host> request security pki ca-certificate load ca-profile profile-name filename
     filename
   ```

3. From configuration mode, disable the revocation check (if required).

   ```
   [edit]
   user@host# set security pki ca-profile profile-name ca-identity ca-identity
     revocation-check disable
   ```

4. From configuration mode, configure the loaded certificate as a trusted CA in the SSL proxy profile.

```
[edit]
user@host# set services ssl proxy profile ssl-proxy-profile-name trusted-ca
  ca-profile-name
```

NOTE: More than one trusted CA can be configured for a profile.

5. (Optional) If you have multiple trusted CA certificates, you do not have to specify each trusted CA separately. You can load *all* the trusted CA certificates using the following command from configuration mode.

```
[edit]
user@host# set services ssl proxy profile ssl-proxy-profile-name trusted-ca all
```

NOTE: Alternatively, you can import a set of trusted CAs from your browser into the SRX Series device. See Knowledge Base article KB23144.

Importing a Root CA Certificate into a Browser

In order to have your browser or system automatically trust all certificates signed by the root CA configured in the SSL proxy profile, you must instruct your platform or browser to trust the CA root certificate.

To import a root CA certificate:

1. Generate a PEM format file for the configured root CA.

```
request security pki local-certificate export certificate-id root-ca type pem filename
  path/file-name.pem
```

2. Import a root CA certificate into a browser.

   From Internet Explorer (version 8.0):

   a. From the Tools menu, select **Internet Options**.

   b. On the Content tab, click **Certificates**.

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c. Select the **Trusted Root Certification Authorities** tab and click **Import**.

d. In the Certificate Import Wizard, navigate to the required root CA certificate and select it.

From Firefox (version 39.0):

a. From the Tools menu, select **Options**.

b. From the Advanced menu, select the **Certificates** tab and click **View Certificate**.

c. In the Certificate Manager window, select the **Authorities** tab and click **Import**.

d. Navigate to the required root CA certificate and select it.

From Google Chrome (45.0):

a. From the Settings menu, select **Show Advanced Settings**.

b. From the Advanced menu, select the **Certificates** tab and click **View Certificate**.

c. Under HTTPS/SSL, click **Manage Certificates**.

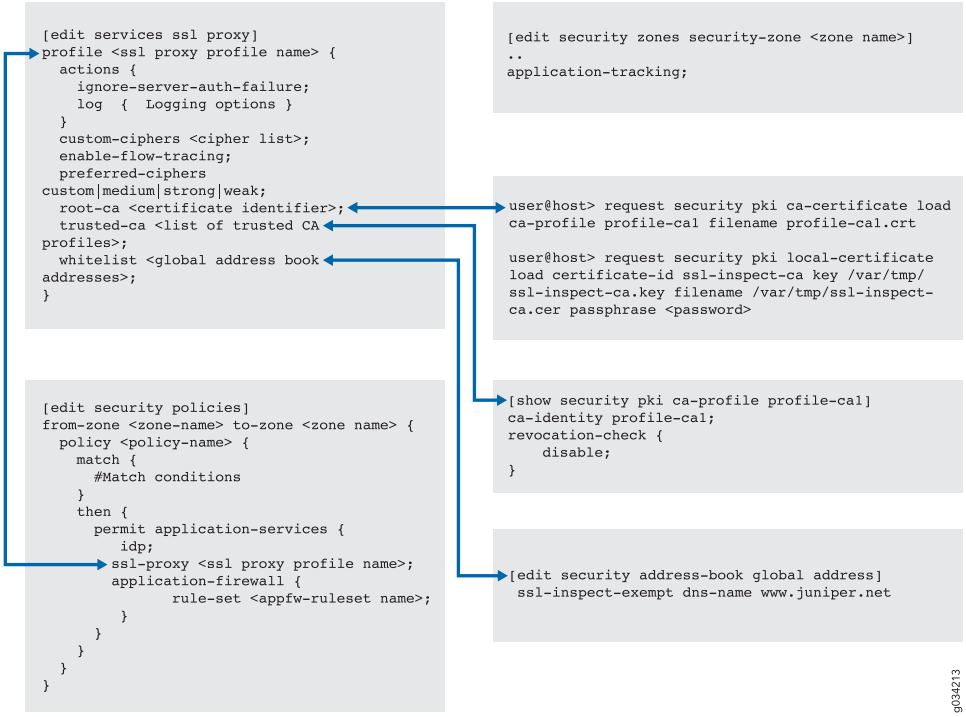
d. In the Certificate window, select **Trusted Root Certification Authorities** and click **Import**.

e. In the Certificate Import Wizard, navigate to the required root CA certificate and select it.

Applying an SSL Proxy Profile to a Security Policy

SSL proxy is enabled as an application service within a security policy. In a security policy, you specify the traffic that you want the SSL proxy enabled on as match criteria and then specify the SSL proxy CA profile to be applied to the traffic. Figure 10 on page 242 displays a graphical view of SSL proxy profile and security policy configuration.

Figure 10: Applying an SSL Proxy Profile to a Security Policy



To enable SSL proxy in a security policy:

1. Create a security policy and specify the match criteria for the policy. As match criteria, specify the traffic for which you want to enable SSL proxy.

   [edit]
   user@host# set security policies from-zone trust to-zone untrust policy *policy-name* match source-address *source-address*
   user@host# set security policies from-zone trust to-zone untrust policy *policy-name* match destination-address *destination-address*
   user@host# set security policies from-zone trust to-zone untrust policy *policy-name* match application *application*

2. Apply the SSL proxy profile to the security policy.

   [edit]
   user@host# set security policies from-zone trust to-zone untrust policy *policy-name* then permit application-services ssl-proxy profile-name *profile-name*

Creating a Whitelist of Exempted Destinations

Because SSL encryption and decryption might consume memory resources on the SRX Series device, network administrators can selectively bypass SSL proxy processing for some sessions. Such sessions mostly include connections and transactions with trusted servers or domains with which network administrators are very familiar. There are also

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legal requirements to exempt financial and banking sites. Such exemptions are achieved by configuring the IP addresses or domain names of the servers under whitelists.

Whitelists include addresses that you want to exempt from undergoing SSL proxy processing. For example, if you want to exempt all sessions to **www.mycompany.com**, then you would include it in the whitelist. To configure the whiltelist, you specify the domain that you want to exempt in an address book and then configure the address in the SSL proxy profile.

1. Configure the domain in the address book.

```
[edit]
user@host# set security address-book global address address dns-name
  www.mycompany.com
```

2. Specify the global address book address in the SSL proxy profile.

```
[edit]
user@host# set services ssl proxy profile profile-name whitelist address
```

Whitelist addresses and address sets are created under the global address book. The following type of addresses (from the global address book) are supported:

- IPv4 addresses (plain text). For example:

```
[edit]
user@host# set security address-book global address address-name ipv4-prefix
```

- IPv4 address range. For example:

```
[edit]
user@host# set security address-book global address address-name range-address
  range-low to range-high
```

- IPv4 wildcard. For example:

```
[edit]
user@host# set security address-book global address address-name wildcard-address
  addr/netmask
```

  Noncontiguous netmasks are not supported. For example:

  - 203.0.113.9/255.255.0.0 is supported.
  - 203.0.113.9/255.255.0.255 is NOT supported.

- IPv6 address (plain text). For example:

```
[edit]
user@host# set security address-book global address address-name ipv6-prefix
```

- DNS name. For example:

```
[edit]
user@host# set security address-book global address address-name dns-name
   domain-name
```

- Translated IP addresses. Sessions are whitelisted based on the actual IP address and not on the translated IP address. Because of this, in the whitelist configuration of the SSL proxy profile, the actual IP address should be provided and not the translated IP address.

  For example, consider a destination NAT rule that translates destination IP address **192.0.2.10/24** to **198.51.100.8/24** using the following commands:

```
[edit]
user@host# set security nat destination pool d1 address 198.51.100.8/24
user@host# set security nat destination rule-set dst-nat rule r1 match
   destination-address 192.0.2.10/24
user@host# set security nat destination rule-set dst-nat rule r1 then destination-nat
   pool d1
```

In this scenario, to exempt a session from SSL proxy inspection, the following IP address should be added to the whitelist:

```
[edit]
user@host# set security address-book global address ssl-proxy-exempted-addr
   192.0.2.10/24
user@host# set services ssl proxy profile ssl-inspect-profile whitelist
   ssl-proxy-exempted-addr
```

Starting with Junos OS Release 15.1X49-D80 and Junos OS Release 17.3R1, the whitelisting feature is extended to include URL categories supported by UTM in SSL proxy. In this implementation, the Server Name Indication (SNI) field is extracted by the UTM module from client hello messages to determine the URL category. Each URL category has a unique ID. The list of URL categories under whitelist is parsed and the corresponding category IDs are pushed to the Packet Forwarding Engine for each SSL forward proxy profile. The SSL forward proxy then determines through APIs whether to accept, and proxy, or to ignore the session.

Example:

```
[edit]
user@host# set services ssl proxy profile profile-name whitelist-url-categories
   category-name
```


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NOTE: The predefined url categories depends on UTM. To enable URL- based whitelisting in SSL proxy, the following basic URL configurations are required:

```
[edit]
user@host# set security utm feature-profile web-filtering type
   juniper-enhanced
user@host# set security utm utm-policy utmpolicy web-filtering http-profile
   junos-wf-enhanced-default
```

Starting with Junos OS Release 17.4R1, the whitelisting feature is extended to support custom URL categories supported by UTM.

The below example shows how to configure custom URL categories. In this example, Enhanced_Financial_Data_and_Services is one of the supported URL categories:

```
[edit]
user@host# set security utm custom-objects url-pattern url1 value www.example.com
user@host# set security utm custom-objects custom-url-category example-url value url1
user@host# set security utm feature-profile web-filtering juniper-local profile utm-p2
   category example-url action permit
user@host# set security utm utm-policy utm-p1 web-filtering http-profile utm-p2
user@host# set services ssl proxy profile pr1 whitelist-url-categories example-url
```

Configuring SSL Proxy Logging

When configuring SSL proxy, you can choose to set the option to receive some or all of the logs. SSL proxy logs contain the logical system name, SSL proxy whitelists, policy information, SSL proxy information, and other information that helps you troubleshoot when there is an error.

You can configure logging of *all* or specific events, such as error, warning, and information events. You can also configure logging of sessions that are whitelisted, dropped, ignored, or allowed after an error occurs.

```
[edit]
user@host# set services ssl proxy profile profile-name actions log all
user@host# set services ssl proxy profile profile-name actions log sessions-whitelisted
user@host# set services ssl proxy profile profile-name actions log sessions-allowed
user@host# set services ssl proxy profile profile-name actions log errors
```

You can use **enable-flow-tracing** option to enable debug tracing.

Exporting Certificates to a Specified Location

When a self-signed certificate is generated using a PKI command, the newly generated certificate is stored in a predefined location (**var/db/certs/common/local**).

Use the following command to export the certificate to a specific location (within the device). You can specify the certificate ID, the filename, and the type of file format (DER/PEM):

```
user@host> request security pki local-certificate export certificate-id certificate-id
user@host> request security pki local-certificate export filename filename
user@host> request security pki local-certificate export type der
```

Ignoring Server Authentication

Junos OS allows you to configure an option to ignore server authentication completely. If you configure your system to ignore authentication, then any errors encountered during server certificate verification at the time of the SSL handshake are ignored. Commonly ignored errors include the inability to verify CA signature, incorrect certificate expiration dates, and so forth. If this option is not set, all the sessions where the server sends self-signed certificates are dropped when errors are encountered.

We do not recommend using this option for authentication because configuring it results in websites not being authenticated at all. However, you can use this option to effectively identify the root cause of dropped SSL sessions.

From configuration mode, specify to ignore server authentication:

```
[edit]
user@host# set services ssl proxy profile profile-name actions ignore-server-auth-failure
```

See Also

- *Understanding Certificates and PKI*
- *Understanding Self-Signed Certificates*
- show services ssl proxy statistics on page 574
- clear services ssl proxy statistics on page 455

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SSL Reverse Proxy

SSL proxy is a transparent proxy that performs SSL encryption and decryption between the client and the server as follows:

- Reverse proxy—Proxying inbound session, that is, externally initiated SSL sessions from the Internet to the local server
- Forward proxy—Proxying outbound session, that is, locally initiated SSL session to the Internet.

The proxy model implementation for server protection (often called *reverse proxy*) is supported on SRX Series devices to provide improved handshaking and support for more protocol versions.

Starting in Junos OS Release 15.1X49-D80, SSL reverse proxy is supported on SRX5000 Series, SRX4100, SRX4200, SRX1500 devices.

On SRX Series devices, client protection (forward proxy) and server protection (reverse proxy) are supported using same echo system SSL-T-SSL [terminator on the client side] and SSL-I-SSL [initiator on the server side]).

NOTE: **You can enable Layer 7 services (application security, IPS, UTM, SKY ATP) on the traffic decrypted by SSL reverse proxy.**

Starting in Junos OS Release 15.1X49-D80, we recommend using the SSL reverse proxy and Intrusion Detection and Prevention (IDP) instead of using the IDP SSL inspection functionality.

Starting from Junos OS 15.1X49-D80, IDP SSL Inspection is deprecated—rather than immediately removed—to provide backward compatibility and a chance to bring your configuration into compliance with the new configuration.

Table 28 on page 248 provides the changes applicable on SRX Series devices post 15.1X48-D80 releases.

Table 28: Comparing Reverse Proxy Before and After Junos OS Release 15.1X49-D80

Feature	Prior to 15.1X49-D80	15.1X49-D80 and later
Proxy model	Runs only in tap mode Instead of participating in SSL handshake, it listens to the SSL handshake, computes session keys and then decrypts the SSL traffic.	Terminates client SSL on the SRX Series device and initiates a new SSL connection with a server. Decrypts SSL traffic from the client/server and encrypts again (after inspection) before sending to the server/client.
Protocol version	Does not support TLS Version 1.1 and 1.2.	Supports all current protocol versions.
Key exchange methods	• Supports RSA • Does not support DHE.	• Supports RSA. • Support DHE or ECDHE.
Echo system	Tightly coupled with IDP engine and its detector.	Uses existing SSL forward proxy with TCP proxy underneath.

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Table 28: Comparing Reverse Proxy Before and After Junos OS Release 15.1X49-D80 (continued)

Feature	Prior to 15.1X49-D80	15.1X49-D80 and later
Security services	Decrypted SSL traffic can be inspected only by IDP.	Just like forward proxy, decrypted SSL traffic is available for all security services.
Ciphers supported	Limited set of ciphers are supported.	All commonly used ciphers are supported.

Like forward proxy, reverse proxy requires a profile to be configured at the firewall rule level. In addition, you must also configure server certificates with private keys for reverse proxy. During an SSL handshake, the SSL proxy performs a lookup for a matching server private key in its server private key hash table database. If the lookup is successful, the handshake continues. Otherwise, SSL proxy aborts the hand shake. Reverse proxy does not prohibit server certificates. It forwards the actual server certificate/chain as is to the client without modifying it. Intercepting the server certificate occurs only with forward proxy.

The following shows example forward and reverse proxy profile configurations.

```
# show services ssl
...
proxy {
    profile ssl-inspect-profile-dut { # For forward proxy. No server cert/key is
 needed.
   trusted-ca all;
        root-ca ssl-inspect-ca;
        actions {
            ignore-server-auth-failure;
            log {
                all;
            }
        }
    }
    profile ssl-1 {
   trusted-ca all;
        root-ca ssl-inspect-ca;
        actions {
            ignore-server-auth-failure;
              log {
                all;
            }
        }
    }
    profile ssl-2 {
   trusted-ca all;
        root-ca ssl-inspect-ca;
        actions {
            ignore-server-auth-failure;
            log {
                all;
            }
        }
    }
    profile ssl-server-protection { # For reverse proxy. No root-ca is needed.
```

```
        server-certificate ssl-server-protection;
        actions {
            log {
                all;
            }
        }
    }
}
...
```

You must configure either **root-ca** or **server-certificate** in an SSL proxy profile. Otherwise the commit check fails. See Table 29 on page 250.

Table 29: Supported SSL Proxy Configurations

server-certificate configured	root-ca configured	Profile type
No	No	Commit check fails. You must configure either **server-certificate** or **root-ca**.
Yes	Yes	Commit check fails. Configuring both **server-certificate** and **root-ca** in the same profile is not supported.
No	Yes	Forward proxy
Yes	No	Reverse proxy

Configuring multiple instances of forward and reverse proxy profiles are supported. But for a given firewall policy, only one profile (either a forward or reverse proxy profile) can be configured. Configuring both forward and reverse proxy on the same device is also supported.

You cannot configure the previous reverse proxy implementation with the new reverse proxy implementation for a given firewall policy. If both are configured, you will receive a commit check failure message.

The following are the minimum steps to configure reverse proxy:

1. Load the server certificates and their keys into the SRX Series device certificate repository using the CLI command **request security pki local-certificate load filename** ***filename*** **key key certificate-id** ***certificate-id*** **passphrase** ***exmample@1234***. For example:

   ```
   user@host> request security pki local-certificate load filename /cf0/cert1.pem
    key /cf0/key1.pem certificate-id server1_cert_id passphrase example@1234
   ```

2. Attach the server certificate identifier to the SSL Proxy profile using the CLI command **set services ssl proxy profile** ***profile*** **server-certificate** ***certificate-id*** **passphrase** ***exmample@1234***. For example

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```
 user@host# set services ssl proxy profile server-protection-profile
server-certificate server2_cert_id passphrase example@1234
```

3. Use the **show services ssl** CLI command to verify your configuration. For example:

```
user@host# show services ssl
profile server-protection-profile {

      server-certificate [server1_cert_id , server2_cert_id];
      actions {
          logs {
               all;
               }
             }
}
```

Configuring the SSL Reverse Proxy

This example shows how to configure reverse proxy to enable server protection. It shows how to configure an SSL proxy profile and apply it at the security policy rule level. For server protection, additionally, server certificate(s) with private key(s) must be configured.

- Requirements on page 251
- Overview on page 251
- Configuration on page 252

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

A reverse proxy protects servers by hiding the details of the servers from the clients, there by adding an extra layer of security.

Similar to SSL forward proxy (client protection), server protection also needs an SSL proxy profile to be configured at the security policy rule level. For server protection, additionally, server certificate(s) with private key(s) must be configured. Note that, for server protection enabled session, SSL proxy do not interdicts server certificate, that is—it forwards the actual server certificate/chain as it is to the client without modifying it. Interdicting the server certificate happens on client protection enabled sessions only.

To configure an SSL reverse proxy, you must:

- Load the server certificate(s) and their key(s) into SRX Series device's certificate repository.
- Attach the server certificate identifier(s) to the SSL proxy profile.
- Apply SSL proxy profile as application services in a security policy.

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Configuration

Configuring SSL Reverse Proxy

Step-by-Step Procedure

To configure SSL reverse proxy:

1. Load the signing certificate and the respective key for the SSL proxy profile in PKI memory.

```
user@host> request security pki local-certificate load filename /cf0/cert1.pem key
  /cf0/key1.pem certificate-id server1_cert_id
```

2. Attach the server certificate to the SSL proxy profile.

```
user@host# set services ssl proxy profile server-protection-profile server-certificate
  server1_cert_id
```

3. Create a security policy and specify the match criteria for the policy. As match criteria, specify the traffic for which you want to enable SSL proxy.

```
user@host# set security policies from-zone untrust to-zone trust policy 1 match
  source-address any
user@host# set security policies from-zone untrust to-zone trust policy 1 match
  destination-address any
user@host# set security policies from-zone untrust to-zone trust policy 1 match
  application any
```

4. Apply the SSL proxy profile to the security policy.

```
user@host# set security policies from-zone untrust to-zone trust policy 1 then permit
  application-services ssl-proxy profile-name server-protection-profile
```

Verifying the SSL Reverse Proxy Configuration on the Device

Purpose

Viewing the SSL reverse proxy statistics on the SRX Series device.

Action

You can view the SSL proxy statistics by using the **show services ssl proxy statistics** command.

```
root@mullai> show services ssl proxy statistics
  PIC:spu-1 fpc[0] pic[1] ------
          sessions matched                          0
          sessions whitelisted                      0
          sessions bypassed:non-ssl                 0
          sessions bypassed:mem overflow            0
          sessions bypassed:low memory              0
          sessions created                          0
          sessions ignored                          0
```


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```
        sessions active                          0
        sessions dropped                         0
```

See Also

- *Example: Loading CA and Local Certificates Manually*
- *Example: Configuring a Device for Peer Certificate Chain Validation*

Enabling Debugging and Tracing for SSL Proxy

Debug tracing on both Routing Engine and the Packet Forwarding Engine can be enabled for SSL proxy by setting the following configuration:

```
user@host# set services ssl traceoptions
```

SSL proxy is supported on SRX340, SRX345, SRX550M, SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, SRX5800 devices and vSRX instances. Table 30 on page 253 shows the supported levels for trace options.

Table 30: Trace Levels

Cause Type	Description
Brief	Only error traces on both the Routing Engine and the Packet Forwarding Engine.
Detail	Packet Forwarding Engine–Only event details up to the handshake should be traced. Routing Engine–Traces related to commit. No periodic traces on the Routing Engine will be available
Extensive	Packet Forwarding Engine–Data transfer summary available. Routing Engine–Traces related to commit (more extensive). No periodic traces on the Routing Engine will be available.
Verbose	All traces are available.

Table 31 on page 253 shows the flags that are supported.

Table 31: Supported Flags in Trace

Cause Type	Description
cli-configuration	Configuration-related traces only.
initiation	Enable tracing on the SSL-I plug-in.
proxy	Enable tracing on the SSL-Proxy-Policy plug-in.
termination	Enable tracing on the SSL-T plug-in.

Table 31: Supported Flags in Trace (continued)

Cause Type	Description
selected-profile	Enable tracing only for profiles that have **enable-flow-tracing** set.

You can enable logs in the SSL proxy profile to get to the root cause for the drop. The following errors are some of the most common:

- Server certification validation error. Check the trusted CA configuration to verify your configuration.
- System failures such as memory allocation failures.
- Ciphers do not match.
- SSL versions do not match.
- SSL options are not supported.
- Root CA has expired. You need to load a new root CA.

You can enable the **ignore-server-auth-failure** option in the SSL proxy profile to ensure that certificate validation, root CA expiration dates, and other such issues are ignored. If sessions are inspected after the **ignore-server-auth-failure** option is enabled, the problem is localized.

See Also

- traceoptions (Services SSL) on page 436

SSL Proxy Support for Unified Policies

Starting from Junos OS Release 18.2R1, unified policies are supported on SRX Series devices, allowing granular control and enforcement of dynamic Layer 7 applications, within the traditional security policy.

Unified policies are the security policies that enable you to use dynamic applications as match conditions as part of the existing 5-tuple or 6-tuple (5-tuple with user firewall) match conditions to detect application changes over time.

SSL proxy functionality is supported when the device is configured with unified policies. As a part of this enhancement, you can configure a default SSL proxy profile.

During the initial policy lookup phase, which occurs prior to a dynamic application being identified, if there are multiple policies present in the potential policy list which contains different SSL proxy profiles, the SRX Series device applies the default SSL proxy profile until a more explicit match has occurred.

We recommend that you create a default SSL proxy profile. The sessions are dropped in case of policy conflicts, if there is no default SSL proxy profile available.

You can configure an SSL proxy profile under the **[edit services ssl proxy]** hierarchy level, and then apply it as a default SSL proxy profile under the **[edit security ngfw]** hierarchy level. This configuration does not impact the existing SSL service configuration.

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Configuring a default SSL proxy profile is supported for both SSL forward and reverse proxy.

Understanding How SSL Proxy Default Profile Works

Table 32 on page 255 summarizes the default SSL proxy profile behavior in unified policies.

Table 32: SSL Proxy Profile Usage in Unified Policies

Application Identification Status	SSL Proxy Profile Usage	Action
No security policy conflict	SSL proxy profile is applied when traffic matches the security policy.	SSL proxy profile is applied.
Security policy conflict (conflicting polices have distinct SSL proxy profiles)	Default SSL proxy profile is not configured or not found.	Session is terminated, because the default SSL proxy profile is not configured.
	Default SSL proxy profile is configured.	Default SSL proxy profile is applied.
Final application is identified	Matching security policy has a SSL proxy profile that is same as default SSL proxy profile.	Default SSL proxy profile is applied.
	Matching security policy does not have a SSL proxy profile.	Default SSL proxy profile is applied.
	Matching security policy has a SSL proxy profile that is different from the default SSL proxy profile that is already applied.	Default SSL proxy profile that is already applied, continues remain as applied.

NOTE: A security policy can have either an SSL reverse proxy profile or an SSL forward proxy profile configured at a time.

If a security policy has an SSL forward proxy profile and another security policy has an SSL reverse proxy profile, in such case, a default profile—either from SSL reverse proxy profile or from SSL forward proxy profile is considered.

CAUTION: We recommend creating default SSL proxy profile because sessions are dropped in case of policy conflicts, when there is no default SSL proxy profile available. A system log message is generated to log the event.

TIP: Example of the system log message:

```
"<14>1 2018-03-07T03:18:33.374-08:00 4.0.0.254 kurinji junos-ssl-proxy
 - SSL_PROXY_SSL_SESSION_DROP [junos@2636.1.1.1.2.105
logical-system-name="root-logical-system" session-id="15"
source-address="4.0.0.1" source-port="37010"
destination-address="5.0.0.1" destination-port="443"
```

```
nat-source-address="4.0.0.1" nat-source-port="37010"
nat-destination-address="5.0.0.1" nat-destination-port="443"
profile-name="(null)" source-zone-name="untrust"
source-interface-name="xe-2/2/1.0" destination-zone-name="trust"
destination-interface-name="xe-2/2/2.0" message="default ssl-proxy
profile is not configured"]
```

Default SSL Proxy Profiles in Different Scenarios

Following examples discuss in detail about the default SSL proxy profile in different scenarios:

- No Policy Conflict—All Policies Have Same SSL Proxy Profile on page 256
- No Policy Conflict—All Policies Have Same SSL Proxy Profile and Final Policy Has No SSL Profile on page 256
- Policy Conflict—No SSL Profile Configured for Final Policy on page 257
- Policy Conflict–Default SSL Proxy Profile and Different SSL Proxy Profile for Final Policy on page 257

No Policy Conflict—All Policies Have Same SSL Proxy Profile

All matching policies have same SSL proxy profile as shown in Table 33 on page 256.

Table 33: No Policy Conflict—All Policies Have Same SSL Proxy Profile

Security Policy	Source Zone	Source IP Address	Destination Zone	Destination IP Address	Port Number	Protocol	Dynamic Application	Service	Default SSL Proxy Profile
Policy-P1	S1	Any	D1	Any	Any	Any	Facebook	SSL Proxy	SSL-1
Policy-P2	S1	Any	D1	Any	Any	Any	Google	SSL Proxy	SSL-1

In this case, both Policy-P1 and Policy-P2 have the same SSL proxy profile (SSL-1). Because there is no conflict, the profile SSL-1 is applied.

If you have configured a default SSL proxy profile (SSL-2), it is not applied. Because there is no conflict in the policies (Policy-P1 and Policy-P2).

No Policy Conflict—All Policies Have Same SSL Proxy Profile and Final Policy Has No SSL Profile

Policy-P1 and Policy-P2 have same SSL proxy profile and the Policy-3 has no SSL profile as shown in Table 34 on page 257.

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Table 34: No Policy Conflict—All Policies Have Same SSL Proxy Profile and Final Policy Has No SSL Profile Configured

Security Policy	Source Zone	Source IP Address	Destination Zone	Destination IP Address	Port Number	Protocol	Dynamic Application	Service	Default SSL Proxy Profile
Policy-P1	S1	Any	D1	Any	Any	Any	Facebook	SSL Proxy	SSL-1
Policy-P3	S1	50.1.1.1	D1	Any	Any	Any	YouTube	SSL Proxy	SSL-1
Policy-P2	S1	Any	D1	Any	Any	Any	Google	Other	None

In this scenario, both Policy-P1 and Policy-P2 have the same SSL proxy profile (SSL-1). Because there is no conflict, the profile SSL-1 is applied before the final policy match.

When the final application is identified, the security policy matching with the final application, that is, Policy-P3 is applied. Because the Policy-P3 has no SSL proxy profile, the already applied profile SSL-1 remains applied. This is because, the SSL proxy profile is already applied on the traffic.

Policy Conflict—No SSL Profile Configured for Final Policy

The default SSL proxy profile is applied during potential match as shown in Table 35 on page 257. The final policy, Policy-P3 does not have any SSL proxy profile.

Table 35: Policy Conflict—No SSL Profile Configured for Final Policy

Security Policy	Source Zone	Source IP Address	Destination Zone	Destination IP Address	Port Number	Protocol	Dynamic Application	Service	Default SSL Proxy Profile
Policy-P1	S1	50.1.1.1	D1	Any	Any	Any	Facebook	SSL Proxy	SSL-1
Policy-P2	S1	50.1.1.1	D1	Any	Any	Any	Google	SSL Proxy	SSL-2
Policy-P3	S1	50.1.1.1	D1	Any	Any	Any	YouTube	Other	NA

In this example, SSL proxy profile SSL-1 is configured as default SSL proxy profile. During the policy conflict for Policy-P1 and Policy-P2, the default profile SSL-1 is applied.

When the final application is identified, the security policy matching with the final application, that is, Policy-P3 is applied. Because the Policy-P3 has no SSL proxy profile, the already applied profile SSL-1 continues to remain as applied. This is because, the SSL proxy profile is applied on the traffic.

Policy Conflict–Default SSL Proxy Profile and Different SSL Proxy Profile for Final Policy

The SSL proxy profile SSL-1 is configured as a default SSL proxy profile and is already applied before the final policy is matched. Refer Table 13 on page 135.

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Table 36: Policy Conflict—Default SSL Proxy Profile and Different SSL Proxy Profile for Final Policy

Security Policy	Source Zone	Source IP Address	Destination Zone	Destination IP Address	Port Number	Protocol	Dynamic Application	Service	Default SSL Proxy Profile
Policy-P1	S1	50.1.1.1	D1	Any	Any	Any	Facebook	SSL Proxy	SSL-1
Policy-P2	S1	50.1.1.1	D1	Any	Any	Any	Google	SSL Proxy	SSL-2
Policy-P3	S1	50.1.1.1	D1	Any	Any	Any	YouTube	SSL Proxy	SSL-3

When the final application is identified, the security policy matching with the final application, that is, Policy-P3 is applied. The SSL profile for the Policy-P3, that is, SSL-3 is not applied. Instead, the SSL proxy profile SSL-2 configured and applied as default profile, continues to remain as applied.

Switching from the default SSL proxy profile that is already applied to the traffic, to another SSL proxy profile is not supported.

Limitations of SSL Proxy with Unified Policies

- When a default SSL proxy profile is enabled, it cannot be disabled even if the final security policy does not have SSL proxy configured.
- When a default SSL proxy profile is enabled and applied on the traffic and the final security policy has a different SSL proxy profile configured other than default profile, switching from the default SSL proxy profile to the SSL proxy profile in the security policy is not supported.

Configuring Default SSL Proxy Profiles

SSL proxy is enabled as an application service within a security policy. In a security policy, specify the match criteria for the traffic that must be SSL proxy enabled. Next, specify the SSL proxy profile to be applied to the traffic. When configuring unified policies, the steps include defining the SSL profile, then adding the SSL profile as default profile under the **[edit security ngfw]** hierarchy level, and then including to it in the desired security policy.

- Configuring Default Profile for SSL Forward Proxy on page 258
- Configuring Default Profile for SSL Reverse Proxy on page 259
- Configuring Default SSL Profiles for Logical System on page 259

Configuring Default Profile for SSL Forward Proxy

In this procedure, you configure an SSL forward proxy profile, and specify the profile as the default profile.

1. Create an SSL profile and attach the CA profile group to the SSL proxy profile.

```
user@host# set services ssl proxy profile profile-name profle-name trusted-ca all
```


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2. Apply the signing certificate as root-ca in the SSL proxy profile.

```
user@host# set services ssl proxy profile profile-name profle-name root-ca
  ssl-inspect-ca
```

3. Define the SSL proxy profile as the default profile.

```
user@host# set security ngfw default-profile ssl-proxy profile-name profle-name
```

Configuring Default Profile for SSL Reverse Proxy

In this procedure, you configure an SSL reverse proxy profile and specify the profile as the default profile.

1. Create an SSL profile and attach the CA profile group to the SSL proxy profile.

```
user@host# set services ssl proxy profile server-protection-profile server-certificate
  server1_certificate-id
```

2. Define the SSL reverse proxy profile as the default profile.

```
user@host# set security ngfw default-profile ssl-proxy profile-name
  server-protection-profile
```

Configuring Default SSL Profiles for Logical System

In this procedure, you assign the SSL forward proxy profile or the SSL reverse proxy profile as the default profile in logical system configurations. In this case, one profile can be a default profile either from the SSL forward proxy or from the SSL reverse proxy.

- Define the SSL forward proxy profile as the default profile.

```
user@host# set logical-systems LSYS1 security ngfw default-profile ssl-proxy
  profile-name profle-name
```

- Define the SSL reverse proxy profile as the default profile.

```
user@host# set logical-systems LSYS1 security ngfw default-profile ssl-proxy
  profile-name profle-name
```

Example: Configuring Default SSL Proxy Profile for Unified Policy

This example shows how to configure a default SSL proxy profile and apply it in a unified policy.

- Requirements on page 260
- Overview on page 260

- Configuration on page 260
- Verification on page 261

Requirements

This example uses the following hardware and software components:

- SRX Series device with Junos OS Release 18.2R1 or later. This configuration example is tested for Junos OS Release 18.2R1.

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you configure an SSL forward proxy profile by specifying the root CA certificate. Next, configure the profile as default SSL proxy profile. Now, you create a unified policy and invoke the SSL proxy as application services on the permitted traffic.

Configuration

To configure a default SSL proxy profile and apply it in a unified policy:

1. Create an SSL profile and attach the CA profile group to the SSL proxy profile.

```
user@host# set services ssl proxy profile SSL-FP-PROFILE-1 trusted-ca all
```

2. Apply the signing certificate as root-ca in the SSL proxy profile.

```
user@host# set services ssl proxy profile SSL-FP-PROFILE-1 root-ca ssl-inspect-ca
```

3. Define the SSL proxy profile as the default profile.

```
user@host#  set security ngfw default-profile ssl-proxy profile-name
   SSL-FP-PROFILE-1
```

4. Create a unified policy and specify the dynamic application as the match criteria.

```
user@host# set security policies from-zone untrust to-zone trust policy from_internet
   match source-address any
user@host# set security policies from-zone untrust to-zone trust policy from_internet
   match destination-address any
user@host# set security policies from-zone untrust to-zone trust policy from_internet
   match application any
user@host# set security policies from-zone untrust to-zone trust policy from_internet
   match dynamic-application junos:web
```

5. Apply the SSL proxy profile to the permitted traffic in the security policy.

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```
user@host# set security policies from-zone untrust to-zone trust policy from_internet
  then permit application-services ssl-proxy profile-name SSL-FP-PROFILE-1
```

Verification

Verify SSL Proxy Configuration

Purpose Confirm that the configuration is working properly by displaying the SSL proxy statistics.

Action From operational mode, enter the **show services ssl proxy statistics** command.

```
user@host> show services ssl proxy statistics

PIC:fwdd0 fpc[0] pic[0]
sessions matched 0
sessions bypassed:non-ssl 0
sessions bypassed:mem overflow 0
sessions bypassed:low memory 0
sessions created 0
sessions ignored 0
sessions active 0
sessions dropped 0
sessions whitelisted 0
whitelisted url category match 0
default profile hit 0
session dropped no default profile 0
policy hit no profile configured 0
```

Meaning The command output displays the following information:

- Details about the sessions matched for the SSL proxy.
- Details about the default SSL proxy profile such as the sessions where the default profile is applied and the sessions that are dropped due to the absence of the default profile.

See Also
- ngfw on page 363

Configuring SSL Forward Proxy Certificate Chain

- Understanding SSL Certificate Chain on page 261
- Configuring the SSL Certificate Chain on page 264

Understanding SSL Certificate Chain

This topic includes the following sections:

- SSL Proxy Overview on page 262
- SSL Certificate Chain Overview on page 262

- Advantage of Certificate Chains on page 263
- Understanding Certificate Chain Processing on page 263

SSL Proxy Overview

SSL proxy acts as an intermediary, performing SSL encryption and decryption between the client and the server, but neither the server nor the client can detect its presence. SSL relies on digital certificates and private-public key exchange pairs for client and server authentication to ensure secure communication.

An SSL certificate (digital certificate) is provided by trusted companies to authenticate the identity of website owners and ensure secure communication between those websites and their customers by ensuring legitimacy of the identification information. However, many certificate authorities (CAs) use a complex certificate chain that includes a number of intermediate certificates.

In order to validate (and trust) an SSL certificate, the CA that issued the certificate must be included in the trusted CA list of the device that is connecting.

For example, when a connection is initiated, the connecting device (such as a Web browser) checks whether the certificate is issued by a trusted CA. If not, , the device checks whether the certificate of the issuing CA was issued by a trusted CA. This check continues until either a trusted CA is found (at which point a trusted, secure connection will be established), or no trusted CA can be found (at which point the device will usually display an error).

If the intermediate certificates are not included in the trusted CA list, then the Web browser of the clients might display a warning message stating that the certificate presented by the device they are accessing is not trusted.

You can resolve this issue by using an SSL certificate chain. The list of SSL certificates, from the root certificate to the end-user certificate, represents the SSL certificate chain.

SSL Certificate Chain Overview

Starting in Junos OS Release 15.1X49-D30, SSL forward proxy supports the certificate chain and sends it to facilitate the certification chain validation by the client (that is, the connecting device).

The certificate chain is a file that contains an ordered list of certificates, including an SSL certificate and a chain of intermediate CA certificates, in Privacy-Enhanced Mail (PEM) format. This enables the receiver to verify that the sender and all CAs are trustworthy.

A root CA certificate is a certificate issued by a trusted certificate authority. A certificate authority issues certificates in the form of a tree structure. A root certificate is the topmost certificate of the tree. All certificates below the root certificate inherit the trustworthiness of the root certificate; these certificates are called intermediate certificates.

Any certificate placed between the root CA certificate and the SSL certificate (used by end-users) is considered an intermediate certificate. These must be installed to the webserver with the end-user certificate for your website to link your certificate to a trusted authority.

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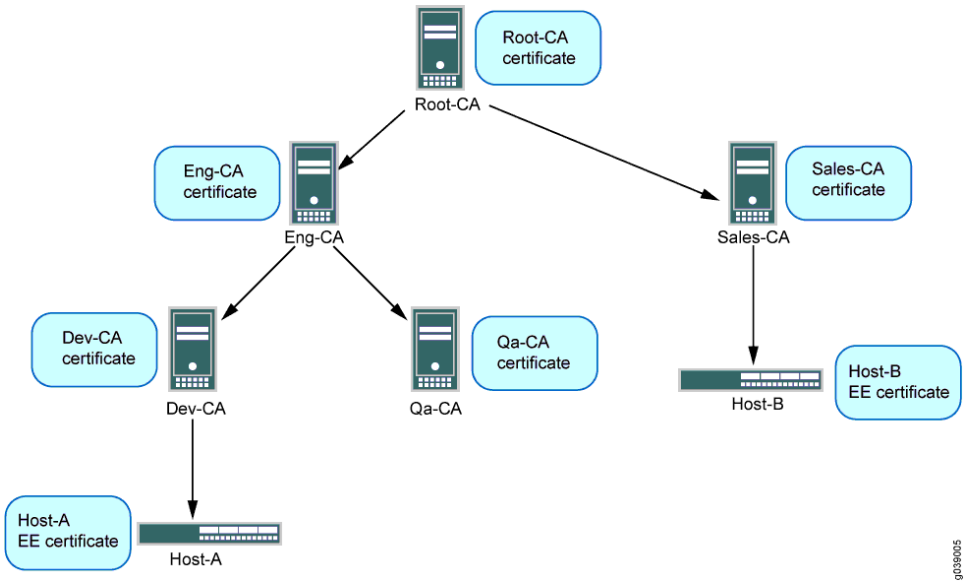
Any certificate signed by a trusted root CA certificate is also trusted. The root CA certificate is always signed by the CA itself. The root CA certificate is the signer/issuer of the intermediate certificate. In turn, the signed intermediate certificate can sign another intermediate certificate and it will also be trusted. The chain terminates at the end-user certificate.

SSL forward proxy sends the entire certificate chain, excluding or including the root CA certificate, to facilitate certificate validation at the client side.

Figure 11 on page 263 illustrates certificate chaining.

Figure 11: Certificate Chaining



Root-CA is the common trusted CA for all devices in the network. Root-CA issues CA certificates to the engineering and sales CAs, which are identified as Eng-CA and Sales-CA, respectively. Eng-CA issues CA certificates to the development and quality assurance CAs, which are identified as Dev-CA and Qa-CA, respectively. Host-A receives its certificate from Dev-CA while Host-B receives its certificate from Sales-CA.

The end-user device needs to be loaded with the entire certificate chain. In this example, Host-A must have Root-CA, Eng-CA, and Dev-CA certificates; and Host-B must have Root-CA and Sales-CA certificates.

Advantage of Certificate Chains

SSL certificate chains eliminate the need to deploy all intermediate certificates separately on all clients.

Understanding Certificate Chain Processing

The following components are involved in certificate chain processing:

- Administrator loads the certificate chain and the local certificate (signing certificate) into the PKI daemon certificate cache.

- The Network Security Daemon (nsd) sends a request to the PKI daemon to provide the certificate chain information for a signing certificate configured in the SSL proxy profile.
- SSL forward proxy stores this certificate chain information (CA certificate profile name) in therespective SSL profile. As a part of security policy implementation, SSL profiles having the certificate chain information and CA certificates are used.

Configuring the SSL Certificate Chain

This example shows how to install the certificate chain to enable browsers to trust your certificate. It shows how to install the root CA certificate and enable the certificate chain in order to ensure secure communications over the Web when using the service.

- Requirements on page 264
- Overview on page 264
- Configuration on page 266

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

Some certificate authorities (CAs) do not sign with their root certificate, but instead use an intermediate certificate. An intermediate CA can sign certificates on behalf of the root CA certificate. The root CA signs the intermediate certificate, forming a chain of trust.

In order to trust a server's certificate, the client must be configured to trust the CA that signed the server certificate. However, clients are configured to trust only the root CA certificate. Therefore the server must present the chain of intermediate CA certificates to ensure that the trust is properly established when clients connect to a server.

Figure 12 on page 265 depicts a full certificate chain, from the root CA certificate to the end-user certificate. The chain terminates at the end-user certificate.

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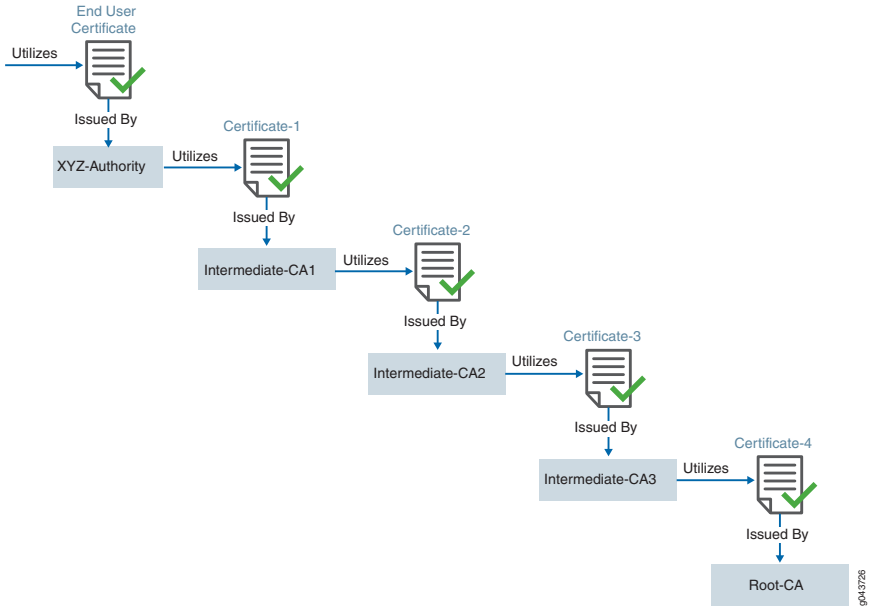
Figure 12: Certification Path from the Certificate Owner to the Root CA



In this example, you have a domain, example.domain-1, and you want to purchase a certificate from XYZ-Authority for your domain. However, XYZ -Authority is not a Root-CA and the visiting Web browser trusts only Root-CA certificate. In other words, its certificate is not directly embedded in your Web browser and therefore it is not explicitly trusted. In this case, trust is established in the following manner using the certificate chain (of intermediate certificates):

- End User Certificate is issued to example.domain-1; issued by XYZ-Authority.
- XYZ-Authority utilizes a certificate (Certificate-1) issued by Intermediate CA-1.
- Intermediate CA-1 utilizes a certificate (Certificate-2) issued by Intermediate CA-2.
- Intermediate CA-2 utilizes a certificate (Certificate-3) issued by Intermediate CA-3.
- Intermediate CA-3 utilizes a certificate (Certificate-4) issued by root-example-authority. The root-example-authority is a root CA.

  Its certificate is directly embedded in your Web browser; therefore it can be explicitly trusted. The certificate chain includes all the certificates starting from Certificate-1 to Root-CA certificate. Because the web browser trusts the root CA, it also implicitly trusts all the intermediate certificates.

Certificate-1 is your end-user certificate, the one you purchase from the CA. The certificates from 2 to 3 are called *intermediate certificates*. Certificate-4, at the end, is called the *root CA certificate*.

When you install your end-user certificate for the server example.domain-1, you must bundle all the intermediate certificates and install them along with your end-user certificate. If the SSL certificate chain is invalid or broken, your certificate will not be trusted by some devices.

NOTE:

- All certificates must be in Privacy-Enhanced Mail (PEM) format.
- When you import the concatenated certificate file into the device, the CA provides a bundle of chained certificates that must be added to the signed server certificate. The server certificate must appear before the chained certificates in the combined file.

Configuration

Configuring the SSL certificate chain includes the following tasks:

- Purchase an SSL certificate from a CA that includes a signing certificate and a respective key.
- Configure a trusted CA profile group.
- Load the intermediate and root CA in public key infrastructure (PKI) memory. This certificate file contains all the required CA certificates, one after each other, in PEM format.
- Set up your device to use the signing certificate received from the CA by configuring and applying the SSL proxy profile to a security policy.

To configure the SSL certificate chain, you must:

1. Load the signing certificate and the key on your device.
2. Create a trusted CA profile for the intermediate or root CA certificate.
3. Attach the signing certificate profile as created in Step 1 to the SSL proxy profile.
4. Attach the trusted CA profiles created in Step 2 to the SSL proxy profile.

This example assumes that you have already purchased an SSL certificate from a CA.

- Loading the Signing Certificate on page 266
- Configuring Trusted CA Profiles for Intermediate or Root CA Certificates on page 267
- Configuring the SSL Proxy Profile on page 267
- Verifying the Certificate Chain on the Device on page 268

Loading the Signing Certificate

Step-by-Step Procedure

To load the local certificate into the PKI memory:

1. Load the signing certificate and the respective key for the SSL proxy profile in PKI memory.

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```
user@host>  request security pki local-certificate load filename ssl_proxy_ca.crt
   key sslserver.key certificate-id ssl-inspect-ca
```

The following message is displayed:

```
Local certificate loaded successfully
```

Note that the certificate ID will be used under the **root-ca** section in the SSL proxy profile.

Configuring Trusted CA Profiles for Intermediate or Root CA Certificates

Step-by-Step Procedure

The CA profile defines the certificate information to be used for authentication. It includes the public key that SSL proxy uses when generating a new certificate. Junos OS allows you to create a group of CA profiles and load multiple certificates in one action, view information about all certificates in a group, and delete unwanted CA groups.

- Load the intermediate or root CA certificate in the PKI memory.

```
user@host> request security pki ca-certificate ca-profile-group load ca-group-name
   ca-latest filename ca-latest.cert.pem
```

The CA profile includes the certificate information used for authentication. It includes the public key that SSL proxy uses when generating a new certificate.

```
Do you want to load this CA certificate? [yes,no] (no) yes

      Loading 1 certificates for group 'ca-latest'.
      ca-latest_1: Loading done.
      ca-profile-group 'ca-latest' successfully loaded
      Success[1] Skipped[0]
```

This certificate will be attached as a certificate chain.

Configuring the SSL Proxy Profile

Step-by-Step Procedure

SSL forward proxy stores this certificate chain information (CA certificate profile name) into respective the SSL profile. As a part of security policy implementation, SSL profiles having the certificate chain information and CA certificates are used.

1. Attach the CA profile group to the SSL proxy profile. You can attach trusted CA one at a time or load all in one action.

```
user@host# set services ssl proxy profile ssl-profile trusted-ca all
```

2. Apply the signing certificate as root-ca in the SSL proxy profile.

```
user@host# set services ssl proxy profile ssl-profile root-ca ssl-inspect-ca
```

3. Create a security policy and specify the match criteria for the policy. As match criteria, specify the traffic for which you want to enable SSL proxy.

```
user@host# set security policies from-zone trust to-zone untrust policy 1 match
    source-address any
```

```
user@host# set security policies from-zone trust to-zone untrust policy 1 match
    destination-address any
```

```
user@host# set security policies from-zone trust to-zone untrust policy 1 match
    application any
```

4. Apply the SSL proxy profile to the security policy.

```
user@host# set security policies from-zone trust to-zone untrust policy 1 then permit
    application-services ssl-proxy profile-name ssl-proxy
```

5. Create a security policy and specify the match criteria for the policy. As match criteria, specify the traffic for which you want to enable SSL proxy.

```
user@host# set security policies from-zone untrust to-zone trust policy 1 match
    source-address any
```

```
user@host# set security policies from-zone untrust to-zone trust policy 1 match
    destination-address any
```

```
user@host# set security policies from-zone untrust to-zone trust policy 1 match
    application any
```

6. Apply the SSL proxy profile to the security policy.

```
user@host# set security policies from-zone untrust to-zone trust policy 1 then permit
    application-services ssl-proxy profile-name ssl-proxy
```

Verifying the Certificate Chain on the Device

Purpose Viewing the certificate chain on the SRX Series device.

Action You can view the certificate chain on the connecting Web browser (that is, the client).

See Also

- *Example: Loading CA and Local Certificates Manually*
- *Example: Configuring a Device for Peer Certificate Chain Validation*

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Working with the Certificate Revocation Lists for SSL Proxy

A certificate issued by a certificate authority (CA) is supposed to be valid until the expiration of the validity period. In the normal course of business, a CA can revoke an issued certificate. A certificate is revoked if it is suspected that the certificate has been compromised. Some of the examples are:

- Unspecified (no particular reason is given).
- Private key associated with the certificate was compromised.
- Private key associated with the CA that issued the certificate was compromised.
- The owner of the certificate is no longer affiliated with the issuer of the certificate and does not have rights to access the certificate or does not require it any longer.
- Another certificate replaces the original certificate.
- The CA that issued the certificate has ceased to operate.
- The certificate is on hold pending further action. It is treated as revoked but might be accepted in the future.

Once the CA determines to revoke a certificate, it publishes the information by some means so that the enduser certificate can use the information to validate a certificate. The CA can publish this information using certificate revocation list (CRL).

The CRL contains the list of digital certificates that have been canceled before their expiration date. When a participating device uses a digital certificate, it checks the certificate signature and validity. It also acquires the most recently issued CRL and checks that the certificate serial number is not on that CRL. By default, CRL verification is enabled on SSL proxy profile.

CRL validation on SRX Series device involves checking for revoked certificates from servers. You can enable or disable the CRL validation to meet your specific security requirements.

Starting with Junos OS Release 15.1X49-D30 and Junos OS Release 17.3R1, certificate revocation list (CRL) checks are supported.

- Disabling CRL Verification on page 269
- Allowing Sessions When CRL Information Is Not Available on page 270
- Allowing Sessions When CRL Status Is Unknown on page 270

Disabling CRL Verification

In order to enhance security, the certificate revocation checking feature has been enabled by default on SRX Series devices on any SSL proxy profile. You can enable or disable the CRL validation to meet your specific security requirements.

- To disable CRL verification:

```
[edit]
user@host# set services ssl proxy profile profile-name actions crl disable
```

You can reenable CRL validation by using the **delete services ssl proxy profile profile-name actions crl disable** command.

Allowing Sessions When CRL Information Is Not Available

Sometimes CRL information might not be available because of various reasons. For example:

- CRL download failed and the PKI daemon did not or could not fetch the CRL from the CA.
- The CRL path was not available from the configuration and it is not present in the root or intermediate certificate, or no URL was configured.

You can allow or drop the sessions when a CRL information is not available.

- To ensure that the sessions are not dropped for any reason when CRL information is not available:

```
[edit]
user@host# edit set services ssl proxy profile profile-name actions crl if-not-present
  allow
```

- To drop the sessions when CRL information is not available:

```
[edit]
user@host# edit set services ssl proxy profile profile-name actions crl if-not-present
  drop
```

Allowing Sessions When CRL Status Is Unknown

You can configure how an SRX Series device will respond when updated CRL information is not available, and the server certificate that is currently offered is not known to be revoked from a previous query. Certificates are presumed not to be revoked, by default, which means they are valid, and a temporary failure to obtain a CRL does not automatically result in an SSL handshake failure. By default, sessions are allowed if CRL status is unknown.

You can configure an SRX Series device to accept a certificate without a reliable confirmation available on the revocation status.

- To allow the sessions when a certificate is revoked and the revocation reason is on hold:

```
[edit]
user@host# edit set services ssl proxy profile profile-name actions crl
  ignore-hold-instruction-code
```

See Also

- *Understanding Online Certificate Status Protocol and Certificate Revocation Lists*

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Application Security Services with SSL Proxy Overview

With the implementation of SSL proxy, AppID can identify applications encrypted in SSL. SSL proxy can be enabled as an application service in a regular firewall policy rule. Intrusion Detection and Prevention (IDP), application firewall (AppFW), application tracking (AppTrack), advanced policy-based routing (APBR) services, UTM, SKY ATP, and Security Intelligence (SecIntel) can use the decrypted content from SSL proxy.

To determine if a feature is supported by a specific platform or Junos OS release, refer Feature Explorer

On the SSL payload, IDP can inspect attacks and anomalies; for example, HTTP chunk length overflow on HTTPS. On encrypted applications, such as Facebook, AppFW can enforce policies and AppTrack (when configured in the from and to zones) can report logging issues based on dynamic applications.

NOTE: **If none of the services (AppFW, IDP, or AppTrack) are configured, then SSL proxy services are bypassed even if an SSL proxy is attached to a firewall policy.**

NOTE: **The IDP module will not perform an SSL inspection on a session if an SSL proxy is enabled for that session. That is, if both SSL inspection and SSL proxy are enabled on a session, SSL proxy will always take precedence.**

See Also

- Example: Configuring Application Firewall When SSL Proxy Is Enabled on page 100
- Example: Configuring Application Tracking When SSL Proxy Is Enabled on page 115

SSL Performance Enhancements

SSL proxy is fundamental building block for deciphering all encrypted HTTPS flows. All security services such as anti-virus, anti-spam, content security, SKY ATP rely on SSL proxy to handle clear text traffic for further processing.

The SSL/TLS handshake used for providing secure connections involves number of communications passed back and forth between the user's browser (client) and web application (server) to verify if the connection is trusted. It is a CPU-intensive process. Since SSL/TLS is the most widely used security protocol on the web, it's performance results in significant impact on the web performance.

Starting from Junos OS Release 15.1X49-D120, when using SSL/TLS for connections between clients and servers, the following new options are available for optimizing the SSL performance:

- Using optimized RSA key exchanges
- Using Authenticated Encryption with Associated Data (AEAD):

  - AES128-CBC-SHA
  - AES256-CBC-SHA

- Maintaining certificate cache

  Certificate cache stores the interdicted server certificate along with the server certificate details. During SSL/TLS handshake, SSL proxy can present the cached interdicted certificate to client instead of generating the new interdicted certificate. This operation also does not involve RSA involvement. The default timeout period of the certificate cache entry is 600 seconds and it can be changed using the appropriate configuration. For example:

  To set the certificate cache timeout to 300 seconds, that is, the time in seconds that certificate details are stored in the cache, use the following command:

  ```
  [edit]
  user@host# services ssl proxy global-config certificate-cache-timeout 300
  ```

  To disable the certificate cache and allow the SSL full handshake to occur for a new connection, use the following command:

  ```
  [edit]
  user@host# services ssl proxy global-config disable-cert-cache
  ```

  To invalidate the existing certificate cache, use the following command:

  ```
  [edit]
  user@host# services ssl proxy global-config invalidate-cache-on-crl-update
  ```

Improving the SSL performance results in improved website performance without compromising security and maximized user experience.

Data Loss Prevention (DLP) Using ICAP Service Redirect

Data loss prevention (DLP) is a method of inspecting and keeping sensitive data from leaving the allowed perimeter. DLP systems are concerned with the data passing over some kind of perimeter gateway device. It relies on several core technologies that enable its engine to accurately identify the sensitive data that enterprise need to secure and take action to prevent incidents. It ensures that it is only accessed by authorized users and are safeguarded against data leak.

Junos OS ICAP Support for SRX Series Device

You can prevent data loss from your network by employing Internet Content Adaptation Protocol (ICAP) redirect services. ICAP is a lightweight HTTP-based remote procedure call protocol. ICAP allows its clients to pass HTTP-based content (HTML) to the ICAP servers for performing services such as virus scanning, content translation, or content filtering and so on for the associated client requests.

SRX Series devices support DLP to redirect HTTP or HTTPS traffic to any third-party server through ICAP. The SRX Series device acts as an SSL proxy server and decrypts the pass-through traffic with the proper SSL profile under a security policy. SRX Series device

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decrypts HTTPS traffic and redirects HTTP message to a third-party, on-premise server using an ICAP channel. After DLP processing, the traffic is redirected back to the SRX Series device and action is taken according to the results from the ICAP server. If any sensitive data is detected per the policies, the SRX Series device logs, redirects, or blocks the data traffic as configured in the profile.

The following sequences are involved in a typical ICAP redirect scenario:

1. The user opens a connection to a Website on the internet.
2. The request goes through the SRX Series device that is acting as a proxy server.
3. The SRX Series device receives information from the end-host, encapsulates the message and forwards the encapsulated ICAP message to the third-party on-premise ICAP server.
4. The ICAP server receives the ICAP request and analyzes it.
5. If the request does not contain any confidential information, the ICAP server sends it back to the proxy server, and directs the proxy server to send the HTTP to the internet.
6. If the request contains confidential information, you can choose to take action (block, permit, log) as per your requirement.

NOTE: **The HTTP throughput depends on the connections between the SRX Series device and the ICAP channel.**

ICAP Profile

When you configure ICAP redirect service on SRX Series devices, you must configure the ICAP server information. This profile is applied to a security policy as application services for the permitted traffic. The ICAP profile defines the settings that allow the ICAP server to process request messages, response messages, fallback options (in case of a timeout), connectivity issues, too many requests, or any other conditions.

Service Redirect for Layer 7 Dynamic Applications with Unified Policies

Starting from Junos OS Release 18.2R1, SRX Series devices support ICAP service redirect feature when the device is configured with unified policies.

Unified policies are the security policies that enable you to use dynamic applications as match conditions as part of the existing 5-tuple or 6-tuple (5-tuple with user firewall) match conditions to detect application changes over time.

In a unified policy with dynamic applications as a match condition, you configure an ICAP redirect profile and SSL proxy profile and apply these profiles as application services in the security policy for the permitted traffic. When the traffic matches the policy, the ICAP redirect service profile that is configured as application services is applied. The ICAP server profile defines the behavior of redirection and server specifications. The ICAP server performs the policy scan and the traffic is redirected to the SRX Series device, and the specified action is taken as per the ICAP redirect profile.

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Note the following behavior while using ICAP redirect service with unified policy:

- When ICAP redirect is configured in a unified policy and the data that needs to be redirected has arrived and the final policy is not determined, the request is ignored by the ICAP redirect service.
- Because ICAP redirect is one of services located in the service chain, the data received by the ICAP redirect service might be different from the original data. The data sent by the ICAP redirect might affect downstream services.

Benefits of ICAP Redirect Service Support

- Keeps the sensitive data from leaving the network.
- Supports common on-premise server pool for redirection thereby improving management, security, and control of the content.

NOTE: **The HTTP throughput depends on the connections between the SRX Series device and SRX ICAP .**

Example: Configuring ICAP Redirect Service on SRX Devices

This example shows how to define an ICAP redirect profile for an SRX Series device.

- Requirements on page 274
- Overview on page 274
- Configuration on page 275
- Verification on page 280

Requirements

This example uses the following hardware and software components:

- SRX Series device with Junos OS Release 18.1R1 or later. This configuration example is tested for Junos OS Release 18.1R1.

  ICAP redirect profile for an SRX Series device with unified policies example is tested for Junos OS Release 18.2R1.

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you configure an ICAP redirect profile and an SSL proxy profile and apply these profiles as application services in the security policy for the permitted traffic.

To enable the service redirect using ICAP, you must configure an SSL profile to secure the connection to the ICAP server. Next, you configure a security policy to process the traffic, and specify the action for the permitted traffic.

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Table 37 on page 275 lists the details of the parameters used in this example.

Table 37: ICAP Redirect Configuration Parameters

Parameters	Names	Description
Profile	icap-pf1	The ICAP server profile allows the ICAP server to process request messages, response messages, fallback options and so on, for the permitted traffic. This profile is applied as an application service in the security policy.
Server name	icap-svr1 icap-svr2	The machine name of the remote ICAP host. Client's request is redirected to this ICAP server.
Server IP address	5.0.0.2 5.0.0.179	The IP address of the remote ICAP host. Client's request is redirected to this ICAP server.
SSL proxy profile	ssl-inspect-profile	An SSL proxy profile defines SSL behavior for the SRX Series device. The SSL proxy profile is applied to the security policy as an application service.
SSL profile	dlp_ssl	The SRX Series device that is acting as an SSL proxy client, initiates and maintains SSL sessions with an SSL server. This configuration enables you to secure the connection to the ICAP server.
Security policy	sp1	In a security policy, apply the SSL proxy profile and ICAP redirect profile. to the permitted traffic.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set services ssl proxy profile ssl-inspect-profile root-ca ssl-inspect-ca
set services ssl proxy profile ssl-inspect-profile actions ignore-server-auth-failure
set services icap-redirect profile icap-pf1 server icap-svr1 host 5.0.0.2
set services icap-redirect profile icap-pf1 server icap-svr1 reqmod-uri echo
set services icap-redirect profile icap-pf1 server icap-svr1 respmod-uri echo
set services icap-redirect profile icap-pf1 server icap-svr1 sockets 64
set services ssl initiation profile dlp_ssl trusted-ca all
set services ssl initiation profile dlp_ssl actions ignore-server-auth-failure
set services ssl initiation profile dlp_ssl actions crl disable
set services icap-redirect profile icap-pf1 server icap-svr2 host 5.0.0.179
set services icap-redirect profile icap-pf1 server icap-svr2 reqmod-uri echo
set services icap-redirect profile icap-pf1 server icap-svr2 respmod-uri echo
set services icap-redirect profile icap-pf1 server icap-svr2 sockets 64
set services icap-redirect profile icap-pf1 server icap-svr2 tls-profile dlp_ssl
set services icap-redirect profile icap-pf1 http redirect-request
set services icap-redirect profile icap-pf1 http redirect-response
```

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```
set security policies from-zone trust to-zone untrust policy sec_policy match
   source-address any
set security policies from-zone trust to-zone untrust policy sec_policy match
   destination-address any
set security policies from-zone trust to-zone untrust policy sec_policy match application
   any
set security policies from-zone trust to-zone untrust policy sec_policy then permit
   application-services ssl-proxy profile-name ssl-inspect-profile
set security policies from-zone trust to-zone untrust policy sec_policy then permit
   application-services icap-redirect icap-pf1
set security policies default-policy permit-all
set security zones security-zone trust host-inbound-traffic system-services all
set security zones security-zone trust host-inbound-traffic protocols all
set security zones security-zone trust interfaces xe-5/0/0.0
set security zones security-zone untrust host-inbound-traffic system-services all
set security zones security-zone untrust host-inbound-traffic protocols all
set security zones security-zone untrust interfaces xe-5/0/1.0
set interfaces xe-5/0/0 unit 0 family inet address 192.0.2.1/8
set interfaces xe-5/0/0 unit 0 family inet6 address 2001:db8::1/64
set interfaces xe-5/0/1 unit 0 family inet address 198.51.100.1/8
set interfaces xe-5/0/1 unit 0 family inet6 address 2001:db8::2/64
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure the ICAP redirect service:

1. Configure the SSL proxy profile.

```
[edit services]
user@host# set services ssl proxy profile ssl-inspect-profile root-ca ssl-inspect-ca
user@host# set services ssl proxy profile ssl-inspect-profile actions
   ignore-server-auth-failure
```

2. Configure the SSL profile for a secured connection with the ICAP server.

```
[edit services]
user@host# set ssl initiation profile dlp_ssl trusted-ca all
user@host# set ssl initiation profile dlp_ssl actions ignore-server-auth-failure
user@host# set ssl initiation profile dlp_ssl actions crl disable
```

3. Configure the ICAP redirect profile for the first server (icap-svr1).

```
[edit services]
user@host# set icap-redirect profile icap-pf1 server icap-svr1 host 5.0.0.2
user@host# set icap-redirect profile icap-pf1 server icap-svr1 reqmod-uri echo
user@host# set icap-redirect profile icap-pf1 server icap-svr1 respmod-uri echo
user@host# set icap-redirect profile icap-pf1 server icap-svr1 sockets 64
```


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4. Configure the ICAP redirect profile for the second server (icap-svr2).

```
[edit services]
user@host# set icap-redirect profile icap-pf1 server icap-svr2 host 5.0.0.179
user@host# set icap-redirect profile icap-pf1 server icap-svr2 reqmod-uri echo
user@host# set icap-redirect profile icap-pf1 server icap-svr2 respmod-uri echo
user@host# set icap-redirect profile icap-pf1 server icap-svr2 sockets 64
user@host# set icap-redirect profile icap-pf1 server icap-svr2 tls-profile dlp_ssl
```

5. Configure the redirect request and the redirect response for the HTTP traffic.

```
[edit services]
user@host# set icap-redirect profile icap-pf1 http redirect-request
user@host# set icap-redirect profile icap-pf1 http redirect-response
```

6. Configure a security policy to apply application services for the ICAP redirect to the permitted traffic.

```
[edit security]
user@host# set policies from-zone trust to-zone untrust policy sec_policy match
   source-address any
user@host# set policies from-zone trust to-zone untrust policy sec_policy match
   destination-address any
user@host# set policies from-zone trust to-zone untrust policy sec_policy match
   application any
user@host# set policies from-zone trust to-zone untrust policy sec_policy then
   permit application-services ssl-proxy profile-name ssl-inspect-profile
user@host# set policies from-zone trust to-zone untrust policy sec_policy then
   permit application-services icap-redirect icap-pf1
user@host# set policies default-policy permit-all
```

7. Configure interfaces and zones.

```
[edit security]
user@host# set interfaces xe-5/0/0 unit 0 family inet address 192.0.2.1/8
user@host# set interfaces xe-5/0/0 unit 0 family inet6 address 2001:db8::1/64
user@host# set interfaces xe-5/0/1 unit 0 family inet address 198.51.100.1/8
user@host# set interfaces xe-5/0/1 unit 0 family inet6 address 2001:db8::2/64
user@host# set zones security-zone trust host-inbound-traffic system-services all
user@host# set zones security-zone trust host-inbound-traffic protocols all
user@host# set zones security-zone trust interfaces xe-5/0/0.0
user@host# set zones security-zone untrust host-inbound-traffic system-services
   all
user@host# set zones security-zone untrust host-inbound-traffic protocols all
user@host# set zones security-zone untrust interfaces xe-5/0/1.0
```

Results From configuration mode, confirm your configuration by entering the **show services icap-redirect**, **show security policies**, **show security zones**, and **show interfaces** commands.

If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
user@host# show services ssl
  initiation {
    profile dlp_ssl {
      trusted-ca all;
      actions {
        ignore-server-auth-failure;
        crl {
          disable;
        }
      }
    }
  }
  proxy {
    ssl-inspect-profile {
      root-ca ssl-inspect-ca;
      actions {
        ignore-server-auth-failure;
      }
    }
  }
```

```
user@host# show services icap-redirect
profile icap-pf1 {
  server icap-svr1 {
    host 5.0.0.2;
    reqmod-uri echo;
    respmod-uri echo;
    sockets 64;
  }
    server icap-svr2 {
      host 5.0.0.179;
      reqmod-uri echo;
      respmod-uri echo;
      sockets 10;
      tls-profile dlp_ssl;
    }
  http {
    redirect-request;
    redirect-response;
  }
}
```

```
user@host# show security policies
  from-zone trust to-zone untrust {
    policy sec_policy {
      match {
        source-address any;
        destination-address any;
        application any;
      }
      then {
```


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```
            permit {
              application-services {
                ssl-proxy {
                  profile-name ssl-inspect-profile;
                }
                icap-redirect icap-pf1;
              }
            }
          }
        }
      }
      default-policy {
        permit-all;
      }
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring ICAP Service Redirect for Unified Policy

Step-by-Step Procedure

You can follow the procedure below if you have configured a unified policy (supported from Junos OS Release 18.2R1).

The following example requires you to navigate to various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure the ICAP redirect service:

1. Configure the SSL proxy profile.

```
[edit services]
user@host# set services ssl proxy profile ssl-inspect-profile root-ca ssl-inspect-ca
user@host# set services ssl proxy profile ssl-inspect-profile actions
   ignore-server-auth-failure
```

2. Configure the SSL profile for secured connection with the ICAP server.

```
[edit services]
user@host# set ssl initiation profile dlp_ssl trusted-ca all
user@host# set ssl initiation profile dlp_ssl actions ignore-server-auth-failure
user@host# set ssl initiation profile dlp_ssl actions crl disable
```

3. Configure the ICAP redirect profile for the first server (icap-svr1).

```
[edit services]
user@host# set icap-redirect profile icap-pf1 server icap-svr1 host 5.0.0.2
user@host# set icap-redirect profile icap-pf1 server icap-svr1 reqmod-uri echo
user@host# set icap-redirect profile icap-pf1 server icap-svr1 respmod-uri echo
user@host# set icap-redirect profile icap-pf1 server icap-svr1 sockets 64
```

4. Configure the ICAP redirect profile for the second server (icap-svr2).

```
[edit services]
user@host# set icap-redirect profile icap-pf1 server icap-svr2 host 5.0.0.179
user@host# set icap-redirect profile icap-pf1 server icap-svr2 reqmod-uri echo
user@host# set icap-redirect profile icap-pf1 server icap-svr2 respmod-uri echo
user@host# set icap-redirect profile icap-pf1 server icap-svr2 sockets 64
user@host# set icap-redirect profile icap-pf1 server icap-svr2 tls-profile dlp_ssl
```

5. Configure the redirect request for HTTP traffic.

```
[edit services]
user@host# set icap-redirect profile icap-pf1 http redirect-request
user@host# set icap-redirect profile icap-pf1 http redirect-response
```

6. Configure a security policy to apply application services for the ICAP redirect to the permitted traffic.

```
[edit security]
user@host# set policies from-zone trust to-zone untrust policy sec_policy match
   source-address any
user@host# set policies from-zone trust to-zone untrust policy sec_policy match
   destination-address any
user@host# set policies from-zone trust to-zone untrust policy sec_policy match
   application any
user@host# set policies from-zone trust to-zone untrust policy sec_policy match
   dynamic-application junos:HTTP
user@host# set policies from-zone trust to-zone untrust policy sec_policy then
   permit application-services ssl-proxy profile-name ssl-inspect-profile
user@host# set policies from-zone trust to-zone untrust policy sec_policy then
   permit application-services icap-redirect icap-pf1
user@host# set policies default-policy permit-all
```

Verification

Verifying ICAP Redirect Configuration

Purpose Verify that the ICAP redirect service is configured on the device.

Action From operational mode, enter the **show services icap-redirect status** and **show services icap-redirect statistic** commands.

```
user@host> show services icap-redirect status

ICAP Status :
         Spu-1 Profile: icap-pf1 Server: icap-svr1 : UP
ICAP Status :
         Spu-1 Profile: icap-pf1 Server: icap-svr2 : UP
ICAP Status :
         Spu-2 Profile: icap-pf1 Server: icap-svr1 : UP
ICAP Status :
         Spu-2 Profile: icap-pf1 Server: icap-svr2 : UP
```

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```
ICAP Status :
        Spu-3 Profile: icap-pf1 Server: icap-svr1 : UP
ICAP Status :
        Spu-3 Profile: icap-pf1 Server: icap-svr2 : UP
```

```
user@host> show services icap-redirect statistic

ICAP Redirect statistic:
  Message Redirected                  : 2
      Message REQMOD Redirected       : 1
      Message RESPMOD Redirected      : 1
  Message Received                    : 2
      Message REQMOD Received         : 1
      Message RESPMOD Received        : 1
Fallback:      permit           log-permit       reject
  Timeout         0                 0                0
  Connectivity    0                 0                0
  Default         0                 0                0
```

Meaning The status **Up** indicates that the ICAP redirect service is enabled. The **Message Redirected** and the **Message Received** fields show the number of HTTP requests that have passed through the ICAP channel.

Release History Table

Release	Description
18.2R1	Starting from Junos OS Release 18.2R1, SRX Series devices support ICAP service redirect feature when the device is configured with unified policies
18.1R1	Starting in Junos OS Release 18.1R1, SSL proxy support is available on SRX300 and SRX320 devices
17.4R1	Starting with Junos OS Release 17.4R1, the whitelisting feature is extended to support custom URL categories supported by UTM.
15.1X49-D80	Starting in Junos OS Release 15.1X49-D80, SSL reverse proxy is supported on SRX5000 Series, SRX4100, SRX4200, SRX1500 devices
15.1X49-D80	Starting in Junos OS Release 15.1X49-D80, we recommend using the SSL reverse proxy and Intrusion Detection and Prevention (IDP) instead of using the IDP SSL inspection functionality.
15.1X49-D80	Starting from Junos OS 15.1X49-D80, IDP SSL Inspection is deprecated—rather than immediately removed—to provide backward compatibility and a chance to bring your configuration into compliance with the new configuration.
15.1X49-D30	Starting with Junos OS Release 15.1X49-D30 and Junos OS Release 17.3R1, server certificates of key size 4096 bits are supported.
15.1X49-D30	Starting with Junos OS Release 15.1X49-D30 and Junos OS Release 17.3R1, TLS version 1.1 and TLS version 1.2 protocols are supported on SRX Series devices along with TLS version 1.0.
15.1X49-D30	Starting with Junos OS Release 15.1X49-D30 and Junos OS Release 17.3R1, certificate revocation list (CRL) checks are supported.
15.1X49-D20	Starting with Junos OS Release 15.1X49-D20 and Junos OS Release 17.3R1, the SSL protocol 3.0 (SSLv3) support is deprecated.

Related Documentation

- Application Firewall on page 85
- Application Tracking on page 104
- *Example: Configuring Integrated User Firewall*

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CHAPTER 5

Configuration Statements

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active-probe-params

Syntax

```
active-probe-params probe-name {
  settings {
    burst-size {
      size;
    }
    data-fill {
      string;
    }
    data-size {
      size;
    }
    dscp-code-points {
      dscp;
    }
    enable-sla-export {
      interval;
    }
    probe-count {
      count;
    }
    probe-interval {
      interval;
    }
  }
}
```

Hierarchy Level [edit security advance-policy-based-routing]

Release Information Statement introduced in Junos OS Release 18.2R1.

Description Specify parameter settings for an active probe.

Application performance is monitored and measured using active probes.

In active probing, custom packets are sent between a spoke device and a hub device on multiple routes to measure RTT,jitter, and packet loss between the book-ended points. You can configure to send active probes periodically on all the active and passive links.

Active probing starts after the configuration is committed. A configured number of samples are collected and used for measuring the SLA. If there is a violation detected for any application, the probe metrics are evaluated to determine the best possible link for that application traffic in order to meet performance requirements as in the SLA.

Consider the example, where you configure the probe count as 1000, probe interval as 10 seconds, and burst size as 100. Burst count is calculated as probe count/burst size (1000/100 = 10). Burst-count is 10. So, probes are sent in sets of 10 bursts each containing 100 packets.

Burst interval is calculated as probe interval/burst-count (10/10 =1). Burst interval is 1 second. So, a burst is sent every 1 second. The active probe is initiated from the spoke device to the hub device on each of the overlay path.

Options

probe-name—Active probe identifier.

burst-size—Number of probes sent as a burst. This value should be less than or equal to probe-count.

Range: 1—100

Default: 10

data-fill *string*—Data payload for a probe packet. This is a hexadecimal string, which is used the payload for probe.

data-size *size*—Size of the data portion.

dscp-code-points *dscp*—DiffServ code point (DSCP) bits value.

enable-sla-export—Time Interval (in seconds) at which the active probe data to be exported to controller. This option is disabled by default.

Range: 60-600

probe-count *count*—Number of samples required to be collected for an SLA measurement.

Range: 10-1000

Default: 100

probe-interval *interval*—Time interval (in seconds) between successive probes in seconds.

Range: 1-30

Default: 5 seconds

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Application Quality of Experience on page 173
- Advanced Policy-Based Routing on page 139

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actions (Services SSL Proxy)

Syntax

```
actions {
  crl {
    disable;
    if-not-present (allow | drop);
    ignore-hold-instruction-code;
  }
  disable-session-resumption;
  ignore-server-auth-failure;
  logs {
    all;
    errors;
    info;
    sessions-allowed;
    sessions-dropped;
    sessions-ignored;
    sessions-whitelisted;
    warning;
  }
  renegotiation {
    (allow | allow-secure | drop);
  }
}
```

Hierarchy Level

[edit services ssl proxy profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10. The **crl** statement is supported from Junos OS Release 15.1X49-D30.

Description

Specify the logging and traffic related actions for a SSL proxy profile.

An SSL proxy profile is required to configure SSL proxy on your SRX Series device. As a part of the proxy profile configuration, you can configure– actions related to certification revocations checks, options to specify if a change in SSL parameters requires renegotiation for a session, option to disable session resumption, option to ignore certificate validation, root CA expiration dates, and other such issues based on your requirements.

Options

- **crl**—Specify the certificate revocation actions.
  - **disable**—Disable CRL verification.
  - **if-not-present**—Specify actions for sessions.
    - **allow**—Allow sessions when CRL information is not available.
    - **drop**—Drop sessions when CRL information is not available.
  - **ignore-hold-instruction-code**—Ignore the unconfirmed (on hold) revocation status, and accept a certificate.

- **disable-session-resumption**—Disable session resumption.
- **ignore-server-auth-failure**—Ignore server authentication failure.
- **log**—Specify the logging actions.
  - **all**—Log all events.
  - **errors**—Log all error events.
  - **info**—Log all information events.
  - **sessions-allowed**—Log SSL session allowed events after an error.
  - **sessions-dropped**—Log only SSL session dropped events.
  - **sessions-ignored**—Log session ignored events.
  - **sessions-whitelisted**—Log SSL session whitelisted events.
  - **warning**—Log all warning events.
- **renegotiation**—Specify the renegotiation options.
  - **allow**—Allow secure and nonsecure renegotiation.
  - **allow-secure**—Allow secure negotiation only.
  - **drop**—Drop session on renegotiation request.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- SSL Proxy Overview on page 221
- Configuring SSL Forward Proxy on page 234
- Enabling Debugging and Tracing for SSL Proxy on page 253

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actions (Services SSL Initiation)

Syntax

```
actions {
  crl {
    disable;
    if-not-present (allow | drop);
    ignore-hold-instruction-code;
  }
  ignore-server-auth-failure;
}
```

Hierarchy Level

[edit services ssl initiation profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10.

Description

Specify the certification revocation checks and traffic related actions for configuring SSL initiation support service. As a part of SSL initiation profile, you can specify actions related to certification revocations checks and chose an option to ignore certificate validation, root CA expiration dates, and other such issues based on your requirements. Commonly ignored errors include the inability to verify CA signature, incorrect certificate expiration dates, and so forth. We do not recommend using this option for authentication because configuring it results in websites not being authenticated at all.

Options

- **crl**—Specify the certificate revocation actions.
  - **disable**—Disable CRL verification.
  - **if-not-present**—Specify actions for sessions.
    - **allow**—Allow sessions when CRL information is not available.
    - **drop**—Drop sessions when CRL information is not available.
  - **ignore-hold-instruction-code**—Ignore the unconfirmed (on hold) revocation status, and accept a certificate.
- **ignore-server-auth-failure**—Ignore server authentication failure.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- SSL Proxy Overview on page 221
- Configuring SSL Forward Proxy on page 234
- Enabling Debugging and Tracing for SSL Proxy on page 253

address-mapping (Application Identification)

Syntax

```
address-mapping address-name {
  filter {
    ip ip-address-and-prefix-length;
    port-range {
      tcp [port];
      udp [port];
    }
  }
}
```

Hierarchy Level

[edit services application-identification application *application-name*]

Release Information

Statement introduced in Junos OS Release 15.1X49-D40.

Description

Match the specified IP address.

Layer 3 and Layer 4 address mapping defines an application by the IP address and optional port range of the traffic. You can use the address mapping option to configure custom applications signatures when the configuration of your private network predicts application traffic to or from trusted servers.

Address mapping provides efficiency and accuracy in handling traffic from a known application.

Options

name—Address mapping name.

filter—Specify the application matching criteria by the IP address of the application or the port range to match TCP or UDP destination port.

- ip—IP address and prefix-length.
- port-range—Port range to match a TCP or UDP destination port.
  - **tcp [*port*]**—Define the TCP port range for the application.
  - **udp [*port*]**—Define the UDP port range for the application.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Understanding Junos OS Application Identification Custom Application Signatures on page 64

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advance-policy-based-routing

Syntax

```
advance-policy-based-routing {
  active-probe-params probe-name {
    settings {
      burst-size {
        size;
      }
      data-fill {
        fill;
      }
      data-size {
        size;
      }
      dscp-code-points {
        dscp;
      }
      probe-count {
        count;
      }
      probe-interval {
        interval;
      }
      enable-sla-export {
        interval;
      }
    }
  }
  destination-path-group name {
    overlay-path {
      overlay-path-name;
    }
    probe-routing-instance {
      routing-instance-name;
    }
  }
  from-zone name {
    policy name {
      description description;
      match {
        source-address;
        destination-address;
        application;
        destination-address-excluded;
        source-address-excluded;
      }
      then {
        application-services {
          apbr-profile apbr-profile;
        }
      }
    }
  }
```

```
metrics-profile metrics-name {
   sla-threshold {
      delay-round-trip {
         delay-value;
      }
      jitter {
         jitter-value;
      }
      jitter-type {
         egress-jitter ;
         ingress-jitter;
         two-way-jitter;
      }
      match {
         [all | any-one] ;
      }
      packet-loss {
         loss-value;
      }
   }
overlay-path overlay-path-name {
   probe-path {
      local ip-address;
      remote ip-address
   }
   tunnel-path {
      local ip-address;
      remote ip-address
   }
}
profile profile-name {
   rule rule-name {
      match {
         category (juniper-enhanced-category | custom-category);
         dynamic-application [system-application];
         dynamic-application-group [system-application-group];
      }
      then {
         routing-instance name;
      }
   }
sla-options {
   local-route-switch {
      [enabled | disabled];
   }
   logging {
      syslog:
   }
}
sla-rule sla-rule-name {
   active-probe-params {
      probe-params-name;
   }
   link-type-affinity strict;
   metrics-profile {
```


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```
        metric-profile-name;
      }
      passive-probe-params {
        sampling-percentage {
          percentage;
        }
        sampling-period {
          period;
        }
        sla-export-factor {
          value;
        }
        type {
          book-ended;
        }
        violation-count {
          count;
        }
      preferred-link-type (Any | IP | MPLS);
      switch-idle-time {
        period;
      }
    }
    traceoptions {
      file {
        filename ;
        files number;
        match regular-expression;
        size maximum-file-size;
        (world-readable | no-world-readable);
      }
      flag flag;
      no-remote-trace;
    }
    tunables {
      drop-on-zone-mismatch;
      max-route-change value;
      enable-logging;
    }
    underlay-interfaces interface-name {
      unit unit-number {
      link-type (IP | MPLS)
      priority priority-number;
    }
}
```

Hierarchy Level [edit security]

Release Information Statement introduced in Junos OS Release 15.1X49-D60.

Description Configure an advanced policy-based routing.

You can create an advanced policy-based routing (APBR) profile (application profile) to match applications and application groups and redirect those matching traffic to the specified routing instance for the route lookup. The profile includes multiple rules. Each rule can contain multiple applications or application groups. If the application matches any of the application or application groups of a rule in a profile, the application profile rule is considered to be a match.

The APBR profile evaluates the application-aware traffic and permits or denies traffic based on the applications and application groups.

The application profile can be attached to a security zone or it can be attached to a specific logical or physical interface associated with the security zone.

Options

profile *profile-name*—Name of the profile. Must be a unique name with a maximum length of 63 characters.

from-zone—Specify a source zone to be associated with the APBR policy.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Application Quality of Experience on page 173
- Understanding Advanced Policy-Based Routing on page 139

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advance-policy-based-routing (Security Zones)

Syntax

```
advance-policy-based-routing;
```

Hierarchy Level

[edit security zones security-zone *zone-name*]

Release Information

Statement introduced in Junos OS Release 15.1X49-D60.

Description

Enable or apply the advanced policy-based (APBR) routing profile (application profile) on the specified security zone.

To classify and redirect the traffic, the APBR profile matches applications and application groups and if the matching rule is found, the packets are routed to the routing instance that sends the traffic to a different interface as specified in the next-hop IP address. So, you must associate the application profile to the ingress traffic—that is, attach the application profile to a security zone.

When the application profile is applied to a security zone, then all interfaces belonging to that zone are attached to the application profile by default unless there is a specific configuration for an interface belonging to that zone.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Advanced Policy-Based Routing for Application-Aware Traffic Management Solution on page 146
- Understanding Advanced Policy-Based Routing on page 139

appfw-profile (System)

Syntax

```
appfw-profile {
   maximum amount;
   reserved amount;
}
```

Hierarchy Level

```
[edit security application-firewall profile profile-name]
[edit tenants tenant-name security application-firewall]
```

Release Information

Statement introduced in Junos OS Release 11.4.
The **edit tenant *tenant-name* security application-firewall** level is introduced in Junos OS Release 18.4R1.

Description

Specify the application firewall profile quota of a logical system and tenant systems.

As a master administrator, you can create a security profile and specify the kinds and amounts of resources to allocate to a logical system to which the security profile is bound. A security profile is used for share the device's resources, including policies, zones, addresses and address books, flow sessions, and various forms of NAT, among all logical systems appropriately. You can dedicate various amounts of a resource to the logical systems and allow them to compete for use of the free resources.

Options

- **maximum *amount***—Specify the maximum allowed quota value.

  Range: 0 through 1024

- **reserved *amount***—Specify a reserved quota value that guarantees that the resource amount specified is always available to the logical system.

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation

- Application Firewall Overview on page 85

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appfw-rule

Syntax

```
appfw-rule {
   maximum amount;
   reserved amount;
}
```

Hierarchy Level

```
[edit system security-profile security-profile-name ]
[edit tenants tenant-name security application-firewall ]
```

Release Information

Statement introduced in Junos OS Release 11.4.
The **edit tenant *tenant-name* security application-firewall** level is introduced in Junos OS Release 18.4R1.

Description

Specify the number of application firewall rule configurations that a master administrator can configure for a master logical system or user logical system when the security profile is bound to the logical systems and tenant systems.

The master administrator:

- Uses security profiles to provision logical systems with resources
- Binds security profiles to the master logical system and the user logical systems
- Can configure more than one security profile, allocating different numbers of resources in various profiles

Only the master administrator can create security profiles and bind them to logical systems.

Options

- **maximum *amount***—A maximum allowed quota. If a logical system requires more of a resource than its reserved amount allows, it can use resources configured for the global maximum amount if they are available—that is, if they are not allocated to other logical systems. The maximum allowed quota specifies the portion of the free global resources that the logical system can use. The maximum allowed quota does not guarantee that the amount specified for the resource in the security profile is available. Logical systems compete for global resources.
- **reserved *amount***—A reserved quota that guarantees that the resource amount specified is always available to the logical system.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

appfw-rule-set

Syntax

```
appfw-rule-set {
   maximum amount;
   reserved amount;
}
```

Hierarchy Level

```
[edit system security-profile security-profile-name ]
[edit tenants tenant-name security application-firewall]
```

Release Information

Statement introduced in Junos OS Release 11.4.
The **edit tenant *tenant-name* security application-firewall** level is introduced in Junos OS Release 18.4R1.

Description

Specify the number of application firewall rule set configurations that a master administrator can configure for a master logical system or user logical system when the security profile is bound to the logical systems and tenant systems.

The master administrator:

- Uses security profiles to provision logical systems with resources
- Binds security profiles to the master logical system and the user logical systems
- Can configure more than one security profile, allocating different numbers of resources in various profiles

Only the master administrator can create security profiles and bind them to logical systems.

Options

- **maximum *amount***—A maximum allowed quota. If a logical system requires more of a resource than its reserved amount allows, it can use resources configured for the global maximum amount if they are available—that is, if they are not allocated to other logical systems. The maximum allowed quota specifies the portion of the free global resources that the logical system can use. The maximum allowed quota does not guarantee that the amount specified for the resource in the security profile is available. Logical systems compete for global resources.
- **reserved *amount***—A reserved quota that guarantees that the resource amount specified is always available to the logical system.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Application Firewall Overview on page 85

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application-firewall

Syntax

```
application-firewall {
  profile profile-name {
    block-message type {
      custom-text content custom-html-text;
      custom-redirect-url content custom-redirect-url;
    }
  }
  rule-sets rule-set-name {
    default-rule {
      (deny [block-message] | permit | reject [block-message]);
    }
    profile profile-name;
    rule rule-name {
      match {
        dynamic-application [system-application];
        dynamic-application-groups [system-application-group];
        ssl-encryption (any | yes | no);
      }
      then {
        (deny [block-message] | permit | reject [block-message]);
      }
    }
  }
  traceoptions {
    file {
      filename;
      files number;
      match regular-expression;
      (world-readable | no-world-readable);
      size maximum-file-size;
    }
    flag flag;
    no-remote-trace;
  }
}
```

Hierarchy Level

[edit security]

Release Information

Statement introduced in Junos OS Release 11.1. Updated with the **ssl-encryption** and **reject** options in Junos OS Release 12.1X44-D10. Updated with the **block-message** option in Junos OS Release 12.1X45-D10.
The **tenant** option is introduced for Junos OS Release 18.4R1.

Description

Specify the profile options, rule set and rule specifications, and trace options to be used for application firewall implementations.

You can configure the application firewall by defining a collection of rule sets. These rule sets can be defined independently and shared across network security policies. A rule

set defines the rules that match the application ID detected, based on the application signature.

The application firewall support in the security policies provides additional security control for dynamic applications.

Starting in Junos OS Release 18.2R1, the application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and an opportunity to bring your configuration into compliance with the new configuration.

Options The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level
security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Application Firewall Overview on page 85

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application (Application Identification)

Syntax

```
application application-name {
  address-mapping address-name {
    filter {
      ip ip-address-and-prefix-length;
      port-range {
        tcp [port];
        udp [port];
      }
    }
  }
  cacheable;
  description;
  icmp-mapping {
    code number;
    type number;
  }
  ip-protocol-mapping {
    protocol number;
  }
  order;
  over protocol-type  {
    signature name  {
      member name  {
        context {
          http-get-url-parsed-param-parsed;
          http-header-content-type;
          http-header-cookie;
          http-header-host;
          http-header-user-agent;
          http-post-url-parsed-param-parsed;
          http-post-variable-parsed ;
          http-url-parsed;
          http-url-parsed-param-parsed;
          ssl-server-name;
          stream;
        }
        direction {
          any;
          client-to-server;
          server-to-client;
        }
        pattern pattern;
      }
      port-range value;
  priority [high | low];
  type;
}
```

Hierarchy Level

```
[edit services application-identification]
```

Release Information Statement introduced in Junos OS Release 15.1X49-D40.

Description Configure application definition.

You can create custom application signatures by specifying a name, protocol, port where the application runs, and match criteria. You can create ICMP-based, address-based, IP protocol-based, and Layer 7-based custom application signatures. Custom applications are created to to identify applications over Layer 7 and transiting or temporary applications, and to achieve further granularity of known applications.

Custom application definitions can be used for applications that are not part of the Juniper Networks predefined application database.

Options **application *application-name***—Name of the custom application signature. Must be a unique name with a maximum length of 63 characters.

NOTE: **Application names are case insensitive.**

cacheable—Enable caching of application identification results. By enabling this option, you can cache the application detection result in an ASC table. If there is an entry in the ASC table, based on the destination IP address, protocol, and the port, we can identify AppID without again sending packet to engine. This option is not supported for address-based, IP protocol-based, and ICMP-based custom application signatures.

description—Description of the application.

order *number*—Specify the order for the custom application. Lower order has higher priority. This option is used when multiple custom applications of the same type match the same traffic. However, you cannot use this option to prioritize among different type of applications such as TCP stream-based applications against TCP port-based applications or IP address-based applications against port-based applications.

priority [high | low]—Specify the priority over other signature applications.

type—Specify if application is a well-known application such as HTTP and FTP.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level trace—To view this statement in the configuration.
trace-control—To add this statement to the configuration.

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Related Documentation

- Example: Configuring Junos OS Application Identification Custom Application Signatures on page 66
- address-mapping (Application Identification) on page 292
- icmp-mapping (Application Identification) on page 349
- ip-protocol-mapping (Application Identification) on page 350
- over (Application Identification) on page 365

application-firewall (Application Services)

Syntax

```
application-firewall {
  rule-set rule-set-name;
}
```

Hierarchy Level

```
[edit security policies from-zone zone-name to-zone zone-name policy policy-name then
  permit application-services]
```

Release Information

Statement introduced in Junos OS Release 11.1.

Description

Specify the rule sets configured as part of application firewall to be applied to permitted traffic in a security policy.

The application firewall is defined by a collection of rule sets. You can implement an application firewall by defining one or more application firewall rule sets and creating rules for each rule set that permit, reject, or deny traffic based on the application ID. These rule sets can be defined independently and shared across network security policies. Then you configure a security policy to invoke the application firewall service and specify the rule set to be applied to permitted traffic.

Starting in Junos OS Release 18.2R1, the application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and an opportunity to bring your configuration into compliance with the new configuration.

Options

rule-set ***rule-set-name***—Name of the rule set that contains application firewall specification rules.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Application Firewall Overview on page 85

  rule-sets (Security Application Firewall) on page 409

application-identification

Syntax

```
application-identification {
  application application-name {
    address-mapping address-name {
      filter {
        ip ip-address-and-prefix-length;
        port-range {
          tcp [port];
          udp [port];
        }
      }
    }
    cacheable;
    description;
    icmp-mapping {
      code number;
      type number;
    }
    ip-protocol-mapping {
      protocol number;
    }
    order;
    over protocol-type  {
      signature name  {
        member name  {
          context {
            http-get-url-parsed-param-parsed;
            http-header-content-type;
            http-header-cookie;
            http-header-host;
            http-header-user-agent;
            http-post-url-parsed-param-parsed;
            http-post-variable-parsed ;
            http-url-parsed;
            http-url-parsed-param-parsed;
            ssl-server-name;
            stream;
          }
          direction {
            any;
            client-to-server;
            server-to-client;
          }
          pattern pattern;
        }
        port-range value;
    priority [high | low];
    type;
  }
  application-group group-name {
    application-groups application-group-name;
    applications application-name;
```


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```
  }
  application-system-cache-timeout value;
  download {
    automatic {
      interval hours;
      start-time  MM-DD.hh:mm;
    }
    url url;
  }
  enable-performance-mode max-packet-threshold number;
  imap-cache-size number;
  imap-cache-timeout number;
  no-application-identification;
  no-application-system-cache;
  statistics {
    interval minutes;
  }
  traceoptions {
    file {
      filename ;
      files number;
      match regular-expression;
      size maximum-file-size;
      (world-readable | no-world-readable);
    }
    flag flag;
    level [all | error | info | notice | verbose | warning]
    no-remote-trace;
  }
}
```

Hierarchy Level

[edit services]

Release Information

Statement introduced in Junos OS Release 10.2. Custom application definition option introduced in Junos OS Release 15.1X49-D40.

Description

Configure application identification to identify applications regardless of the application port or protocol that is used to transmit the application.

Configure application signatures, group applications under predefined and custom application groups, configuring and deactivating application system cache, application traffic throughput, and trace options to be used for application identification implementations.

Once the application is determined, other AppSecure service modules can be configured to monitor and control traffic for tracking, prioritization, access control, detection, and prevention based on the application ID of the traffic.

Options

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level
security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation
- Understanding Application Identification Techniques on page 27

application-group (Services)

Syntax

```
application-group group-name {
   application-groups application-group-name;
   applications application-name;
}
```

Hierarchy Level

```
[edit services application-identification]
```

Release Information
Statement introduced in Junos OS Release 11.2.

Description
Configure a custom application group for application identification.

Applications can be grouped under predefined and custom application groups. You can add number of applications or application groups that you want to include in your custom application group.

You can configure an application group to associates related applications under a single name for simplified, consistent reuse in configuring application-based policies.

Options

group-name—Name of the group. This name is used in policy configuration statements in place of multiple predefined applications, user-defined applications, or other groups.

application-groups *application-group-name*— Name of an application group to be assigned to this group. There is no maximum number of groups that can be assigned to a group. Use multiple commands to assign multiple groups.

applications *application-name*—Name of an application to be assigned to this group. An application can remain unassigned or be assigned to a group, but it cannot be assigned to more than one group. There is no maximum number of applications that can be assigned to a group. Use multiple commands to assign multiple groups.

Required Privilege Level
security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation
- Example: Configuring a Custom Application Group for Junos OS Application Identification for Simplified Management on page 72

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application-services (Security Policies)

Syntax

```
application-services {
  advanced-anti-malware-policy advanced-anti-malware-policy;
  application-firewall {
    rule-set rule-set;
  }
  application-traffic-control {
    rule-set rule-set;
  }
  gprs-gtp-profile gprs-gtp-profile;
  gprs-sctp-profile gprs-sctp-profile;
  idp idp;
  (redirect-wx redirect-wx | reverse-redirect-wx reverse-redirect-wx);
  security-intelligence-policy security-intelligence-policy;
  ssl-proxy {
    profile-name profile-name;
  }
  uac-policy {
    captive-portal captive-portal;
  }
  utm-policy utm-policy;
}
```

Hierarchy Level

```
[edit security policies from-zone zone-name to-zone zone-name policy policy-name then
  permit]
```

Release Information

Statement modified in Junos OS Release 11.1.

Description

Enable application services within a security policy. You can enable service such as application firewall, IDP, UTM, SSL proxy, and so on by specifying them in a security policy permit action, when the traffic matches the policy rule.

Options

advanced-anti-malware-policy—Specify advanced-anti-malware policy name.

application-firewall—Specify the rule sets configured as part of application firewall to be applied to the permitted traffic.

application-traffic-control—Specify the rule sets configured as part of AppQoS, application-aware quality of service, to be applied to the permitted traffic.

gprs-gtp-profile—Specify GPRS tunneling protocol profile name.

gprs-sctp-profile—Specify GPRS stream control protocol profile name.

idp—Apply Intrusion detection and prevention (IDP) as application services.

redirect-wx—Specify the WX redirection needed for the packets that arrive from the LAN.

reverse-redirect-wx—Specify the WX redirection needed for the reverse flow of the packets that arrive from the WAN.

security-intelligence-policy—Specify security-intelligence policy name.

uac-policy —Enable Unified Access Control (UAC) for the security policy. This statement is required when you are configuring the SRX Series device to act as a Junos OS Enforcer in a UAC deployment.

captive-portal ***captive-portal***—Specify the preconfigured security policy for captive portal on the Junos OS Enforcer to enable the captive portal feature. The captive portal policy is configured as part of the UAC policy. By configuring the captive portal feature, you can redirect traffic destined for protected resources to the IC Series device or to the URL you configure on the Junos OS Enforcer.

utm-policy ***utm-policy***—Specify UTM policy name. The UTM policy configured for antivirus, antispam, content-filtering, traffic-options, and Web-filtering protocols is attached to the security policy to be applied to the permitted traffic.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Application Firewall Overview on page 85

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application-system-cache

Syntax

```
application-system-cache;
```

Hierarchy Level

```
application-system-cache {
   no-miscellaneous-services;
   security-services;
}
```

Release Information

Statement introduced in Junos OS Release 9.2. The options **no-miscellaneous-services** and **security-services** are introduced in Junos OS Release 18.2R1.

Description

Enable application system cache (ASC) to save the mapping between an application type and the corresponding destination IP address, destination port, protocol type, and service.

ASC is enabled by default when a session is created. You can manually turn this caching off using the **set services application-identification no-application-system-cache** command. You can re-enable the ASC by using the **delete services application-identification application-system-cache** command.

You can enable the ASC for faster application identification process and disable it for performance benefits and security.

Note the differences in the default behavior of ASC for services starting from Junos OS Release 18.2R1:

- Security services including security policies, application firewall (AppFW), application tracking (AppTrack), application quality of service (AppQoS), Juniper Sky ATP, IDP, and UTM do not use the ASC by default.
- Miscellaneous services including advanced policy-based routing (APBR) use the ASC for application identification by default.

Options

no-miscellaneous-services—Disable the ASC for miscellaneous services such as APBR and AppTrack.

security-services—Enable the ASC for security services such as security policies, application firewall (AppFW), Juniper Sky ATP, IDP, and UTM.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Understanding the Application System Cache on page 31

application-system-cache-timeout (Services)

Syntax

```
application-system-cache-timeout value;
```

Hierarchy Level

```
[edit services application-identification]
```

Release Information

Statement introduced in Junos OS Release 9.2. Support for application identification in the services hierarchy added in Junos OS Release 10.2.

Description

Specify the timeout value in seconds for the application system cache (ASC) entries.

ASC saves the mapping between an application type and the corresponding destination IP address, destination port, protocol type, and service. By default, the ASC saves the mapping information for 3600 seconds.

NOTE: On SRX Series devices, when you change the timeout value for the application system cache entries using the command **set services application-identification application-system-cache-timeout**, the cache entries need to be cleared to avoid inconsistency in timeout values of existing entries.

NOTE: ASC is not cleared when the IDP policy is loaded. Users need to manually clear or wait for the cache entries to expire.

Options

value—Timeout value for the application system cache entries.

Range: 0 through 1,000,000 seconds

Default: 3600 seconds

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Understanding the Application System Cache on page 31

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application-tracking

Syntax

```
application-tracking {
   disable;
   (first-update | first-update-interval first-update-interval);
   session-update-interval session-update-interval;
}
```

Hierarchy Level

[edit security]

Release Information

Statement introduced in Junos OS Release 10.2. Support for **disable** added in Junos OS Release 11.4.

Description

Enable application tracking (AppTrack).

After application identification identifies the application, AppTrack collects statistics for the application usage on the device, and when the session closes, AppTrack generates a message that provides the byte and packet counts and duration of the session, and sends details to the host device such as Security Threat Response Manager (STRM). STRM retrieves the data and provides flow-based application visibility details.

Options

first-update—Generate application tracking initial message when a session is created. This option overrides the **first-update-interval** option if both are specified.

first-update-interval—Interval when the first update message is sent (minutes).

NOTE: **The first-update-interval setting is disregarded if the first-update option is set to log the first message at session start.**

- ***minutes***—Maximum number of minutes after session start for the first update message to be sent. This value must be smaller than the **session-update-interval** setting.

  Default: 1

disable—Disable application tracking.

session-update-interval—Frequency in which application tracking update messages are generated (minutes).

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Application Tracking on page 109

application-tracking (Security Zones)

Syntax

```
application-tracking;
```

Hierarchy Level

[edit security zones security-zone *zone-name*]

Release Information

Statement introduced in Junos OS Release 10.2.

Description

Enable application tracking support for the zone.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Application Tracking on page 109

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application-traffic-control

Syntax

```
application-traffic-control {
  rate-limiters {
    rate-limiter-name {
      bandwidth-limit value-in-kbps;
      burst-size-limit value-in-bytes;
    }
  }
  rule-sets ruleset-name{
    {
      rule rule-name {
        match {
          application application-name1;
          application-any;
          application-group application-group-name;
          application-known;
          application-unknown;
        }
        then {
          dscp-code-point dscp-value;
          forwarding-class forwarding-class-name;
          log;
          loss-priority [ high | medium-high | medium-low | low ];
          rate-limit {
            loss-priority-high;
            client-to-server rate-limiter-name;
            server-to-client rate-limiter-name;
          }
        }
      }
    }
  }
}
```

Hierarchy Level

[edit class-of-service]

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Mark DSCP values for outgoing packets or apply rate limits based on the specified Layer 7 application types.

Options

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Application Tracking on page 109

application-traffic-control (Application Services)

Syntax

```
application-traffic-control {
  rule-set rule-set-name;
}
```

Hierarchy Level

```
[edit security policies from-zone zone-name to-zone zone-name policy policy-name then
  permit application-services]
```

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Enables AppQoS, application-aware quality of service, as specified in the rules of the specified rule set.

Options

- **rule-set *rule-set-name***—Name of the rule set that contains application-aware traffic control specification rules.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Application Quality of Service on page 124
- *Security Policies Overview*

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authorization (icap-redirect profile)

Syntax

```
authorization {
   authorization-type authorization-type;
   credentials (ascii ascii | base64 base64);
}
```

Hierarchy Level

[edit services icap-redirect profile *name* server *name*]

Release Information

Statement introduced in Junos OS Release 18.1R1.

Description

User authentication for the ICAP server if the request needs to be authorized.

Options

authorization-type—Authentication type for the ICAP server. Authorization type is basic by default.

credentials—Credentials (user name and password) for authentication to ICAP server.

Values:

ascii *ascii*—ASCII string.

base64 *base64*—bBase64 encoded string.

Required Privilege Level

system

Related Documentation

- Example: Configuring ICAP Redirect Service on SRX Devices on page 274

block-message (Application Firewall)

Syntax

```
block-message type {
   custom-text content custom-html-text;
   custom-redirect-url content custom-redirect-url;
}
```

Hierarchy Level

[edit security application-firewall profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 12.1X45-D10.

Description

Defines the profile of the notification to be sent to clients when HTTP or HTTPS traffic is blocked by a reject or deny action from an application firewall.

NOTE: The block message option is not supported for non-HTTP traffic such as FTP, SSH, Telnet, and so on. In these instances, if the action is drop or reject, the traffic is silently dropped or rejected. The user is not informed of the action and no redirection occurs. The associated system log message identifies the action taken for this traffic.

The reject or deny message actions are logged with the reason field containing one of the following phrases:

- appfw deny
- appfw reject

Following sample shows a system log message for SSH traffic, where the traffic was rejected:

```
RT_FLOW_SESSION_DENY [junos@2636.1.1.1.2.134 source-address="1.2.0.100"
 source-port="53540" destination-address="1.1.0.100"
destination-port="22" connection-tag="0" service-name="junos-ssh"
protocol-id="6" icmp-type="0" policy-name="p1" source-zone-name="untrust"
 destination-zone-name="trust" application="SSH"
nested-application="UNKNOWN" username="N/A" roles="N/A"
packet-incoming-interface="reth2.0" encrypted="No" reason="appfw reject"]
```

NOTE: You need to enable SSL forward proxy for the HTTPS traffic that needs to be blocked by a reject or a deny action from an application firewall.

When the **block-message** option is specified, a splash screen and message inform the client that the traffic has been blocked. The default message text is:

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```
"username, Application Firewall has blocked your request to application
application-name at dest-ip:dest-port  accessed from src-ip:source-port "
```

The variables in the message are replaced with specific traffic values. For clarity, the prefix **junos:** is truncated from the application name.

NOTE: You need to enable SSL forward proxy for the HTTPS traffic,that needs to be blocked by a reject or a deny action from an application firewall.

Starting in Junos OS Release 18.2R1, the application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and an opportunity to bring your configuration into compliance with the new configuration.

Options Use the following option pairs to customize the default message or to redirect the client to a custom webpage instead of the default splash screen.

NOTE: **Both the type and content fields must be used to add custom text or redirect the client to a URL.**

- **type**—(Optional) The message type to be displayed after a reject or deny action.
  - **custom-text**—Text message in HTML to be added to the default text. If **custom-text** is specified, the splash screen displays both the default block message and the custom-defined block message.

    When specified, the user is redirected when a reject or deny action is taken during one of the following HTTP methods: GET, POST, OPTIONS, HEAD, PUT, DELETE, TRACE, CONNECT, PROPFIND, PROPPATCH, LOCK, UNLOCK, COPY, MOVE, MKCOL, BCOPY, BDELETE, BCOPY, BMOVE, BPROPFIND, BPROPPATCH, POLL, SEARCH, SUBSCRIBE, and UNSUBSCRIBE. If the reject or deny action occurs during a different HTTP method, the traffic is silently dropped.
  - **custom-redirect-url**—URL redirection.
- **content**—(Optional) Message content for the selected message type.

NOTE: **The content value must match the type option selected: custom-text requires text, and custom-redirect-url requires a URL value.**

  - *custom-text*—Custom text to be added to the splash screen. Custom text is inserted below the default message. Add the characters \n to insert a line break in the displayed text.
  - *custom-redirect-url*—The URL of the webpage to which the client is directed. When traffic is rejected or denied, the client is redirected to the specified webpage for further action. The URL can be hosted on either the SRX Series device or an external server.

    Enter the redirect URL in quotation marks for an HTTP or HTTPS site, as shown in the following examples:

    “http:*//custom-redirect-url*”
    “https:*//custom-redirect-url*”

Required Privilege Level security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation
- Example: Configuring Application Quality of Service on page 124

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context (Application Identification)

Syntax

```
context {
   http-get-url-parsed-param-parsed;
   http-header-content-type;
   http-header-cookie;
   http-header-host;
   http-header-user-agent;
   http-post-url-parsed-param-parsed;
   http-post-variable-parsed ;
   http-url-parsed;
   http-url-parsed-param-parsed;
   ssl-server-name;
   stream;
}
```

Hierarchy Level

[edit services application-identification application *application-name* over *protocol-type* signature *name* member *name*]

Release Information

Statement introduced in Junos OS Release 15.1X49-D40.

Description

Specify context for matching application running over TCP, UDP, or Layer 7.

Application identification supports custom application signatures to detect applications as they pass through the device. You can create custom application signatures for applications based on ICMP, IP protocol, IP address, and Layer 7. While configuring custom application signatures, you must specify context values that the device can use to match patterns in the application traffic.

Options

http-get-url-parsed-param-parsed—The decoded, normalized GET URL in an HTTP request along with the decoded CGI parameters (if any).

http-header-content-type —The content-type header in an HTTP transaction.

http-header-cookie—The cookie header in an HTTP transaction.

http-header-host —The host header in an HTTP transaction.

http-header-user-agent—The user-agent header in an HTTP transaction.

http-post-url-parsed-param-parsed —The decoded, normalized POST URL in an HTTP request along with the decoded CGI parameters (if any).

http-post-variable-parsed—The decoded POST URL or form data variables.

http-url-parsed—The decoded, normalized URL in an HTTP request.

http-url-parsed-param-parsed—The decoded, normalized URL in an HTTP request along with the decoded CGI parameters (if any).

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ssl-server-name —Server name in the TLS server name extension or the SSL server certificate. This is also known as Server Name Indication (SNI).

stream —TCP or UDP stream data.

Starting from Junos OS release 15.1X49-D60 and Junos OS Release 17.3R1, when configuring custom application signatures, the context-direction combinations as mentioned in Table 38 on page 322 is supported. Any other combination other than this is not supported.

Table 38: Supported Context-Direction Combination for Custom Application Signatures

Context	Direction
http-get-url-parsed-param-parsed	client-to-server
http-header-host	client-to-server
http-header-user-agent	client-to-server
http-post-url-parsed-param-parsed	client-to-server
http-post-variable-parsed	client-to-server
http-url-parsed	client-to-server
http-url-parsed-param-parsed	client-to-server
ssl-server-name	client-to-server
stream	any/client-to-server/server-to-client
http-header-content-type	any/client-to-server/server-to-client
http-header-cookie	any/client-to-server/server-to-client

NOTE: If you are planning to upgrade the device to Junos OS release 15.1X49-D60 from the previous versions of the Junos OS, you must change the configuration to the valid combination of context-direction as mentioned in Table 38 on page 322 to avoid any commit failure and possible disabling of the secondary node.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Understanding Junos OS Application Identification Custom Application Signatures on page 64

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crl

Syntax

```
crl {
   disable disable;
   if-not-present (allow | drop);
   ignore-hold-instruction-code ignore-hold-instruction-code;
}
```

Hierarchy Level

[edit services ssl initiation profile *name* actions]

Release Information

Statement introduced in Junos OS Release 15.1X49-D30. This statement is supported in the SRX340, SRX345, SRX550M, SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices and vSRX instances.

Description

Specify certificate revocation actions.

CRL validation on SRX Series device involves checking for revoked certificates from servers. You can enable or disable the CRL validation to meet your specific security requirements. You can allow or drop the sessions when a CRL information is not available.

To enhance security, the certificate revocation checking feature has been enabled by default on SRX Series devices on any SSL proxy profile.

Options

disable—Disable CRL validation.

if-not-present—Specify an action if CRL information is not present.

Values:

- **allow**—Allow session if CRL information is not present.
- **drop**—Drop session if CRL information is not present.

ignore-hold-instruction-code—Allow the sessions when a certificate is revoked and the revocation reason is on hold.

Required Privilege Level

system

Related Documentation

- Working with the Certificate Revocation Lists for SSL Proxy on page 269

custom-ciphers

Syntax

```
custom-ciphers [ecdhe-rsa-with-3des-ede-cbc-sha | ecdhe-rsa-with-aes-128-cbc-sha |
    ecdhe-rsa-with-aes-128-cbc-sha256 | ecdhe-rsa-with-aes-128-gcm-sha256 |
    ecdhe-rsa-with-aes-256-cbc-sha | ecdhe-rsa-with-aes-256-cbc-sha384 |
    ecdhe-rsa-with-aes-256-gcm-sha384 | rsa-with-aes-128-cbc-sha256 RSA |
    rsa-with-aes-128-gcm-sha256 RSA | rsa-with-aes-256-cbc-sha256 RSA |
    rsa-with-aes-256-gcm-sha384 RSA | rsa-with-rc4-128-md5 RSA | 128bit rc4 | md5 hash
    rsa-with-rc4-128-sha RSA | 128bit rc4 |sha hash rsa-with-des-cbc-sha RSA | des cbc | sha
    hash rsa-with-3des-ede-cbc-sha RSA | 3des ede/cbc | sha hash rsa-with-aes-128-cbc-sha
    RSA | 128 bit aes/cbc | sha hash rsa-with-aes-256-cbc-sha RSA | 256 bit aes/cbc |sha
    hash rsa-export-with-rc4-40-md5 RSA-export | 40 bit rc4 | md5 hash
    rsa-export-with-des40-cbc-sha RSA-export | 40 bit des/cbc | sha hash rsa-with-null-md5
    RSA | no symmetric cipher | md5 hash rsa-with-null-sha RSA | no symmetric cipher | sha
    hash | ecdhe-ecdsa-with-aes-256-gcm-sha384 | ecdhe-ecdsa-with-aes-256-cbc-sha384
    | ecdhe-ecdsa-with-aes-256-cbc-sha | ecdhe-ecdsa-with-aes-128-gcm-sha256
    |ecdhe-ecdsa-with-aes-128-cbc-sha256 |ecdhe-ecdsa-with-aes-128-cbc-sha
    |ecdhe-ecdsa-with-3des-ede-cbc-sha);];
```

Hierarchy Level

[edit services ssl proxy profile *profile-name*]
[edit services ssl termination profile *profile-name*]
[edit services ssl initiation profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10.
This statement is supported in the SRX340, SRX345, SRX550M, SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices and vSRX instances. Options to support Elliptic Curve Digital Signature Algorithm (ECDSA) added in Junos OS Release 18.3R1.

Description

Configure custom cipher, which SSH server can use to perform encryption and decryption functions.

Custom ciphers allow you to define your own cipher list. If you do not want to use one of the three categories, you can select ciphers from each of the categories to form a custom cipher set.

To configure custom ciphers, you must set preferred-ciphers to custom. See preferred-ciphers for more details.

Options

ecdhe-rsa-with-3des-ede-cbc-sha—ECDHE/RSA, 3 DES EDE/CBC, SHA hash

ecdhe-rsa-with-aes-128-cbc-sha—ECDHE/RSA, 128-bit AES/CBC, SHA hash

ecdhe-rsa-with-aes-128-cbc-sha256—ECDHE/RSA, 128-bit AES/CBC, SHA256 hash

ecdhe-rsa-with-aes-128-gcm-sha256—ECDHE/RSA, 128-bit AES/GCM, SHA256 hash

ecdhe-rsa-with-aes-256-cbc-sha—ECDHE/RSA, 256-bit AES/CBC, SHA hash

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ecdhe-rsa-with-aes-256-cbc-sha384—ECDHE/RSA, 256-bit AES/CBC, SHA384 hash

ecdhe-rsa-with-aes-256-gcm-sha384—ECDHE/RSA, 256-bit AES/GCM, SHA384 hash

rsa-export-with-des40-cbc-sha—RSA-export, 40-bit DES/CBC, SHA hash

rsa-export-with-rc4-40-md5—RSA-export, 40-bit RC4, MD5 hash

rsa-export1024-with-des-cbc-sha—RSA 1024-bit export, DES/CBC, SHA hash

rsa-export1024-with-rc4-56-md5—RSA 1024-bit export, 56 bit RC4, MD5 hash

rsa-export1024-with-rc4-56-sha—RSA 1024-bit export, 56 bit RC4, SHA hash

rsa-with-3des-ede-cbc-sha—RSA, 3DES EDE/CBC, SHA hash

rsa-with-aes-128-cbc-sha—RSA, 128-bit AES/CBC, SHA hash

rsa-with-aes-128-cbc-sha256—RSA, 128-bit AES/CBC, SHA256 hash

rsa-with-aes-128-gcm-sha256—RSA, 128-bit AES/GCM, SHA256 hash

rsa-with-aes-256-cbc-sha—RSA, 256-bit AES/CBC, SHA hash

rsa-with-aes-256-cbc-sha256—RSA, 256-bit AES/CBC, SHA256 hash

rsa-with-aes-256-gcm-sha384—RSA, 256-bit AES/GCM, SHA384 hash

rsa-with-des-cbc-sha—RSA, DES CBC, SHA hash

rsa-with-null-md5—RSA, no symmetric cipher, MD5 hash

rsa-with-null-sha—RSA, no symmetric cipher, SHA hash

rsa-with-rc4-128-md5—RSA, 128-bit RC4, MD5 hash

rsa-with-rc4-128-sha—RSA, 128-bit RC4, SHA hash

ecdhe-ecdsa-with-aes-256-gcm-sha384—ECDHE,ECDSA, 256 bit aes/gcm, sha384 hash

ecdhe-ecdsa-with-aes-256-cbc-sha384—ECDHE,ECDSA, 256 bit aes/cbc, sha384 hash

ecdhe-ecdsa-with-aes-256-cbc-sha—ECDHE,ECDSA, 256 bit aes/cbc, sha hash

ecdhe-ecdsa-with-aes-128-gcm-sha256—ECDHE,ECDSA, 128 bit aes/gcm, sha256 hash

ecdhe-ecdsa-with-aes-128-cbc-sha256—ECDHE,ECDSA, 128 bit aes/cbc, sha256 hash

ecdhe-ecdsa-with-aes-128-cbc-sha—ECDHE,ECDSA, 128 bit aes/cbc, sha hash

ecdhe-ecdsa-with-3des-ede-cbc-sha—ECDHE,ECDSA, 3des ede/cbc, sha hash

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Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- SSL Proxy Overview on page 221
- Configuring SSL Forward Proxy on page 234
- Enabling Debugging and Tracing for SSL Proxy on page 253

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default-rule

Syntax

```
default-rule {
   (deny [block-message] | permit | reject [block-message]);
}
```

Hierarchy Level

[edit security application-firewall rule-sets *rule-set-name*]

Release Information

Statement introduced in Junos OS Release 11.1. Statement updated in Junos OS Release 12.1X44-D10 with the **reject** option. The **block-message** option added in Junos OS Release 12.1X45-D10.

Description

Configure the default rule that defines the actions to be performed on a packet that does not match any defined rule.

An application firewall permits, rejects, or denies traffic based on the application of the traffic. The firewall consists of one or more rule sets with rules that specify match criteria, including dynamic applications, and the action to be taken for matching traffic. The application firewall rule set must contain a single default rule. The default rule defines the action to be taken for any traffic that does not match one of the rules.

Starting in Junos OS Release 18.2R1 application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and a chance to bring your configuration into compliance with the new configuration.

Options

- **deny**—Block the traffic at the firewall. The device drops the packet. No message is returned to the sender.
  - **block-message**—(Optional) In application firewall rules, provide information to the user regarding blocked traffic. Depending on the content of the **profile** option for this rule set, including the **block-message** option displays a default message or customized message, or redirects the user for denied HTTP or HTTPS traffic. All other traffic is dropped silently.
- **permit**—Permit traffic at the firewall.
- **reject**—Block the traffic at the firewall. For TCP traffic, by default the device drops the packet and returns a TCP reset (RST) message to the source host and to the server in some cases. For UDP and other protocol traffic, by default the device drops the packet and returns an ICMP “destination unreachable, port unreachable” message to both the client and the server.
  - **block-message**—(Optional) In application firewall rules, provide information to the user regarding blocked traffic. Depending on the content of the **profile** option for this rule set, including the **block-message** option displays a default message or customized

message, or redirects the user for rejected HTTP or HTTPS traffic. All other traffic is dropped as specified in the default action for the **reject** option.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Application Firewall Rule Sets Within a Security Policy on page 92

destination-path-group

Syntax

```
destination-path-group group-name {
  overlay-path {
    overlay-path-name;
  }
  probe-routing-instance {
    routing-instance-name;
  }
}
```

Hierarchy Level

[edit security advance-policy-based-routing]

Release Information

Statement introduced in Junos OS Release 18.2R1

Description

Define a group containing multiple overlay paths terminating at a same destination.

In the hub-and-spoke configuration, because there is a single destination available (hub device), all paths are configured under the same destination group and all the paths must be available in the routing instance specified for active probing.

Options

group-name—Name that identifies the destination path group.

overlay-path *overlay-path-name*—Overlay path name.

probe-routing-instance *routing-instance-name*—Routing instance for the probe path

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Application Quality of Experience on page 173
- Advanced Policy-Based Routing on page 139

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direction (Application Identification)

Syntax

```
direction {
   any;
   client-to-server;
   server-to-client;
}
```

Hierarchy Level

[edit services application-identification application *application-name* over *protocol-type* signature *name* member *name*]

Release Information

Statement introduced in Junos OS Release 15.1X49-D40.

Description

The connection direction of the packets to apply pattern matching. You can specify match patterns on both client to server and server to client while configuring custom application signatures.

Options

any—The directions of packets are either from client-side to server-side or from server-side to client-side.

client-to-server—The direction of packets is from client-side to server-side.

server-to-client—The direction of packets is from server-side to client-side.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Understanding Junos OS Application Identification Custom Application Signatures on page 64

disable (Application Tracking)

Syntax

```
disable;
```

Hierarchy Level

```
[edit security application-tracking]
```

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Disable application tracking on a device without deleting the zone configuration.

Application tracking is enabled by default. If application tracking has been previously disabled and you want to reenable it, delete the configuration statement that specifies disabling of application tracking as shown in the following statement:

```
[edit]
user@host# delete security application-tracking disable
```

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Application Tracking on page 109

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download (Services)

Syntax

```
download {
  automatic {
    interval hours;
    start-time MM-DD.hh:mm;
  }
url url;
```

Hierarchy Level

[edit services application-identification]

Release Information

Statement introduced in Junos OS Release 10.2.

Description

Configure automatic download for the application identification services application package.

The application package contains definitions for known applications, such as: DNS, Facebook, FTP, Skype, and SNMP. The application package is extracted from the IDP signature database located at **https://signatures.juniper.net**. If you do not have access to the default download site from your device, you can use the URL option to download from a different location.

NOTE: **You need to download the application package before configuring application identification services.**

Options

- automatic—Download the application package automatically at a certain time of day or at intervals.
- *interval*—Download the application package at intervals.

  Range: 6 through 720 hours

- *start-time*—Start time in which the application package will be download. Format is MM-DD.hh:mm. Example: 04-15.09:00 will start the download on April 15 at 9 AM.
- *url*—Use this option to change the default download location of the application package.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Example: Scheduling the Application Signature Package Updates on page 53

dynamic-application

Syntax

```
dynamic-application [system-application];
```

Hierarchy Level

[edit security application-firewall rule-sets *rule-set-name* rule *rule-name* match]

Release Information

Statement introduced in Junos OS Release 11.1.

Description

Specify the dynamic application names for match criteria in application firewall rule set.

An application firewall configuration permits, rejects, or denies traffic based on the application of the traffic. The AppFW consists of one or more rule sets with rules that specify match criteria, including dynamic applications, and the action to be taken for matching traffic.

The junos:UNKNOWN keyword is reserved for unknown dynamic applications. In the following cases, the application ID is set to junos:UNKNOWN:

- The traffic does not match an application signature in the database.
- The system encounters an error when identifying the application.
- The session fails over to another device.

Traffic with an application ID of junos:UNKNOWN matches a rule with a dynamic application of junos:UNKNOWN. If there is no rule defined for junos:UNKNOWN, the default rule is applied.

Starting in Junos OS Release 18.2R1 application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and a chance to bring your configuration into compliance with the new configuration.

Options

system-application—Set of system applications for match criteria.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Application Firewall Overview on page 85

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dynamic-application-group

Syntax

```
dynamic-application-group [system-application-group];
```

Hierarchy Level

[edit security application-firewall rule-sets *rule-set-name* rule *rule-name* match]

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Specify the dynamic application group to match. When you define application firewall rules, you can specify dynamic application groups as match criteria.

With application identification, multiple applications can be configured in a dynamic application groups for consistent reuse. AppFW rules permit and deny traffic by specifying application names, dynamic application group names, or both. By using predefined application groups, AppFW rules require no updating when new applications are added to common groups.

Starting in Junos OS Release 18.2R1 application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and a chance to bring your configuration into compliance with the new configuration.

Options

system-application-group—Set of groups defining one or more system applications for match criteria.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Application Firewall Overview on page 85

enable-flow-tracing (Services)

Syntax

```
enable-flow-tracing;
```

Hierarchy Level

[edit services ssl proxy profile *profile-name*]
[edit services ssl termination profile *profile-name*]
[edit services ssl initiation profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10. This statement is supported on the SRX550M, SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices.

Description

Enable flow tracing for the profile.

When you configure **enable-flow-tracing** for SSL profiles, the debug tracing will be enabled on that profile when the flag is set as **selected-profile**.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- SSL Proxy Overview on page 221
- Configuring SSL Forward Proxy on page 234
- Enabling Debugging and Tracing for SSL Proxy on page 253

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enable-performance-mode

Syntax

```
enable-performance-mode max-packet-threshold number;
```

Hierarchy Level

[edit services application-identification]

Release Information

Statement introduced in Junos OS Release 12.1X47-D10.

Description

Set the deep packet inspection (DPI) in performance mode for application identification.

The application traffic throughput can be improved by setting the DPI in performance mode with default packet inspection limit as two packets, including both client-to-server and server-to-client directions. By default, performance mode is disabled on SRX Series devices.

If you want to set DPI to default accuracy mode and disable the performance mode, delete the configuration statement that specifies enabling of the performance mode by using the **delete services application-identification enable-performance-mode** command.

Options

max-packet-threshold *number*—Set the maximum packet threshold for DPI performance mode.

Range: 1 through 100

Default: 2

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Improving the Application Traffic Throughput on page 36
- **show services application-identification status on page 566**

enable-reverse-reroute

Syntax

```
enable-reverse-reroute;
```

Hierarchy Level

[edit security zones security-zone *zone-name*]

Release Information

Statement introduced in Junos OS Release 15.1X49-D123.

Description

Reroute the reverse traffic when there is a link switch for the incoming traffic.

When you configure the **enable-reverse-reroute** option for a security zone, then the packets of each session that has been initiated from the zone are checked for the change in the incoming interface. When an incoming packet arrives on an interface that is different from the one cached in session, the route lookup is performed for the reverse path, and the preference is given to the interface on which the packet has arrived when there are ECMP routes available to the source. Ensure that when you configure enable-reverse-reroute option, the new interface on which packets arrive must be part of the same zone as the earlier interface.

You can enable reverse rerouting in hub-and-spoke deployments, where a spoke device uses APBR to re-route the traffic based on the dynamic applications. In such cases reverse re-route can be used on hub device to correctly re-route the reverse traffic.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Understanding Advanced Policy-Based Routing on page 139

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enable-session-cache

Syntax

```
enable-session-cache;
```

Hierarchy Level

[edit services ssl termination profile *profile-name*]
[edit services ssl initiation profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10. This statement is supported on the SRX550M, SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices.

Description

Enable SSL session cache.

You can enable session caching to cache session information, such as the pre-master secret key and agreed-upon ciphers, for both the client and server.

The cached information is identified by a session ID. In subsequent connections both parties agree to use the session ID to retrieve the information rather than create a new pre-master secret key. Session resumption shortens the handshake process and accelerates SSL transactions there by improves the throughput and maintains an appropriate level of security at the same time.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- SSL Proxy Overview on page 221
- Configuring SSL Forward Proxy on page 234
- Enabling Debugging and Tracing for SSL Proxy on page 253

fallback-option (ICAP Redirect Service)

Syntax

```
fallback-option {
   connectivity (block | log-permit | permit);
   default-action (block | log-permit | permit);
   timeout (block | log-permit | permit);
}
```

Hierarchy Level

[edit services icap-redirect profile *name*]
[edit logical-system *logical-system-name* services icap-redirect profile *name*]

Release Information

Statement introduced in Junos OS Release 18.1R1.
The logical system option is introduced in Junos OS Release 18.3R1.

Description

Specify fallback options for the device. Fallback settings enable the device to handle errors.

The fallback option is used to define the actions such as permit, log-and-permit, or block. This is the action that occurs when a request fails due to conditions such as too many requests, or a timeout occurred, or connectivity issues.

Options

connectivity—Fallback settings when connection-related failures occur.

Values:

- block—Log the error and deny the requests.
- log-permit—Log the error and permit the requests.
- permit—Permit the requests.

default-action—Default failure action.

Values:

- block—Log the error and deny the requests.
- log-permit—Log the error and permit the requests.
- permit—Permit the requests.

throttle—Fallback action when the total number of requests received concurrently exceeds the devices limit.

Values:

- block—Log the error and deny the requests.
- log-permit—Log the error and permit the requests.
- permit—Permit the requests.

timeout—Fallback action when there is a timeout occurrence.

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Values:

- block—Log the error and deny the requests.
- log-permit—Log the error and permit the requests.
- permit—Permit the requests.

Required Privilege Level system

Related Documentation

- Example: Configuring ICAP Redirect Service on SRX Devices on page 274

file (System Logging)

Syntax

```
file filename {
  allow-duplicates;
  any (alert | any | critical | emergency | error | info | none | notice | warning);
  archive {
    archive-sites {
      url password;
    }
    (binary-data | no-binary-data);
    files number;
    size size;
    start-time start-time;
    transfer-interval transfer-interval;
    (world-readable | no-world-readable);
  }
  authorization (alert | any | critical | emergency | error | info | none | notice | warning);
  change-log (alert | any | critical | emergency | error | info | none | notice | warning);
  conflict-log (alert | any | critical | emergency | error | info | none | notice | warning);
  daemon (alert | any | critical | emergency | error | info | none | notice | warning);
  dfc (alert | any | critical | emergency | error | info | none | notice | warning);
  explicit-priority;
  external (alert | any | critical | emergency | error | info | none | notice | warning);
  firewall (alert | any | critical | emergency | error | info | none | notice | warning);
  ftp (alert | any | critical | emergency | error | info | none | notice | warning);
  interactive-commands (alert | any | critical | emergency | error | info | none | notice | warning);
  kernel (alert | any | critical | emergency | error | info | none | notice | warning);
  match "regular-expression";
  ntp (alert | any | critical | emergency | error | info | none | notice | warning);
  pfe (alert | any | critical | emergency | error | info | none | notice | warning);
  security (alert | any | critical | emergency | error | info | none | notice | warning);
  structured-data {
    brief;
  }
  user (alert | any | critical | emergency | error | info | none | notice | warning);
}
```

Hierarchy Level

[edit system syslog]

Release Information

Statement introduced before Junos OS Release 12.1X47 for SRX Series.

Description

Specify the file in which to log data.

Options

- *filename*—Specify the name of the file in which to log data.
- *allow-duplicates*—Do not suppress the repeated messages.
- *any*—Specify all facilities information.
  - *alert*—Specify the conditions that should be corrected immediately.

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  - *critical*—Specify the critical conditions.
  - *emergency*—Specify the conditions that cause security functions to stop.
  - *error*—Specify the general error conditions.
  - *info*—Specify the information about normal security operations.
  - *none*—Do not specify any messages.
  - *notice*—Specify the conditions that should be handled specifically.
  - *warning*—Specify the general warning conditions.
- *archive*—Specify the archive file information.
  - *archive-sites*—Specify a list of destination URLs for the archived log files.
    - *url*—Specify the primary and failover URLs to receive archive files.
  - *binary-data*—Mark file such that it contains binary data.
  - *no-binary-data*—Do not mark the file such that it contains binary data.
  - *files*—Specify the number of files to be archived. Range: 1 through 1000 files.
  - *size*—Specify the size of files to be archived. Range: 65,536 through 1,073,741,824 bytes.
  - *world-readable*—Allow any user to read the log file.
  - *no-world-readable*—Do not allow any user to read the log file.
  - *start-time*—Specify the start time for file transmission. Enter the start time in the yyyy-mm-dd.hh:mm format.
  - *transfer-interval*—Specify the frequency at which to transfer the files to archive sites.
- *authorization*—Specify the authorization system.
- *change-log*—Specify the configuration change log.
- *conflict-log*—Specify the configuration conflict log.
- *daemon*—Specify the various system processes.
- *dfc*—Specify the dynamic flow capture.
- *explicit-priority*—Include the priority and facility in messages.
- *external*—Specify the local external applications.
- *firewall*—Specify the firewall filtering system.
- *ftp*—Specify the FTP process.
- *interactive-commands*—Specify the commands executed by the UI.
- *kernel*—Specify the kernel information.
- *match*—Specify the regular expression for lines to be logged.
- *ntp*—Specify the NTP process.

- *pfe*—Specify the Packet Forwarding Engine.
- *security*—Specify the security-related information.
- *structured-data*—Log the messages in structured log format.
  - *brief*—Omit English language text from the end of the logged message.
- *user*—Specify the user processes.
  - *info*—Specify the informational messages.

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

flag (Services)

Syntax

flag (*all* | *cli-configuration* | *initiation* | *proxy* | *selected-profile* | *termination*);

Hierarchy Level

[edit services ssl traceoptions]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10. This statement is supported on the SRX1500, SRX5400, SRX5600, and SRX5800 devices and vSRX.

Description

Specify the tracing flag parameters.

Options

- *all*—Trace all the parameters.
- *cli-configuration*—Trace CLI configuration events.
- *initiation*—Trace initiation service events.
- *proxy*—Trace proxy service events.
- *selected-profile*—Trace events for profiles with **enable-flow-tracing** set.
- *termination*—Trace termination service events.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234

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format (Security Log)

Syntax

```
format (binary | sd-syslog | syslog)
```

Hierarchy Level

```
[edit security log]
```

Release Information

Statement introduced prior to Junos OS Release 10.0. Statement updated in Junos OS Release 12.1.

Description

Set the default log format for event mode security logging on the device.

Options

- **binary**—Binary encoded text to conserve resources.
- **sd-syslog**—Structured system log file.
- **syslog**—Traditional system log file.

Default: syslog.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- log (Security) on page 353

forwarding-classes (CoS)

Syntax

```
forwarding-classes {
   class class-name {
      priority (high | low);
      queue-num number;
      spu-priority (high | low | medium-high | medium-low);
   }
   queue queue-number {
      class-name {
         priority (high | low);
      }
   }
}
```

Hierarchy Level

[edit class-of-service]

Release Information

Statement introduced in Junos OS Release 8.5. Statement updated in Junos OS Release 11.4. The **spu-priority** option introduced in Junos OS Release 11.4R2.

Description

Configure forwarding classes and assign queue numbers.

Options

- **class class-name**—Display the forwarding class name assigned to the internal queue number.

  NOTE: This option is supported only on SRX1500, SRX5400, SRX5600, and SRX5800.

  NOTE: AppQoS forwarding classes must be different from those defined for interface-based rewriters.

- **priority**—Fabric priority value:
  - **high**—Forwarding class' fabric queuing has high priority.
  - **low**—Forwarding class' fabric queuing has low priority.

  The default **priority** is **low**.

- **queue queue-number**—Specify the internal queue number to which a forwarding class is assigned.
- **spu-priority**—Services Processing Unit (SPU) priority queue, **high**, **medium-high**, **medium-low**, or **low**. The default **spu-priority** is **low**.

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NOTE: The **spu-priority** option is only supported on SRX1500 devices and SRX5000 line devices.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Application Quality of Service on page 124

global-config (Services)

Syntax

```
global-config {
   disable-cert-cache;
   certificate-cache-timeout;
   invalidate-cache-on-crl-update;
   session-cache-timeout seconds;
}
```

Hierarchy Level

[edit services ssl proxy]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10. **disable-cert-cache**, **certificate-cache-timeout**, and **Invalidate-cache-on-crl-update** options are introduced in Junos OS Release 18.1R1.

Description

Specify the global proxy configuration. When SSL proxy is configured at a global level (within "services ssl proxy"), it is visible across the system configurations on the device.

Options

certificate-cache-timeout—Regulates the certificate cache timeout.

Default: 600 seconds

disable-cert-cache—Disable the certificate cache. By default certificate cache is enabled.

invalidate-cache-on-crl-update—Invalidate the existing certificate cache. By default, this option is disabled.

session-cache-timeout—Specify the session cache timeout.

Range: 300 to 3600 seconds

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- SSL Proxy Overview on page 221
- Configuring SSL Forward Proxy on page 234
- Enabling Debugging and Tracing for SSL Proxy on page 253

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http (icap-redirect profile)

Syntax

```
http {
   redirect-request;
   redirect-response;
}
```

Hierarchy Level

[edit services icap-redirect profile *name*]
[edit logical system *logical-system-name* services icap-redirect profile *name*]

Release Information

Statement introduced in Junos OS Release 18.1R1.
The logical system option is introduced in Junos OS Release 18.3R1.

Description

Enable the redirect request and the redirect response for the HTTP traffic.

You can forward HTTP requests and HTTP responses to a Internet Content Adaptation Protocol (ICAP) server before sending a request to a Web server or returning a response to the client system.

The SRX Series device decrypts the HTTPS traffic and redirects the HTTP message to a third-party, on-premise, DLP server using the ICAP channel. After DLP processing, the traffic is reflected back to the SRX Series device.

Options

redirect-request—Enable the redirect service on HTTP request

redirect-response—Enable the redirect service on HTTP response

Required Privilege Level

system

Related Documentation

- Example: Configuring ICAP Redirect Service on SRX Devices on page 274

icap-redirect

Syntax

```
icap-redirect {
  profile name {
    fallback-option {
      connectivity (block | log-permit | permit);
      default-action (block | log-permit | permit);
      timeout (block | log-permit | permit);
    }
    http {
      redirect-request redirect-request;
      redirect-response redirect-response;
    }
    server name {
      authorization {
        authorization-type authorization-type;
        credentials (ascii ascii | base64 base64);
      }
      host host;
      port port;
      reqmod-uri reqmod-uri;
      respmod-uri respmod-uri;
      routing-instance ri-name;
      sockets sockets;
      tls-profile tls-profile;
    }
    timeout timeout;
  }
  traceoptions {
    file <filename> <files files>< match match><size size> (world-readable |
      no-world-readable)>;
    flag name;
    no-remote-trace no-remote-trace;
  }
}
```

Hierarchy Level

```
[edit services]
[edit logical-system logical-system-name services]
```

Release Information

Statement introduced in Junos OS Release 18.1 R1.
The logical system option is introduced in Junos OS Release 18.3R1.

Description

Configure the ICAP redirection service.

The SRX Series device acts as an SSL proxy, decrypts HTTP or HTTPS traffic, and redirects the HTTP message to a third-party, on-premise DLP server through the Internet Content Adaptation Protocol (ICAP) channel. To enable ICAP redirection service, you must configure an ICAP redirect profile.

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The ICAP server profile allows the ICAP server to process request messages, response messages, fallback options, and so on, to the permitted traffic. This profile is applied as an application service in the security policy.

Required Privilege Level
security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

icmp-mapping (Application Identification)

Syntax

```
icmp-mapping {
   code number;
   type number;
}
```

Hierarchy Level
[edit services application-identification application *application-name*]

Release Information
Statement introduced in Junos OS Release 15.1X49-D40.

Description
Specify the Internet Control Message Protocol (ICMP) value for an application to match while configuring custom application signatures for Junos OS application identification.

The ICMP mapping technique maps standard ICMP message types and optional codes to a unique application name. The ICMP code and type provide additional specification, for packet matching in an application definition.

Options

code *number*—Numeric value of an ICMP code. The code field provides further information about the associated type field.

Range: 0-254

type *number*—Numeric value of an ICMP type. The type field identifies the ICMP message.

Range: 0-254

Required Privilege Level
services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Understanding Junos OS Application Identification Custom Application Signatures on page 64

ip-protocol-mapping (Application Identification)

Syntax

```
ip-protocol-mapping {
   protocol number;
}
```

Hierarchy Level

[edit services application-identification application *application-name*]

Release Information

Statement introduced in Junos OS Release 15.1X49-D40.

Description

Specify the IP protocol value for an application to match. This parameter is used to identify an application based on IP and is intended only for IP traffic. To ensure adequate security, use IP protocol mapping only in your private network for trusted servers.

Options

protocol *number*—Industry-standard numeric protocol value.

Range: 0 through 254.

You can find a complete list of industry standard protocol numbers at the IANA website.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Understanding Junos OS Application Identification Custom Application Signatures on page 64

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initiation (Services)

Syntax

```
initiation{
  profile name {
    actions {
      crl {
        disable disable;
        if-not-present (allow | drop);
        ignore-hold-instruction-code ignore-hold-instruction-code;
      }
      ignore-server-auth-failure ignore-server-auth-failure;
    }
    client-certificate client-certificate;
    custom-ciphers (ecdhe-rsa-with-3des-ede-cbc-sha | ecdhe-rsa-with-aes-128-cbc-sha
      | ecdhe-rsa-with-aes-128-cbc-sha256 | ecdhe-rsa-with-aes-128-gcm-sha256 |
      ecdhe-rsa-with-aes-256-cbc-sha | ecdhe-rsa-with-aes-256-cbc-sha384 |
      ecdhe-rsa-with-aes-256-gcm-sha384 | rsa-export-with-des40-cbc-sha |
      rsa-export-with-rc4-40-md5 | rsa-export1024-with-des-cbc-sha |
      rsa-export1024-with-rc4-56-md5 | rsa-export1024-with-rc4-56-sha |
      rsa-with-3des-ede-cbc-sha | rsa-with-aes-128-cbc-sha | rsa-with-aes-128-cbc-sha256
      | rsa-with-aes-128-gcm-sha256 | rsa-with-aes-256-cbc-sha |
      rsa-with-aes-256-cbc-sha256 | rsa-with-aes-256-gcm-sha384 | rsa-with-des-cbc-sha
      | rsa-with-null-md5 | rsa-with-null-sha | rsa-with-rc4-128-md5 | rsa-with-rc4-128-sha);
    enable-flow-tracing enable-flow-tracing;
    enable-session-cache enable-session-cache;
    preferred-ciphers (custom | medium | strong | weak);
    protocol-version (all | ssl3 | tls1 | tls11 | tls12);
    trusted-ca ;
  }
}
```

Hierarchy Level

```
[edit services ssl]
```

Release Information

Statement introduced in Junos OS Release 12.1X44-D10. The **protocol-version** statement is updated to include **tls11** and **tls12** from Junos OS Release 15.1X49-D30.

Description

Specify the configuration for Secure Socket Layer (SSL) initiation support service. The SRX Series device, acting as an SSL proxy client, initiates and maintains SSL sessions between itself and an SSL server. SRX device receives un-encrypted data from an HTTP client, and encrypts and transmits the data as ciphertext to the SSL server.

Options

- **client-certificate**—Local certificate.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234
- *Firewall User Authentication Overview*

level (Services)

Syntax

```
level [brief | detail | extensive | verbose]];
```

Hierarchy Level

```
[edit services ssl traceoptions]
```

Release Information

Statement introduced in Junos OS Release 12.1X44-D10.

Description

Specify the level of debugging the output. This statement is supported on the SRX550M, SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices and vSRX.

Options

- *brief*—Specify brief debugging output.
- *detail*—Specify detailed debugging output.
- *extensive*—Specify extensive debugging output.
- *verbose*—Specify verbose debugging output.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234

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log (Security)

Syntax

```
log {
  cache {
    exclude exclude-name {
      destination-address destination-address;
      destination-port destination-port;
      event-id event-id;
      failure;
      interface-name interface-name;
      policy-name policy-name;
      process process-name;
      protocol protocol;
      source-address source-address;
      source-port source-port;
      success;
      user-name user-name;
    }
    limit value;
  }
  disable;
  event-rate rate;
  facility-override (authorization | daemon | ftp | kernel | local | user);
  file {
    files max-file-number;
    name file-name;
    path binary-log-file-path;
    size maximum-file-size;
  }
  format (binary | sd-syslog | syslog);
  max-database-record <max-database-record>;
  mode (event | stream);
  rate-cap <rate-cap-value>;
  report;
  (source-address source-address | source-interface interface-name);
  stream stream-name {
    category (all | content-security | fw-auth | screen | alg | nat | flow | sctp | gtp | ipsec | idp
      | rtlog |pst-ds-lite | appqos |secintel);
    file {
      name file-name;
      size file-size;
      rotation max-rotation-number;
    }
    filter {
      threat-attack;
      }
    format (binary | sd-syslog | syslog | welf);
    host {
      ip-address;
      port port-number;
    }
    rate-limit {
      log-rate;
```

```
    }
    severity (alert | critical | debug | emergency | error | info | notice | warning);
  }
  traceoptions {
    file {
      filename;
      files number;
      match regular-expression;
      size maximum-file-size;
      (world-readable | no-world-readable);
    }
    flag (all | configuration | hpl | report | source);
    no-remote-trace;
  }
  transport {
    protocol (udp | tcp | tls);
    tcp-connections tcp-connections;
    tls-profile tls-profile-name;
  }
  utc-timestamp;
}
```

Hierarchy Level

[edit security]

Release Information

Statement introduced in Junos OS Release 9.2.

Description

Configure security log. Set the mode of logging (event for traditional system logging or stream for streaming security logs through a revenue port to a server). You can also specify all the other parameters for security logging.

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Options **cache**—Cache security log events in the audit log buffer.

disable—Disable the security logging for the device.

event-rate ***rate***—Limit the rate at which logs are streamed per second.

Range: 0 through 1500

Default: 1500

facility-override—Alternate facility for logging to remote host.

file—Specify the security log file options for logs in binary format.

Values:

- ***max-file-number***—Maximum number of binary log files.
  - The range is 2 through 10 and the default value is 10.
- ***file-name***—Name of binary log file.
- ***binary-log-file-path***—Path to binary log files.
- ***maximum-file-size***—Maximum size of binary log file in megabytes.
  - The range is 1 through 10 and the default value is 10.

format—Set the security log format for the device.

max-database-record—The following are the disk usage range limits for the database:

Range:

- SRX1500, SRX4100, and SRX4200: 0 through 15,000,000
- vSRX: 0 through 1,000,000

Default:

- SRX1500, SRX4100, and SRX4200: 15,000,000
- vSRX: 1,000,000

NOTE: **Be sure there is enough free space in /var/log/hostlogs/, otherwise logs might be dropped when written into the database.**

mode—Control how security logs are processed and exported.

rate-cap ***rate-cap-value***—Work with event mode only. This option limits the rate at which data plane logs are generated per second.

Range: 0 through 5000 logs per second

Default: 5000 logs per second

source-address ***source-address***—Specify a source IP address or IP address used when exporting security logs, which is mandatory to configure *stream host*.

source-interface ***interface-name***—Specify a source interface name, which is mandatory to configure *stream host*.

NOTE: **The source-address and source-interface are alternate values. Using one of the options is mandatory.**

stream—Every stream can configure file or host.

- ***category***— Type of events that might be logged.
- ***file name***—Specify the filename.
- ***file size***—Specify the file size.
  - SRX1500, SRX4100, and SRX4200—The default value is 25 MB and the range is 10 MB through 50 MB.
  - vSRX - The default value is 2 MB and the range is 1 MB through 3 MB.
- ***rotation***—Configure the maximum file number for rotation.
  - The default value is 10 and the range is 2 through 19.
- ***rate-limit***—Rate-limit for security logs.
  - The range is 1 through 65,535 logs per second and the default value is 65,535 .
- ***filter***—Selects the filter to filter the logs to be logged.
- ***format***—Specify the log stream format.
- ***host***—Destination to send security logs.
- ***severity***—Severity threshold for security logs.

traceoptions—Specify security log daemon trace options.

transport—Set security log transport settings.

utc-timestamp—Specify to use UTC time for security log timestamps.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

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log (Services)

Syntax

```
log {
   all;
   errors;
   info;
   sessions-allowed;
   sessions-dropped;
   sessions-ignored;
   sessions-whitelisted;
   warning;
}
```

Hierarchy Level

[edit services ssl proxy profile *profile-name* actions]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10.

Description

Specify the logging actions. When configuring SSL proxy, you can choose to set the option to receive some or all of the logs.

SSL proxy logs contain the logical system name, SSL proxy whitelists, policy information, SSL proxy information, and other information that helps you troubleshoot when there is an error.

You can configure logging of all or specific events, such as error, warning, and information events. You can also configure logging of sessions that are whitelisted, dropped, ignored, or allowed after an error occurs.

Options

- **all**—Log all events.
- **errors**—Log all error events.
- **info**—Log all information events.
- **sessions-allowed**—Log SSL session allowed events after an error.
- **sessions-dropped**—Log only SSL session dropped events.
- **sessions-ignored**—Log session ignored events.
- **sessions-whitelisted**—Log SSL session whitelisted events.
- **warning**—Log all warning events.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234

maximum-transactions

Syntax

maximum-transactions *transactions-number*;

Hierarchy Level

[edit services application-identification]

Release Information

Statement introduced in Junos OS Release 18.2R1

Description

Configure the maximum number of transactions matched by application identification for finalizing the application.

Application classification does not terminate for applications that are transaction based such as Facebook applications. To terminate the application classifications for such applications, you can choose to consider the results from multiple transaction as the final classification. You can configure the number of transactions before concluding the final result for the identified application.

For example, when you configure the maximum number of transactions as 10, the following sequence is applied for identifying the final application:

- In the first and second transactions, application-1 and application-2 are identified respectively.
- The identification process continues till the 10th transaction is reached.
- Since 10th transaction is equal to the configured value of the maximum number of transactions, the application identified in this transaction is considered as the final match.

Options

maximum-transactions *transactions-number*—Number of transaction results that can be considered before concluding the final result for application identification.

Range: 0 through 25

Default: 5

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

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multipath-rule

Syntax

```
multipath-rule rule-name {
   application application-name;
   application-group application-group-name
   bandwidth-limit percentage;
   link-type (IP | MPLS);
   max-time-to-wait time-period;
   number-of-paths number;
}
```

Hierarchy Level

```
[edit security advance-policy-based-routing]
```

Release Information

Statement introduced in Junos OS Release 15.1X49-D160.

Description

Multipath identifies two or more paths based on the SLA configuration and triggers a copy of the original traffic on all the identified paths.

You can configure multipath rules for specific application traffic and then associate multipath rules with SLA rules. Multipath routing obtains the underlay link types and corresponding overlays on which packet duplication is required based on the SLA rule. Based on the application traffic and the configured bandwidth limit, multipath identifies two or more paths and triggers a copy of the original traffic on all the identified paths.

Multipath rule is applied on the matching traffic and forwarded to and the next-hop address as specified in the routing instance.

When traffic reaches on receiving end, the receiving device accepts packets of a session arriving through different links, and maintains sequence of a packet arriving on different CoS queues and drops any duplicate packets.

Options

application *application-name*—Application name for configuring multipath rule.

application-group *application-group-name*—Application group for configuring multipath rule.

bandwidth-limit *percentage*—Bandwidth limit to stop packet duplication on the links. These links are configured based on the **link-type** option specified in the multipath rule. When a configured percentage of bandwidth is utilized for the least chosen underlay speed, then packet duplication halts for the multipath rule. Halting of packet duplication impacts all multipath sessions for all the applications configured under the rule. Packet duplication is halted for a duration that is configured in **max-time-to-wait** option (in seconds).

Range: 0 through 100

Default: 50 percent

link-type (IP | MPLS)—Select an MPLS or Internet link as the preferred link path. This link with corresponding link type must be configured under AppQoE underlay interface

configuration. Configuring link-speed with link type helps in calculating the bandwidth limit for this rule. Else default values are applied.

max-time-to-wait ***time-period***—Maximum time to wait before restarting multipath routing if it is halted due to bandwidth consumption.

Multipath routing copies packets on all the links belonging to the multipath routing rule till the bandwidth limit is reached. The bandwidth limit is calculated based on the least link speed identified for that rule. This is applicable for all sessions for all applications that match the multipath routing rule. Once the limit is reached, multipath routing stops copying of packets and starts a timer for a time period as configured in **max-time-wait** option in the multipath routing configuration. When the timer expires, it restarts the copying of the packets again.

Range: 1 through 60 seconds

Default: 10 seconds

number-of-paths ***number***—Configure number of paths for multipath routing. Multipath identifies two or more paths based on the SLA configuration and triggers a copy of the original traffic on all the identified paths

Range: 2 through 16

Default: 2

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Application Quality of Experience on page 173

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no-application-identification (Services)

Syntax

```
no-application-identification;
```

Hierarchy Level

```
[edit services application-identification]
```

Release Information

Statement introduced in Junos OS Release 10.2.

Description

Disable the application identification of applications running on nonstandard ports. By default, application identification is enabled on the device. You can disable application identification by using the following command:

user@host# set services application-identification no-application-identification

If you want to reenable application identification, delete the configuration statement that specifies disabling of application identification by using the following command:

user@host# delete services application-identification no-application-identification

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Disabling and Reenabling Junos OS Application Identification on page 31

no-application-system-cache (Services)

Syntax

```
no-application-system-cache;
```

Hierarchy Level

```
[edit services application-identification]
```

Release Information

Statement introduced in Junos OS Release 10.2.

Description

Application identification information is saved in the application system cache to improve performance. This cache is updated when a different application is identified. This caching is turned on by default. Use the **no-application-system-cache** statement to turn it off.

ASC is enabled by default when a session is created. You can manually turn this caching off using the **set services application-identification no-application-system-cache** command. You can re-enable the ASC by using the **set services application-identification application-system-cache** command.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Enabling or Disabling Application System Cache for Application Services on page 32

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ngfw

Syntax

```
ngfw {
  default-profile {
    application-traffic-control {
      rule-set rule-set;
    }
    ssl-proxy {
      profile-name profile-name;
    }
  }
}
```

Hierarchy Level

```
[edit security],
[edit security logical-systems logical-system-name]
```

Release Information

Statement introduced in Junos OS Release 18.2R1

Description

Specify a default profile to manage conflicts when a security policy lookup returns a list of policies before the final application is identified.

The initial policy lookup phase occurs prior to identifying a dynamic application. If there are multiple policies present in the potential policy list that contain different SSL proxy profiles, then the SRX Series device applies the default profile until a more explicit match has occurred.

You can configure a default profile for an SSL proxy and for an application quality of service (AppQoS) under the **[edit security ngfw]** hierarchy level.

You can configure an SSL proxy profile under the **[edit services ssl proxy]** hierarchy level, which can be applied as the default SSL proxy profile under the **[edit security ngfw]** hierarchy level. Similarly, you can configure application traffic rule sets under the **[edit class-of-service]** hierarchy level, and apply the rule set under the **[edit security ngfw]** hierarchy level as the default AppQoS rule set.

Options

application-traffic-control—Specify the application traffic control rule as the default rule.

rule-set *rule-set*—Rule set name of the application traffic control.

ssl-proxy—Specify the SSL forward proxy profile or the SSL reverse proxy profile as the default profile.

profile-name *profile-name*—Name of the SSL forward proxy profile or the SSL reverse proxy profile.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234
- *Firewall User Authentication Overview*

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over (Application Identification)

Syntax

```
over protocol-type {
  signature name {
    member name {
      context {
        http-get-url-parsed-param-parsed;
        http-header-content-type;
        http-header-cookie;
        http-header-host;
        http-header-user-agent;
        http-post-url-parsed-param-parsed;
        http-post-variable-parsed ;
        http-url-parsed;
        http-url-parsed-param-parsed;
        ssl-server-name;
        stream;
      }
      direction {
        any;
        client-to-server;
        server-to-client;
      }
      pattern pattern;
    }
    port-range value;
```

Hierarchy Level [edit services application-identification application *application-name*]

Release Information Statement introduced in Junos OS Release 15.1X49-D40.

Description Specify set of L4/L7 application that carries given application

Configure a custom signature based on Layer 4/Layer 7 applications. You create Layer 7-based custom application signatures for the identification of multiple applications running on the same Layer 7 protocols. For example, applications such as Facebook and Yahoo Messenger can both run over HTTP, but there is a need to identify them as two different applications running on the same Layer 7 protocol.

Options ***protocol-type***—Application protocol

signature *name* —Name of the custom application signature. Must be a unique name with a maximum length of 63 characters.

member *name* —Member name for a custom application signature. Custom signatures can contain multiple members that define attributes for an application. (The supported member name range is m01 through m15.)

context—Service-specific context, such as http-header-content-type.

direction—Connection direction of the packets to match pattern

patterns—(Optional) Deterministic finite automaton (DFA) pattern matched on the context. The DFA pattern specifies the pattern to be matched for the signature. Maximum length is 128.

port-range—Port range. This option is applicable for TCP or UDP-based applications only.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Understanding Junos OS Application Identification Custom Application Signatures on page 64

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overlay-path

Syntax

```
overlay-path overlay-path-name {
  probe-path {
    local ip-address;
    remote ip-address
  }
  tunnel-path {
    local ip-address;
    remote ip-address
  }
}
```

Hierarchy Level [edit security advance-policy-based-routing]

Release Information Statement introduced in Junos OS Release 18.2R1.

Description Configure overlay path to specify the destinations to which the active probe data needs to be sent. Overlay paths are configured for all overlay endpoints. Overlay path configuration includes two set of IP addresses—tunnel IP addresses and probe IP addresses.

You need to create the overlay setup between local and remote endpoints on both ends of the overlay (spoke device and hub device).

Options ***overlay-path-name***—Overlay path name.

probe-path—Probe IP addresses are used as probes' start and end addresses to send over the corresponding tunnel paths. Probe IP addresses must be unique across individual overlay paths.

local *ip-address*—IP address of the local device.

remote *ip-address*—IP address of the remote device.

tunnel-path—Start and end IP addresses of a tunnel. Tunnel IP addresses must be unique across individual overlay paths.

local *ip-address*—IP address of the local device.

remote *ip-address*—IP address of the remote device.

Required Privilege Level services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Application Quality of Experience on page 173
- Advanced Policy-Based Routing on page 139

passive-probe-params

Syntax

```
passive-probe-params {
  sampling-percentage {
    percentage;
  }
  sampling-period {
    period;
  }
  sla-export-factor {
    value;
  }
  type {
    book-ended;
  }
  violation-count {
    count;
  }
```

Hierarchy Level [edit security advance-policy-based-routing]

Release Information Statement introduced in Junos OS Release 18.2R1.

Description Configure the passive probe parameters with the SLA rule.

Passive probes measure the service quality of an application by inserting a custom probe header in the live traffic between the spoke and hub points and measuring the RTT, jitter and packet loss between the points of installation of the probes.

SLA violation is determined through passive probing of live application or application group traffic.

Options

sampling-percentage *percentage*—Indicates the percentage of sessions that are selected for a book-ended SLA measurement.

Example: If 18 sessions are available for a particular application are available, and if you have configured 25%, then 25% of the 18 sessions—that is 5 sessions out of 18 sessions, are evaluated.

Range: 1-100

sampling-period *period*—Indicates a defined sampling period (in milliseconds) in which the number of violations are collected. Once this period is expired, the collected sampling data is purged and a new data is collected.

Range: 2000-60,000

Default: 5000 milliseconds

sla-export-factor *value*—Defines a factor of probe-interval at which the passive probe results can be exported.

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Example: When you configure the **sla-export-factor** as 5 and **probe-interval** as 15 seconds, passive probe results are exported once at the end of the 5th, 10th, and 15th probe interval. You can generate a passive probe report to report any data that remains unreported in the probe interval at the end of a session.

NOTE: **Generating passive probe report for every probe interval is performance intensive.**

Range: 5-200

Default: 25

type—Indicates the type of probe measurement, only p-encap or book-ended supported.

violation-count *count*—Indicates the number of violations that must occur in a sampling-period for a given session before a link is marked as having violated the SLA.

Range: 1-32

Default: 5

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Application Quality of Experience on page 173
- Advanced Policy-Based Routing on page 139

policies

Syntax

```
policies {
  default-policy (deny-all | permit-all);
  from-zone zone-name to-zone zone-name {
    policy policy-name {
      description description;
      match {
        application {
          [application];
          any;
        }
        destination-address {
          [address];
          any;
          any-ipv4;
          any-ipv6;
        }
        source-address {
          [address];
          any;
          any-ipv4;
          any-ipv6;
        }
        source-identity {
          [role-name];
          any;
          authenticated-user;
          unauthenticated-user;
          unknown-user;
        }
      }
      scheduler-name scheduler-name;
      then {
        count {
          alarm {
            per-minute-threshold number;
            per-second-threshold number;
          }
        }
        deny;
        log {
          session-close;
          session-init;
        }
        permit {
          application-services {
            application-firewall {
              rule-set rule-set-name;
            }
            application-traffic-control {
              rule-set rule-set-name;
            }
```


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```
                gprs-gtp-profile profile-name;
                gprs-sctp-profile profile-name;
                idp;
                idp-policy idp-policy;
                redirect-wx | reverse-redirect-wx;
                ssl-proxy {
                    profile-name profile-name;
                }
                uac-policy {
                    captive-portal captive-portal;
                }
                utm-policy policy-name;
            }
            destination-address {
                drop-translated;
                drop-untranslated;
            }
            firewall-authentication {
                pass-through {
                    access-profile profile-name;
                    client-match user-or-group-name;
                    ssl-termination-profile profile-name;
                    web-redirect;
                    web-redirect-to-https;
                }
                user-firewall {
                    access-profile profile-name;
                    domain domain-name
                    ssl-termination-profile profile-name;
                }
                web-authentication {
                    client-match user-or-group-name;
                }
            }
            services-offload;
            tcp-options {
                sequence-check-required;
                syn-check-required;
            }
            tunnel {
                ipsec-group-vpn group-vpn;
                ipsec-vpn vpn-name;
                pair-policy pair-policy;
            }
        }
        reject;
    }
  }
}
global {
  policy policy-name {
    description description;
    match {
      application {
        [application];
```

```
        any;
      }
      destination-address {
        [address];
        any;
        any-ipv4;
        any-ipv6;
      }
      from-zone {
        [zone-name];
        any;
      }
      source-address {
        [address];
        any;
        any-ipv4;
        any-ipv6;
      }
      source-identity {
        [role-name];
        any;
        authenticated-user;
        unauthenticated-user;
        unknown-user;
      }
      to-zone {
        [zone-name];
        any;
      }
    }
    scheduler-name scheduler-name;
    then {
      count {
        alarm {
          per-minute-threshold number;
          per-second-threshold number;
        }
      }
      deny;
      log {
        session-close;
        session-init;
      }
      permit {
        application-services {
          application-firewall {
            rule-set rule-set-name;
          }
          application-traffic-control {
            rule-set rule-set-name;
          }
          gprs-gtp-profile profile-name;
          gprs-sctp-profile profile-name;
          idp;
          idp-policy idp-policy;
```


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```
                redirect-wx | reverse-redirect-wx;
                ssl-proxy {
                    profile-name profile-name;
                }
                uac-policy {
                    captive-portal captive-portal;
                }
                utm-policy policy-name;
            }
            destination-address {
                drop-translated;
                drop-untranslated;
            }
            firewall-authentication {
                pass-through {
                    access-profile profile-name;
                    client-match user-or-group-name;
                    ssl-termination-profile profile-name;
                    web-redirect;
                    web-redirect-to-https;
                }
                web-authentication {
                    client-match user-or-group-name;
                }
            }
            services-offload;
            tcp-options {
                initial-tcp-mss mss-value;
                reverse-tcp-mss mss-value;
                sequence-check-required;
                syn-check-required;
            }
        }
        reject;
    }
  }
}
policy-rematch;
policy-stats {
  system-wide (disable | enable) ;
}
traceoptions {
  file {
    filename;
    files number;
    match regular-expression;
    size maximum-file-size;
    (world-readable | no-world-readable);
  }
  flag flag;
  no-remote-trace;
}
}
```

Hierarchy Level [edit security]

Release Information Statement introduced in Junos OS Release 8.5.
Support for the **services-offload** option added in Junos OS Release 11.4.
Support for the **source-identitiy** option added in Junos OS Release 12.1.
Support for the **description** option added in Junos OS Release 12.1.
Support for the **ssl-termination-profile** and **web-redirect-to-https** options are added starting from Junos OS Release 12.1X44-D10 and Junos OS Release 15.1X49-D40.
Support for the **user-firewall** option added in Junos OS Release 12.1X45-D10.
Support for the **domain** option, and for the **from-zone** and **to-zone** global policy match options, added in Junos OS Release 12.1X47-D10.
Support for the **initial-tcp-mss** and **reverse-tcp-mss** options added in Junos OS Release 12.3X48-D20. Support for the **extensive** option for **policy-rematch** added in Junos OS Release 15.1X49-D20.
Starting in Junos OS Release 18.2R1, an IDP policy is available within unified security policy. The IDP policy access is simplified and made available under the unified policy as one of the policy. When an IDP policy is available within a unified security policy, configuring source or destination address, source and destination-except, from and to zone, or application is not required, because the match happens in the security policy itself.
Starting in Junos OS Release 18.3R1, when an SRX Series device is configured with a unified policies, you can configure multiple IDP policies and set one of those policies as the default IDP policy. If multiple IDP policies are configured for a session and when policy conflict occurs, the device applies the default IDP policy for that session and thus resolves any policy conflicts.

NOTE: **If you have configured two or more IDP policies in a unified security policy, then you must configure the default IDP policy.**

Description Configure network security policies.

Required Privilege Level security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation
- *Security Policies Overview*

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policy (advanced-policy-based-routing)

Syntax

```
policy policy-name {
  match {
    application;
    destination-address;
    destination-address-excluded;
    source-address;
    source-address-excluded;
  }
  then {
    application-services {
      advance-policy-based-routing-profile apbr-profile-name;
    }
  }
}
```

Hierarchy Level

[edit security advanced-policy-based-routing from-zone *name*]

Release Information

Statement introduced in Junos OS Release 18.2R1

Description

Configure advanced policy-based routing (APBR) policies.

You can create APBR policies for a security zone and apply advanced policy-based routing (APBR) profiles on the traffic that matches the policy.

In the APBR policy, you can define source addresses, destination addresses, and applications as match conditions; and after a successful match, the configured APBR profile is applied as an application services for the session.

The routing instance associated with APBR profile includes a static route and next hop configured. The matching traffic arriving at the trust zone is forwarded to a specific device or interface as specified by the next-hop IP address.

NOTE: **When using specific address or address set in the APBR policy rule, we recommend to use the global address book. Because, zone specific rules might not be applicable for destination address, as the destination zone is not known at time of policy evaluation.**

Options

policy *policy-name*—Specify the name of the APBR policy.

description—Specify descriptive text for the APBR policy.

match—Specify an APBR policy match-criteria.

source-address—Define the source address as the matching criteria.

destination-address—Define the destination address as the matching criteria.

application—Name of the predefined or custom application or application set used as match criteria.

destination-address-excluded—Exclude destination addresses.

source-address-excluded—Exclude source addresses.

then—Specify the policy action to be performed when packets match the defined criteria.

application-services—Enable application services within a security policy. the following application services is supported:

- advance-policy-based-routing-profile *apbr-profile-name*—Specify the advanced policy-based routing (APBR) profile.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234
- *Firewall User Authentication Overview*

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policy (Security Policies)

Syntax

```
policy policy-name {
  description description;
  match {
    application {
      [application];
      any;
      junos-twamp;
    }
    destination-address {
      [address];
      any;
      any-ipv4;
      any-ipv6;
    }
    source-address {
      [address];
      any;
      any-ipv4;
      any-ipv6;
    }
    source-identity {
      [role-name];
      any;
      authenticated-user;
      unauthenticated-user;
      unknown-user;
    }
  }
  scheduler-name scheduler-name;
  then {
    count {
      alarm {
        per-minute-threshold number;
        per-second-threshold number;
      }
    }
    deny;
    log {
      session-close;
      session-init;
    }
    permit {
      application-services {
        application-firewall {
          rule-set rule-set-name;
        }
        application-traffic-control {
          rule-set rule-set-name;
        }
        gprs-gtp-profile profile-name;
        gprs-sctp-profile profile-name;
```

```
            idp;
            redirect-wx | reverse-redirect-wx;
            ssl-proxy {
                profile-name profile-name;
            }
            uac-policy {
                captive-portal captive-portal;
            }
            utm-policy policy-name;
        }
        destination-address {
            drop-translated;
            drop-untranslated;
        }
        firewall-authentication {
            pass-through {
                access-profile profile-name;
                client-match user-or-group-name;
                web-redirect;
            }
            user-firewall {
                access-profile profile-name;
                domain domain-name
                ssl-termination-profile profile-name;
            }
            web-authentication {
                client-match user-or-group-name;
            }
        }
        services-offload;
        tcp-options {
            initial-tcp-mss mss-value;
            reverse-tcp-mss mss-value;
            sequence-check-required;
            syn-check-required;
        }
        tunnel {
            ipsec-group-vpn group-vpn;
            ipsec-vpn vpn-name;
            pair-policy pair-policy;
        }
    }
    reject;
  }
}
```

Hierarchy Level

```
[edit security policies from-zone zone-name to-zone zone-name]
```


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Release Information

Statement introduced in Junos OS Release 8.5. The **services-offload** option added in Junos OS Release 11.4. Statement updated with the **source-identity** option and the **description** option added in Junos OS Release 12.1. Support for the **user-firewall** option added in Junos OS Release 12.1X45-D10. Support for the **initial-tcp-mss** and **reverse-tcp-mss** options added in Junos OS Release 12.3X48-D20.
The **junos-twamp** application is introduced in Junos OS Release 18.2R1.

Description

Define a security policy.

Options

policy-name—Name of the security policy.

—

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234
- *Security Policies Overview*

port-range (Application Identification)

Syntax

```
port-range {
   tcp [port];
   udp [port];
}
```

Hierarchy Level

[edit services application-identification application *application-name* address-mapping *address-name* filter]

Release Information

Statement introduced in Junos OS Release 15.1X49-D40.

Description

Specify a port to match a TCP or UDP destination port for Layer 3 and Layer 4 address-based custom applications.

.

Layer 3 and Layer 4 address-based custom applications, you can match the IP address and port range to destination IP address and port. When both IP address and port are configured, both should match destination tuples (IP address and port range) of the packet. The format for numeric port ranges is in the format *minimum-value–maximum-value*.

Options

- **tcp [*port*]**—Define the TCP port range for the application.
- **udp [*port*]**—Define the UDP port range for the application.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Understanding Junos OS Application Identification Custom Application Signatures on page 64

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preferred-ciphers

Syntax

```
preferred-ciphers (custom | medium | strong | weak);
```

Hierarchy Level

```
[edit services ssl proxy profile profile-name ]
[edit services ssl termination profile profile-name ]
[edit services ssl initiation profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 12.1X44-D10.

Description

Select preferred ciphers. Preferred ciphers allow you to define an SSL cipher that can be used with acceptable key strength. Ciphers are divided in three categories depending on their key strength: strong, medium, or weak.

Custom ciphers allow you to define your own cipher list. If you do not want to use one of the three categories, you can select ciphers from each of the categories to form a custom cipher set. To configure custom ciphers, you must set **preferred-ciphers** to **custom**.

Options

- **custom**—Configure custom cipher suite and order of preference.
- **medium**—Use ciphers with key strength of 128 bits or greater.
- **strong**—Use ciphers with key strength of 168 bits or greater.
- **weak**—Use ciphers with key strength of 40 bits or greater.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- *Firewall User Authentication Overview*
- SSL Proxy Overview on page 221

profile (Application Firewall)

Syntax

```
profile profile-name {
  block-message {
    type {
      custom-redirect-url {
        content content;
      }
      custom-text {
        content content;
      }
    }
  }
}
```

Hierarchy Level

[edit security application-firewall]

Release Information

Statement introduced in Junos OS Release 12.1X45-D10.

Description

Define the profile of the response to be issued when an application firewall rule set blocks HTTP or HTTPS traffic with a **deny** or **reject** action.

Although drop and reject actions are logged, application firewall does not notify users when either action is taken. To provide an explanation for the action or to redirect the users to an informative webpage, you can use the **block-message** option with the reject or deny action in an application firewall rule.

You can customize the redirect action by including additional text on the splash screen or by specifying a URL to which the user is redirected. To customize the block message, define the **type** and **content** in a block message profile defined in the rule set.

Starting in Junos OS Release 18.2R1, the application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and an opportunity to bring your configuration into compliance with the new configuration.

Options

name—Profile name.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Application Firewall Overview on page 85

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profile (icap-redirect)

Syntax

```
profile name {
  fallback-option {
    connectivity (block | log-permit | permit);
    default-action (block | log-permit | permit);
    timeout (block | log-permit | permit);
  }
  http {
    redirect-request redirect-request;
    redirect-response redirect-response;
  }
  server name {
    authorization {
      authorization-type authorization-type;
      credentials (ascii ascii | base64 base64);
    }
    host host;
    port port;
    reqmod-uri reqmod-uri;
    respmod-uri respmod-uri;
    routing-instance ri-name;
    sockets sockets;
    tls-profile tls-profile;
  }
  timeout timeout;
}
```

Hierarchy Level

[edit services]

Release Information

Statement introduced in Junos OS Release 18.1 R1.

Description

Configure the ICAP redirect profile.

The ICAP server profile allows the ICAP server to process request messages, response messages, fallback options, and so on, for the permitted traffic.

When you configure an ICAP redirect service on SRX Series devices, you must configure the ICAP redirect profile. The ICAP redirect profile defines the settings for ICAP server to process request messages, response messages, fallback options incase of a timeout, connectivity issues, too many requests, or other conditions.

This profile is applied to a security policy as an application service when the traffic is permitted by the security policy.

Options

profile *name*—ICAP redirect profile name.

fallback-option—Fallback options to specify the actions the device applies if the ICAP server is unavailable.

http—Redirect request and redirect response for HTTP traffic.

Values:

- redirect-request—Enable the redirect service on HTTP request
- redirect-response—Enable the redirect service on HTTP response

timeout—Server response timeout in milliseconds. Timeout is the interval after which the server is considered inactive if there is no response from the server. A new incoming requests can bypass inactive status server.

Default: 500

Range: 100 through 50000

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring ICAP Redirect Service on SRX Devices on page 274

profile (Rule Sets)

Syntax

```
profile profile-name;
```

Hierarchy Level

```
[edit security application-firewall rule-sets rule-set-name]
```

Release Information

Statement introduced in Junos OS Release 12.1X45-D10.

Description

Specifies the profile of the block message to be used for any deny or reject action in the rule set that specifies the **block-message** option.

The block-message option enables you to provide an explanation for the action or to redirect the client to an informative webpage. You can configure the block-message in **set security application-firewall profile** hierarchy.

Options

profile-name—Name of the block-message profile to be used for this rule set.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Application Firewall Overview on page 85

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profile (Services SSL Proxy)

Syntax

```
profile name {
  ( root-ca root-ca | server-certificate [ server-certificate ... ]);
  actions {
    crl {
      disable disable;
      if-not-present (allow | drop);
      ignore-hold-instruction-code ignore-hold-instruction-code;
    }
    disable-session-resumption disable-session-resumption;
    ignore-server-auth-failure ignore-server-auth-failure;
    log {
      all all;
      errors errors;
      info info;
      sessions-allowed sessions-allowed;
      sessions-dropped sessions-dropped;
      sessions-ignored sessions-ignored;
      sessions-whitelisted sessions-whitelisted;
      warning warning;
    }
    renegotiation (allow | allow-secure | drop);
  }
  custom-ciphers (ecdhe-rsa-with-3des-ede-cbc-sha | ecdhe-rsa-with-aes-128-cbc-sha |
    ecdhe-rsa-with-aes-128-cbc-sha256 | ecdhe-rsa-with-aes-128-gcm-sha256 |
    ecdhe-rsa-with-aes-256-cbc-sha | ecdhe-rsa-with-aes-256-cbc-sha384 |
    ecdhe-rsa-with-aes-256-gcm-sha384 | rsa-export-with-des40-cbc-sha |
    rsa-export-with-rc4-40-md5 | rsa-export1024-with-des-cbc-sha |
    rsa-export1024-with-rc4-56-md5 | rsa-export1024-with-rc4-56-sha |
    rsa-with-3des-ede-cbc-sha | rsa-with-aes-128-cbc-sha | rsa-with-aes-128-cbc-sha256
    | rsa-with-aes-128-gcm-sha256 | rsa-with-aes-256-cbc-sha |
    rsa-with-aes-256-cbc-sha256 | rsa-with-aes-256-gcm-sha384 | rsa-with-des-cbc-sha
    | rsa-with-null-md5 | rsa-with-null-sha | rsa-with-rc4-128-md5 | rsa-with-rc4-128-sha);
  enable-flow-tracing enable-flow-tracing;
  mirror-decrypt-traffic {
    interface interface-name;
    only-after-secruity-policies-enforcement;
    destination-mac-address mac-address;
  }
  preferred-ciphers (custom | medium | strong | weak);
  trusted-ca ;
  whitelist [ whitelist ... ];
  whitelist-url-categories [ whitelist-url-categories ... ];
}
```

Hierarchy Level

[edit services ssl proxy]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10. The **crl** statement is supported from 15.1X49-D30.

Description Specify the SSL server profile. An SSL proxy profile defines SSL behavior for the SRX Series device.

The SSL proxy profile will be applied to the security policy as application services.

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Options ***profile-name***—Profile identifier.

root-ca—Root certificate for interdicting server certificates in proxy mode.

server-certificate—Local certificate identifier.

custom-ciphers—Custom cipher list.

Values:

- **ecdhe-rsa-with-3des-ede-cbc-sha**—ECDHE/RSA, 3DES EDE/CBC, SHA hash
- **ecdhe-rsa-with-aes-128-cbc-sha**—ECDHE/RSA, 128-bit AES/CBC, SHA hash
- **ecdhe-rsa-with-aes-128-cbc-sha256**—ECDHE/RSA, 128-bit AES/CBC, SHA256 hash
- **ecdhe-rsa-with-aes-128-gcm-sha256**—ECDHE/RSA, 128-bit AES/GCM, SHA256 hash
- **ecdhe-rsa-with-aes-256-cbc-sha**—ECDHE/RSA, 256-bit AES/CBC, SHA hash
- **ecdhe-rsa-with-aes-256-cbc-sha384**—ECDHE/RSA, 256-bit AES/CBC, SHA384 hash
- **ecdhe-rsa-with-aes-256-gcm-sha384**—ECDHE/RSA, 256-bit AES/gcm, SHA384 hash
- **rsa-export-with-des40-cbc-sha**—RSA-export, 40-bit DES/CBC, SHA hash
- **rsa-export-with-rc4-40-md5**—RSA-export, 40-bit RC4, MD5 hash
- **rsa-export1024-with-des-cbc-sha**—RSA 1024-bit export, DES/CBC, SHA hash
- **rsa-export1024-with-rc4-56-md5**—RSA 1024-bit export, 56 bit RC4, MD5 hash
- **rsa-export1024-with-rc4-56-sha**—RSA 1024-bit export, 56 bit RC4, SHA hash
- **rsa-with-3des-ede-cbc-sha**—RSA, 3DES EDE/CBC, SHA hash
- **rsa-with-aes-128-cbc-sha**—RSA, 128-bit AES/CBC, SHA hash
- **rsa-with-aes-128-cbc-sha256**—RSA, 128-bit AES/CBC, SHA256 hash
- **rsa-with-aes-128-gcm-sha256**—RSA, 128-bit AES/gcm, SHA256 hash
- **rsa-with-aes-256-cbc-sha**—RSA, 256-bit AES/CBC, SHA hash
- **rsa-with-aes-256-cbc-sha256**—RSA, 256-bit AES/CBC, SHA256 hash
- **rsa-with-aes-256-gcm-sha384**—RSA, 256-bit AES/gcm, SHA384 hash
- **rsa-with-des-cbc-sha**—RSA, DES CBC, SHA hash
- **rsa-with-null-md5**—RSA, no symmetric cipher, MD5 hash
- **rsa-with-null-sha**—RSA, no symmetric cipher, SHA hash
- **rsa-with-rc4-128-md5**—RSA, 128-bit RC4, MD5 hash
- **rsa-with-rc4-128-sha**—RSA, 128-bit RC4, SHA hash

enable-flow-tracing—Enable flow tracing for the profile.

preferred-ciphers—Select preferred ciphers.

Values:

- **custom**—Configure custom cipher suite and order of preference.
- **medium**—Use ciphers with key strength of 128-bits or greater.
- **strong**—Use ciphers with key strength of 168-bits or greater.
- **weak**—Use ciphers with key strength of 40-bits or greater.

trusted-ca—List of trusted certificate authority profiles.

whitelist—Addresses exempted from SSL proxy.

whitelist-url-categories—URL categories exempted from SSL proxy.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- SSL Proxy Overview on page 221
- Configuring SSL Forward Proxy on page 234
- Enabling Debugging and Tracing for SSL Proxy on page 253

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profile (Services Proxy)

Syntax

```
profile name {
  protocol {
    http {
      host host;
      port port;
    }
  }
}
```

Hierarchy Level

[edit services proxy]

Release Information

Statement introduced in Junos OS Release 18.3R1.

Description

Define the proxy profile settings for application signature package download.

You can download the application signature package hosted on an external server, using a proxy sever. To use the proxy server for downloading, you must configure a profile with host and port details of the proxy server, and apply the proxy profile in the **set services application-identification download** command.

This configuration enables you to download the signature package when you have already deployed a web proxy on your device as part of your overall security solution.

Options

name—Proxy profile name.

protocol—Protocol type for the profile. Support is available for only HTTP connections.

host—IP address of the proxy server.

port—Port number used by the proxy server.

Required Privilege Level

system

Related Documentation

- Predefined Application Signatures for Application Identification on page 38

profile (Services Proxy)

Syntax

```
profile name {
  protocol {
    http {
      host host;
      port port;
    }
  }
}
```

Hierarchy Level

[edit services proxy]

Release Information

Statement introduced in Junos OS Release 18.3R1.

Description

Define the proxy profile settings for application signature package download.

You can download the application signature package hosted on an external server, using a proxy sever. To use the proxy server for downloading, you must configure a profile with host and port details of the proxy server, and apply the proxy profile in the **set services application-identification download** command.

This configuration enables you to download the signature package when you have already deployed a web proxy on your device as part of your overall security solution.

Options

name—Proxy profile name.

protocol—Protocol type for the profile. Support is available for only HTTP connections.

host—IP address of the proxy server.

port—Port number used by the proxy server.

Required Privilege Level

system

Related Documentation

- *Downloading Junos OS Application Signature Package From Proxy Server*

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profile (SSL Initiation)

Syntax

```
profile name {
  actions {
    crl {
      disable disable;
      if-not-present (allow | drop);
      ignore-hold-instruction-code ignore-hold-instruction-code;
    }
    ignore-server-auth-failure ignore-server-auth-failure;
  }
  client-certificate client-certificate;
  custom-ciphers (ecdhe-rsa-with-3des-ede-cbc-sha | ecdhe-rsa-with-aes-128-cbc-sha |
    ecdhe-rsa-with-aes-128-cbc-sha256 | ecdhe-rsa-with-aes-128-gcm-sha256 |
    ecdhe-rsa-with-aes-256-cbc-sha | ecdhe-rsa-with-aes-256-cbc-sha384 |
    ecdhe-rsa-with-aes-256-gcm-sha384 | rsa-export-with-des40-cbc-sha |
    rsa-export-with-rc4-40-md5 | rsa-export1024-with-des-cbc-sha |
    rsa-export1024-with-rc4-56-md5 | rsa-export1024-with-rc4-56-sha |
    rsa-with-3des-ede-cbc-sha | rsa-with-aes-128-cbc-sha | rsa-with-aes-128-cbc-sha256
    | rsa-with-aes-128-gcm-sha256 | rsa-with-aes-256-cbc-sha |
    rsa-with-aes-256-cbc-sha256 | rsa-with-aes-256-gcm-sha384 | rsa-with-des-cbc-sha
    | rsa-with-null-md5 | rsa-with-null-sha | rsa-with-rc4-128-md5 | rsa-with-rc4-128-sha);
  enable-flow-tracing enable-flow-tracing;
  enable-session-cache enable-session-cache;
  preferred-ciphers (custom | medium | strong | weak);
  protocol-version (all | ssl3 | tls1 | tls11 | tls12);
  trusted-ca ;
}
```

Hierarchy Level

```
[edit services ssl initiation]
```

Release Information

Statement introduced in Junos OS Release 12.1X44-D10. The **protocol-version** statement is updated to include **tls11** and **tls12** from Junos OS Release 15.1X49-D30.

Description

Specify the name of the profile for SSL initiation support service.

The SRX Series device, acting as an SSL proxy client, initiates and maintains SSL sessions between itself and an SSL server. SRX device receives un-encrypted data from an HTTP client, and encrypts and transmits the data as ciphertext to the SSL server.

Options

actions—Traffic related actions

crl—Specify certificate revocation actions.

client-certificate—Local certificate.

custom-ciphers—Configure custom cipher, which SSH server can use to perform encryption and decryption functions.

enable-flow-tracing—Enable flow tracing for the profile.

enable-session-cache—Enable SSL session cache.

ignore-server-auth-failure—Ignore server authentication completely. In this case, SSL forward proxy ignores errors encountered during the server certificate verification process (such as CA signature verification failure, self-signed certificates, and certificate expiry).

preferred-ciphers—Select preferred ciphers.

protocol-version—Specify the accepted SSL protocol version.

trusted-ca—Specify the list of trusted certificate authority profiles

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234

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profile (SSL Termination)

Syntax

```
profile name {
  custom-ciphers (ecdhe-rsa-with-3des-ede-cbc-sha | ecdhe-rsa-with-aes-128-cbc-sha |
    ecdhe-rsa-with-aes-128-cbc-sha256 | ecdhe-rsa-with-aes-128-gcm-sha256 |
    ecdhe-rsa-with-aes-256-cbc-sha | ecdhe-rsa-with-aes-256-cbc-sha384 |
    ecdhe-rsa-with-aes-256-gcm-sha384 | rsa-export-with-des40-cbc-sha |
    rsa-export-with-rc4-40-md5 | rsa-export1024-with-des-cbc-sha |
    rsa-export1024-with-rc4-56-md5 | rsa-export1024-with-rc4-56-sha |
    rsa-with-3des-ede-cbc-sha | rsa-with-aes-128-cbc-sha | rsa-with-aes-128-cbc-sha256
    | rsa-with-aes-128-gcm-sha256 | rsa-with-aes-256-cbc-sha |
    rsa-with-aes-256-cbc-sha256 | rsa-with-aes-256-gcm-sha384 | rsa-with-des-cbc-sha
    | rsa-with-null-md5 | rsa-with-null-sha | rsa-with-rc4-128-md5 | rsa-with-rc4-128-sha);
  enable-flow-tracing enable-flow-tracing;
  enable-session-cache enable-session-cache;
  preferred-ciphers (custom | medium | strong | weak);
  protocol-version (all | ssl3 | tls1 | tls11 | tls12);
  server-certificate server-certificate;
  trusted-ca ;
}
```

Hierarchy Level

```
[edit services ssl termination]
```

Release Information

Statement introduced in Junos OS Release 12.1X44-D10.The **protocol-version** statement is updated to include **tls11** and **tls12** from Junos OS Release 15.1X49-D30.

Description

Specify the name of the profile for SSL termination support service.

The SRX Series device, acting as an SSL proxy server, terminates the SSL session from the client and then establishing a new SSL connection to the server. The SRX Series device decrypts the data and then sends the data as un-encrypted request to the other servers (HTTP server).

The SSL proxy profile will be applied to the security policy as application services.

The remaining statements are explained separately. See CLI Explorer.

Options

custom-ciphers—Configure custom cipher, which SSH server can use to perform encryption and decryption functions.

enable-flow-tracing—Enable flow tracing for the profile

enable-session-cache—Enable SSL session cache.

preferred-ciphers—Select preferred ciphers

protocol-version—Specify the accepted SSL protocol version.

server-certificate—Local certificate identifier

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trusted-ca—List of trusted certificate authority profiles

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234
- *Firewall User Authentication Overview*

protocol-version

Syntax

```
protocol-version (all | tls1 | tls11 | tls12);
```

Hierarchy Level

```
[edit services ssl termination profile profile-name]
[edit services ssl initiation profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 12.1X44-D10. The **tls11** and **tls12** options are introduced in 15.1X49-D30.

Description

Specify the accepted SSL protocol version.

You can specify the SSL/TLS protocol version the SRX Series device uses to negotiate in SSL connections.

Options

- **all**—Accept all versions of TLS.
- **TLS version 1.0**—Accept TLS version 1.0. It provides secure communication over networks by providing privacy and data integrity between communicating applications
- **TLS version 1.1**—Accept TLS version 1.1. This enhanced version of TLS provides protection against cipher-block chaining (CBC) attacks.
- **TLS version 1.2** —Accept TLS version 1.2. This enhanced version of TLS provides improved flexibility for negotiation of cryptographic algorithms.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- *Firewall User Authentication Overview*
- SSL Proxy Overview on page 221

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proxy (Services)

Syntax

```
proxy {
  global-config {
    session-cache-timeout seconds;
  }
  profile profile-name {
    actions {
      crl {
        disable;
        if-not-present (allow | drop);
        ignore-hold-instruction-code;
      }
      disable-session-resumption;
      ignore-server-auth-failure;
      logs {
        all;
        errors;
        info;
        sessions-allowed;
        sessions-dropped;
        sessions-ignored;
        sessions-whitelisted;
        warning;
      }
      renegotiation {
        (allow | allow-secure | drop);
      }
    }
    custom-ciphers [cipher];
    enable-flow-tracing;
    preferred-ciphers (custom | medium | strong | weak);
    root-ca root-certificate;
    trusted-ca (all | [ca-profile] );
    whitelist [global-address-book-addresses];
  }
}
```

Hierarchy Level

[edit services ssl]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10. The **crl** statement is supported from 15.1X49-D30.

Description

Specify the configuration for Secure Socket Layer (SSL) proxy support service.

Options

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- SSL Proxy Overview on page 221
- Configuring SSL Forward Proxy on page 234
- Enabling Debugging and Tracing for SSL Proxy on page 253

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rate-limiters

Syntax

```
rate-limiters {
  rate-limiter-name {
    bandwidth-limit value-in-kbps;
    burst-size-limit value-in-bytes;
  }
}
```

Hierarchy Level

```
[edit class-of-service application-traffic-control]
```

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Share the available bandwidth and burst size of a device's PICs by defining rate limiter profiles and applying them in AppQoS rules.

Options

- ***rate-limiter-name***—Name of the rate limiter. It is applied in AppQoS rules to share device resources based on quality-of-service requirements.

  The combination of rate limiting parameters, namely bandwidth- limit and burst-size-limit rate limit, make up the rate limiter profile. A maximum of 16 profiles are allowed per device. The same profile can be used by multiple rate limiters. For example, a profile with a bandwidth-limit of 200 Kbps and a burst-limit of 130,000 bytes, could be used in several rate limiters.

  A maximum of 1000 rate limiters can be created. Rate limiters are defined for the device, and are assigned in rules in a rule set. A single rate limiter can be used multiple times within the same rule set. However, the rate limiter cannot be used in another rule set.

- **bandwidth-limit *value-in-Kbps***—Maximum number of kilobits to be transmitted per second for this rate limiter. Up to 2 GB of bandwidth can be provisioned among multiple rate limiters to share the resource proportionally.

- **burst-size-limit *value-in-bytes***—Maximum number of bytes to be transferred in a single burst or time-slice. This limit ensures that a high-priority transmission does not keep a lower priority transmission from transmitting.

NOTE: **The number of bandwidth-limit and burst-size-limit combinations cannot exceed 16.**

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Application Quality of Service on page 124

renegotiation (Services)

Syntax

```
renegotiation (allow | allow-secure | drop);
```

Hierarchy Level

[edit services ssl proxy profile *profile-name* actions]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10.

Description

Specify the renegotiation options.

Options

- **allow**—Allow secure and nonsecure renegotiation.
- **allow-secure**—Allow secure negotiation only.
- **drop**—Drop session on renegotiation request.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234

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root-ca (Services)

Syntax

```
root-ca root-certificate;
```

Hierarchy Level

```
[edit services ssl proxy profile profile-name]
[edit services ssl termination profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 12.1X44-D10.

Description

Root certificate for interdicting server certificates in proxy mode. This statement is supported on the SRX1500, SRX5400, SRX5600, and SRX5800 devices and vSRX.

Options

root-ca-name—Specify root certificate for interdicting server certificates in proxy mode.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234
- *Firewall User Authentication Overview*

routing-instance (Advanced Policy-Based Routing)

Syntax

```
routing-instance name ;
```

Hierarchy Level

[edit security advance-policy-based-routing profile *profile-name* rule *rule-name* then]

Description

Specify a specific routing instance to which the device sends the matched packets.

When traffic arrives at the specified zone or interface, it is matched by the advanced policy-based routing (APBR) profile (application profile). The application profile matches applications and application groups and if the matching rule is found, the packets are routed to the routing instance that sends the traffic to a different interface as specified in the next-hop IP address.

The routing instances specify the routing table and the destination to which a packet is forwarded. The following types of routing instances are supported:

- Forwarding—Use this routing instance type for filter-based forwarding applications.
- Virtual router—Similar to the forwarding instance type, but used for non-VPN-related applications.

Options

name—Specify the name of the routing instance.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Advanced Policy-Based Routing for Application-Aware Traffic Management Solution on page 146
- Understanding Advanced Policy-Based Routing on page 139

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rule (Advanced Policy-Based Routing)

Syntax

```
rule rule-name {
  match {
    category (juniper-enhanced-category | custom-category);
    dynamic-application [system-application];
    dynamic-application-group [system-application-group];
  }
  then {
    routing-instance name ;
  }
}
```

Hierarchy Level

[edit security advance-policy-based-routing profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 15.1X49-D60. The option **category** is introduced in Junos OS Release 18.3R1.

Description

Configure rules for the advanced policy-based routing (APBR) profile (application profile). Associate the rule with one or more than one dynamic applications or application groups or URL categories as follows:

- For matching the dynamic applications, APBR consults the application identification (AppID) and application system cache (ASC) to get the application type. If the application matches any of the application or application groups of a rule in a profile, the application profile rule is considered to be a match, and the traffic is redirected to the defined routing instance for the route lookup.
- For matching the URL categories, APBR leverages category identification from the Enhanced Web Filtering (EWF) and local Web filtering results obtained from the unified threat management (UTM) module. Web filtering classifies websites into categories. If the traffic matches the URL categories specified in the rule of the APBR profile, it is redirected to the defined routing instance.

Options

match—Define a match criteria for matching the traffic in APBR profile rule.

category (*juniper-enhanced-category* | *custom-category*)—Define the category type as the Juniper Enhanced Web Filtering (EWF) or a custom category if you are using local Web filtering.

juniper-enhanced-category—Define URL categories such as Enhanced_Social_Web_Facebook, Enhanced_Social_Web_Linkedin, Enhanced_Social_Web_Twitter or Enhanced_Social_Web_Youtube as match criteria in APBR profile rule.

custom-category—Define either custom URL or IP address of a site as match criteria in APBR profile rule.

dynamic-application [*system-application*]—Specify the dynamic application names for match criteria in APBR rule.

dynamic-application-group [*system-application-group*]—Dynamic application groups for match criteria in APBR rule.

then—Define the action for the match condition by specifying the routing instance name.

routing-instance *name*—Name of the routing instance for redirecting traffic.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Advanced Policy-Based Routing for Application-Aware Traffic Management Solution on page 146
- Understanding Advanced Policy-Based Routing on page 139

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rule (Application Firewall)

Syntax

```
rule rule-name {
  match {
    dynamic-application [system-application];
    dynamic-application-groups [system-application-group];
    ssl-encryption (any | yes | no);
  }
  then {
    deny {
      block-message block-message;
    }
    permit permit;
    reject {
      block-message block-message;
    }
  }
}
```

Hierarchy Level

```
[edit security application-firewall rule-sets name ]
```

Release Information

Statement introduced in Junos OS Release 11.1. Statement updated in Junos OS Release 12.1X44-D10 to include the **ssl-encryption** and **reject** options. The **block-message** options added in Junos OS Release 12.1X45-D10.

Description

Specify rules for application firewall.

You need to create rules to permit, reject, or deny traffic for dynamic applications to configure application firewall rule sets within the security policy. The application firewall support in the policies provides additional security control for dynamic applications.

Starting in Junos OS Release 18.2R1 application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and a chance to bring your configuration into compliance with the new configuration.

Options

match—Specify security rule match-criteria

dynamic-application—Select dynamic applications as match criteria.

dynamic-application-group—Select dynamic applications group as match criteria.

ssl-encryption—Select SSL encryption rules as match criteria.

Values:

- **any**—Encrypted and non-encrypted rule.
- **no**—Non-encrypted rule.

- **yes**—Encrypted rule.

then—Specify the action to be performed when traffic matches the associated match criteria.

deny—Block the traffic at the firewall. The device drops the packet. By default, no message is returned to the sender.

block-message ***block-message***—(Optional) In application firewall rules, provide information to the user regarding blocked traffic. Depending on the content of the **profile** option for this rule set, including the **block-message** option displays a default message or customized message, or redirects the user for denied HTTP or HTTPS traffic. All other traffic is dropped silently.

reject—Block the traffic at the firewall. For TCP traffic, by default the device drops the packet and returns a TCP reset (RST) message to the source host. For UDP and other protocol traffic, by default the device drops the packet and returns an ICMP "destination unreachable, port unreachable" message to both the client and the server.

block-message ***block-message***—(Optional) In application firewall rules, provide information to the user regarding blocked traffic. Depending on the content of the **profile** option for this rule set, including the **block-message** option displays a default message or customized message, or redirects the user for denied HTTP or HTTPS traffic. All other traffic is dropped silently.

permit—Permit traffic at the firewall.

Required Privilege Level

security

Related Documentation

- Application Firewall Overview on page 85
- **rule-sets (Security Application Firewall) on page 409**
- **application-firewall (Application Services) on page 305**

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metrics-profile

Syntax

```
metrics-profile metrics-profile-name {
  sla-threshold {
    delay-round-trip {
      delay-value;
    }
    jitter {
      jitter-value;
    }
    jitter-type {
      egress-jitter ;
      ingress-jitter;
      two-way-jitter;
    }
    match {
      [all | any] ;
    }
    packet-loss {
      loss-value;
    }
  }
```

Hierarchy Level [edit security advance-policy-based-routing]

Release Information Statement introduced in Junos OS Release 18.2R1.

Description Create a set of metrics, which can be used by AppQoE to evaluate the SLA of the link.

A metrics profile defines the performance metrics for delay round trip, one-way jitter or two-way jitter, and packet loss.

To ensure compliance with the SLA, metrics are required to measure and monitor the network performance. This measurement capability provides a greater visibility into the performance characteristics of the links and helps in network performance evaluation.

Options ***metrics-profile-name***—Metrics profile name.

delay-round-trip *delay-value*—Sets the total round-trip time (in microseconds), from the device to the remote server, that triggers a probe failure.

jitter *jitter-value*—Total jitter (in microseconds) for a test, which, if exceeded, triggers a probe failure

jitter-type—Jitter type.

Values: Ingress jitter, egress jitter, and two-way jitter.

Default: Two-way jitter

match—Matching SLA metrics.

all—The path selection mechanism attempts to find a path that satisfies all the metrics. If no such path exists, then the next best path (based on number of metrics satisfied) is used. If there are more than one path that satisfy the metric, a random path among the available paths will be selected. Also, SLA violation will be detected and raised even if any one of the metrics is violated.

This is the default match option.

any—Path selection mechanism attempts to find a path which satisfies the maximum number of metrics. For example, if there is a path available that conforms to more than one metric, then the path is chosen over another path which satisfies less number of metrics. In this case, SLA violation is detected only when none of the metrics meets the requirement. If either one of the metric is meets the requirement, then violation is not triggered.

packet-loss ***loss-value***—Percentage of number of packets that must be lost successively to trigger a probe failure.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Application Quality of Experience on page 173
- Advanced Policy-Based Routing on page 139

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rule-sets (CoS AppQoS)

Syntax

```
rule-sets {
  rule-set-name {
    rule rule-name {
      match {
        application application-name;
        application-any;
        application-group application-group-name;
        application-known;
        application-unknown;
      }
      then {
        dscp-code-point dscp-value ;
        forwarding-class forwarding-class-name;
        log;
        loss-priority [ high | medium-high | medium-low | low ];
        rate-limit {
          loss-priority-high;
          client-to-server rate-limiter-name;
          server-to-client rate-limiter-name;
        }
      }
    }
  }
}
```

Hierarchy Level

[edit class-of-service application-traffic-control]

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Defines AppQoS rule sets and the rules that establish priorities based on quality-of-service requirements for the associated applications. AppQoS rules can be included in policy statements to implement application-aware quality of service control.

Options

- ***rule-set-name***—Name used to refer to a collection of AppQoS rules.
- **rule *rule-name***—Name applied to the match criteria and resulting actions that control the quality-of-service provided to any matching applications.
- **application *application-name***—Name of the application to be used as match criteria for the rule.
- **application-any** —Any application encountering this rule. Note that when you use this specification, all application matching ends. Any application rule following this one will never be encountered.
- **application-group *application-group-name***—Group of applications to be used as match criteria for the rule. Both applications and application groups can be match criteria for a single rule.

- **application-known**—Match criteria specifying any session that is identified, but its corresponding application is not specified.
- **application-unknown**—Match criteria specifying any session that is not identified.
- **forwarding-class** ***forwarding-class-name***—The AppQoS class with which matching applications will be marked. This field identifies the rewriter that has marked the DSCP value . Therefore, the AppQoS forwarding class must be different from those used by IDP or firewall filters. With this class specified, firewall filter class will not overwrite the existing DSCP value.
- **dscp-code-point**—DSCP alias or bit map with which matching applications will be marked to establish the output queue. This value can be marked by rewriters from IDP, AppQoS, or a firewall filter. The forwarding-class value identifies which rewriter has re-marked the packet with the current DSCP value. If a packet triggers all three rewriters, IDP takes precedence over AppQoS, which takes precedence over a firewall filter.
- **loss-priority**—Loss priority with which matching applications will be marked. This value is used to determine the likelihood that a packet would be dropped when encountering congestion. A high loss priority means that there is an 80% chance of packet loss in congestion. Possible values are high, medium-high, medium-low and low.
- **rate-limit**—Rate limiters to be associated with client-to-server and with server-to-client traffic for this application. The rate limiter profile defines maximum speed and volume limits for matching applications.
- **log**—AppQoS event logging.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Application Quality of Service on page 124

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rule-sets (Security Application Firewall)

Syntax

```
rule-sets rule-set-name {
  default-rule {
    (deny [block-message] | permit | reject [block-message]);
  }
  profile profile-name;
  rule rule-name {
    match {
      dynamic-application [system-application];
      dynamic-application-groups [system-application-group];
      ssl-encryption (any | yes | no);
    }
    then {
      deny {
        block-message block-message;
      }
      permit permit;
      reject {
        block-message block-message;
      }
    }
  }
}
```

Hierarchy Level

```
[edit security application-firewall]
```

Release Information

Statement introduced in Junos OS Release 11.1. Statement updated in Junos OS Release 12.1X44-D10 to include the **ssl-encryption** and **reject** options. The **block-message** options added in Junos OS Release 12.1X45-D10.

Description

Configure the set of rules for the application firewall.

The application firewall is defined by a collection of rule sets. These rule sets can be defined independently and shared across network security policies. A rule set defines the rules that specify match criteria, including dynamic applications, and the action to be taken for matching traffic.

To implement an application firewall, you need to:

- Define one or more application firewall rule sets.
- Create rules for each rule set that permit, reject, or deny traffic based on the application ID.
- Configure a security policy to invoke the application firewall service and specify the rule set to be applied to permitted traffic.

The application firewall support in the policies provides additional security control for dynamic applications.

Starting in Junos OS Release 18.2R1, the application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and an opportunity to bring your configuration into compliance with the new configuration.

Options

rule-set-name—Name of the rule set.

profile *profile-name*—Profile for block message.

default-rule—Specify default rule.

rule—Specify security rule match-criteria

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring an Application Group for Application Firewall on page 96

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security-zone

Syntax

```
security-zone zone-name {
  address-book {
    address address-name {
      ip-prefix {
        description text;
      }
      description text;
      dns-name domain-name {
        ipv4-only;
        ipv6-only;
      }
      range-address lower-limit to upper-limit;
      wildcard-address ipv4-address/wildcard-mask;
    }
    address-set address-set-name {
      address address-name;
      address-set address-set-name;
      description text;
    }
  }
  advance-policy-based-routing;
  application-tracking;
  description text;
  enable-reverse-reroute;
  host-inbound-traffic {
    protocols protocol-name {
      except;
    }
    system-services service-name {
      except;
    }
  }
  interfaces interface-name {
    host-inbound-traffic {
      protocols protocol-name {
        except;
      }
      system-services service-name {
        except;
      }
    }
  }
  screen screen-name;
  tcp-rst;
}
```

Hierarchy Level

```
[edit security zones]
```

Release Information Statement introduced in Junos OS Release 8.5. Support for wildcard addresses added in Junos OS Release 11.1. The **description** option added in Junos OS Release 12.1.

Description Define a security zone, which allows you to divide the network into different segments and apply different security options to each segment.

Options ***zone-name*** —Name of the security zone.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- *Security Zones Overview*
- Example: Configuring Application Firewall Rule Sets Within a Security Policy on page 92

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server (icap-redirect profile)

Syntax

```
server name {
  authorization {
    authorization-type authorization-type;
    credentials (ascii ascii | base64 base64);
  }
  host host;
  port port;
  reqmod-uri reqmod-uri;
  respmod-uri respmod-uri;
  routing-instance ri-name;
  sockets sockets;
  tls-profile tls-profile;
}
```

Hierarchy Level

```
[edit services icap-redirect profile name]
[edit logical-system logical-system-name services icap-redirect profile name]
```

Release Information

Statement introduced in Junos OS Release 18.1R1.
The logical system option is introduced in Junos OS Release 18.3R1.

Description

Configure the ICAP server details.

When you configure the ICAP redirect service on SRX Series devices, you must configure the ICAP server details. ICAP server configuration allows you to define the settings required to process request messages, response messages, authorization, and so on. You can also specify an SSL profile in the ICAP server configuration that enables you to secure the connection to the ICAP server.

You can configure up to two ICAP servers.

Options

name—ICAP server name.

host—ICAP server hostname or IP address.

port—ICAP server listening port, default port is reached according to the protocol defined.

Default: 1344

Range: 1025 through 65535

route-instance—Virtual router that is used for launching the service.

reqmod-uri—Path to the service that handles Request Modification (REQMOD) requests.

respmod-uri—Path to the service that handles Response Modification (RESPMOD) requests.

sockets—Number of connections to create the ICAP service.

Default: 8

Range: 1 through 64

tls-profile—SSL profile configured to provide a secure connection to the ICAP server.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level system

Related Documentation
- Example: Configuring ICAP Redirect Service on SRX Devices on page 274

server-certificate (Services)

Syntax

```
server-certificate server-certificate;
```

Hierarchy Level

```
[edit services ssl termination profile profile-name]
```

Release Information Statement introduced in Junos OS Release 12.1X44-D10. This statement is supported on the SRX1500, SRX5400, SRX5600, and SRX5800 devices and vSRX.

Description Specify the local certificate identifier.

Options **server-certificate**—Specify the name of the local certificate identifier.

Required Privilege Level services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

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session-update-interval

Syntax

```
session-update-interval session-update-interval;
```

Hierarchy Level

[edit security application-tracking]

Release Information

Statement introduced in Junos OS Release 10.2.

Description

Configure the interval between session update messages for long-lived sessions being monitored by AppTrack. Byte count, packet count, and start and end times are updated and logged when the amount of time between session start or the previous update and the current time exceeds the interval.

Options

session-update-interval—Minutes between updates.

Default: 5

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Application Tracking on page 109

signature

Syntax

```
signature name {
  member name {
    context context;
    direction (any | client-to-server | server-to-client);
    pattern pattern;
  }
  port-range [ port-range ... ];
}
```

Hierarchy Level

[edit services application-identification application *application-name* over *protocol-type*]

Release Information

Statement introduced in Junos OS Release 15.1X49-D40.

Description

Application signature for pattern matching. A unique application signature identifier. Must be a unique name with a maximum length of 63 characters.

You need to define an application signature to match the pattern by defining a unique application signature identifier, application signature member identifier, connection direction of the packets, and set the context to be matched. You also need to specify port range for TCP or UDP.

Options

member—Member name for a custom application signature. Custom signatures can contain multiple members that define attributes for an application. (The supported member name range is m01 through m15.)

port-range—Port range. This option is applicable for TCP-based or UDP-based applications only.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

system

Related Documentation

- Custom Application Signatures for Application Identification on page 63

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size (Services)

Syntax

size *size*;

Hierarchy Level

[edit services ssl traceoptions file *file-name*]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10.

Description

Specify the maximum trace file size. This statement is supported on the SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices and vSRX.

Options

size—Specify the maximum trace file size.

Range: 10,240 to 1,073,741,824.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234
- *Firewall User Authentication Overview*

ssl (Services)

Syntax

```
ssl {
  initiation {
    profile profile-name {
      actions {
        ignore-server-auth-failure;
      }
      client-certificate;
      custom-ciphers [cipher];
      enable-flow-tracing;
      enable-session-cache;
      preferred-ciphers (custom | medium | strong | weak);
      protocol-version (all | tls1 | tls11 | tls12);
      trusted-ca (all | [ca-profile] );
    }
  }
  proxy {
    global-config {
      session-cache-timeout seconds;
    }
    profile profile-name {
      actions {
        crl {
          disable;
          if-not-present (allow | drop);
          ignore-hold-instruction-code;
        }
        disable-session-resumption;
        ignore-server-auth-failure;
        log {
          all;
          errors;
          info;
          sessions-allowed;
          sessions-dropped;
          sessions-ignored;
          sessions-whitelisted;
          warning;
        }
        renegotiation {
          (allow | allow-secure | drop);
        }
      }
      custom-ciphers [cipher];
      enable-flow-tracing;
      preferred-ciphers (custom | medium | strong | weak);
      root-ca root-certificate;
      trusted-ca (all | [ca-profile] );
      whitelist [global-address-book-addresses];
    }
  }
  termination {
```


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```
    profile profile-name {
      custom-ciphers [cipher];
      enable-flow-tracing;
      enable-session-cache;
      preferred-ciphers (custom | medium | strong | weak);
      protocol-version (all | tls1 | tls11 | tls12);
      server-certificate certificate-identifier;
    }
  }
  traceoptions {
    file {
      filename;
      files number;
      match regular-expression;
      (no-world-readable | world-readable);
      size maximum-file-size;
    }
    flag flag;
    level [brief | detail | extensive | verbose];
    no-remote-trace;
  }
}
```

Hierarchy Level

[edit services]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10. The **crl** statement is supported from 15.1X49-D30. The **protocol-version** statement is updated to include **tls11** and **tls12** from Junos OS Release 15.1X49-D30.

Description

Specify the configuration for Secure Socket Layer (SSL) support service. This statement is supported on the SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices and vSRX.

Options

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234
- *Firewall User Authentication Overview*

ssl-encryption

Syntax

```
ssl-encryption (any | no | yes);
```

Hierarchy Level

[edit security application-firewall rule-sets *rule-set-name* rule *rule-name* match]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10.

Description

Distinguishes between encrypted and unencrypted SSL traffic as match criteria for the rule. In application firewall usage, this option lets you specify different actions for encrypted and unencrypted SSL traffic.

Starting in Junos OS Release 18.2R1 application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and a chance to bring your configuration into compliance with the new configuration.

Options

- **any**—Matches both encrypted and unencrypted SSL traffic.
- **no**—Matches unencrypted SSL traffic only.
- **yes**—Matches encrypted SSL traffic only.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234

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ssl-proxy (Application Services)

Syntax

```
ssl-proxy {
   profile-name profile-name
}
```

Hierarchy Level

```
[edit security policies from-zone zone-name to-zone zone-name policy policy-name then
   permit application-services]
```

Release Information

Statement introduced in Junos OS Release 12.1.

Description

Enable SSL proxy and identify the name of the SSL proxy profile to be used. This option is supported on SRX340, SRX345, SRX550M, SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices.

Options

profile-name—SSL proxy profile.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234

statistics (Services)

Syntax

```
statistics {
   interval interval-number;
}
```

Hierarchy Level

[edit services application-identification]

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Specify the interval, in minutes, for statistics collection.

Options

interval *interval-number*—Length of time, in minutes, that application statistics are collected.

Range: 1 through 1440 minutes

Default: 1 minute

NOTE: For SRX Series devices, the maximum number of interval periods for which statistics are stored is 8.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Onbox Application Identification Statistics on page 35

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sla-options

Syntax

```
sla-options {
  local-route-switch {
    [enabled | disabled];
  }
  logging {
    syslog:
  }
}
```

Hierarchy Level [edit security advance-policy-based-routing]

Release Information Statement introduced in Junos OS Release 18.2R1.

Description Enable or disable switching of the application traffic to another route (local to the device) during an SLA violation.

When local route switching is enabled, switching of the application traffic to an alternate route is enabled and also SLA monitoring and reporting functionality is available.

When local route switching is disabled, only SLA monitoring and reporting functionality is available and switching of the application traffic to the different route because of an SLA violation is tuned off.

Options **local-route-switch [enabled | disabled]**—Enable or disable local route switch during an SLA violation.

Default: enabled

logging—System-log based logging is enabled.

Required Privilege Level services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Application Quality of Experience on page 173
- Advanced Policy-Based Routing on page 139

sla-rule

Syntax

```
sla-rule sla-rule-name {
  active-probe-params {
    probe-params-name;
  }
  link-type-affinity strict;
  metrics-profile {
    metric-profile-name;
  }
  passive-probe-params {
    sampling-percentage {
      percentage;
    }
    sampling-period {
      period;
    }
    sla-export-factor {
      value;
    }
    type {
      book-ended;
    }
    violation-count {
      count;
    }
  preferred-link-type (Any | IP | MPLS);
  switch-idle-time {
    period;
  }
}
```

Hierarchy Level [edit security advance-policy-based-routing]

Release Information Statement introduced in Junos OS Release 18.2R1. The options **preferred-link-type** and **link-type-affinity** are introduced in Junos OS Release 18.4R1.

Description Configure an SLA rule.

An SLA rule includes all information required to measure the SLA and to identify whether any SLA violation has occurred or not. It contains the complete probe profiles, time interval which the profiles need to be sent, preferred SLA configuration, and so on.

When you configure an APBR rule, you must associate the corresponding SLA rule for the application.

The presence of SLA rule in the APBR configuration triggers the AppQoE functionality; If there are no SLA profiles available, APBR operates without AppQoE.

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Options

active-probe-params ***probe-params-name***—Name of the active probe parameter. Associate the active probe parameter with the SLA rule.

link-type-affinity (strict);—(optional) Configure the link-type affinity as strict for the preferred link type. For strict affinity, AppQoE ensures that the path selected is always of the preferred link type. When the default affinity (loose) is configured and if there are no SLA meeting links belonging to the preferred link type available, then AppQoE selects a link outside the preferred link type that meets the SLA requirements.

metrics-profile ***profile-name***—Metric profile name. The SLA rule contains metric profiles that provide the acceptable threshold. If the violation goes beyond the threshold, an alternate path is identified and then traffic is rerouted.

passive-probe-params—Active probe parameter name. Associate the active probe parameter with the SLA rule.

preferred-link-type (IP | MPLS | Any)—Select an MPLS or Internet link as the preferred path. If you do not select **IP** or **MPLS**, the preferred link type **Any** is selected when the link-type affinity is configured as loose (default link type affinity). Configuring the link type as **Any** when the link-type affinity is configured as **strict** is not supported.

Default: Any

switch-idle-time ***period***—Path switch idle time in seconds. This is the period during which no subsequent switching of application traffic path occurs until the switch idle time expires. This idle time starts when application traffic switches the path.

Range: 5-300 seconds

Default: 15 seconds

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Application Quality of Experience on page 173
- Advanced Policy-Based Routing on page 139

termination (Services)

Syntax

```
termination {
  profile profile-name {
    custom-ciphers [cipher];
    enable-flow-tracing;
    enable-session-cache;
    preferred-ciphers (custom | medium | strong | weak);
    protocol-version (all | tls1 | tls11 | tls12);
    server-certificate certificate-identifier;
  }
}
```

Hierarchy Level

```
[edit services ssl]
```

Release Information

Statement introduced in Junos OS Release 12.1X44-D10. The **protocol-version** statement is updated to include **tls11** and **tls12** from Junos OS Release 15.1X49-D30.

Description

Specify the configuration for Secure Socket Layer (SSL) termination support service.

Following types of SSL profiles are supported on SRX Series to secure connections based on the role of the SRX Series device:

- SSL initiation: The SRX Series device, acting as an SSL proxy client, initiates and maintains SSL sessions between itself and an SSL server. SRX device receives unencrypted data from an HTTP client, and encrypts and transmits the data as ciphertext to the SSL server.
- SSL termination: The SRX Series device, actings as an SSL proxy server, terminates the SSL session from the client and then establishing a new SSL connection to the server. The SRX Series device decrypts the data and then sends the data as un-encrypted request to the other servers (HTTP server).

The SSL proxy profile will be applied to the security policy as application services.

Options

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

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then (Security Application Firewall)

Syntax

```
then {
   (deny [block-message] | permit | reject [block-message]);
}
```

Hierarchy Level

[edit security application-firewall rule-set *rule-set-name* rule *rule-name*]

Release Information

Statement introduced in Junos OS Release 11.1. Statement updated in Junos OS Release 12.1X44-D10 with the **reject** option. The **block-message** option added in Junos OS Release 12.1X45-D10.

Description

Specify the action to be performed when traffic matches the associated match criteria.

Note that an application firewall is applied after a session has already been created by the security firewall. When traffic is rejected or denied by an application firewall, therefore, logs contain a session open message, a session reject or deny message, and a session close message.

Starting in Junos OS Release 18.2R1, the application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and an opportunity to bring your configuration into compliance with the new configuration.

Options

- **deny**—Block the traffic at the firewall. The device drops the packet. By default, no message is returned to the sender.
  - **block-message**—(Optional) In application firewall rules, provide information to the user regarding blocked traffic. Depending on the content of the **profile** option for this rule set, including the **block-message** option displays a default message or customized message, or redirects the user for denied HTTP or HTTPS traffic. All other traffic is dropped silently.
- **permit**—Permit traffic at the firewall.
- **reject**—Block the traffic at the firewall. For TCP traffic, by default the device drops the packet and returns a TCP reset (RST) message to the source host. For UDP and other protocol traffic, by default the device drops the packet and returns an ICMP “destination unreachable, port unreachable” message to both the client and the server.
  - **block-message**—(Optional) In application firewall rules, provide information to the user regarding blocked traffic. Depending on the content of the **profile** option for this rule set, including the **block-message** option displays a default message or customized message, or redirects the user for rejected HTTP or HTTPS traffic. All other traffic is dropped as specified in the default action for the **reject** option.

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Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring an Application Group for Application Firewall on page 96

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traceoptions (advanced policy-based routing)

Syntax

```
traceoptions {
   file {
      filename;
      files number;
      match regular-expression;
      size maximum-file-size;
      (world-readable | no-world-readable);
   }
   flag flag;
   no-remote-trace;
}
```

Hierarchy Level [edit security advance-policy-based-routing]

Release Information Statement introduced in Junos OS Release 15.1X49-D60.

Description Configure tracing operations for advanced policy-based routing.

Options

- **file**—Configure the trace file options.
  - ***filename***—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory **/var/log**. By default, the name of the file is the name of the process being traced.
  - **files *number***—Maximum number of trace files. When a trace file named ***trace-file*** reaches its maximum size, it is renamed to ***trace-file*.0**, then ***trace-file*.1**, and so on, until the maximum number of trace files is reached. The oldest archived file is overwritten.

    If you specify a maximum number of files, you also must specify a maximum file size with the **size** option and a filename.

    Range: 2 through 1000 files

    Default: 10 files
  - **match *regular-expression***—Refine the output to include lines that contain the regular expression.
  - **size *maximum-file-size***—Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). 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 file size, you also must specify a maximum number of trace files with the **files** option and a filename.

    Syntax: ***x* K** to specify KB, ***x* m** to specify MB, or ***x* g** to specify GB

Range: 10 KB through 1 GB

Default: 128 KB

- **world-readable | no-world-readable**—By default, log files can be accessed only by the user who configures the tracing operation. The **world-readable** option enables any user to read the file. To explicitly set the default behavior, use the **no-world-readable** option.

- **flag**—Trace operation to perform. To specify more than one trace operation, include multiple **flag** statements.
  - **all**—Trace with all flags enabled
  - **compilation**—Trace rule set compilation events
  - **configuration**—Trace configuration events
  - **ipc**—Trace process inter communication events
  - **lookup**—Trace rule set lookup events
- **no-remote-trace**—Set remote tracing as disabled.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Advanced Policy-Based Routing for Application-Aware Traffic Management Solution on page 146
- Understanding Advanced Policy-Based Routing on page 139

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traceoptions (Security Application Firewall)

Syntax

```
traceoptions {
  file {
    filename;
    files number;
    match regular-expression;
    size maximum-file-size;
    (world-readable | no-world-readable);
  }
  flag flag;
  no-remote-trace;
}
```

Hierarchy Level

```
[edit security application-firewall]
[edit tenants tenant-name security application-firewall]
```

Release Information

Statement introduced in Junos OS Release 11.1.
The statement **set tenant *tenant-name* security application-firewall** is introduced in Junos OS Release 18.4R1.

Description

Configure trace options for the application firewall.

Starting in Junos OS Release 18.2R1, the application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and an opportunity to bring your configuration into compliance with the new configuration.

Options

- **file**—Configure the trace file options.
  - ***filename***—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory **/var/log**. By default, the name of the file is the name of the process being traced.
  - **files *number***—Maximum number of trace files. When a trace file named ***trace-file*** reaches its maximum size, it is renamed to ***trace-file*.0**, then ***trace-file*.1**, and so on, until the maximum number of trace files is reached. The oldest archived file is overwritten.

    If you specify a maximum number of files, you also must specify a maximum file size with the **size** option and a filename.

    Range: 2 through 1000 files

    Default: 10 files
  - **match *regular-expression***—Refine the output to include lines that contain the regular expression.

- **size** ***maximum-file-size***—Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). 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 file size, you also must specify a maximum number of trace files with the **files** option and a filename.

  Syntax: ***x*** **K** to specify KB, ***x*** **m** to specify MB, or ***x*** **g** to specify GB

  Range: 10 KB through 1 GB

  Default: 128 KB

- **world-readable** | **no-world-readable**—By default, log files can be accessed only by the user who configures the tracing operation. The **world-readable** option enables any user to read the file. To explicitly set the default behavior, use the **no-world-readable** option.

- **flag**—Trace operation to perform. To specify more than one trace operation, include multiple **flag** statements.
  - **all**—Trace with all flags enabled
  - **compilation**—Trace rule set compilation events
  - **configuration**—Trace configuration events
  - **ipc**—Trace process inter communication events
  - **lookup**—Trace rule set lookup events
- **no-remote-trace**—Set remote tracing as disabled.

Required Privilege Level

trace—To view this statement in the configuration.
trace-control—To add this statement to the configuration.

Related Documentation

- Application Firewall Overview on page 85

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traceoptions (Services Application Identification)

Syntax

```
traceoptions {
  file {
    filename ;
    files number;
    match regular-expression;
    size maximum-file-size;
    (world-readable | no-world-readable);
  }
  flag all;
  level (all | error | info | notice | verbose | warning)
  no-remote-trace;
}
```

Hierarchy Level

[edit services application-identification]

Release Information

Statement introduced in Junos OS Release 10.2.

Description

Configure tracing operations for application identification services.

Options

- **file**—Configure the trace file options.
  - ***filename***—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory **/var/log**. By default, the name of the file is the name of the process being traced.
  - **files *number***—Maximum number of trace files. When a trace file named ***trace-file*** reaches its maximum size, it is renamed to ***trace-file*.0**, then ***trace-file*.1**, and so on, until the maximum number of trace files is reached. The oldest archived file is overwritten.

    If you specify a maximum number of files, you also must specify a maximum file size with the **size** option and a filename.

    Range: 2 through 1000 files

    Default: 10 files
  - **match *regular-expression***—Refine the output to include lines that contain the regular expression.
  - **size *maximum-file-size***—Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). 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 file size, you also must specify a maximum number of trace files with the **files** option and a filename.

Syntax: ***x*** **K** to specify KB, ***x*** **m** to specify MB, or ***x*** **g** to specify GB

Range: 10 KB through 1 GB

Default: 128 KB

- **world-readable** | **no-world-readable**—By default, log files can be accessed only by the user who configures the tracing operation. The **world-readable** option enables any user to read the file. To explicitly set the default behavior, use the **no-world-readable** option.

- **flag**—Trace operation to perform. To specify more than one trace operation, include multiple **flag** statements.

  all—Trace with all flags enabled.

- **level**—Set the level of debugging the output option.
  - **all**—Match all levels.
  - **error**—Match error conditions.
  - **info**—Match informational messages.
  - **notice**—Match conditions that should be handled specially
  - **verbose**—Match verbose messages.
  - **warning**—Match warning messages.
- **no-remote-trace**—Set remote tracing as disabled.

Required Privilege Level

trace—To view this statement in the configuration.
trace-control—To add this statement to the configuration.

Related Documentation

- Understanding Application Identification Techniques on page 27

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trusted-ca (Services)

Syntax

```
trusted-ca (all | [ca-profile] );
```

Hierarchy Level

```
[edit services ssl proxy profile profile-name]
[edit services ssl termination profile profile-name]
[edit services ssl initiation profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 12.1X44-D10.

Description

Specify the list of trusted certificate authority profiles. This statement is supported on the SRX1500, SRX5400, SRX5600, and SRX5800 devices, and vSRX.

Options

- *trusted-ca-name*—Specify the certificate authority profile name.
- **all**—Select all certificate authority profiles.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234
- *Firewall User Authentication Overview*

traceoptions (Services SSL)

Syntax

```
traceoptions {
  file {
    filename;
    files number;
    match regular-expression;
    size maximum-file-size;
    (world-readable | no-world-readable);
  }
  flag flag;
  level [brief | detail | extensive | verbose];
  no-remote-trace;
}
```

Hierarchy Level

[edit services ssl]

Release Information

Statement introduced in Junos OS Release 12.1X44-D10. This statement is supported on the SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices and vSRX.

Description

Specify the trace file information.

Debug tracing on both Routing Engine and the Packet Forwarding Engine can be enabled for SSL proxy by using **[edit services ssl traceoptions]** command.

Options

- *file-name*—Specify the name of file in which to write trace information.
  - **files**—Specify the maximum number of trace files. Range: 2 to 1000.
  - **match**—Specify the regular expression for lines to be logged. This statement is supported on the SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices and vSRX.
  - **no-world-readable size**—Do not allow any user to read the log file.
  - **size**—Specify the maximum trace file size. Range: 10,240 to 1,073,741,824.
  - **world-readable**—Allow any user to read the log file.
- **flag**—Trace operation to perform. To specify more than one trace operation, include multiple **flag** statements.
  - *all*—Trace all the parameters.
  - *cli-configuration*—Trace CLI configuration events.
  - *initiation*—Trace initiation service events.
  - *proxy*—Trace proxy service events.
  - *selected-profile*—Trace events for profiles with **enable-flow-tracing** set.

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  - *termination*—Trace termination service events.
- **level**—Set the level of debugging the output option.
  - **brief**—Match brief messages.
  - **detail**—Match detail messages.
  - **extensive**—Match extensive messages.
  - **verbose**—Match verbose messages.
- **no-remote-trace**—Set remote tracing as disabled.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234
- *Firewall User Authentication Overview*

tunables

Syntax

```
tunables {
   drop-on-zone-mismatch;
   enable-logging;
   max-route-change value;
}
```

Hierarchy Level [edit security advance-policy-based-routing]

Release Information Statement introduced in Junos OS Release 15.1X49-D110.

Description Configure the advanced policy-based (APBR) routing options to streamline the traffic handling.

You can streamline the traffic handling with APBR such as limiting the number of times a route can change for a session, terminating the session if there is a mismatch between zones when APBR is being applied in the middle of the session, and enabling logging to record events that occur on the device.

Fine-tuning the APBR configuration is required to avoid the possible issues such as excessive transitions due to route changes.

Options

drop-on-zone-mismatch—Terminate the session instead of instead of allowing traffic to traverse through the same route bypassing APBR.

enable-logging—Enable logging to record events that occur on the device for APBR-related operations.

max-route-change *value*—Configure the threshold for limiting the number of times a route can change for a session.

Range: 0-5

Default: 1

Required Privilege Level services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Example: Configuring Advanced Policy-Based Routing for Application-Aware Traffic Management Solution on page 146
- Understanding Advanced Policy-Based Routing on page 139

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underlay-interfaces

Syntax

```
underlay-interfaces interface-name {
   unit unit-number {
   link-type (IP | MPLS)
   priority priority-number;
}
```

Hierarchy Level

```
[edit security advance-policy-based-routing]
```

Release Information

Statement introduced in Junos OS Release 18.4R1

Description

Configure the link priority and link type for the underlay interface in an APBR profile.

When a list of best paths that meet the SLA requirements are available for the application path, the path selection mechanism selects a path that matches the configured link preference (link type and priority). Paths are the WAN links that are used for forwarding the application traffic.

You can define the link type and priority for the underlay links in the APBR profile. Because the APBR rule is defined for an application or a group of applications, you can enforce the link preference at the application or application group level.

The link preference configuration is applied for the application traffic matching the APBR rule.

NOTE: **If any of the parameters are not configured (*link-type* or *priority*) then the path selection mechanism follows the existing behavior. That is, applications traffic is assigned to a particular overlay link based on the SLA metrics of that overlay link only.**

Options

link-type (IP | MPLS)—Select an MPLS or Internet link as the preferred path.

priority—Assign the priority for the link. If there are multiple paths available, the path that has the highest priority is selected.

Range: 1 through 255

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234
- *Firewall User Authentication Overview*

whitelist (Services)

Syntax

```
whitelist [global-address-book-addresses];
```

Hierarchy Level

```
[edit services ssl proxy profile profile-name]
[edit services ssl termination profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 12.1X44-D10.

Description

Specify the addresses exempted from the SSL proxy. This statement is supported on the SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices and vSRX.

You can selectively bypass SSL proxy processing for some sessions by configuring a whitelist. Typically, you might configure the whitelist to include trusted servers or domains with which you are very familiar. Whitelists include addresses that you want to exempt from undergoing SSL proxy processing.

To configure the whiltelist, you need to specify the domain that you want to exempt in an address book and then configure the address in the SSL proxy profile.

Options

- *whitelist-address*—Specify address from the global address book.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- Configuring SSL Forward Proxy on page 234
- *Firewall User Authentication Overview*

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whitelist-url-categories

Syntax

```
whitelist-url-categories url-category-list;
```

Hierarchy Level

[edit services ssl proxy profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 15.1X49-D80.

Description

Specify the enhanced Web filtering URL categories to be whitelisted.

Whitelist URL categories include URL categories supported by UTM in the whitelist configuration of SSL forward proxy.

The predefined URL categories depends on UTM. To enable the URL-based whitelisting in SSL proxy, the following basic configurations are required:

```
[edit]
user@host# set security utm feature-profile web-filtering type juniper-enhanced
user@host# set security utm utm-policy policy-name web-filtering http-profile
  junos-wf-enhanced-default
```

NOTE: Starting with Junos OS Release 17.4R1, the whitelisting feature is extended to support custom URL categories.

Options

url-category-list— List of custom URLs along with URL categories defined by enhanced Web filtering that need to be whitelisted.

Required Privilege Level

services—To view this statement in the configuration.
services-control—To add this statement to the configuration.

Related Documentation

- SSL Proxy Overview on page 221
- Configuring SSL Forward Proxy on page 234
- show services ssl proxy statistics on page 574

zones

Syntax

```
zones {
  functional-zone {
    management {
      description text;
      host-inbound-traffic {
        protocols protocol-name {
          except;
        }
        system-services service-name {
          except;
        }
      }
      interfaces interface-name  {
        host-inbound-traffic {
          protocols protocol-name {
            except;
          }
          system-services service-name {
            except;
          }
        }
      }
      screen screen-name;
    }
  }
  security-zone zone-name {
    address-book {
      address address-name {
        ip-prefix {
          description text;
        }
        description text;
        dns-name domain-name {
          ipv4-only;
          ipv6-only;
        }
        range-address lower-limit to upper-limit;
        wildcard-address ipv4-address/wildcard-mask;
      }
      address-set address-set-name {
        address address-name;
        address-set address-set-name;
        description text;
      }
    }
    advance-policy-based-routing;
    application-tracking;
    description text;
    host-inbound-traffic {
      protocols protocol-name {
        except;
```


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```
        }
        system-services service-name {
            except;
        }
    }
    interfaces interface-name {
        host-inbound-traffic {
            protocols protocol-name {
                except;
            }
            system-services service-name {
                except;
            }
        }
    }
    screen screen-name;
    tcp-rst;
  }
}
```

Hierarchy Level

[edit security]

Release Information

Statement introduced in Junos OS Release 8.5. Support for wildcard addresses added in Junos OS Release 11.1. The **description** option added in Junos OS Release 12.1.

Description

A zone is a collection of interfaces for security purposes. All interfaces in a zone are equivalent from a security point of view. Configure the following zones:

- Functional zone—Special-purpose zone, such as a management zone that can host dedicated management interfaces.
- Security zone—Most common type of zone that is used as a building block in policies.

Options

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

Related Documentation

- *Security Zones Overview*
- *Supported System Services for Host Inbound Traffic*

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CHAPTER 6

Operational Commands

- clear security advance-policy-based-routing sla statistics
- clear security application-firewall rule-set statistics
- clear security application-firewall rule-set statistics logical-system
- clear services application-identification application-statistics
- clear services application-identification application-statistics cumulative
- clear services application-identification application-statistics interval
- clear services application-identification application-system-cache (Junos OS)
- clear services application-identification counter (Values)
- clear services ssl proxy statistics
- request security pki ca-certificate ca-profile-group load
- request security pki local-certificate export
- request security pki local-certificate generate-self-signed
- request security pki local-certificate load
- request services application-identification application
- request services application-identification download
- request services application-identification download status
- request services application-identification group
- request services application-identification install
- request services application-identification install status
- request services application-identification proto-bundle-status
- request services application-identification uninstall
- request services application-identification uninstall status
- show class-of-service application-traffic-control counter
- show class-of-service application-traffic-control statistics rate-limiter
- show class-of-service application-traffic-control statistics rule
- show security advance-policy-based-routing multipath rule
- show security advanced-policy-based-routing policy-name
- show security advance-policy-based-routing profile

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- show security advance-policy-based-routing statistics
- show security advance-policy-based-routing status
- show security advance-policy-based-routing sla active-probe-statistics
- show security advance-policy-based-routing sla profile
- show security advance-policy-based-routing sla statistics
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- show security application-firewall rule-set
- show security application-firewall rule-set logical-system
- show security application-tracking counters
- show security flow session
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- show security pki ca-certificate
- show security pki local-certificate (View)
- show security policies
- show services application-identification application
- show services application-identification application-system-cache (View)
- show services application-identification commit-status
- show services application-identification counter (AppSecure)
- show services application-identification group
- show services application-identification statistics applications
- show services application-identification statistics application-groups
- show services application-identification status
- show services application-identification version
- show services icap-redirect server status
- show services service-redirect statistic
- show services ssl proxy statistics

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clear security advance-policy-based-routing sla statistics

Syntax

```
clear security advance-policy-based-routing sla statistics
```

Release Information Command introduced in Junos OS Release 15.1X49-D130.

Description Clears SLA rule-specific statistics and counters.

Required Privilege Level view

Related Documentation

- Application Quality of Experience on page 173
- Advanced Policy-Based Routing on page 139

Output Fields This command produces no output.

Sample Output

clear security application-firewall rule-set statistics

Syntax

```
clear security application-firewall rule-set statistics
```

Release Information

Command introduced in Junos OS Release 11.1.

Description

Clear all the security application firewall rule set statistics information.

Starting in Junos OS Release 18.2R1, the application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and an opportunity to bring your configuration into compliance with the new configuration.

Required Privilege Level

clear

Related Documentation

- show security application-firewall rule-set on page 502

Output Fields

This command produces no output.

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clear security application-firewall rule-set statistics logical-system

Syntax

The master, or root, administrator can issue the following statements:

```
clear security application-firewall rule-set statistics [logical-system logical-system-name |
  all | root-logical-system]
```

The user logical system administrator can issue the following statement:

```
clear security application-firewall rule-set statistics all
```

Release Information

Command introduced in Junos OS Release 11.4.

Description

Clear all security application firewall rule set statistics.

NOTE: User logical system administrators can clear statistics only for the logical systems they can access. For information about master and user administrator roles in logical systems, see *Understanding the Master Logical Systems and the Master Administrator Role*.

Starting in Junos OS Release 18.2R1 application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and a chance to bring your configuration into compliance with the new configuration.

Options

logical-system-name—Name of a specific logical system.

all—(default) Clear all rule set statistics for a specific logical system or all logical systems.

root-logical-system—Clear application firewall rule set statistics on the root logical system (master administrator only).

Required Privilege Level

clear

Related Documentation

- show security application-firewall rule-set logical-system on page 506

Output Fields

This command produces no output.

clear services application-identification application-statistics

Syntax

```
clear services application-identification application-statistics
```

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Clears all Junos OS application statistics such as cumulative, interval, applications, and application groups.

Required Privilege Level

clear

Related Documentation

- show services application-identification statistics applications on page 562
- show services application-identification statistics application-groups on page 564
- clear services application-identification application-statistics interval on page 452
- clear services application-identification application-statistics cumulative on page 451

Output Fields

This command produces no output.

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clear services application-identification application-statistics cumulative

Syntax

```
clear services application-identification application-statistics cumulative
```

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Clear all Junos OS application cumulative statistics.

Required Privilege Level

clear

Related Documentation

- show services application-identification statistics applications on page 562
- show services application-identification statistics application-groups on page 564
- clear services application-identification application-statistics on page 450
- clear services application-identification application-statistics interval on page 452

Output Fields

This command produces no output.

clear services application-identification application-statistics interval

Syntax

```
clear services application-identification application-statistics interval
```

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Clear all Junos OS application interval statistics.

Required Privilege Level

clear

Related Documentation

- show services application-identification statistics applications on page 562
- show services application-identification statistics application-groups on page 564
- clear services application-identification application-statistics on page 450
- clear services application-identification application-statistics cumulative on page 451

Output Fields

This command produces no output.

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clear services application-identification application-system-cache (Junos OS)

Syntax

```
clear services application-identification application-system-cache
<node ( node-id | all | local | primary ) >
```

Release Information

Command introduced in Junos OS Release 10.2. Command syntax updated in Junos OS Release 12.1.

Description

Clear Junos OS application identification application system cache.

Options

- none—Clear the application system cache on the device.
- **node**—(Optional) For chassis cluster configurations, clear application system cache on the specified nodes.
  - ***node-id***—Specific node number
  - **all**—All nodes
  - **local**—Local node
  - **primary**—Primary node

Required Privilege Level

clear

Related Documentation

- show services application-identification application-system-cache (View) on page 552

Output Fields

This command produces no output.

clear services application-identification counter (Values)

Syntax

```
clear services application-identification counter
  <ssl-encrypted-sessions>
logical-system
```

Release Information

Command introduced in Junos OS Release 10.2. Command updated in Junos OS Release 12.1-X47-D15.
The **logical-system** option is introduced in Junos OS Release 18.3R1.

Description

Reset all the Junos OS application identification counter values.

Options

ssl-encrypted-sessions—Reset application identification counter values for SSL encrypted sessions.

logical-system— Name of the logical system.

Required Privilege Level

clear

Related Documentation

- show services application-identification counter (AppSecure) on page 556

List of Sample Output

clear services application-identification counter on page 454
clear services application-identification counter logical-system all on page 454

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

clear services application-identification counter

```
user@host> clear services application-identification counter
clear_counter_class: counters cleared, status = 0
```

clear services application-identification counter logical-system all

```
user@host> clear services application-identification counter logical-system all
appid counter cleared
```


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clear services ssl proxy statistics

Syntax

```
clear services ssl proxy statistics
```

Release Information Command introduced in Junos OS Release 12.1.

Description Clear services SSL proxy statistics.

Options **none**—Clear the ssl proxy statistics.

Required Privilege Level clear

Related Documentation

- show services ssl proxy statistics on page 574

Output Fields This command produces no output.

request security pki ca-certificate ca-profile-group load

Syntax

```
request security pki ca-certificate ca-profile-group load ca-group-name ca-group-name
  filename [path/filename | default]
```

Release Information

Command introduced in Junos OS Release 12.1; **default** option added in Junos OS Release 12.1X47-D10.

Description

For SSL forward proxy, you need to load trusted CA certificates on your system. By default, Junos OS provides a list of trusted CA certificates that include default certificates used by common browsers. Alternatively, you can define your own list of trusted CA certificates and import them on to your system.

Use this command to load the default certificates or to specify a path and filename of trusted CA certificates that you define.

Options

ca-group-name ***ca-group-name***—Load the specified CA group profile.

filename ***path/filename***—Directory location and filename of the trusted CA certificates defined by you.

filename default—Load the trusted CA certificates available by default.

Required Privilege Level

maintenance

Related Documentation

- show security pki ca-certificate on page 523
- *Understanding Certificates and PKI*

List of Sample Output

request security pki ca-certificate ca-profile-group load (default) on page 456
request security pki ca-certificate ca-profile-group load (path/filename) on page 457

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request security pki ca-certificate ca-profile-group load (default)

`user@host>` **request security pki ca-certificate ca-profile-group load ca-group-name ca-default filename default**

```
Do you want to load this CA certificate ? [yes,no] (no) yes
Loading 157 certificates for group 'ca-default'.
ca-default_1: Loading done.
ca-default_2: Loading done.
ca-default_3: Loading done.
......
```


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Sample Output

request security pki ca-certificate ca-profile-group load (path/filename)

user@host> **request security pki ca-certificate ca-profile-group load ca-group-name ca-manual filename /var/tmp/firefox-all.pem**

```
Do you want to load this CA certificate ? [yes,no] (no) yes

Loading 196 certificates for group 'ca-manual'.
ca-manual_1_sysgen: Loading done.
ca-manual_2_sysgen: Loading done.
ca-manual_3_sysgen: Loading done.
ca-manual_4_sysgen: Loading done.
ca-manual_5_sysgen: Loading done.
ca-manual_6_sysgen: Loading done.

...
ca-manual_195_sysgen: Loading done.
ca-manual_196_sysgen: Loading done.
ca-profile-group 'ca-manual' successfully loaded. Success[193] Skipped[3]
```

request security pki local-certificate export

Syntax

```
request security pki local-certificate export
```

Release Information

Command introduced in Junos OS Release 12.1.

Description

Export a generated self-signed certificate from the default location (var/db/certs/common/local) to a specific location within the device.

Options

certificate id *certificate-id-name*—Name of the local digital certificate.

filename *path/filename*—Target directory location and filename of the CA digital certificate.

type (der | pem)—Certificate format: DER (distinguished encoding rules) or PEM (privacy-enhanced mail).

Required Privilege Level

maintenance

Related Documentation

- *Understanding Certificates and PKI*

List of Sample Output

request security pki local-certificate export on page 458

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request security pki local-certificate export

```
user@host> request security pki local-certificate export filename /var/tmp/my-cert.pem
certificate-id nss-cert type pem
certificate exported successfully
```


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request security pki local-certificate generate-self-signed

Syntax

```
request security pki local-certificate  generate-self-signed certificate-id certificate-id-name
  domain-name domain-name ip-address ip-address email email-address
  subject subject-distinguished-name
```

Release Information

Command introduced in Junos OS Release 9.1.

Description

Manually generate a self-signed certificate for the given distinguished name.

Options

certificate-id ***certificate-id-name***—Name of the local digital certificate and the public/private key pair.

domain-name ***domain-name***—Fully qualified domain name (FQDN). The FQDN provides the identity of the certificate owner for Internet Key Exchange (IKE) negotiations and provides an alternative to the subject name.

email ***email-address***—E-mail address of the certificate holder.

ip-address ***ip-address***—IP address of the router.

subject ***subject-distinguished-name***—Distinguished name format that contains the common name, department, company name, state, and country:

- **CN**—Common name
- **OU**—Organizational unit name
- **O**—Organization name
- **ST**—State
- **C**—Country

Required Privilege Level

maintenance
security

Related Documentation

- *Requesting for and Installing a Digital Certificates on Your Router*

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

```
user@host>  request security pki local-certificate generate-self-signed certificate-id self-cert
subject cn=abc domain-name example.net email user1@example.net
Self-signed certificate generated and loaded successfully
```

request security pki local-certificate load

Syntax

```
request security pki local-certificate load certificate-id certificate-id-name  filename path
```

Release Information

Command introduced in Junos OS Release 7.5.

Description

Manually load a local digital certificate from a specified location.

Options

certificate-id ***certificate-id-name***—Name of the public/private key pair mapped to the local digital certificate.

filename ***path/filename***—Directory location and filename of the local digital certificate provided by the CA.

Required Privilege Level

maintenance

List of Sample Output

request security pki local-certificate load on page 460

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request security pki local-certificate load

```
user@host> request security pki local-certificate load filename /tmp/router2-cert certificate-id
local-entrust2
Local certificate local-entrust2 loaded successfully
```


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request services application-identification application

Syntax

```
request services application-identification application [disable | enable]
  predefined-application-name
```

Release Information

Command introduced in Junos OS Release 11.4.

Description

Disable, or enable a predefined application signature.

Options

disable—(Optional) Disable a predefined application signature, initiate signature recompilation, and commit all pending uncompiled signatures to the configuration.

The following conditions apply:

- You cannot disable a predefined application signature that is referenced by an active security policy or custom application signature. First modify or deactivate the policy or custom application signature.
- If you disable an application signature, for example, junos:HTTP, that has nested applications, the nested applications are not recognized.

enable—(Optional) Enable a predefined application signature, initiate signature recompilation, and commit all pending uncompiled signatures to the configuration.

Required Privilege Level

maintenance

Related Documentation

- show services application-identification application on page 546

Output Fields

When you enter this command, the system provides feedback on the status of your request.

Sample Output

request services application-identification application disable

```
user@host> request services application-identification application disable junos:163
 Please wait while we are updating signatures ...
Please wait while we are updating signatures ...
Please wait while we are updating signatures ...
Please wait while we are updating signatures ...
Please wait while we are updating signatures ...
Please wait while we are updating signatures ...
 Disable application junos:163 succeed.
```

request services application-identification download

Syntax

```
request services application-identification download <version>;
```

Release Information

Statement introduced in Junos OS Release 10.2.
Statement modified in Junos OS Release 11.4.

Description

Manually download the application package for Junos OS application identification. The application package is extracted from the IDP signature database and contains signature definitions for known applications, such as: DNS, Facebook, FTP, Skype, and SNMP.

Options

version—(Optional) Download a specific version of the application package from the Juniper Networks security website. If you do not enter a version, the most recent version is downloaded.

Required Privilege Level

maintenance

Related Documentation

- request services application-identification download status on page 463
- request services application-identification install on page 466

List of Sample Output

request services application-identification download on page 462

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request services application-identification download

```
user@host> request services application-identifications download

Please use command "request services application-identification download status"
 to check status
```


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request services application-identification download status

Syntax

```
request services application-identification download status
```

Release Information

Statement introduced in Junos OS Release 10.2.
Statement modified in Junos OS Release 11.4.

Description

Check the download status of the application signature package. The downloaded application package is saved under **/var/db/appid/sec-download/**.

Required Privilege Level

maintenance

Related Documentation

- request services application-identification download on page 462

List of Sample Output

request services application-identification download status on page 463

Output Fields

When you enter this command, the system provides feedback on the status of your request.

Sample Output

request services application-identification download status

```
user@host> request services application-identifications download status
Application package 1608 is downloaded successfully.
```

request services application-identification group

Syntax

```
request services application-identification group [copy | disable | enable]
  predefined-application-group-name
```

Release Information

Command introduced in Junos OS Release 11.4.

Description

Copy, disable, or enable a predefined application signature group.

Options

copy—(Optional) Copy a predefined application signature group from the database to the configuration and change the name (for example, my:FTP). The ID and order are generated automatically. Do not name your custom application signature group with the **junos** prefix; this prefix is reserved for predefined application signature groups. You can copy the same predefined application signature group only once; duplicate custom signature groups are not allowed.

NOTE: In configuration mode, if an uncommitted action is pending, the **request services application-identification group copy** command fails.

disable—(Optional) Disable a predefined application signature group.

NOTE: You cannot disable a predefined application signature group that is referenced by an active security policy or custom application signature group. First modify or deactivate the policy or custom application signature group.

enable—(Optional) Enable a predefined application signature group.

predefined-application-group-name—Name of the predefined application signature group.

Required Privilege Level

maintenance

Related Documentation

- show services application-identification group on page 560

Output Fields

When you enter this command, the system provides feedback on the status of your request.

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Sample Output

request services application-identification group

user@host> **request services application-identification group disable junos:infrastructure:networking**

```
Disable application group junos:infrastructure:networking succeed.
```

request services application-identification group

user@host> **request services application-identification group enable junos:infrastructure:networking**

```
Enable application group junos:infrastructure:networking succeed.
```

request services application-identification group

user@host> **request services application-identification group copy junos:infrastructure:networking**

```
Please wait while we are copying group ...
Copy application group junos:infrastructure:networking succeed.
```

request services application-identification install

Syntax

```
request services application-identification install
```

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Install the downloaded predefined application signature package.

Required Privilege Level

maintenance

Related Documentation

- request services application-identification install status on page 467
- request services application-identification download on page 462

Output Fields

When you enter this command, the system provides feedback on the status of your request.

Sample Output

user@host> **request services application-identification install**

```
Please use command "request services application-identification install status"
to check status and use command "request services application-identification
proto-bundle-status" to check protocol bundle status
```


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request services application-identification install status

Syntax

```
request services application-identification install status
```

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Display the status of the install operation.

Required Privilege Level

maintenance

Related Documentation

- request services application-identification install on page 466

Output Fields

When you enter this command, the system provides feedback on the status of your request.

Sample Output

```
user@host> request services application-identification install status
Install application package version (1776) succeed.
```

request services application-identification proto-bundle-status

Syntax

```
request services application-identification proto-bundle-status
```

Release Information

Statement introduced in Junos OS Release 12.1X47-D10.

Description

Display the status of the install operation of the protocol bundle.

Required Privilege Level

maintenance

Related Documentation

- request services application-identification install on page 466

Output Fields

When you enter this command, the system provides feedback on the status of your request.

Sample Output

```
user@host> request services application-identification proto-bundle-status
Protocol Bundle Version (1.30.4-22.005 (build date Jan 17 2014)) and application
 secpack version (2345) is loaded and activated.
```


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request services application-identification uninstall

Syntax

```
request services application-identification uninstall
```

Release Information

Statement introduced in Junos OS Release 10.2. Statement modified in Junos OS Release 10.4. Statement modified in Junos OS Release 11.4.

Description

Uninstall the predefined application package.

The uninstall operation will fail if any active security policies reference predefined application signatures or predefined application signature groups in the Junos OS configuration.

Required Privilege Level

maintenance

Related Documentation

- request services application-identification install on page 466

Output Fields

When you enter this command, the system provides feedback on the status of your request.

Sample Output

```
user@host> request services application-identification uninstall
Please use command "request services application-identification uninstall status"
 to check status and use command "request services application-identification
proto-bundle-status" to check protocol bundle status
```

request services application-identification uninstall status

Syntax

```
request services application-identification uninstall status
```

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Display the status of the uninstall operation.

Required Privilege Level

maintenance

Related Documentation

- request services application-identification uninstall on page 469

Output Fields

When you enter this command, the system provides feedback on the status of your request.

Sample Output

```
user@host> request services application-identification uninstall status
Uninstall application package version (1776) succeed.
```


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show class-of-service application-traffic-control counter

Syntax

show class-of-service application-traffic-control counter

Release Information

Command introduced in Junos OS Release 11.4.

Description

Display AppQoS DSCP marking and honoring statistics based on Layer 7 application classifiers.

Required Privilege Level

view

Related Documentation

- Example: Configuring Application Quality of Service on page 124

List of Sample Output

show class-of-service application-traffic-control counter on page 471
show class-of-service application-traffic-control counter (Unified Policies) on page 472

Output Fields

Table 39 on page 471 lists the output fields for the **show class-of-service application-traffic-control counter** command. Output fields are listed in the approximate order in which they appear.

Table 39: show class-of-service application-traffic-control counter Output Fields

Field Name	Field Description
pic	PIC number of the accumulated statistics. NOTE: The PIC number is always displayed as **0** for SRX300, SRX320, SRX340, SRX345, SRX550M, and SRX1500 devices.
Sessions processed	The number of sessions where the class of service was checked.
Sessions marked	The number of sessions marked based on application-aware DSCP marking.
Sessions honored	The number of sessions honored based on application-aware traffic honoring.
Sessions rate limited	The number of sessions that have been rate limited.
Client-to-server flows rate limited	The number of client-to-server flows that have been rate limited.
Server-to-client flows rate limited	The number of server-to-client flows that have been rate limited.

Sample Output

show class-of-service application-traffic-control counter

```
user@host> show class-of-service application-traffic-control counter
```

```
pic: 2/1
  Counter type                                                Value
  Sessions processed                                          300
  Sessions marked                                             200
  Sessions honored                                            0
  Sessions rate limited                                       100
  Client-to-server flows rate limited                         100
  Server-to-client flows rate limited                         70

pic: 2/0
  Counter type                                                Value
  Sessions processed                                          400
  Sessions marked                                             300
  Sessions honored                                            0
  Sessions rate limited                                       200
  Client-to-server flows rate limited                         200
  Server-to-client flows rate limited                         100
```

show class-of-service application-traffic-control counter (Unified Policies)

```
user@host> show class-of-service application-traffic-control counter
```

```
pic: 0/0
  Counter type                                                    Value
 Sessions processed                                               2
 Sessions marked                                                  1
 Sessions honored                                                 1
 Sessions rate limited                                            1
 Client-to-server flows rate limited                              0
 Server-to-client flows rate limited                              1
 Session default ruleset hit                     1
 Session ignored no default ruleset                               1
```


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show class-of-service application-traffic-control statistics rate-limiter

Syntax show class-of-service application-traffic-control statistics rate-limiter

Release Information Command introduced in Junos OS Release 11.4.

Description Display AppQoS real-time run information about application rate limiting of current or recent sessions.

Required Privilege Level view

Related Documentation
- Example: Configuring Application Quality of Service on page 124

List of Sample Output show class-of-service application-traffic-control statistics rate-limiter on page 473

Output Fields Table 40 on page 473 lists the output fields for the **show class-of-service application-traffic-control statistics rate-limiter** command. Output fields are listed in the approximate order in which they appear.

Table 40: show class-of-service application-traffic-control statistics rate-limiter Output Fields

Field Name	Field Description
pic	PIC number. NOTE: The PIC number is always displayed as **0** for SRX300, SRX320, SRX340, SRX345, and SRX550M devices.
Ruleset	The rule set applied on the session.
Application	The application match for applying the rule set.
Client-to-server	The rate limiter applied from client to server.
Rate(kbps)	The rate in the client-to-server direction
Server-to-client	The rate limiter applied from server to client.
Rate(kbps)	The rate in the server-to-client direction.

Sample Output

show class-of-service application-traffic-control statistics rate-limiter

```
user@host> show class-of-service application-traffic-control statistics rate-limiter
```

```
pic: 2/1
  Ruleset       Application  Client-to-server   Rate(kbps)   Server-to-client
Rate(kbps)
  my-ruleset-1  HTTP         my-http-c2s-rl     10000000    my-http-s2c-rl
20000000
  my-ruleset-2  HTTP         my-http-c2s-rl-2   20000000    my-http-s2c-rl-2
30000000
  my-ruleset-2  FTP          my-ftp-c2s-rl      50000       my-ftp-s2c-rl
50000
  ...

pic: 2/0
  Ruleset       Application  Client-to-server   Rate(kbps)   Server-to-client
Rate(kbps)
  my-ruleset-1  HTTP         my-http-c2s-rl     10000000    my-http-s2c-rl
20000000
  my-ruleset-2  HTTP         my-http-c2s-rl-2   20000000    my-http-s2c-rl-2
30000000
  my-ruleset-2  FTP          my-ftp-c2s-rl      50000       my-ftp-s2c-rl
50000
```


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show class-of-service application-traffic-control statistics rule

Syntax show class-of-service application-traffic-control statistics rule

Release Information Command introduced in Junos OS Release 11.4.

Description Display AppQoS counters identifying rule hits.

Required Privilege Level view

Related Documentation
- Example: Configuring Application Quality of Service on page 124

List of Sample Output show class-of-service application-traffic-control statistics rule on page 475

Output Fields Table 41 on page 475 lists the output fields for the **show class-of-service application-traffic-control statistics rule** command. Output fields are listed in the approximate order in which they appear.

Table 41: show class-of-service application-traffic-control statistics rule Output Fields

Field Name	Field Description
pic	PIC number where the rule is applied. NOTE: The PIC number is always displayed as **0** for for SRX300, SRX320, SRX340, SRX345, and SRX550M devices.
Ruleset	The rule set containing the rule.
Rule	The rule to which the statistic applies.
Hits	The number of times a match for the rule was encountered.

Sample Output

show class-of-service application-traffic-control statistics rule

```
user@host> show class-of-service application-traffic-control statistics rule
pic: 2/0
  Ruleset          Rule           Hits
  my-ruleset-1     ftp-rule       100
  my-ruleset-1     httpp-rule     100
  my-ruleset-2     telnet-rule    300
  my-ruleset-2     smtp-rule      300
  ...

pic: 2/1
```

```
Ruleset          Rule           Hits
my-ruleset-1     ftp-rule       200
my-ruleset-1     httpp-rule     300
my-ruleset-2     telnet-rule    400
my-ruleset-2     smtp-rule      500
```


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show security advance-policy-based-routing multipath rule

Syntax

show security advance-policy-based-routing multipath rule *rule-name*

Release Information

Command introduced in Junos OS Release 15.1X49-D160.

Description

Display the SLA statistics.

Required Privilege Level

view

Related Documentation

- Application Quality of Experience on page 173

Output Fields

Table 42 on page 477 and Table 43 on page 479 list the output fields for the **show security advance-policy-based-routing multipath rule** command. Output fields are listed in the approximate order in which they appear.

Table 42: show security advance-policy-based-routing multipath rule (Device Configured to Send Traffic)

Field Name	Field Description
Multipath Rule Information	
Multipath rule name	Name of the multipath rule
Multipath rule type	Type of multipath rule
Multipath rule state	State of the rule (if active or not)
Configured number of paths	Number of paths configured in the multipath rule
Configured applications	Application configured in the multipath rule
Path Group Information	
Total path groups	Destination groups. You can group all the overlay paths terminating at the same destination under a destination group
Path-Group-Id	ID of the path group
State	State of the paths (if active or not)
Avl-Num-Paths	Available number of paths
Sender Information Statistics:	

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Table 42: show security advance-policy-based-routing multipath rule (Device Configured to Send Traffic) (continued)

Field Name	Field Description
Current Sessions	Number of sessions active currently
Ignored Sessions	Number of sessions ignored
Applications Matched	Number of sessions where application traffic matched
Applications Switched	Number of sessions where application traffic changed after the final match
Stopped due to Bandwidth Limit	Number of sessions stopped because of bandwidtt limits.
Packets in path inactive state	Number of packets transferred when the rule is not active.
Packets in path active state	Number of packets transferred when the rule is active
Midstream Packets Ignored	Number of sessions ignored in midstream
Total Packets Processed	Total number of packets processed
Total Packets Copied	Total number of packets duplicated
Status:	
Policy reference count	Current sessions count on the policy.
Credit Limit (Mbps)	Credit limit. The policers begin to drop packets when the current credit exceeds the limit. Total credit available in Mbs per second.
Policer Rate (Kbits per ms)	Policer rate. Total credit available in Kbs per millisecond.
Bandwidth Limit	Configured bandwidth limit.
Maximum Wait Time (secs)	Configured maximum wait time
Time to Reinforce (secs)	Time after which the multipath routing resumes when bandwidth limit has reached.
Application Hit List	Matched application list
Path Groups Information	
Total sender path groups	Path groups from sending device
Path-Group-Id	Identification number of the paths

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Table 42: show security advance-policy-based-routing multipath rule (Device Configured to Send Traffic) (continued)

Field Name	Field Description
Cur-Num-Paths	Current number of paths
Path Information	
Dst-IP	Destination IP address
Pkts-Sent	Packets sent for destination IP address
Link-type	Link type (MPLS or IP) selected for destination IP address
Cos Q Statistics	
Total sender cos queues	Total number CoS queues.
COS-Q-Id	CoS queue identification number.
Pkts-Sent	Packets sent in the CoS queue ID for the entire multipath rule.

Table 43: show security advance-policy-based-routing multipath rule (Device Configured to Receive Traffic)

Field Name	Field Description
Multipath Rule Information	
Multipath rule name	Name of the multipath rule
Multipath rule type	Type of multipath rule
Multipath rule state	State of the rule (if active or not)
Configured number of paths	Number of paths configured in the multipath rule
Configured applications	Application configured in the multipath rule
Path Group Information	
Total path groups	Destination groups. You can group all the overlay paths terminating at the same destination under a destination group
Path-Group-Id	ID of the path group
State	State of the paths (if active or not)
Avl-Num-Paths	Available number of routes for the destination path groups

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Table 43: show security advance-policy-based-routing multipath rule (Device Configured to Receive Traffic) (continued)

Field Name	Field Description
Receiver Information (Path Groups Information)	
Total receiver path groups	Total number of path group
Path-Group-Id	Identification number of path group
Avg-Pkt-Loss	Average packet loss for the combined links
Avg-Ingress-Jitter(us)	Average ingress jitter for the combined links
Path Information	
Dst-IP	Destination IP address
Pkts-Rcvd	Number of packets received for the destination IP address
Pkt-Loss(%)	Percentage of packet lost in this link
Ingress-Jitter(us)	Ingress jitter experienced in the link
Reduction-Pkt-Loss(%)	Reduction in packet loss over the link (because of multipath routing)
Reduction-Ingress-Jitter(us)	Reduction in ingress jitter over the link (because of multipath routing)
Cos Q Statistics	
Total sender cos queues	Total number CoS queues
COS-Q-Id	CoS queue identification number
Pkts-Pkts-Rcvd	Number of packets received in the queue
Out-Of-Seq-Drop	Number of out-of-sync packets dropped in the queue

Sample Output

show security show security advance-policy-based-routing sla statistics (Device Configured to Receive Traffic)

```
user@host> show security advance-policy-based-routing multipath rule multi1

Multipath Rule Status:
  Multipath Rule Information:
    Multipath rule name                 multi1
    Multipath rule type                 Packet-Copy
    Multipath rule state                Active
```


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```
    Configured number of paths         2
    Configured application groups      junos:web
    Configured applications            junos:GOOGLE, junos:YAHOO
  Path Group Information:
    Total path groups : 1
    Path-Group-Id  State               Avl-Num-Paths
    1              Active              3
  Receiver Information:
    Path Groups Information:
      Total receiver path groups : 1
      Path-Group-Id : 1, Avg-Pkt-Loss(%) : 0, Avg-Ingress-Jitter(us) : 171
        Path Information:

Dst-IP       Pkts-Rcvd     Pkt-Loss(%)    Ingress-Jitter(us)       Reduction-Pkt-Loss(%)    Reduction-Ingress-Jitter(us)


 40.1.1.1      2442           0                  165          0                                  -6


 41.1.1.1      2442           0                  158          0                                  -13

       Cos Q Statistics:
          Total receiver cos queues: 8
          COS-Q-Id       Pkts-Rcvd      Out-Of-Seq-Drop
          0              4884           2442
          1              0              0
          2              0              0
          3              0              0
          4              0              0
          5              0              0
          6              0              0
          7              0              0
```

Sample Output

show security advance-policy-based-routing multipath rule (Device Configured to Send Traffic)

```
user@host> show security advance-policy-based-routing multipath rule multi1
```

```
Multipath Rule Status:
  Multipath Rule Information:
    Multipath rule name                multi1
    Multipath rule type                Packet-Copy
    Multipath rule state               Active
    Configured number of paths         2
    Configured application groups      junos:web
    Configured applications            junos:GOOGLE, junos:YAHOO
  Path Group Information:
    Total path groups : 1
    Path-Group-Id  State               Avl-Num-Paths
    1              Active              3
  Sender Information:
    Statistics:
      Current Sessions                   0
      Ignored Sessions                   0
      Applications Matched               1
      Applications Switched              0
      Stopped due to Bandwidth Limit     0
      Packets in path inactive state     26
      Packets in path active state       2416
      Midstream Packets Ignored          0
      Total Packets Processed            2442
```

```
    Total Packets Copied              2442
  Status:
    Policy reference count            2383
    Credit Limit (Mbps)               480
    Policer Rate (Kbits per ms)       480
    Bandwidth Limit                   Not-Reached
    Maximum Wait Time (secs)          30
    Time to Reinforce (secs)          0
    Application Hit List              junos:YAHOO
  Path Groups Information:
    Total sender path groups : 1
    Path-Group-Id : 1, Cur-Num-Paths: 2
      Path Information:
        Dst-IP         Pkts-Sent       Link-type
        40.1.1.2       2416           IP
        41.1.1.2       2416           MPLS
      Cos Q Statistics:
        Total sender cos queues: 8
        COS-Q-Id       Pkts-Sent
        0              2416
        1              0
        2              0
        3              0
        4              0
        5              0
        6              0
        7              0
```


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show security advanced-policy-based-routing policy-name

Syntax

```
show security advanced-policy-based-routing policy-name policy-name
<count | detail | from-zone |logical-system |root-logical-system | start>
```

Release Information

Command introduced in Junos OS Release 18.2R1.

Description

Display a summary of all APBR policies configured on the device.

You can use this command to understand the details of an APBR policy such as:

- Name, status, zone-context of the APBR policy.
- The number of times the traffic matches the APBR policy and APBR profile applied for the session.

Options

count— Display the number of configured APBR policies.

Range: 1 to 65535

detail—Display a detailed view of all of the APBR policies configured on the device.

from-zone—Display specific zone details applicable to the APBR policy.

logical-system—Displaythe logical system name.

root-logical-system—Display information about the default root-logical-system.

start—Display the policy from the given position.

Range: 1 to 65535

Required Privilege Level

view

Related Documentation

- Example: Configuring Advanced Policy-Based Routing for Application-Aware Traffic Management Solution on page 146

Output Fields

Table 44 on page 483 lists the output fields for the **show security advanced-policy-based-routing *policy-name*** command. Output fields are listed in the approximate order in which they appear.

Table 44: show security advanced-policy-based-routing policy-name

Field Name	Field Description
Policy	Name of the APBR policy.

Table 44: show security advanced-policy-based-routing policy-name (continued)

Field Name	Field Description
State	Status of the policy. The policy is in one of the following state: • 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.
Sequence Number	Number of the policy within a given context. For example, three policies that are applicable in a from-zone A-to-zone B context might be ordered with sequence numbers 1, 2, 3. Also, in a from-zone C-to-zone D context, four policies might have sequence numbers 1, 2, 3, 4.
From zone	Name of the source zone.
Source addresses	The names of the source addresses for a policy. Address sets are resolved to their individual names.
Destination addresses	Name of the destination address (or address set) as it was entered in the destination zone's address book
Applications	Name of a preconfigured or custom application whose type the packet matches, as specified at configuration time.
APBR Profile	Name of the applicable ABPR profile.

Table 45 on page 484 lists the output fields for the **show security advanced-policy-based-routing detail** command. Output fields are listed in the approximate order in which they appear.

Table 45: show security advanced-policy-based-routing detail

Field Name	Field Description
APBR Policy	Name of the APBR policy.
State	Status of the policy. The policy is in one of the following state: • 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.
Sequence Number	Number of the policy within a given context. For example, three policies that are applicable in a from-zone A-to-zone B context might be ordered with sequence numbers 1, 2, 3. Also, in a from-zone C-to-zone D context, four policies might have sequence numbers 1, 2, 3, 4.

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Table 45: show security advanced-policy-based-routing detail (continued)

Field Name	Field Description
From zone	Name of the source zone.
Source addresses	The names and corresponding IP addresses of the source addresses for a 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.
Applications	Name of a preconfigured or custom application whose type the packet matches, as specified at configuration time. • IP protocol: The Internet protocol used by the application—for example, TCP, UDP, ICMP. • ALG: If an ALG is explicitly associated with the policy, the name of the ALG is displayed. If application-protocol ignore is configured, ignore is displayed. Otherwise, 0 is displayed. However, even if this command shows ALG: 0, ALGs might be triggered for packets destined to well-known ports on which ALGs are listening, unless ALGs are explicitly disabled or when application-protocol ignore is not configured for custom applications. • Inactivity timeout: Elapsed time without activity after which the application is terminated. • Source port range: The low-high source port range for the session application. • Destination port range: The low-high destination port range for the session application.
APBR Profile	Name of the applicable ABPR profile.

Table 46 on page 485 lists the output fields for the **show security advanced-policy-based-routing from-zone** command. Output fields are listed in the approximate order in which they appear.

Table 46: show security advanced-policy-based-routing from-zone

Field Name	Field Description
From zone	Name of the source zone.
Policy count	Number of APBR policies configured for the zone.

Table 47 on page 485 lists the output fields for the **show security advanced-policy-based-routing hit-count** command. Output fields are listed in the approximate order in which they appear.

Table 47: show security advanced-policy-based-routing hit-count

Field Name	Field Description
Logical system	Name of the associated logical system.

Table 47: show security advanced-policy-based-routing hit-count (continued)

Field Name	Field Description
Index	Internal number associated with the policy.
From zone	Name of the source zone.
Name	Name of the APBR policy.
Policy count	Number of hits for each security policy.
Number of policy	Number of security policies for which hit counts are displayed.

Sample Output

show security advanced-policy-based-routing detail

```
user@host> show security advanced-policy-based-routing detail
```

```
Policy: p1, State: enabled, Index: 4
  Sequence number: 1
  From zone: trust
  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]
  APBR Profile: apbr-pr1
```

show security advanced-policy-based-routing from-zone

```
user@host> show security advanced-policy-based-routing from-zone trust
```

```
From zone: trust
  Policy: p1, State: enabled, Index: 4, Sequence number: 1
    Source addresses: any
    Destination addresses: any
    Applications: any
  APBR Profile: apbr-pr1
                                  1
```

show security advanced-policy-based-routing hit-count

```
user@host> show security advanced-policy-based-routing hit-count
```

```
Logical system: root-logical-system
 Index   From zone        Name           Hit count
 1       trust           p1             0

Number of policy: 1
```


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show security advanced-policy-based-routing policy-name

```
user@host>  show security advanced-policy-based-routing policy-name sla_policy1
```

```
From zone: trust
  APBR Policy: sla_policy1, State: enabled, Index: 7, Sequence number: 1
    Source addresses: any
    Destination addresses: any
    Applications: any
    APBR profile: apbr-pr-default
```

show security advance-policy-based-routing profile

Syntax

show security advance-policy-based-routing profile

Release Information

Command introduced in Junos OS Release 15.1X49-D60.

Description

Display the advanced policy-based routing (APBR) profile-to-zone mapping.

Required Privilege Level

view

Related Documentation

- Example: Configuring Advanced Policy-Based Routing for Application-Aware Traffic Management Solution on page 146

Output Fields

Table 48 on page 488 lists the output fields for the **show security advance-policy-based-routing profile** command. Output fields are listed in the approximate order in which they appear.

Table 48: show security advance-policy-based-routing profile

Field Name	Field Description
pic	PIC number of the accumulated statistics. NOTE: The PIC number is always displayed as 0 for SRX300, SRX320, SRX340, SRX345, SRX550M, and SRX1500 devices.
Profile	The name of the advanced policy-based (APBR) routing profile.
Zone	The zone on which APBR profile is applied to.

Sample Output

show security advance-policy-based-routing profile

```
user@host> show security advance-policy-based-routing profile

pic: 0/0
Profile    Zone
Profile1  trust
```


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show security advance-policy-based-routing statistics

Syntax

show security advance-policy-based-routing statistics

Release Information

Command introduced in Junos OS Release 15.1X49-D60. Support for Advanced Policy-Based Routing Midstream is introduced in Junos OS Release 15.1X49-D110. Command is updated to include **App rule hit on cache hit**, **URL cat rule hit on cache hit**, **App rule hit midstream** and **URL cat rule hit midstream** fields in Junos OS Release 18.4R1.

Description

Display the statistics counter for APBR.

You can use this command to understand the details on traffic handling with APBR such as:

- Sessions processed for the application-based routing.
- The number of times the application traffic matches the APBR profile and APBR is applied for the session.
- The number of times AppID was consulted to identify application traffic.

Required Privilege Level

view

Related Documentation

- Example: Configuring Advanced Policy-Based Routing for Application-Aware Traffic Management Solution on page 146

Output Fields

Table 44 on page 483 lists the output fields for the **show security advance-policy-based-routing statistics** command. Output fields are listed in the approximate order in which they appear.

Table 49: show security advance-policy-based-routing statistics

Field Name	Field Description
Session Processed	The number of sessions processed for the application-based routing.
ASC Success	The number of times the presence of an entry in the application system cache (ASC) is found.
Rule match success	The number of times the application traffic matches the APBR profile.
Route modified	The number of times the APBR is applied for the session.
AppID Requested	The number of times AppID was consulted to identify application traffic.

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Table 50 on page 490 lists the output fields for the **show security advance-policy-based-routing statistics** command for midstream support. Output fields are listed in the approximate order in which they appear.

Table 50: show security advance-policy-based-routing statistics (Advanced Policy-Based Routing Midstream Support)

Field Name	Field Description
Session Processed	The number of sessions processed for the application-based routing.
AppID cache hits	The number of times the presence of an entry in the application system cache (ASC) is found.
AppID Requested	The number of times AppID was consulted to identify application traffic.
Rule matches	The number of times the application traffic matches the APBR profile.
Route changed on cache hits	The number of times the APBR is applied for the session.
Route changed midstream	Number of times a route is changed for a session.
Zone mismatch	No of times a zone for an interface is changed in the middle of a session.
Drop on zone mismatch	Number of times a session is terminated because of change of zone in the middle of the session.

Table 51 on page 490 lists the output fields for the **show security advance-policy-based-routing statistics** command starting in Junos OS Release 18.4R1. Output fields are listed in the approximate order in which they appear.

Table 51: show security advance-policy-based-routing statistics

Field Name	Field Description
Session Processed	The number of sessions processed for the application-based routing.
App rule hit on cache hit	The number of times the rule with a matching entry in the application system cache (ASC) is found.
URL cat rule hit on cache hit	The number of times the rule with defined URL categories is matched.
App rule hit midstream	The number of times a route is changed in the middle of a session because of the rule with defined application is matched.
URL cat rule hit midstream	The number of times a route is changed in the middle of a session because of the rule with defined URL categories is matched.
Route changed on cache hits	Number of times a route is changed for a session because of the APBR applied for the session.

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Table 51: show security advance-policy-based-routing statistics (continued)

Field Name	Field Description
Route changed midstream	Number of times a route is changed in the middle of a session because of the APBR applied for the session.
Zone mismatch	No of times a zone for an interface is changed in the middle of a session.
Drop on zone mismatch	Number of times a session is terminated because of change of zone in the middle of the session.
Next hop not found	Number of times a session is terminated because next-hop IP address was not reachable.

Sample Output

show security advance-policy-based-routing statistics

```
user@host>  show security advance-policy-based-routing statistics

Advance Profile Based Routing statistics:
  Session Processed:                    5529
  ASC Success:                          3113
  Rule match success:                   107
  Route  modified:                      107
  AppID Requested:                      2416
```

show security advance-policy-based-routing statistics (Midstream Support)

```
user@host>  show security advance-policy-based-routing statistics

Advance Profile Based Routing statistics:
  Sessions Processed                    0
  AppID cache hits                      0
  AppID requested                       0
  Rule matches                          0
  Route changed on cache hits           0
  Route changed midstream               0
  Zone mismatch                         0
  Drop on zone mismatch                 0
```

show security advance-policy-based-routing statistics (Changed Options from Junos OS Release 18.4R1)

```
user@host>  show security advance-policy-based-routing statistics

Advance Profile Based Routing statistics:
  Sessions Processed                    2
  App rule hit on cache hit             1
  URL cat rule hit on cache hit         0
  App rule hit midstream                1
  URL cat rule hit midstream            0
  Route changed on cache hits           1
  Route changed midstream               1
  Zone mismatch                         0
  Drop on zone mismatch                 0
  Next hop not found                    0
```

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show security advance-policy-based-routing status

Syntax

```
show security advance-policy-based-routing status
```

Release Information

Command introduced in Junos OS Release 15.1X49-D60.

Description

Check if the advanced policy-based routing (APBR) is enabled.

You can create an advanced policy-based routing (APBR) profile (application profile) to match applications and application groups and redirect those matching traffic to the specified routing instance for the route lookup. The application profile is attached to a security zone or it can be attached to a specific logical or physical interface associated with the security zone.

Required Privilege Level

view

Related Documentation

- Example: Configuring Advanced Policy-Based Routing for Application-Aware Traffic Management Solution on page 146

Sample Output

show security advance-policy-based-routing status

```
user@host> show security advance-policy-based-routing status
Advance Policy Based Routing is enabled.
```

show security advance-policy-based-routing sla active-probe-statistics

Syntax

show security advance-policy-based-routing sla active-probe-statistics
active-probe-params-name *probe-name*

Release Information

Command introduced in Junos OS Release 18.2R1.

Description

Displays the details of active probe parameters. Active probe parameters are used by AppQoE to evaluate the SLA of the link. In active probing, custom packets are sent between a spoke device and a hub device on multiple routes to measure RTT, jitter, and packet loss between two SRX Series devices.

Required Privilege Level

view

Related Documentation

- Application Quality of Experience on page 173
- Advanced Policy-Based Routing on page 139

Output Fields

Table 52 on page 494 lists the output fields for the **show** command. Output fields are listed in the approximate order in which they appear.

Table 52: show security advance-policy-based-routing sla active-probe-statistics

Field Name	Field Description
Src-IP	Probe IP addresses used as probes' start point.
Dst-IP	Probe IP addresses used as probes' end point.
PKT-LOSS	Percentage of number of packets lost.
RTT(us)	Round-trip time (in microseconds)
2way-Jit	Two-way jitter (in microseconds).
Ing-Jit	Ingress jitter (in microseconds).
Egr-Jit	Egress jitter (in microseconds).

Sample Output

```
user@host> show security advance-policy-based-routing sla active-probe-statistics
Active Probe Statistics:
  Src-IP          Dst-IP          PKT-LOSS(%)     RTT(us)         2way-Jit(us)
  Ing-Jit(us)     Egr-Jit(us)
  42.1.1.2        42.1.1.1        100             0               0
```


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```
0               0
41.1.1.2        41.1.1.1        100             0               0
0               0
40.1.1.2        40.1.1.1        100             0               0
0               0
```

show security advance-policy-based-routing sla profile

Syntax

```
show security advance-policy-based-routing sla profile profile-name
<application application-name>
<destination group-name>
```

Release Information

Command introduced in Junos OS Release 18.2R1.

Description

Displays the number of times SLA violations occurred, application traffic switched route path, and monitored sessions.

Required Privilege Level

view

Related Documentation

- Application Quality of Experience on page 173
- Advanced Policy-Based Routing on page 139

Output Fields

Table 44 on page 483 lists the output fields for the **show** command. Output fields are listed in the approximate order in which they appear.

Table 53: show security advance-policy-based-routing sla profile

Field Name	Field Description
Application Name	Name of the application.
Application ID	ID of the application
APBR Profile Name	Name of the advanced policy-based (APBR) routing profile.
APBR Rule Name	Name of the APBR rule.
Application State	State of the application traffic.
Path Switch Idle State	Path switch idle state where no subsequent switching of application traffic path occurred.
Routing Instance Name	Name of the routing instance applied.
SLA Rule Name	Name of the SLA rule applied.
Active Probe Name	Name of the active probe parameter configured.
Selected Tunnel Destination	Selected tunnel destination where active probes are sent.
SLA Metrics	SLA metrics parameters, that are used by AppQoE to evaluate the SLA of the link. The SLA metric includes following parameters such as packet loss, RTT, jitter, and jitter type.

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Sample Output

user@host> **show security advance-policy-based-routing sla profile apbr-1 application junos:HTTP destination-group-name d1**

```
Application Details:
  Application Name            junos:HTTP
  Application ID              67
  APBR Profile Name           apbr1
  APBR Rule Name              rule1
  Application State           NO PATH SELECTED
  Path Switch Idle State      0
  Routing Instance Name       appqoe-vrf
  SLA Rule Name               sla1
  Active Probe Name           probe1
  Selected Tunnel Destination 0.0.0.0
SLA Metrics:
PKT-LOSS(%)     RTT(us)         2way-Jit(us)    Ing-Jit(us)     Egr-Jit(us)
  0               0               0               0               0
```

show security advance-policy-based-routing sla statistics

Syntax

```
show security advance-policy-based-routing sla statistics
```

Release Information

Command introduced in Junos OS Release 18.2R1.

Description

Display the SLA statistics.

Required Privilege Level

view

Related Documentation

- Application Quality of Experience on page 173
- Advanced Policy-Based Routing on page 139

Output Fields

Table 42 on page 477 lists the output fields for the **show security advance-policy-based-routing sla statistics** command. Output fields are listed in the approximate order in which they appear.

Table 54: show security advance-policy-based-routing sla statistics

Field Name	Field Description
Passive Probe Session Processed	Number of sessions on which passive probes are sent.
Possible Passive Probe Sessions	Number of sessions considered for passive probes.
Passive Probe Sessions Sampled	Number of sessions, from which, data is subjected to sampling.
Passive Probe Ongoing Sessions	Number of sessions on which passive probes are active.
SLA violations	Number of SLA violations detected.
Active Probe Paths	Number of links identified for active probe.
Active Probe Session	Number of sessions on which active probes are sent.
Active Probes Sent	Number of active probes sent.
Active Probe Paths down	Number of links on which active probes are sent, are not active.

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Sample Output

show security show security advance-policy-based-routing sla statistics

```
user@host> show security advance-policy-based-routing sla statistics

Advance Profile Based Routing SLA statistics:
Passive Probe Statistics
Passive Probe Session Processed 7040
Possible Passive Probe Sessions 0
Passive Probe Sessions Sampled 0
Passive Probe Ongoing Sessions 0
SLA violations 0
Active Probe Statistics
Active Probe Paths 0
Active Probe Session 3
Active Probes Sent 18360
Active Probe Paths down 3
```

show security advance-policy-based-routing sla status

Syntax

```
show security advance-policy-based-routing sla status
```

Release Information

Command introduced in Junos OS Release 18.2R1.

Description

Display the status of enabling switching of application path to an alternate route.

When local route switching is enabled, switching of application traffic to other route is enabled and also SLA monitoring and reporting functionality is available. By enabling local switch routing, the best possible link is selected for the application traffic to meet performance requirements as specified in SLA (service-level agreement).

Required Privilege Level

view

Related Documentation

- Example: Configuring Advanced Policy-Based Routing for Application-Aware Traffic Management Solution on page 146

Sample Output

show security advance-policy-based-routing sla status

```
user@host> show security advance-policy-based-routing sla status
Local Switching is enabled.
```


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show security advance-policy-based-routing sla version

Syntax

```
show security advance-policy-based-routing sla version
```

Release Information

Command introduced in Junos OS Release 18.2R1.

Description

Displays AppQoE version details. This information helps verify that the SLA version on both hub device and spoke device is same.

Required Privilege Level

view

Related Documentation

- Application Quality of Experience on page 173
- Advanced Policy-Based Routing on page 139

show security advance-policy-based-routing sla version

```
user@host> show security advance-policy-based-routing sla version
SLA version: APPQOE.VERS.1.0.0.0
```

show security application-firewall rule-set

Syntax

```
show security application-firewall rule-set (<rule-set-name> | all)
show security application-firewall rule-set (rule-set-name | all) | (logical-system
  logical-system-name  | all) | all-logical-systems-tenants | root-logical-system | tenant
  (tenant-name  | all)
```

Release Information

Command introduced in Junos OS Release 11.1. Updated in Junos OS Release 12.1X44-D10 with output format changes. Updated in Junos OS Release 12.1X45-D10 with redirection counters.
The **tenant** and **all-logical-systems-tenants** options are introduced in Junos OS Release 18.4R1.

Description

Display information about the specified rule set defined in the application firewall.

The application firewall is defined by a collection of rule sets. A rule set defines the rules that specify match criteria, including dynamic applications, and the action to be taken for matching traffic.

Starting in Junos OS Release 18.2R1, the application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and an opportunity to bring your configuration into compliance with the new configuration.

Options

rule-set-name— Display the name of the rule set.

all—(default) Display all rule sets for all logical systems. The user logical system administrator can display all rule sets only for the logical system they can access.

logical-system-name— Display application firewall rule set information for a specific logical system.

root-logical-system— Display application firewall rule set information for the root logical system (master administrator only).

all-logical-systems-tenants— Display application firewall rule set information for all the logical systems and tenants.

tenant—Display application firewall rule set information for the tenant systems.

Required Privilege Level

view

Related Documentation

- clear security application-firewall rule-set statistics on page 448

List of Sample Output

show security application-firewall rule-set my_ruleset1 on page 503

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show security application-firewall rule-set all on page 504
show security application-firewall rule-set ruleset1 tenant all on page 504

Output Fields Table 55 on page 503 lists the output fields for the **show security application-firewall rule-set** command. Output fields are listed in the approximate order in which they appear.

Table 55: show security application-firewall rule-set Output Fields

Field Name	Field Description
Rule-set	Name of the rule set.
Logical system	Name of the logical system of the rule set.
Tenant	Name of the tenant system of the rule set.
Profile	The redirect profile to be used for rules requiring redirection for reject or deny actions.

Rule	Name of the rule
	• **Dynamic applications**—Name of the applications.
	• **Dynamic application groups**—Name of the application groups.
	• **SSL-Encryption**—Setting for SSL traffic.
	• **Action**—The action taken with respect to a packet that matches the application firewall rule set. Actions include the following:
	  ◦ **permit**
	  ◦ **deny**
	  ◦ **reject**
	  ◦ **redirect**
	• **Number of sessions matched**—Number of sessions matched with the application firewall rule.
	• **Number of sessions redirected**—Number of sessions redirected by the application firewall rule.

Default rule	The default rule applied when the identified application is not specified in any rules of the rule set. • **Number of sessions matched**—Number of sessions matched with the application firewall default rule. • **Number of sessions redirected**—Number of sessions redirected by the application firewall rule.
Number of sessions with appid pending	Number of sessions that are pending application identification processing

Sample Output

show security application-firewall rule-set my_ruleset1

```
user@host>show security application-firewall rule-set my_ruleset1
Rule-set: my_ruleset1
     Rule: rule1
```

```
        Dynamic Applications: junos:FACEBOOK-ACCESS, junos:YMSG
        Dynamic Application Groups: junos:web, junos:chat
        SSL-Encryption: any
        Action: deny or redirect
        Number of sessions matched: 10
        Number of sessions redirected: 10
    Default rule: permit
        Number of sessions matched: 200
        Number of sessions redirected: 0
    Number of sessions with appid pending: 2
```

Sample Output

show security application-firewall rule-set all

user@host> **show security application-firewall rule-set all**

```
Rule-set: ls-product-design-rs1
    Logical system: ls-product-design
    Rule: r1
        Dynamic Applications: junos:TELNET
        Action:permit
        Number of sessions matched: 10
Default rule:deny
        Number of sessions matched: 100
Number of sessions with appid pending: 2

Rule-set: ls-product-design-rs1
    Logical system: ls-product-design
    Rule: r2
        Dynamic Application Groups: junos:web
        Action:permit
        Number of sessions matched: 20
Default rule:deny
        Number of sessions matched: 200
Number of sessions with appid pending: 4

Rule-set: ls-product-design-rs2
    Logical system: ls-product-design
    Rule: r1
        Dynamic Applications: junos:FACEBOOK-ACCESS
        Action:deny
        Number of sessions matched: 40
Default rule:permit
        Number of sessions matched: 400
Number of sessions with appid pending: 10
```

Sample Output

show security application-firewall rule-set ruleset1 tenant all

user@host> **show security application-firewall rule-set ruleset1 tenant all**

```
Rule-set: ruleset1
    Logical system: root-logical-system
    Tenant: TSYS1
    Rule: rule1
```


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```
        Dynamic Applications: junos:HTTP, junos:FTP
        SSL-Encryption: any
        Action:permit
        Number of sessions matched: 0
        Number of sessions redirected: 0
Default rule:permit
        Number of sessions matched: 0
        Number of sessions redirected: 0
Number of sessions with appid pending: 0
```

show security application-firewall rule-set logical-system

Syntax The master, or root, administrator can issue the following statements:

```
show security application-firewall rule-set all
show security application-firewall rule-set rule-set-name | all | logical-system
  logical-system-name | all | root-logical-system [logical-system-name | all ]
```

The user logical system administrator can issue the following statement:

```
show security application-firewall rule-set all
```

Release Information Command introduced in Junos OS Release 11.4.

Description Display information about application firewall rule set(s) associated with a specific logical system, all logical systems, or the root logical system configured on a device.

NOTE: The master administrator can configure and view application firewall rule sets for the root logical system and all user logical systems configured on the device. User logical system administrators can configure and view application firewall rule set information only for the user logical systems for which they have access. For information about master and user administrator roles in logical systems, see *Understanding Logical Systems for SRX Series Services Gateways*.

Starting in Junos OS Release 18.2R1, the application firewall (AppFW) functionality is deprecated. As a part of this change, the **[edit security application-firewall]** hierarchy and all the configuration options under this hierarchy are deprecated— rather than immediately removed—to provide backward compatibility and an opportunity to bring your configuration into compliance with the new configuration.

Options ***rule-set-name***—Name of a specific rule set.

logical-system-name—Name of a specific logical system.

all—(default) Display all rule sets for all logical systems. The user logical system administrator can display all rule sets only for the logical system they can access.

root-logical-system—Display application firewall rule set information for the root logical system (master administrator only).

Required Privilege Level view

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Related Documentation

- clear security application-firewall rule-set statistics logical-system on page 449

List of Sample Output

show security application-firewall rule-set logical-system all on page 507
show security application-firewall rule-set all on page 508

Output Fields

Table 56 on page 507 lists the output fields for the **show security application-firewall rule-set logical-system** command. Output fields are listed in the approximate order in which they appear.

Table 56: show security application-firewall rule-set logical-system Output Fields

Field Name	Field Description
Rule-set	Name of the rule set.
Logical system	Name of the logical system.

Rule	Name of the rule.
	• **Dynamic applications**—Name of the applications.
	• **Dynamic application groups**—Name of the application groups.
	• **Action**—The action taken with respect to a packet that matches the application firewall rule set. Actions include the following:
	  ◦ **permit**
	  ◦ **deny**
	• **Number of sessions matched**—Number of sessions matched with the application firewall rule.

Default rule	The default rule applied when the identified application is not specified in any rules of the rule set. • **Number of sessions matched**—Number of sessions matched with the application firewall default rule.
Number of sessions with appid pending	Number of sessions that are pending with the application ID processing.

Sample Output

show security application-firewall rule-set logical-system all

```
root@host> show security application-firewall rule-set logical-system all

Rule-set: root_rs1
    Logical system: root-logical-system
    Rule: r1
        Dynamic Applications: junos:FTP
        Action:permit
        Number of sessions matched: 10
Default rule:deny
        Number of sessions matched: 100
Number of sessions with appid pending: 4
```

```
Rule-set: root-rs2
    Logical system: root-logical-system
    Rule: r1
        Dynamic Application Groups: junos:web
        Action:permit
        Number of sessions matched: 20
Default rule:deny
        Number of sessions matched: 100
Number of sessions with appid pending: 10
```

show security application-firewall rule-set all

root@host> **show security application-firewall rule-set all**

```
Rule-set: ls-product-design-rs1
    Logical system: ls-product-design
    Rule: r1
        Dynamic Applications: junos:TELNET
        Action:permit
        Number of sessions matched: 10
Default rule:deny
        Number of sessions matched: 100
Number of sessions with appid pending: 2

Rule-set: ls-product-design-rs1
    Logical system: ls-product-design
    Rule: r2
        Dynamic Application Groups: junos:web
        Action:permit
        Number of sessions matched: 20
Default rule:deny
        Number of sessions matched: 200
Number of sessions with appid pending: 4

Rule-set: ls-product-design-rs2
    Logical system: ls-product-design
    Rule: r1
        Dynamic Applications: junos:FACEBOOK-ACCESS
        Action:deny
        Number of sessions matched: 40
Default rule:permit
        Number of sessions matched: 400
Number of sessions with appid pending: 10
```


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show security application-tracking counters

Syntax show security application-tracking counters

Release Information Command introduced in Junos OS Release 10.2.

Description Display the status of AppTrack counters.

Required Privilege Level view

Related Documentation

- Understanding Application Tracking on page 104
- Example: Configuring Application Tracking on page 109

Output Fields Table 57 on page 509 lists the output fields for the **show security application-tracking counters** command. Output fields are listed in the approximate order in which they appear.

Table 57: show security application-tracking counters

Field Name	Field Description
Session create messages	The number of log messages generated when a session was created.
Session close messages	The number of log messages generated when a session was closed.
Session volume updates	The number of log messages generated when an update interval was exceeded.
Session route updates	The number of log messages generated when an egress interface was selected based on application carried in the session by APBR.
Failed messages	The number of messages that were not generated due to memory or session constraints.

Sample Output

show security application-tracking counters

```
user@host> show security application-tracking counters

Application tracking counters:

   AppTrack counter type                              Value
 Session create messages                                1
 Session close messages                                 1
 Session volume updates                                 0
 Session route updates                                  1
 Failed messages                                        0
```

show security flow session

Syntax

```
show security flow session [<filter>] [brief | extensive | summary]
<node ( node-id  | all | local | primary)>
```

Release Information

Command introduced in Junos OS Release 8.5. Support for filter and view options added in Junos OS Release 10.2.
Application firewall, dynamic application, and logical system filters added in Junos OS Release 11.2.
Policy ID filter added in Junos OS Release 12.3X48-D10.
Support for connection tag added in Junos OS Release 15.1X49-D40.
The **tenant** option introduced in Junos OS Release 18.3R1.

Description

Display information about all currently active security sessions on the device.

NOTE: For the normal flow sessions, the **show security flow session** command displays byte counters based on IP header length. However, for sessions in Express Path mode, the statistics are collected from the IOC2 and IOC3 ASIC hardware engines and include full packet length with L2 headers. Because of this, the output displays slightly larger byte counters for sessions in Express Path mode than for the normal flow session.

Options

- *filter*—Filter the display by the specified criteria.

  The following filters reduce the display to those sessions that match the criteria specified by the filter. Refer to the specific **show** command for examples of the filtered output.

  advanced-anti-malware—Show advanced-anti-malware sessions. For details on the **advanced-anti-malware** option, see the Sky Advanced Threat Prevention CLI Reference Guide.

  all-logical-systems-tenants—All multitenancy systems.

  application—Predefined application name.

  application-firewall—Application firewall enabled.

  application-firewall-rule-set—Application firewall enabled with the specified rule set.

  application-traffic-control—Application traffic control session.

  application-traffic-control-rule-set—Application traffic control rule set name and rule name.

  conn-tag—Session connection tag (0..4294967295).

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destination-port—Destination port.

destination-prefix—Destination IP prefix or address.

dynamic-application—Dynamic application.

dynamic-application-group—Dynamic application.

encrypted—Encrypted traffic.

family—Display session by family.

idp—IDP-enabled sessions.

interface—Name of incoming or outgoing interface.

logical-system (all | ***logical-system-name*****)**—Name of a specific logical system or **all** to display all logical systems.

nat—Display sessions with network address translation.

node—(Optional) For chassis cluster configurations, display security flow session information on a specific node (device) in the cluster.

- ***node-id*** —Identification number of the node. It can be 0 or 1.
- **all** —Display information about all nodes.
- **local** —Display information about the local node.
- **primary**—Display information about the primary node.

policy-id—Display session information based on policy ID; the range is 1 through 4,294,967,295.

protocol—IP protocol number.

resource-manager—Resource manager.

root-logical-system—Display root logical system as default.

security-intelligence—Display security intelligence sessions.

services-offload—Display services offload sessions.

session-identifier—Display session with specified session identifier.

source-port—Source port.

source-prefix—Source IP prefix.

tenant—Displays the security flow session information for a tenant system.

tunnel—Tunnel sessions.

- brief | extensive | summary—Display the specified level of output.

- none—Display information about all active sessions.

Required Privilege Level view

Related Documentation
- *Understanding Traffic Processing on Security Devices*
- *clear security flow session all*

List of Sample Output
show security flow session on page 514
show security flow session (with default policy) on page 514
show security flow session brief on page 515
show security flow session extensive on page 515
show security flow session summary on page 515

Output Fields Table 58 on page 512 lists the output fields for the **show security flow session** command. Output fields are listed in the approximate order in which they appear.

Table 58: show security flow session Output Fields

Field Name	Field Description	Level of Output
Session ID	Number that identifies the session. Use this ID to get more information about the session.	brief extensive none
If	Interface name.	brief none
State	Status of security flow session.	brief extensive none
Conn Tag	A 32-bit connection tag that uniquely identifies the GPRS tunneling protocol, user plane (GTP-U) and the Stream Control Transmission Protocol (STCP) sessions. The connection tag for GTP-U is the tunnel endpoint identifier (TEID) and for SCTP is the vTag. The connection ID remains 0 if the connection tag is not used by the sessions.	brief extensive none
CP Session ID	Number that identifies the central point session. Use this ID to get more information about the central point session.	brief extensive none

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Table 58: show security flow session Output Fields (continued)

Field Name	Field Description	Level of Output
Policy name	Name and ID of the policy that the first packet of the session matched.	brief extensive none
Timeout	Idle timeout after which the session expires.	brief extensive none
In	Incoming flow (source and destination IP addresses, application protocol, interface, session token, route, gateway, tunnel, port sequence, FIN sequence, FIN state, packets and bytes).	brief extensive none
Bytes	Number of received and transmitted bytes.	brief extensive none
Pkts	Number of received and transmitted packets.	brief extensive none
Total sessions	Total number of sessions.	brief extensive none
Out	Reverse flow (source and destination IP addresses, application protocol, interface, session token, route, gateway, tunnel, port sequence, FIN sequence, FIN state, packets and bytes).	brief extensive none
Status	Session status.	extensive
Flag	Internal flag depicting the state of the session, used for debugging purposes.	extensive
Source NAT pool	The name of the source pool where NAT is used.	extensive
Dynamic application	Name of the application.	extensive
Application traffic control rule-set	AppQoS rule set for this session.	extensive

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Table 58: show security flow session Output Fields (continued)

Field Name	Field Description	Level of Output
Rule	AppQoS rule for this session.	extensive
Maximum timeout	Maximum session timeout.	extensive
Current timeout	Remaining time for the session unless traffic exists in the session.	extensive
Session State	Session state.	extensive
Start time	Time when the session was created, offset from the system start time.	extensive
Unicast-sessions	Number of unicast sessions.	Summary
Multicast-sessions	Number of multicast sessions.	Summary
Services-offload-sessions	Number of services-offload sessions.	Summary
Failed-sessions	Number of failed sessions.	Summary
Sessions-in-use	Number of sessions in use. • Valid sessions • Pending sessions • Invalidated sessions • Sessions in other states	Summary
Maximum-sessions	Maximum number of sessions permitted.	Summary

Sample Output

show security flow session

```
root> show security flow session
Flow Sessions on FPC0 PIC1:

Session ID: 10115977, Policy name: SG/4, State: Active, Timeout: 56, Valid
  In: 203.0.113.1/1000 --> 203.0.113.11/2000;udp, Conn Tag: 0x0, If: reth1.0,
Pkts: 1, Bytes: 86, CP Session ID: 10320276
  Out: 203.0.113.11/2000 --> 203.0.113.1/1000;udp, Conn Tag: 0x0, If: reth0.0,
Pkts: 0, Bytes: 0, CP Session ID: 10320276

Total sessions: 1
```

show security flow session (with default policy)

```
root> show security flow session
Session ID: 36, Policy name: pre-id-default-policy/n, Timeout: 2, Valid
  In: 10.10.10.2/61606 --> 10.10.10.1/179;tcp, Conn Tag: 0x0, If: ge-0/0/2.0,
```


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```
Pkts: 1, Bytes: 64,
  Out: 10.10.10.1/179 --> 10.10.10.2/61606;tcp, Conn Tag: 0x0, If: .local..0,
Pkts: 1, Bytes: 40,
```

show security flow session brief

root> **show security flow session brief**

```
Flow Sessions on FPC0 PIC1:

Session ID: 10115977, Policy name: SG/4, State: Active, Timeout: 62, Valid
  In: 203.0.113.11/1000 --> 203.0.113.1/2000;udp, Conn Tag: 0x0, If: reth1.0,
Pkts: 1, Bytes: 86, CP Session ID: 10320276
  Out: 203.0.113.1/2000 --> 203.0.113.11/1000;udp, Conn Tag: 0x0, If: reth0.0,
Pkts: 0, Bytes: 0, CP Session ID: 10320276

Total sessions: 1
```

show security flow session extensive

root> **show security flow session extensive**

```
Flow Sessions on FPC0 PIC1:

Session ID: 10115977, Status: Normal, State: Active
Flags: 0x8000040/0x18000000/0x12000003
Policy name: SG/4
Source NAT pool: Null, Application: junos-gprs-gtp-v0-udp/76
Dynamic application: junos:UNKNOWN,
Encryption:  Unknown
Application traffic control rule-set: INVALID, Rule: INVALID
Maximum timeout: 90, Current timeout: 54
Session State: Valid
Start time: 6704, Duration: 35
   In: 203.0.113.11/1000 --> 201.11.0.100/2000;udp,
    Conn Tag: 0x0, Interface: reth1.0,
    Session token: 0x6, Flag: 0x40000021
    Route: 0x86053c2, Gateway: 201.10.0.100, Tunnel: 0
    Port sequence: 0, FIN sequence: 0,
    FIN state: 0,
    Pkts: 1, Bytes: 86
    CP Session ID: 10320276
   Out: 203.0.113.1/2000 --> 203.0.113.11/1000;udp,
    Conn Tag: 0x0, Interface: reth0.0,
    Session token: 0x7, Flag: 0x50000000
    Route: 0x86143c2, Gateway: 203.0.113.11, Tunnel: 0
    Port sequence: 0, FIN sequence: 0,
    FIN state: 0,
    Pkts: 0, Bytes: 0
    CP Session ID: 10320276
Total sessions: 1
```

show security flow session summary

root> **show security flow session summary**

```
Flow Sessions on FPC10 PIC1:
Unicast-sessions: 1
Multicast-sessions: 0
```

```
Services-offload-sessions: 0
Failed-sessions: 0
Sessions-in-use: 1
  Valid sessions: 1
  Pending sessions: 0
  Invalidated sessions: 0
  Sessions in other states: 0
Maximum-sessions: 6291456

Flow Sessions on FPC10 PIC2:
Unicast-sessions: 0
Multicast-sessions: 0
Services-offload-sessions: 0
Failed-sessions: 0
Sessions-in-use: 0
  Valid sessions: 0
  Pending sessions: 0
  Invalidated sessions: 0
  Sessions in other states: 0
Maximum-sessions: 6291456

Flow Sessions on FPC10 PIC3:
Unicast-sessions: 0
Multicast-sessions: 0
Services-offload-sessions: 0
Failed-sessions: 0
Sessions-in-use: 0
  Valid sessions: 0
  Pending sessions: 0
  Invalidated sessions: 0
  Sessions in other states: 0
Maximum-sessions: 6291456
```


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show security flow session application-firewall

Syntax

```
show security flow session application-firewall
< dynamic-application (dyn-app-name | junos:UNKNOWN) >
< dynamic-application-group (dyn-app-group | junos:UNASSIGNED) >
< application-firewall-rule-set rule-set-name >
< rule rule-name >
< brief | extensive | summary >
```

Release Information

Command introduced in Junos OS Release 11.2.

Description

Display all sessions where application firewall is enabled.

Include options to filter the output and display only those enabled sessions with the specified features.

Options

- **dynamic-application (*dyn-app-name* | junos:UNKNOWN)**—Display only those enabled sessions with the specified dynamic application. Enter **junos:UNKNOWN** to display all enabled sessions where no dynamic application can be determined.
- **dynamic-application-group (*dyn-app-group* | junos:UNASSIGNED)**— Display only those enabled session with the specified dynamic application group. Enter **junos:UNASSIGNED** to display all enabled sessions where no dynamic application group can be determined.
- **application-firewall-rule-set *rule-set-name***—Display only those enabled sessions that match the specified rule set.
- **rule *rule-name***—Display only those enabled sessions that match the specified rule.
- **brief | extensive | summary**—Specify the level of detail for the display.

  The output fields for the **brief** and **summary** options are the same as those of the **show security flow session** command. Only the **extensive** display is different and is shown in the following output table and examples.

Required Privilege Level

view

Related Documentation

- Example: Configuring an Application Group for Application Firewall on page 96
- show security flow session on page 510

List of Sample Output

show security flow session application-firewall extensive on page 519
show security flow session application-firewall dynamic-application junos:FTP extensive on page 519
show security flow session application-firewall dynamic-application junos:UNKNOWN extensive on page 520
show security flow session application-firewall dynamic-application-group junos:WEB extensive on page 521

show security flow session application-firewall application-firewall-rule-set rule-set1 extensive on page 521

Output Fields Table 59 on page 518 lists the output fields for the **show security flow session application-firewall extensive** command. Output fields are listed in the approximate order in which they appear in the extensive display.

Table 59: show security flow session application-firewall extensive Output Fields

Field Name	Field Description
Session ID	Number that identifies the session. Use this ID to display more information about a session.
Status	Session status.
State	Current state of the session: Active, Pending, Closed, Unknown.
Flag	Internal flag depicting the state of the session. It is used for debugging purposes.
Policy name	The name of the policy that permitted the traffic.
Source NAT pool	The name of the source pool where NAT is used.
Dynamic application	Name of the dynamic application of the session. If the dynamic application has yet to be determined, the output indicates Pending. If the dynamic application cannot be determined, the output indicates junos:UNKNOWN.
Dynamic application group	Name of the dynamic application group of the session. If the dynamic application cannot be determined, the output indicates junos:UNASSIGNED.
Dynamic nested application	Name of the dynamic nested application of the session if one exists. If the dynamic nested application is yet to be determined, the output indicates Pending. If the dynamic nested application cannot be determined, the output indicates junos:UNKNOWN.
Application firewall rule-set	Name of the rule set that the session matched.
Rule	Name of the rule that the session matched. If the match has not yet been made, the output indicates Pending. If the rule has been deleted since the match was made, the output indicates the rule is invalid.
Maximum timeout	Maximum amount of idle time allowed for the session.
Current timeout	Number of seconds that the current session has been idle.
Session State	Session state.
Start time	Time when the session was created. Start time is indicated as an offset from the system start time.
In	Incoming flow (source and destination IP addresses, application protocol, interface, session token, route, gateway, tunnel, port sequence, FIN sequence, FIN state, packets, and bytes).

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Table 59: show security flow session application-firewall extensive Output Fields (continued)

Field Name	Field Description
Out	Reverse flow (source and destination IP addresses, application protocol, interface, session token, route, gateway, tunnel, port sequence, FIN sequence, FIN state, packets and bytes).
Total sessions	Total number of sessions per PIC that fit the display criteria.

Sample Output

show security flow session application-firewall extensive

The displayed information is similar to the **show security flow session** output but includes dynamic application and application firewall details for the session.

`user@host>` **show security flow session application-firewall extensive**

```
Flow Sessions on FPC9 PIC0:

     Session ID: 3729, Status: Normal, State: Active
      Policy name: self-traffic-policy/1
      Source NAT pool: Null
      Dynamic application: junos:HTTP, Dynamic nested application:
junos:FACEBOOK-ACCESS
      Application firewall rule-set: rule-set1, Rule: rule2
      Maximum timeout: 300, Current timeout: 276
      Session State: Valid
      Start time: 18292, Duration: 603536
         In: 192.0.2.1/1 --> 203.0.113.1/1;pim,
          Interface: reth1.0,
          Session token: 0x1c0, Flag: 0x0x21
          Route: 0x0, Gateway: 192.0.2.4, Tunnel: 0
          Port sequence: 0, FIN sequence: 0,
          FIN state: 0,
          Pkts: 21043, Bytes: 1136322
         Out: 203.0.113.1/1 --> 192.0.2.1/1;pim,
          Interface: .local..0,
          Session token: 0x80, Flag: 0x0x30
          Route: 0xfffd0000, Gateway: 203.0.113.13, Tunnel: 0
          Port sequence: 0, FIN sequence: 0,
          FIN state: 0,
          Pkts: 0, Bytes: 0

     Total sessions: 1
```

show security flow session application-firewall dynamic-application junos:FTP extensive

Entering a specific dynamic application in the command line filters the output and displays only those sessions with the specified application.

`user@host>` **show security flow session application-firewall dynamic-application junos:FTP extensive**

```
Flow Sessions on FPC3 PIC0:
```

```
    Session ID: 180013338, Policy name: policy1/4, Timeout: 1776, Valid
     Dynamic application: junos:FTP
     Application firewall rule-set: rule-set1, Rule: rule1
     Maximum timeout: 300, Current timeout: 276
     Session State: Valid
     Start time: 18292, Duration: 603536
        In: 192.0.2.4/1 --> 203.0.113.13/1;pim,
         Interface: reth1.0,
         Session token: 0x1c0, Flag: 0x0x21
         Route: 0x0, Gateway: 192.0.2.4, Tunnel: 0
         Port sequence: 0, FIN sequence: 0,
         FIN state: 0,
         Pkts: 21043, Bytes: 1136322
        Out: 203.0.113.13/1 --> 192.0.2.4/1;pim,
         Interface: .local..0,
         Session token: 0x80, Flag: 0x0x30
         Route: 0xfffd0000, Gateway: 203.0.113.13, Tunnel: 0
         Port sequence: 0, FIN sequence: 0,
         FIN state: 0,
         Pkts: 0, Bytes: 0

     Total sessions: 1
```

show security flow session application-firewall dynamic-application junos:UNKNOWN extensive

Using the keyword **junos:UNKNOWN** displays those enabled sessions where the dynamic application cannot be determined.

`user@host>` **show security flow session application-firewall dynamic-application junos:UNKNOWN extensive**

```
Flow Sessions on FPC9 PIC0:

    Session ID: 180013338, Policy name: policy1/4, Timeout: 1776, Valid
     Dynamic application: junos:UNKNOWN
     Application firewall rule-set: rule-set1, Rule:rule1
     Maximum timeout: 300, Current timeout: 276
     Session State: Valid
     Start time: 18292, Duration: 603536
        In: 192.0.2.4/1 --> 203.0.113.13/1;pim,
         Interface: reth1.0,
         Session token: 0x1c0, Flag: 0x0x21
         Route: 0x0, Gateway: 192.0.2.4, Tunnel: 0
         Port sequence: 0, FIN sequence: 0,
         FIN state: 0,
         Pkts: 21043, Bytes: 1136322
        Out: 203.0.113.13/1 --> 192.0.2.4/1;pim,
         Interface: .local..0,
         Session token: 0x80, Flag: 0x0x30
         Route: 0xfffd0000, Gateway: 203.0.113.13, Tunnel: 0
         Port sequence: 0, FIN sequence: 0,
         FIN state: 0,
         Pkts: 0, Bytes: 0

     Session ID: 180013339, Policy name: policy1/4, Timeout: 1776, Valid
     Dynamic application: junos:HTTP, Dynamic nested application: junos:UNKNOWN

     Application firewall rule-set: rule-set1, Rule:rule1
     Maximum timeout: 300, Current timeout: 276
```


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```
     Session State: Valid
     Start time: 18292, Duration: 603536
        In: 192.0.2.4/1 --> 203.0.113.13/1;pim,
         Interface: reth1.0,
         Session token: 0x1c0, Flag: 0x0x21
         Route: 0x0, Gateway: 192.0.2.4, Tunnel: 0
         Port sequence: 0, FIN sequence: 0,
         FIN state: 0,
         Pkts: 21043, Bytes: 1136322
        Out: 203.0.113.13/1 --> 192.0.2.4/1;pim,
         Interface: .local..0,
         Session token: 0x80, Flag: 0x0x30
         Route: 0xfffd0000, Gateway: 203.0.113.13, Tunnel: 0
         Port sequence: 0, FIN sequence: 0,
         FIN state: 0,
         Pkts: 0, Bytes: 0

     Total sessions: 2
```

show security flow session application-firewall dynamic-application-group junos:WEB extensive

Entering a specific dynamic application group in the command line filters the output and displays only those sessions with the specified application group.

`user@host>` **show security flow session application-firewall dynamic-application-group junos:WEB extensive**

```
Flow Sessions on FPC9 PIC0:

     Session ID: 180013338, Policy name: policy1/4, Timeout: 1776, Valid
      Dynamic application: junos:HOTMAIL
      Application firewall rule-set: rule-set1, Rule: rule1
      Maximum timeout: 300, Current timeout: 276
      Session State: Valid
      Start time: 18292, Duration: 603536
         In: 192.0.2.4/1 --> 203.0.113.13/1;pim,
          Interface: reth1.0,
          Session token: 0x1c0, Flag: 0x0x21
          Route: 0x0, Gateway: 192.0.2.4, Tunnel: 0
          Port sequence: 0, FIN sequence: 0,
          FIN state: 0,
          Pkts: 21043, Bytes: 1136322
         Out: 203.0.113.13/1 --> 192.0.2.4/1;pim,
          Interface: .local..0,
          Session token: 0x80, Flag: 0x0x30
          Route: 0xfffd0000, Gateway: 203.0.113.13, Tunnel: 0
          Port sequence: 0, FIN sequence: 0,
          FIN state: 0,
          Pkts: 0, Bytes: 0

     Total sessions: 1
```

show security flow session application-firewall application-firewall-rule-set rule-set1 extensive

Specifying a rule set name reduces the display to only those sessions matching the specified rule set.

user@host> **show security flow session application-firewall application-firewall-rule-set rule-set1 extensive**

```
Flow Sessions on FPC9 PIC0:

     Session ID: 180013338, Policy name: policy1/4, Timeout: 1776, Valid
      Dynamic application: junos:FTP
      Application firewall rule-set: rule-set1, Rule: rule1
      Maximum timeout: 300, Current timeout: 276
      Session State: Valid
      Start time: 18292, Duration: 603536
         In: 192.0.2.4/1 --> 203.0.113.13/1;pim,
          Interface: reth1.0,
          Session token: 0x1c0, Flag: 0x0x21
          Route: 0x0, Gateway: 192.0.2.4, Tunnel: 0
          Port sequence: 0, FIN sequence: 0,
          FIN state: 0,
          Pkts: 21043, Bytes: 1136322
         Out: 203.0.113.13/1 --> 192.0.2.4/1;pim,
          Interface: .local..0,
          Session token: 0x80, Flag: 0x0x30
          Route: 0xfffd0000, Gateway: 203.0.113.13, Tunnel: 0
          Port sequence: 0, FIN sequence: 0,
          FIN state: 0,
          Pkts: 0, Bytes: 0

     Session ID: 180013339, Policy name: policy1/4, Timeout: 1776, Valid
      Dynamic application: junos:HTTP, Dynamic nested application:
junos:FACEBOOK-ACCESS
      Application firewall rule-set: rule-set1, Rule: rule2
      Maximum timeout: 300, Current timeout: 276
      Session State: Valid
      Start time: 18292, Duration: 603536
         In: 192.0.2.4/1 --> 203.0.113.13/1;pim,
          Interface: reth1.0,
          Session token: 0x1c0, Flag: 0x0x21
          Route: 0x0, Gateway: 192.0.2.4, Tunnel: 0
          Port sequence: 0, FIN sequence: 0,
          FIN state: 0,
          Pkts: 21043, Bytes: 1136322
         Out: 203.0.113.13/1 --> 192.0.2.4/1;pim,
          Interface: .local..0,
          Session token: 0x80, Flag: 0x0x30
          Route: 0xfffd0000, Gateway: 203.0.113.13, Tunnel: 0
          Port sequence: 0, FIN sequence: 0,
          FIN state: 0,
          Pkts: 0, Bytes: 0


      Total sessions: 2
```


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show security pki ca-certificate

Syntax

```
show security pki ca-certificate
<brief | detail>
<ca-profile ca-profile-name>
```

Release Information

Command introduced in Junos OS Release 7.5.

Description

Display information about certificate authority (CA) digital certificates installed in the router.

Options

none—(Same as brief) Display information about all CA digital certificates.

brief | detail—(Optional) Display the specified level of output.

ca-profile *ca-profile-name*—(Optional) Display information about only the specified CA profile.

Required Privilege Level

view

List of Sample Output

show security pki ca-certificate on page 524
show security pki ca-certificate detail on page 525

Output Fields

Table 60 on page 523 lists the output fields for the **show security pki ca-certificate** command. Output fields are listed in the approximate order in which they appear.

Table 60: show security pki ca-certificate Output Fields

Field Name	Field Description	Level of Output
Certificate identifier	Name of the digital certificate.	All levels
Certificate version	Revision number of the digital certificate.	**detail**
Serial number	Unique serial number of the digital certificate.	**detail**
Issued by	Authority that issued the digital certificate.	**none brief**
Issued to	Device that was issued the digital certificate.	**none brief**

Table 60: show security pki ca-certificate Output Fields (continued)

Field Name	Field Description	Level of Output
Issuer	Authority that issued the digital certificate, including details of the authority organized using the distinguished name format. Possible subfields are: • **Common name**—Name of the authority. • **Organization**—Organization of origin. • **Organizational unit**—Department within an organization. • **State**—State of origin. • **Country**—Country of origin.	**detail**
Subject	Details of the digital certificate holder organized using the distinguished name format. Possible subfields are: • **Common name**—Name of the requestor. • **Organization**—Organization of origin. • **Organizational unit**—Department within an organization. • **State**—State of origin. • **Country**—Country of origin.	**detail**
Validity	Time period when the digital certificate is valid. Values are: • **Not before**—Start time when the digital certificate becomes valid. • **Not after**—End time when the digital certificate becomes invalid.	All levels
Public key algorithm	Encryption algorithm used with the private key, such as **rsaEncryption(1024 bits)**.	All levels
Signature algorithm	Encryption algorithm that the CA used to sign the digital certificate, such as **sha1WithRSAEncryption**.	**detail**
Fingerprint	Secure Hash Algorithm (SHA1) and Message Digest 5 (MD5) hashes used to identify the digital certificate.	**detail**
Distribution CRL	Distinguished name information and the URL for the certificate revocation list (CRL) server.	**detail**
Use for key	Use of the public key, such as **Certificate signing**, **CRL signing**, **Digital signature**, or **Key encipherment**.	**detail**

Sample Output

show security pki ca-certificate

```
user@host> show security pki ca-certificate
```

```
Certificate identifier: abc
  Issued to: example, Issued by: exmple
  Validity:
    Not before: 2005 Oct 18th, 23:54:22 GMT
    Not after: 2025 Oct 19th, 00:24:22 GMT
  Public key algorithm: rsaEncryption(1024 bits)
```


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```
Certificate identifier: entrust
  Issued to: First Officer, Issued by: example
  Validity:
    Not before: 2005 Oct 18th, 23:55:59 GMT
    Not after: 2008 Oct 19th, 00:25:59 GMT
  Public key algorithm: rsaEncryption(1024 bits)

Certificate identifier:abe
  Issued to: First Officer, Issued by: example
  Validity:
    Not before: 2005 Oct 18th, 23:55:59 GMT
    Not after: 2008 Oct 19th, 00:25:59 GMT
  Public key algorithm: rsaEncryption(1024 bits)
```

show security pki ca-certificate detail

user@host> **show security pki ca-certificate detail**

```
Certificate identifier: entrust
  Certificate version: 3
  Serial number: 4355 9235
  Issuer:
    Organization: example, Country: us
  Subject:
    Organization: example, Country: us
  Validity:
    Not before: 2005 Oct 18th, 23:54:22 GMT
    Not after: 2025 Oct 19th, 00:24:22 GMT
  Public key algorithm: rsaEncryption(1024 bits)
    cb:9e:2d:c0:70:f8:ea:3c:f2:b5:f0:02:48:87:dc:68:99:a3:57:4f
    0e:b9:98:0b:95:47:0d:1f:97:7c:53:17:dd:1a:f8:da:e5:08:d1:1c
    78:68:1f:2f:72:9f:a2:cf:81:e3:ce:c5:56:89:ce:f0:97:93:fa:36
    19:3e:18:7d:8c:9d:21:fe:1f:c3:87:8d:b3:5d:f3:03:66:9d:16:a7
    bf:18:3f:f0:7a:80:f0:62:50:43:83:4f:0e:d7:c6:42:48:c0:8a:b2
    c7:46:30:38:df:9b:dc:bc:b5:08:7a:f3:cd:64:db:2b:71:67:fe:d8
    04:47:08:07:de:17:23:13
  Signature algorithm: sha1WithRSAEncryption
  Fingerprint:
    00:8e:6f:58:dd:68:bf:25:0a:e3:f9:17:70:d6:61:f3:53:a7:79:10 (sha1)
    71:6f:6a:76:17:9b:d6:2a:e7:5a:72:97:82:6d:26:86 (md5)
  Distribution CRL:
    C=us, O=example, CN=CRL1
    http://CA-1/CRL/example_us_crlfile.crl
  Use for key: CRL signing, Certificate signing
Certificate identifier: entrust
  Certificate version: 3
  Serial number: 4355 925c
  Issuer:
    Organization: example, Country: us
  Subject:
    Organization: example, Country: us, Common name: First Officer
  Validity:
    Not before: 2005 Oct 18th, 23:55:59 GMT
    Not after: 2008 Oct 19th, 00:25:59 GMT
  Public key algorithm: rsaEncryption(1024 bits)
    c0:a4:21:32:95:0a:cd:ec:12:03:d1:a2:89:71:8e:ce:4e:a6:f9:2f
    1a:9a:13:8c:f6:a0:3d:c9:bd:9d:c2:a0:41:77:99:1b:1e:ed:5b:80
    34:46:f8:5b:28:34:38:2e:91:7d:4e:ad:14:86:78:67:e7:02:1d:2e
    19:11:b7:fa:0d:ba:64:20:e1:28:4e:3e:bb:6e:64:dc:cd:b1:b4:7a
```

```
    ca:8f:47:dd:40:69:c2:35:95:ce:b8:85:56:d7:0f:2d:04:4d:5d:d8
    42:e1:4f:6b:bf:38:c0:45:1e:9e:f0:b4:7f:74:6f:e9:70:fd:4a:78
    da:eb:10:27:bd:46:34:33
  Signature algorithm: sha1WithRSAEncryption
  Fingerprint:
    bc:78:87:9b:a7:91:13:20:71:db:ac:b5:56:71:42:ad:1a:b6:46:17 (sha1)
    23:79:40:c9:6d:a6:f0:ca:e0:13:30:d4:29:6f:86:79 (md5)
  Distribution CRL:
    C=us, O=example, CN=CRL1
    http://CA-1/CRL/example_us_crlfile.crl
  Use for key: Key encipherment
Certificate identifier: entrust
  Certificate version: 3
  Serial number: 4355 925b
  Issuer:
    Organization: example, Country: us
  Subject:
    Organization: example, Country: us, Common name: First Officer
  Validity:
    Not before: 2005 Oct 18th, 23:55:59 GMT
    Not after: 2008 Oct 19th, 00:25:59 GMT
  Public key algorithm: rsaEncryption(1024 bits)
    ea:75:c4:f3:58:08:ea:65:5c:7e:b3:de:63:0a:cf:cf:ec:9a:82:e2
    d7:e8:b9:2f:bd:4b:cd:86:2f:f1:dd:d8:a2:95:af:ab:51:a5:49:4e
    00:10:c6:25:ff:b5:49:6a:99:64:74:69:e5:8c:23:5b:b4:70:62:8e
    e4:f9:a2:28:d4:54:e2:0b:1f:50:a2:92:cf:6c:8f:ae:10:d4:69:3c
    90:e2:1f:04:ea:ac:05:9b:3a:93:74:d0:59:24:e9:d2:9d:c2:ef:22
    b9:32:c7:2c:29:4f:91:cb:5a:26:fe:1d:c0:36:dc:f4:9c:8b:f5:26
    af:44:bf:53:aa:d4:5f:67
  Signature algorithm: sha1WithRSAEncryption
  Fingerprint:
    46:71:15:34:f0:a6:41:76:65:81:33:4f:68:47:c4:df:78:b8:e3:3f (sha1)
    ee:cc:c7:f4:5d:ac:65:33:0a:55:db:59:72:2c:dd:16 (md5)
  Distribution CRL:
    C=us, O=example, CN=CRL1
    http://CA-1/CRL/example_us_crlfile.crl
  Use for key: Digital signature
```


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show security pki local-certificate (View)

Syntax

```
show security pki local-certificate
< brief | detail >
< certificate-id certificate-id-name >
<system-generated>
```

Release Information

Command modified in Junos OS Release 9.1. Subject string output field added in Junos OS Release 12.1X44-D10.

Description

Display information about the local digital certificates, corresponding public keys, and the automatically generated self-signed certificate configured on the device.

Options

- none—Display basic information about all configured local digital certificates, corresponding public keys, and the automatically generated self-signed certificate.
- **brief** | **detail**—(Optional) Display the specified level of output.
- certificate-id ***certificate-id-name*** —(Optional) Display information about only the specified local digital certificates and corresponding public keys.
- **system-generated**—Display information about the automatically generated self-signed certificate.

Required Privilege Level

view

Related Documentation

- *clear security pki local-certificate (Device)*
- *request security pki local-certificate generate-self-signed (Security)*

List of Sample Output

show security pki local-certificate certificate-id hello on page 529
show security pki local-certificate certificate-id hello detail on page 529
show security pki local-certificate system-generated on page 530
show security pki local-certificate system-generated detail on page 530
show security pki local-certificate certificate-id mycert - (local certificate enrolled online using SCEP) on page 531
show security pki local-certificate certificate-id mycert detail - (local certificate enrolled online using SCEP) on page 531

Output Fields

Table 61 on page 527 lists the output fields for the **show security pki local-certificate** command. Output fields are listed in the approximate order in which they appear.

Table 61: show security pki local-certificate Output Fields

Field Name	Field Description
Certificate identifier	Name of the digital certificate.

Table 61: show security pki local-certificate Output Fields (continued)

Field Name	Field Description
Certificate version	Revision number of the digital certificate.
Serial number	Unique serial number of the digital certificate.
Issued to	Device that was issued the digital certificate.
Issued by	Authority that issued the digital certificate.
Issuer	Authority that issued the digital certificate, including details of the authority organized using the distinguished name format. Possible subfields are: • **Organization**—Organization of origin. • **Organizational unit**—Department within an organization. • **Country**—Country of origin. • **Locality**—Locality of origin. • **Common name**—Name of the authority.
Subject	Details of the digital certificate holder organized using the distinguished name format. Possible subfields are: • **Organization**—Organization of origin. • **Organizational unit**—Department within an organization. • **Country**—Country of origin. • **Locality**—Locality of origin. • **Common name**—Name of the authority. • **Serial number**—Serial number of the device. If the certificate contains multiple subfield entries, all entries are displayed.
Subject string	Subject field as it appears in the certificate.
Alternate subject	Domain name or IP address of the device related to the digital certificate.
Validity	Time period when the digital certificate is valid. Values are: • **Not before**—Start time when the digital certificate becomes valid. • **Not after**—End time when the digital certificate becomes invalid.
Public key algorithm	Encryption algorithm used with the private key, such as **rsaEncryption**(**1024 bits**).
Public key verification status	Public key verification status: **Failed** or **Passed**. The **detail** output also provides the verification hash.
Signature algorithm	Encryption algorithm that the CA used to sign the digital certificate, such as **sha1WithRSAEncryption**.
Fingerprint	Secure Hash Algorithm (**SHA1**) and Message Digest 5 (**MD5**) hashes used to identify the digital certificate.

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Table 61: show security pki local-certificate Output Fields (continued)

Field Name	Field Description
Distribution CRL	Distinguished name information and URL for the certificate revocation list (**CRL**) server.
Use for key	Use of the public key, such as **Certificate signing**, **CRL signing**, **Digital signature**, or **Data encipherment**.

Sample Output

show security pki local-certificate certificate-id hello

```
user@host> show security pki local-certificate certificate-id hello
Certificate identifier: hello
  Issued to: cn1, Issued by: DC = local, DC = demo, CN = domain-example-WIN-CA
  Validity:
    Not before: 08- 8-2012 17:02
    Not after: 08- 8-2014 17:02
  Public key algorithm: rsaEncryption(1024 bits)
```

Sample Output

show security pki local-certificate certificate-id hello detail

```
user@host> show security pki local-certificate certificate-id hello detail
Certificate identifier: hello
  Certificate version: 3
  Serial number: 61ba9da000000000d72e
  Issuer:
    Common name: Example-CA,
    Domain component: local, Domain component: demo
  Subject:
    Organization: o1, Organization: o2,
    Organizational unit: ou1, Organizational unit: ou2, Country: US, State: CA,
    Locality: Sunnyvale, Common name: cn1, Common name: cn2,
    Domain component: dc1, Domain component: dc2
  Subject string:
    C=Example, DC=dc1, DC=dc2, ST=CA, L=Sunnyvale, O=o1, O=o2, OU=ou1, OU=ou2,
CN=cn1, CN=cn2
  Alternate subject: "user@example.net", user.example.net, 192.0.2.1
  Validity:
    Not before: 08- 8-2012 17:02
    Not after: 08- 8-2014 17:02
  Public key algorithm: rsaEncryption(1024 bits)
    30:81:89:02:81:81:00:b4:14:01:d5:4f:79:87:d5:bb:e6:5e:c1:14
    97:da:b4:40:ad:1a:77:3e:ec:2e:68:8e:e4:93:a3:fe:7c:0b:58:af
    e1:20:27:82:ca:8d:6f:f0:97:d1:ad:fe:df:6c:cb:3c:b0:4f:cc:dd
    ac:d8:69:3f:3c:59:b5:2a:c6:83:e8:b3:94:5e:0a:2d:cd:e2:b0:15
    3e:97:a7:8a:4e:fb:59:f7:20:4c:ba:a8:80:3e:ba:be:69:ef:2b:32
    e4:1a:1c:24:53:1b:d5:c3:aa:d4:25:73:96:76:ea:49:d4:da:7e:3e
    0c:c6:6b:22:43:cb:04:84:0d:25:33:07:6b:49:41:02:03:01:00:01
  Signature algorithm: sha1WithRSAEncryption
  Distribution CRL:
    ldap:///Example-CA,CN=cn-win,CN=CDP,CN=Public%20Key
%20Services,CN=Services,CN=Configuration,DC=demo,DC=local?certificateRevocationList?base?
```

```
objectClass=cRLDistributionPoint
    http://example.example.net/CertEnroll/Example-CA.crl
  Use for key: Key encipherment, Digital signature, 1.3.6.1.5.5.8.2.2,
  1.3.6.1.5.5.8.2.2
  Fingerprint:
    76:a8:5f:65:b4:bf:bd:10:d8:56:82:65:ff:0d:04:3a:a5:e9:41:dd (sha1)
    8f:99:a4:15:98:10:4b:b6:1a:3d:81:13:93:2a:ac:e7 (md5)
  Auto-re-enrollment:
    Status: Disabled
    Next trigger time: Timer not started
```

Sample Output

show security pki local-certificate system-generated

user@host> **show security pki local-certificate system-generated**

```
Certificate identifier: system-generated
  Issued to: JN10B9390AGB, Issued by: CN = JN10B9390AGB, CN = system generated,
CN = self-signed
  Validity:
    Not before: 10-30-2009 23:02
    Not after: 10-29-2014 23:02
  Public key algorithm: rsaEncryption(1024 bits)
```

Sample Output

show security pki local-certificate system-generated detail

user@host> **show security pki local-certificate system-generated detail**

```
Certificate identifier: system-generated
  Certificate version: 3
  Serial number: e90d42ebd14ef954b3e48c2eed5b30fb
  Issuer:
    Common name: JN10B9390AGB, Common name: system generated, Common name:
self-signed
  Subject:
    Common name: JN10B9390AGB, Common name: system generated, Common name:
self-signed
  Subject string:
    CN=JN10B9390AGB, CN=system generated, CN=self-signed
  Validity:
    Not before: 10-30-2009 23:02
    Not after: 10-29-2014 23:02
  Public key algorithm: rsaEncryption(1024 bits)
    30:81:89:02:81:81:00:cb:c8:3f:e6:d3:e5:ca:9d:dc:2d:e9:ca:c7
    5f:b1:f5:3a:f0:1c:a7:55:43:0f:ef:fd:1c:fe:29:09:d5:37:d0:fa
    d6:ee:bc:b8:3f:58:d4:31:fb:96:4f:4f:cc:a9:1a:8f:2e:1b:50:6f
    2b:88:34:74:b2:6d:ad:94:b5:dd:3d:80:87:56:d0:42:50:4d:ac:d7
    8c:21:06:2d:07:1e:f4:d0:c7:85:2e:25:60:ad:1b:b5:b2:d2:1d:c8
    79:67:8c:56:06:04:75:6e:be:4e:99:b8:07:e6:9a:11:fe:b5:ec:c0
    1e:68:da:47:99:1b:b2:c8:07:ab:cd:6e:fe:c1:fd:02:03:01:00:01
  Signature algorithm: sha1WithRSAEncryption
  Fingerprint:
    be:1f:21:13:71:cd:9d:de:7a:41:d7:4c:52:8d:3e:d6:ba:db:75:96 (sha1)
    ba:fc:90:4b:5f:a8:66:a3:b9:64:89:9f:e2:45:b5:84 (md5)
  Auto-re-enrollment:
```


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```
    Status: Disabled
    Next trigger time: Timer not started
```

Sample Output

show security pki local-certificate certificate-id mycert - (local certificate enrolled online using SCEP)

user@host> **show security pki local-certificate certificate-id mycert**

```
Certificate identifier: mycert
  Issued to: bubba, Issued by: DC = local, DC = demo, CN = domain-example-WIN-CA

  Validity:
    Not before: 11-15-2012 18:58
    Not after: 11-15-2014 18:58
  Public key algorithm: rsaEncryption(1024 bits)
```

Sample Output

show security pki local-certificate certificate-id mycert detail - (local certificate enrolled online using SCEP)

user@host> **show security pki local-certificate certificate-id mycert detail**

```
Certificate identifier: mycert
  Certificate version: 3
  Serial number: 1f00b50a000000013ad2
  Issuer:
    Common name: Example-CA,
    Domain component: local, Domain component: demo
  Subject:
    Organization: example, Organizational unit: SSD, Country: US,
    Common name: host1, Serial number: SRX240-11152012
  Subject string:
    serialNumber=SRX240-11152012, C=US, O=example, OU=SSD, CN=host1
  Alternate subject: "user@example.net", user.example.net, 192.0.2.1
  Validity:
    Not before: 11-15-2012 18:58
    Not after: 11-15-2014 18:58
  Public key algorithm: rsaEncryption(1024 bits)
    30:81:89:02:81:81:00:e3:e5:ae:c0:82:af:db:94:01:2f:56:46:50
    7d:3d:0b:0c:f0:1f:1d:7d:c3:aa:d4:4c:a0:cd:23:8b:3f:47:05:ee
    7b:65:42:a0:dc:c4:ac:a7:b6:a6:9f:5c:ea:d8:22:b0:bf:03:75:09
    be:fa:77:cb:d6:67:19:e6:80:fa:a5:7c:93:af:96:66:9f:cc:45:d5
    eb:ab:c1:f0:32:a6:d9:27:1b:80:bb:57:ec:31:a2:e0:2b:e1:42:c0
    92:8a:9b:ed:a6:d2:ec:7c:84:5a:8a:d9:96:a7:7e:40:c3:80:0e:f4
    d6:a2:5d:78:93:3b:7d:d5:8a:f5:de:fb:bc:0d:6d:02:03:01:00:01
  Signature algorithm: sha1WithRSAEncryption
  Distribution CRL:
    ldap:///Example-CA,CN=cn-win,CN=CDP,CN=Public%20Key%20Services,
CN=Services,CN=Configuration,DC=demo,DC=local?certificateRevocationList?
base?objectClass=cRLDistributionPoint
    http://example.example.net/CertEnroll/Example-CA.crl
  Use for key: Key encipherment, Digital signature, 1.3.6.1.5.5.8.2.2,
  1.3.6.1.5.5.8.2.2
  Fingerprint:
    1f:2f:a9:22:a8:d5:a9:36:cc:c4:bd:81:59:9d:9c:58:bb:40:15:72 (sha1)
    51:27:e4:d5:29:90:f7:85:9e:67:84:a1:75:d1:5b:16 (md5)
  Auto-re-enrollment:
```

```
Status: Disabled
Next trigger time: Timer not started
```


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show security policies

Syntax

```
show security policies
application-firewall
count
detail
from-zone <zone-name>
global
hit-count
interface
logical-system <logical-system-name>
policy <policy-name>
root-logical-system
service-set
start
tenant <tenant-name>
to-zone <zone-name>
unknown-source-identity
zone-context
```

Release Information

Command modified in Junos OS Release 9.2.
Support for IPv6 addresses is added in Junos OS Release 10.2.
Support for wildcard addresses is added in Junos OS Release 11.1.
Support for global policy and services offloading is added in Junos OS Release 11.4.
Support for source-identities and the **Description** output field is added in Junos OS Release 12.1.
Support for negated address added in Junos OS Release 12.1X45-D10.
The output fields for Policy Statistics expanded, and the output fields for the **global** and **policy-name** options are expanded to include from-zone and to-zone global match criteria in Junos OS Release 12.1X47-D10.
Support for the **initial-tcp-mss** and **reverse-tcp-mss** options is added in Junos OS Release 12.3X48-D20.
Output field and description for **source-end-user-profile** option is added in Junos OS Release 15.1x49-D70.
Output field and description for **dynamic-applications** option is added in Junos OS Release 15.1x49-D100.
Output field and description for **dynapp-redir-profile** option is added in Junos OS Release 18.2R1.
The **tenant** option is introduced in Junos OS Release 18.3R1.

Description

Displays a summary of all security policies configured on the device. If a particular policy is specified, display information specific to that policy. The existing show commands for displaying the policies configured with multiple tenant support are enhanced. A security policy controls the traffic flow from one zone to another zone. The security policies allow you to deny, permit, reject (deny and send a TCP RST or ICMP port unreachable message to the source host), encrypt and decrypt, authenticate, prioritize, schedule, filter, and monitor the traffic attempting to cross from one security zone to another.

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Options

- **application-firewall**—Displays the information of application-firewall.
- **count**—Displays the number of policies. Range is 1 through 65,535.
- **detail**—(Optional) Displays a detailed view of all of the policies configured on the device.
- **from-zone**—Displays the policy information matching the given source zone.
- **global**—(Optional) Displays information about global policies.
- **hit-count**—Displays the policies hit count.
- **interface**—Displays the name of the adaptive services interface.
- **logical-system**—Displays the logical system name.
- **policy-name**—(Optional) Displays the information about a specified policy.
- **root-logical-system**—Displays root logical system as default.
- **service-set**—Displays the name of the service set.
- **start**—Displays the policies from a given position. Range is 1 through 65,535.
- **tenant**—Displays the name of the tenant system.
- **to-zone**—Displays the policy information matching the given destination zone.
- **unknown-source-identity**—Displays the unknown-source-identity of a policy.
- **zone-context**—Displays the count of policies in each context (from-zone and to-zone).

Required Privilege Level

view

Related Documentation

- *Security Policies Overview*
- *Understanding Security Policy Rules*
- *Understanding Security Policy Elements*
- *Unified Policies Configuration Overview*

List of Sample Output

show security policies on page 537
show security policies (Dynamic Applications) on page 538
show security policies policy-name detail on page 539
show security policies (Services-Offload) on page 540
show security policies (Device Identity) on page 540
show security policies detail on page 540
show security policies detail (TCP Options) on page 543
show security policies policy-name (Negated Address) on page 543
show security policies policy-name detail (Negated Address) on page 543
show security policies global on page 544
show security policies detail tenant on page 544

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Output Fields Table 62 on page 535 lists the output fields for the **show security policies** command. Output fields are listed in the approximate order in which they appear.

Table 62: show security policies Output Fields

Field Name	Field Description
From zone	Name of the source zone.
To zone	Name of the destination zone.
Policy	Name of the applicable policy.
Description	Description 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.
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.
Source addresses	For standard display mode, the names of the source addresses for a policy. Address sets are resolved to their individual names. For detail display mode, the names and corresponding IP addresses of the source addresses for a 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.
source-end-user-profile	Name of the device identity profile (referred to as **end-user-profile** in the CLI) that contains attributes, or characteristics of a device. Specification of the device identity profile in the **source-end-user-profile** field is part of the device identity feature. If a device matches the attributes specified in the profile and other security policy parameters, then the security policy's action is applied to traffic issuing from the device.
Source addresses (excluded)	Name of the source address excluded from the policy.
Destination addresses (excluded)	Name of the destination address excluded from the policy.
Source identities	One or more user roles specified for a policy.

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Table 62: show security policies Output Fields (continued)

Field Name	Field Description
Applications	Name of a preconfigured or custom application whose type the packet matches, as specified at configuration time. • **IP protocol**: The Internet protocol used by the application—for example, TCP, UDP, ICMP. • **ALG**: If an ALG is explicitly associated with the policy, the name of the ALG is displayed. If **application-protocol ignore** is configured, **ignore** is displayed. Otherwise, **0** is displayed. However, even if this command shows **ALG: 0**, ALGs might be triggered for packets destined to well-known ports on which ALGs are listening, unless ALGs are explicitly disabled or when **application-protocol ignore** is not configured for custom applications. • **Inactivity timeout**: Elapsed time without activity after which the application is terminated. • **Source port range**: The low-high source port range for the session application.
Dynamic Applications	Application identification-based Layer 7 dynamic applications.
Destination Address Translation	Status of the destination address translation traffic: • **drop translated**—Drop the packets with translated destination addresses. • **drop untranslated**—Drop the packets without translated destination addresses.

Application Firewall	An application firewall includes the following:
	• **Rule-set**—Name of the rule set.
	• **Rule**—Name of the rule.
	  • **Dynamic applications**—Name of the applications.
	  • **Dynamic application groups**—Name of the application groups.
	  • **Action**—The action taken with respect to a packet that matches the application firewall rule set. Actions include the following:
	  • **permit**
	  • **deny**
	• **Default rule**—The default rule applied when the identified application is not specified in any rules of the rule set.

Action or Action-type	• The action taken for a packet that matches the policy's tuples. Actions include the following:
	  • **permit**
	  • **firewall-authentication**
	  • **tunnel ipsec-vpn** *vpn-name*
	  • **pair-policy** *pair-policy-name*
	  • **source-nat pool** *pool-name*
	  • **pool-set** *pool-set-name*
	  • **interface**
	  • **destination-nat** *name*
	  • **deny**
	  • **reject**
	  • **services-offload**

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Table 62: show security policies Output Fields (continued)

Field Name	Field Description
Session log	Session log entry that indicates whether the **at-create** and **at-close** flags were set at configuration time to log session information.
Scheduler name	Name of a preconfigured scheduler whose schedule determines when the policy is active and can be used as a possible match for traffic.

Policy statistics	• **Input bytes**—The total number of bytes presented for processing by the device.
	  ◦ **Initial direction**—The number of bytes presented for processing by the device from the initial direction.
	  ◦ **Reply direction**—The number of bytes presented for processing by the device from the reply direction.
	• **Output bytes**—The total number of bytes actually processed by the device.
	  ◦ **Initial direction**—The number of bytes from the initial direction actually processed by the device.
	  ◦ **Reply direction**—The number of bytes from the reply direction actually processed by the device.
	• **Input packets**—The total number of packets presented for processing by the device.
	  ◦ **Initial direction**—The number of packets presented for processing by the device from the initial direction.
	  ◦ **Reply direction**—The number of packets presented for processing by the device from the reply direction.
	• **Output packets**—The total number of packets actually processed by the device.
	  ◦ **Initial direction**—The number of packets actually processed by the device from the initial direction.
	  ◦ **Reply direction**—The number of packets actually processed by the device from the reply direction.
	• **Session rate**—The total number of active and deleted sessions.
	• **Active sessions**—The number of sessions currently present because of access control lookups that used this policy.
	• **Session deletions**—The number of sessions deleted since system startup.
	• **Policy lookups**—The number of times the policy was accessed to check for a match.

dynapp-redir-profile	Displays unified policy redirect profile. See *profile(dynamic-application)*.
Per policy TCP Options	Configured syn and sequence checks, and the configured TCP MSS value for the initial direction, the reverse direction or, both.

Sample Output

show security policies

```
user@host> show security policies

From zone: trust, To zone: untrust
Policy: p1, State: enabled, Index: 4, Sequence number: 1
  Source addresses:
  sa-1-ipv4: 198.51.100.11/24
```

```
    sa-2-ipv6: 2001:db8:a0b:12f0::1/32
    sa-3-ipv6: 2001:db8:a0b:12f0::22/32
    sa-4-wc:   203.0.113.1/255.255.0.255
    Destination addresses:
    da-1-ipv4: 2.2.2.2/24
    da-2-ipv6: 2001:db8:a0b:12f0::8/32
    da-3-ipv6: 2001:db8:a0b:12f0::9/32
    da-4-wc:   192.168.22.11/255.255.0.255
    Source identities: role1, role2, role4
    Applications: any
    Action: permit, application services, log, scheduled
    Application firewall : my_ruleset1
  Policy: p2, State: enabled, Index: 5, Sequence number: 2
    Source addresses:
    sa-1-ipv4:  198.51.100.11/24
    sa-2-ipv6:  2001:db8:a0b:12f0::1/32
    sa-3-ipv6:  2001:db8:a0b:12f0::22/32
    Destination addresses:
    da-1-ipv4:  2.2.2.2/24
    da-2-ipv6:  2001:db8:a0b:12f0::1/32
    da-3-ipv6:  2001:db8:a0b:12f0::9/32
    Source identities: role1, role4
    Applications: any
    Action: deny, scheduled
```

show security policies (Dynamic Applications)

user@host>**show security policies**

```
  Policy: p1, State: enabled, Index: 4, Scope Policy: 0, Sequence number: 1
    Source addresses: any
    Destination addresses: any
    Applications: any
    Dynamic Applications: junos:YAHOO
    Action: deny, log
  Policy: p2, State: enabled, Index: 5, Scope Policy: 0, Sequence number: 2
    Source addresses: any
    Destination addresses: any
    Applications: any
    Dynamic Applications: junos:web, junos:web:social-networking:facebook,
    junos:TFTP, junos:QQ
    Action: permit, log
  Policy: p3, State: enabled, Index: 6, Scope Policy: 0, Sequence number: 3
    Source addresses: any
    Destination addresses: any
    Applications: any
    Dynamic Applications: junos:HTTP, junos:SSL
    Action: permit, application services, log
```

The following example displays the output with unified policies configured.

user@host> **show security policies**

```
Default policy: deny-all
Pre ID default policy: permit-all
From zone: trust, To zone: untrust
  Policy: p2, State: enabled, Index: 4, Scope Policy: 0, Sequence number: 1
    Source addresses: any
```


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```
    Destination addresses: any
    Applications: junos-defaults
    Dynamic Applications: junos:GMAIL, junos:FACEBOOK-CHAT
    dynapp-redir-profile: profile1
```

show security policies policy-name detail

user@host> **show security policies policy-name p1 detail**

```
  Policy: p1, action-type: permit, State: enabled, Index: 4, Scope Policy: 0
  Description: The policy p1 is for the sales team
  Sequence number: 1
  From zone: trust, To zone: untrust
  Source addresses:
    sa-1-ipv4:  198.51.100.11/24
    sa-2-ipv6:  2001:db8:a0b:12f0::1/32
    sa-3-ipv6:  2001:db8:a0b:12f0::9/32
    sa-4-wc:    203.0.113.1/255.255.0.255
  Destination addresses:
    da-1-ipv4: 192.0.2.0/24
    da-2-ipv6: 2001:db8:a0b:12f0::1/32
    da-3-ipv6: 2001:db8:a0b:12f0::9/32
    da-4-wc:   192.168.22.11/255.255.0.255
 Source identities:
  role1
  role2
  role4
  Application: any
    IP protocol: 0, ALG: 0, Inactivity timeout: 0
      Source port range: [0-0]
      Destination port range: [0-0]
  Destination Address Translation: drop translated
  Application firewall :
  Rule-set: my_ruleset1
    Rule: rule1
      Dynamic Applications: junos:FACEBOOK-ACCESS, junos:YMSG
      Dynamic Application groups: junos:web, junos:chat
      Action: deny
    Default rule: permit
  Session log: at-create, at-close
  Scheduler name: sch20
  Per policy TCP Options: SYN check: No, SEQ check: No
  Policy statistics:
    Input  bytes       :                18144                  545 bps
      Initial direction:                 9072                 272 bps
      Reply direction  :                 9072                  272 bps
    Output bytes       :                18144                  545 bps
      Initial direction:                 9072                  272 bps
      Reply direction  :                 9072                  272 bps
    Input  packets     :                  216                    6 pps
      Initial direction:                  108                    3 bps
      Reply direction  :                  108                    3 bps
    Output packets     :                  216                    6 pps
      Initial direction:                  108                    3 bps
      Reply direction  :                  108                    3 bps
    Session rate       :                  108                    3 sps
    Active sessions    :                   93
    Session deletions  :                   15
    Policy lookups     :                  108
```

The following example displays the output with unified policies configured.

```
user@host>  show security policies policy-name p1 detail

Default policy: permit-all
Pre ID default policy: permit-all
From zone: trust, To zone: trust
  Policy: p1, State: enabled, Index: 4, Scope Policy: 0, Sequence number: 1
    Source addresses: any
    Destination addresses: any
    Applications: any
    Action: reject
    dynapp-redir-profile: profile1
```

show security policies (Services-Offload)

```
user@host> show security policies

  Policy: p1, action-type: reject, State: enabled, Index: 4, Scope Policy: 0
  Policy Type: Configured
  Sequence number: 1
  From zone: trust, To zone: trust
  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]
  dynapp-redir-profile: profile1(1)
  Per policy TCP Options: SYN check: No, SEQ check: No, Window scale: No
```

show security policies (Device Identity)

```
user@host>  show security policies

From zone: trust, To zone: untrust
       Policy: dev-id-marketing, State: enabled, Index: 5, Scope Policy: 0,
Sequence number: 1
         Source addresses: any
         Destination addresses: any
         source-end-user-profile: marketing-profile
         Applications: any
         Action: permit
```

show security policies detail

```
user@host> show security policies detail

Default policy: deny-all
Policy: p1, action-type: permit, services-offload:enabled , State: enabled, Index:
 4, Scope Policy: 0
  Policy Type: Configured
  Description: The policy p1 is for the sales team
```


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```
  Sequence number: 1
  From zone: trust, To zone: untrust
  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
 Source identities:
  role1
  role2
  role4
  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
  Policy statistics:
    Input  bytes       :                18144                  545 bps
      Initial direction:                 9072                 272 bps
      Reply direction  :                 9072                  272 bps
    Output bytes       :                18144                  545 bps
      Initial direction:                 9072                  272 bps
      Reply direction  :                 9072                  272 bps
    Input  packets     :                  216                    6 pps
      Initial direction:                  108                    3 bps
      Reply direction  :                  108                    3 bps
    Output packets     :                  216                    6 pps
      Initial direction:                  108                    3 bps
      Reply direction  :                  108                    3 bps
    Session rate       :                  108                    3 sps
    Active sessions    :                   93
    Session deletions  :                   15
    Policy lookups     :                  108
Policy: p2, action-type: permit, services-offload:enabled , State: enabled, Index:
 5, Scope Policy: 0
  Policy Type: Configured
  Description: The policy p2 is for the sales team
  Sequence number: 1
  From zone: untrust, To zone: trust
  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
 Source identities:
  role1
  role2
  role4
  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
```

The following example displays the output with unified policies configured.

```
user@host> show security policies detail
```

```
Default policy: deny-all
Pre ID default policy: permit-all
Policy: p2, action-type: reject, State: enabled, Index: 4, Scope Policy: 0
  Policy Type: Configured
  Sequence number: 1
  From zone: trust, To zone: untrust
  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: junos-defaults
    IP protocol: 6, ALG: 0, Inactivity timeout: 1800
      Source port range: [0-0]
      Destination port range: [443-443]
    IP protocol: 6, ALG: 0, Inactivity timeout: 1800
      Source port range: [0-0]
      Destination port range: [5432-5432]
    IP protocol: 6, ALG: 0, Inactivity timeout: 1800
      Source port range: [0-0]
      Destination port range: [80-80]
    IP protocol: 6, ALG: 0, Inactivity timeout: 1800
      Source port range: [0-0]
      Destination port range: [3128-3128]
    IP protocol: 6, ALG: 0, Inactivity timeout: 1800
      Source port range: [0-0]
      Destination port range: [8000-8000]
    IP protocol: 6, ALG: 0, Inactivity timeout: 1800
      Source port range: [0-0]
      Destination port range: [8080-8080]
    IP protocol: 17, ALG: 0, Inactivity timeout: 60
      Source port range: [0-0]
      Destination port range: [1-65535]
    IP protocol: 6, ALG: 0, Inactivity timeout: 1800
      Source port range: [0-0]
      Destination port range: [443-443]
    IP protocol: 6, ALG: 0, Inactivity timeout: 1800
      Source port range: [0-0]
      Destination port range: [5432-5432]
    IP protocol: 6, ALG: 0, Inactivity timeout: 1800
      Source port range: [0-0]
      Destination port range: [80-80]
    IP protocol: 6, ALG: 0, Inactivity timeout: 1800
      Source port range: [0-0]
      Destination port range: [3128-3128]
    IP protocol: 6, ALG: 0, Inactivity timeout: 1800
      Source port range: [0-0]
      Destination port range: [8000-8000]
    IP protocol: 6, ALG: 0, Inactivity timeout: 1800
      Source port range: [0-0]
      Destination port range: [8080-8080]
    IP protocol: 17, ALG: 0, Inactivity timeout: 60
      Source port range: [0-0]
      Destination port range: [1-65535]
  Dynamic Application:
    junos:FACEBOOK-CHAT: 10704
    junos:GMAIL: 51
```


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```
  dynapp-redir-profile: profile1(1)
  Per policy TCP Options: SYN check: No, SEQ check: No, Window scale: No
```

show security policies detail (TCP Options)

```
user@host> show security policies policy-name p2 detail
node0:
--------------------------------------------------------------------------
Policy:p2, action-type:permit, State: enabled,Index: 4, Scope Policy: 0
  Policy Type: Configured
  Sequence number: 1
  From zone: trust, To zone: trust
  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: junos-defaults
    IP protocol: tcp, ALG: 0, Inactivity timeout: 0
      Source port range: [0-0]
 Destination port range: [80-80]
Per policy TCP Options: SYN check: No, SEQ check: No, Window scale: No
  Dynamic-application: junos:HTTP
```

show security policies policy-name (Negated Address)

```
user@host> show security policies policy-name p1
node0:
--------------------------------------------------------------------------
From zone: trust, To zone: untrust
  Policy: p1, State: enabled, Index: 4, Scope Policy: 0, Sequence number: 1
    Source addresses(excluded): as1
    Destination addresses(excluded): as2
    Applications: any
    Action: permit
```

show security policies policy-name detail (Negated Address)

```
user@host> show security policies policy-name p1 detail
node0:
--------------------------------------------------------------------------
Policy: p1, action-type: permit, State: enabled, Index: 4, Scope Policy: 0
  Policy Type: Configured
  Sequence number: 1
  From zone: trust, To zone: untrust
  Source addresses(excluded):
    ad1(ad): 255.255.255.255/32
    ad2(ad):  198.51.100.1/24
    ad3(ad):  198.51.100.6  ~ 198.51.100.56
    ad4(ad):  192.0.2.8/24
    ad5(ad):  198.51.100.99 ~ 198.51.100.199
    ad6(ad):  203.0.113.9/24
    ad7(ad):  203.0.113.23/24
  Destination addresses(excluded):
    ad13(ad2): 198.51.100.76/24
```

```
    ad12(ad2): 198.51.100.88/24
    ad11(ad2): 192.0.2.23 ~ 192.0.2.66
    ad10(ad2): 192.0.2.93
    ad9(ad2):  203.0.113.76 ~ 203.0.113.106
    ad8(ad2):  203.0.113.199
  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
```

show security policies global

user@host> **show security policies global policy-name Pa**

```
node0:
--------------------------------------------------------------------------
  Global policies:
  Policy: Pa, State: enabled, Index: 6, Scope Policy: 0, Sequence number: 1
    From zones: any
    To zones: any
    Source addresses: H0
    Destination addresses: H1
    Applications: junos-http
    Action: permit
```

show security policies detail tenant

user@host> **show security policies detail tenant TN1**

```
Default policy: deny-all
Pre ID default policy: permit-all
Policy: p1, action-type: permit, State: enabled, Index: 4, Scope Policy: 0
Policy Type: Configured
Sequence number: 1
From zone: trust, To zone: untrust
Source addresses: any
Destination addresses: any
Application: junos-ping
IP protocol: 1, ALG: 0, Inactivity timeout: 60
ICMP Information: type=255, code=0
Application: junos-telnet
IP protocol: tcp, ALG: 0, Inactivity timeout: 1800
Source port range: [0-0]
Destination port range: [23-23]
Application: app_udp
IP protocol: udp, ALG: 0, Inactivity timeout: 1800
Source port range: [0-0]
Destination port range: [5000-5000]
Application: junos-icmp6-all
IP protocol: 58, ALG: 0, Inactivity timeout: 60
ICMP Information: type=255, code=0
Per policy TCP Options: SYN check: No, SEQ check: No, Window scale: No
Session log: at-create, at-close
Policy statistics:
Input  bytes     :                    0                    0 bps
Initial direction:                    0                    0 bps
```


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```
Reply direction  :                    0                    0 bps
Output bytes     :                    0                    0 bps
Initial direction:                    0                    0 bps
Reply direction  :                    0                    0 bps
Input  packets   :                    0                    0 pps
Initial direction:                    0                    0 bps
Reply direction  :                    0                    0 bps
Output packets   :                    0                    0 pps
Initial direction:                    0                    0 bps
Reply direction  :                    0                    0 bps
Session rate     :                    0                    0 sps
Active sessions  :                    0
Session deletions:                    0
Policy lookups   :                    0
```

show services application-identification application

Syntax

show services application-identification application (detail | summary)

Release Information

Command introduced in Junos OS Release 11.4. Starting in Junos OS Release 15.1X49-D100, the options **Cacheable**, **Activation Date**, and **Last modified** are introduced for **show services application-identification application detail** command. The **Underlying consolidated Protocols/ports application is dependent on** and **Layer-7 Immediate Protocol(s)** options are introduced in Junos OS Release 18.2R1.

Description

Display detailed information about a specified application signature, detailed information about all application signatures, or a summary of the existing application signatures.

Options

detail —Display detailed information for all application signatures.

summary—Display summary information for all application signatures.

Required Privilege Level

view

Related Documentation

- request services application-identification application on page 461

List of Sample Output

show services application-identification application summary on page 548
show services application-identification application detail on page 549
show services application-identification application detail (Custom Applications) on page 550
show services application-identification application detail (Unified Policies) on page 550

Output Fields

Table 63 on page 546 lists shows the output details for the **show services application-identification application detail** command.

Table 63: show services application-identification application summary Output Fields

Field Name	Field Description
Application(s)	The number of applications present.
Application	Name of the custom application.
Disabled	The status of the application and whether the mapping method is currently used to identify this application.
ID	The unique ID number of an application. ID numbers 1 through 32,767 are automatically generated for applications; these IDs do not change. ID numbers for custom applications use 16,777,216 to 33,554,431.

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Table 63: show services application-identification application summary Output Fields (continued)

Field Name	Field Description
Order	Number used to specify priority when multiple applications match the traffic. The lowest order number takes the highest priority.

Table 64 on page 547 lists the output fields for the **show services application-identification application** command. Output fields are listed in the approximate order in which they appear.

Table 64: show services application-identification application Output Fields

Field Name	Field Description
Application Name	Name of the application.
Application Type	The basic application type, such as HTTP.
Description	A description of the application.
Application ID	The unique ID number of an application signature. ID numbers 1 through 32,767 are automatically generated for application; these IDs do not change. ID numbers for custom applications use 16,777,216 to 33,554,431.
Priority	Priority over other signature applications.
Disabled	The status of the application and whether the mapping method is currently used to identify this application.
Cacheable	The status whether the application identification results caching is enabled or not for the application. When this option is enabled, you can cache the application detection result in an ASC table.
Activation Date	Date when the application was activated for the first time.
Last Modified	Date when the application was last updated.
Number of Parent Group(s)	Total number of parent groups in this application signature group or cluster.
Application Group	Name of the application signature group associated with this application signature. Must be a unique name with a maximum length of 32 characters.
Application Tags	General information about this application type, for example, associated risk factors, technology, type of traffic, and so on. Support of application signature tags is dependent on the version of the loaded signature database (Juniper Networks security website).

Table 64: show services application-identification application Output Fields (continued)

Field Name	Field Description
Underlying consolidated Protocols/ports application is dependent on	List of default protocols and ports for dependent applications of the specified application.
Layer-7 Immediate Protocol(s)	List of applications over which that dynamic application can be identified.
Application Specific Ports:	The default port for this application type.
Signature:	Signature mapping criteria for application identification: Port range, Client-to-server, and Order.
Alias List:	An alternative name for an application.

Sample Output

show services application-identification application summary

```
user@host> show services application-identification application summary

Application(s): 3616
  Applications                                  Disabled        ID      Order
  junos:SLACKER                                  No              1179    1

  junos:GOOGLE-TRUSTED-STORE                     No              2819    5

  junos:AMJILT                                   No              2272    4

  junos:DSI                                      No              2644    3

  junos:HLN                                      No              2096    2

  junos:ETSI-LI                                  No              537     1

  junos:CRAZYSALOON                              No              1720    5

  junos:EKSISOZLUK                               No              2436    4

  junos:SABAH                                    No              2574    3

  junos:AFREECA                                  No              2373    2

  junos:SENEWEB                                  No              2068    1

  junos:DIINO                                    No              776     5

  junos:CARE2                                    No              376     4

  junos:MOBAGE                                   No              1456    3

  junos:CARTOONNETWORK                           No              982     2

  junos:AVATARS-UNITED                           No              363     1
```


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```
  junos:CONVIVA                                 No              2015    5

  junos:DREAMORA                                No              1725    4

  junos:ELWATANNEWS                             No              2381    3

  junos:REUTERS                                 No              1044    2

  junos:BABYCENTER                              No              364     1

  junos:SOUTHWEST                               No              289     5

  junos:ONEDIO                                  No              2517    4


........
........
```

show services application-identification application detail

user@host> **show services application-identification application detail junos:FTP**

```
Application Name: junos:FTP
Application type: FTP
Description: This signature detects the File Transfer Protocol (FTP), which
provides facilities for transferring files to and from remote computer systems.
It usually runs on TCP port 21.
Application ID: 45
Priority: high
Order: 0
Disabled: Yes
Cacheable: Yes
Activation Date: 2003-05-05
Last Modified: 2016-04-11
Number of Parent Group(s): 1
Application Groups:
    junos:infrastructure:file-servers
Application Tags:
    characteristic        : Supports File Transfer
    characteristic        : Known Vulnerabilities
    characteristic        : Capable of Tunneling
    risk                  : 3
    subcategory           : File-Servers
    category              : Infrastructure
Layer-7 Protocol(s):
    Protocol: TCP         / 205
    Protocol: SPDY        / 1469
    Protocol: SOCKS5      / 193
    Protocol: SOCKS4      / 192
    Protocol: HTTPS       / 68
    Protocol: HTTP2       / 2553
    Protocol: HTTP        / 67
Port Mapping:
    Default ports: TCP/21
```

show services application-identification application detail (Custom Applications)

```
user@host> show services application-identification application detail my-custom-app

Application Name: my-custom-app
Application type: MY-CUSTOM-APP
Description: custom App
Application ID: 16777216
Priority: high
Order: 65500
Disabled: No
Cacheable: No
Activation Date: N/A
Last Modified: N/A
Layer-7 Protocol(s):
    Protocol: http        / http
    Port range: N/A
    Member(s): 1
        Member m01
            Context: http-header-host
            Pattern: MY-SERVER.COM
            Direction: CTS
```

Sample Output

show services application-identification application detail (Unified Policies)

```
user@host> show services application-identification application detail

Application Name: junos:GOOGLE
Application type: GOOGLE
Description: This signature detects SSL connections to Google.com. Google is a
             company best known for their search engine but offers many cloud
             based services.
Application ID: 54
Priority: high
Order: 0
Disabled: No
Cacheable: No
Activation Date: 2003-05-05
Last Modified: 2017-06-28
Number of Parent Group(s): 2
Application Groups:
    junos:web:applications
    junos:web:portal
Application Tags:
    characteristic        : Can Leak Information
    characteristic        : Loss of Productivity
    characteristic        : Supports File Transfer
    risk                  : 3
    subcategory           : Applications
    category              : Web
Underlying consolidated Protocols/ports application is dependent on:
    Protocols:
        Protocol: junos:GOOGLE-GEN / 943
        Protocol: junos:STUN  / 201
```


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```
        Protocol: junos:UDP   / 216
        Protocol: junos:TCP   / 205
        Protocol: junos:HTTP-PROXY / 2956
        Protocol: junos:SSL   / 199
        Protocol: junos:SPDY  / 1469
        Protocol: junos:POSTGRESQL / 150
        Protocol: junos:HTTPS / 68
        Protocol: junos:HTTP  / 67
        Protocol: junos:NET-PROXY / 2629
        Protocol: junos:HTTP2 / 2553
        Protocol: junos:HTTP-TUNNEL / 750
        Protocol: junos:COTP  / 22
        Protocol: junos:RTSP  / 176
        Protocol: junos:RTP   / 175
        Protocol: junos:DTLS  / 1291
        Protocol: junos:RTMP  / 337
        Protocol: junos:QUIC  / 2521
        Protocol: junos:JABBER / 94
    TCP Ports:
        Port: 443
        Port: 554
        Port: 80
    UDP Ports:
        Port: 554
Layer-7 Immediate Protocol(s):
    Protocol: GOOGLE-GEN  / 943
Alias List:
    junos:GOOGLE-SSL
Application Specific Ports:
    Default ports: N/A
Signature:
    Port range: N/A
    Client-to-server
    Order: 1
```

show services application-identification application-system-cache (View)

Syntax

show services application-identification application-system-cache

Release Information

Command introduced in Junos OS Release 10.2. Command updated in Junos OS Release 12.1X47-D10. Output updated in Junos OS Release 12.1X47-D15. The **Cache lookup for security-services** and the **Cache lookup for miscellaneous-services** are introduced in Junos OS Release 18.2R1.

Description

Display application ID from default port/protocol binding or from the application system cache.

Required Privilege Level

view

Related Documentation

- clear services application-identification application-system-cache (Junos OS) on page 453

List of Sample Output

show services application-identification application-system-cache on page 553
show services application-identification application-system-cache (Application System Cache Changes with Unified Policy Support) on page 553

Output Fields

Table 65 on page 552 and Table 66 on page 553 list the output fields for the **show services application-identification application-system-cache** command. Output fields are listed in the approximate order in which they appear.

Table 65: show services application-identification application-system-cache Output Fields

Field Name	Field Description
application-cache	On or Off status of the application cache.
nested-application-cache	On or Off status of the nested application cache.
cache-unknown-result	On or Off status for caching unknown results.
cache-entry-timeout	The number of seconds the mapping information is saved.
pic	PIC number of the accumulated statistics.
Logical system name	Name of a specific logical system.
IP address	IP address.
Port	Port number.
Protocol	Type of protocol.

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Table 65: show services application-identification application-system-cache Output Fields (continued)

Field Name	Field Description
Application	Name of the application.
Encrypted	Yes or No to identify the traffic as encrypted or not.

Table 66: show services application-identification application-system-cache Output Fields (For Unified Policies)

Field Name	Field Description
application-cache	On or Off status of the application cache.
Cache lookup for security-services	On or Off status of the application cache for security services such as security policies, application firewall (AppFW), Juniper Sky ATP, IDP, and UTM. By default, the ASC is disabled for the security services.
Cache lookup for miscellaneous-services	On or Off status of the application cache for miscellaneous services such as APBR and AppTrack. By default, the ASC is enabled for the miscellaneous services.
cache-entry-timeout	The number of seconds the mapping information is saved.

Sample Output

show services application-identification application-system-cache

```
user@host> show services application-identification application-system-cache
Application System Cache Configurations:
  application-cache: on
  nested-application-cache: on
  cache-unknown-result: on
  cache-entry-timeout: 3600 seconds
  pic: 1/0
  Logical system name: root-logical-system
  IP address: 192.0.2.1                                  Port: 443    Protocol:
TCP
  Application: SSL                                     Encrypted: Yes

  pic: 1/1
  Logical system name: root-logical-system
  IP address: 192.0.2.2                                  Port: 80     Protocol:
TCP
  Application: HTTP                                    Encrypted: No
```

Sample Output

show services application-identification application-system-cache (Application System Cache Changes with Unified Policy Support)

```
user@host> show services application-identification application-system-cache

Application System Cache Configurations:
```

```
application-cache: on
  Cache lookup for security-services: off
  Cache lookup for miscellaneous-services: on
cache-entry-timeout: 3600 seconds
```


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show services application-identification commit-status

Syntax

show services application-identification commit-status]

Release Information

Command introduced in Junos OS Release 15.1X49-D40.

Description

Display information about the commit status. Because the custom signatures commit is performed asynchronously, the command output shows the current status of your configuration commit.

Required Privilege Level

view

Related Documentation

- request services application-identification application on page 461

List of Sample Output

show services application-identification commit-status on page 555
show services application-identification commit-status on page 555
show services application-identification commit-status on page 555

Sample Output

show services application-identification commit-status

```
user@host> show services application-identification commit-status
Custom signatures commit is in progress
```

show services application-identification commit-status

```
user@host> show services application-identification commit-status
Custom signatures committed successfully
```

show services application-identification commit-status

```
user@host> show services application-identification commit-status
Custom signatures serialization failed
```

show services application-identification counter (AppSecure)

Syntax

```
show services application-identification counter
  <ssl-encrypted-sessions>
logical-system
```

Release Information

Command introduced in Junos OS Release 10.2. Output updated in Junos OS Release 12.1X47-D10. Command and output updated in Junos OS Release 12.1X47-D15.
The **logical-system** option is introduced in Junos OS Release 18.3R1.

Description

Display the status of all Junos OS application identification counter values per SPU.

Options

ssl-encrypted-sessions—Displays counters for SSL encrypted sessions.

logical-system— Name of the logical system.

Required Privilege Level

view

Related Documentation

- clear services application-identification counter (Values) on page 454

List of Sample Output

show services application-identification counter on page 558
show services application-identification counter ssl-encrypted-sessions on page 558
show services application-identification counter logical-system all on page 559

Output Fields

Table 67 on page 556 lists the output fields for the **show services application-identification counter** command. Output fields are listed in an approximate order in which they appear.

Table 67: show services application-identification counter Output Fields

Field Name	Field Description
PIC	PIC number of the accumulated statistics. NOTE: The PIC number is always displayed as 0 for SRX300, SRX320, SRX340, and SRX345 devices.
Unknown applications	Number of unknown applications.
Encrypted unknown applications	Number of encrypted unknown applications.
Cache hits	Number of sessions that matched the application in the AI cache.
Cache hits pkt-plugin	Number of packet plugin hits in a session.
Cache hits stream-plugin	Number of stream plugin hits in a session.

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Table 67: show services application-identification counter Output Fields (continued)

Field Name	Field Description
Cache misses	Number of sessions that did not find the application in the AI cache.
Cache misses pkt-plugin	Number of packet plugin miss in a session.
Cache misses stream-plugin	Number of stream plugin miss in a session
Client-to-server packets processed	Number of client-to-server packets processed.
Server-to-client packets processed	Number of server-to-client packets processed.
Client-to-server bytes processed	Number of client-to-server payload bytes processed.
Server-to-client layer bytes processed	Number of server-to-client payload bytes processed.
Client-to-server encrypted packets processed	Number of client-to-server encrpted packets processed.
Server-to-client encrypted packets processed	Number of server-to-client encrpted packets processed.
Client-to-server encrypted bytes processed	Number of client-to-server encrpted payload bytes processed.
Server-to-client encrypted bytes processed	Number of server-to-client encrpted payload bytes processed.
Sessions bypassed due to resource allocation failure	Number of sessions bypassed due to resource allocation failure.
Segment case 1 - New segment to left	Number of TCP segments contained before the previous segment.
Segment case 2 - New segment overlap right	Number of TCP segments that start before the previous segment and are contained in it
Segment case 3 - Old segment overlapped	Number of TCP segments that start before the previous segment and extend beyond it.
Segment case 4 - New segment overlapped	Number of TCP segments that start and end within the previous segment.
Segment case 5 - New segment overlap left	Number of TCP segments that start within the previous segments and extend beyond it.
Segment case 6 - New segment to right	Number of TCP segments that start after the previous segment. This is the normal case.

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Sample Output

show services application-identification counter

```
user@host> show services application-identification counter

pic: 6/0
 Counter type                                                    Value
Unknown applications                                                 5
Encrpted unknown applications                                        0
Cache hits                                                           0
Cache misses                                                         8
Client-to-server packets processed                                   678
Server-to-client packets processed                                   0
Client-to-server bytes processed                                     83577
Server-to-client bytes processed                                     0
Client-to-server encrypted packets processed                         0
Server-to-client encrypted packets processed                         0
Client-to-server encrypted bytes processed                           0
Server-to-client encrypted bytes processed                           0
Sessions bypassed due to resource allocation failure                 0
Segment case 1 - New segment to left                                 0
Segment case 2 - New segment overlap right                           0
Segment case 3 - Old segment overlapped                              0
Segment case 4 - New segment overlapped                              0
Segment case 5 - New segment overlap left                            0
Segment case 6 - New segment to right                                0
```

Sample Output

show services application-identification counter ssl-encrypted-sessions

```
user@host> show services application-identification counter ssl-encrypted-sessions

 pic: 1/0
Counter type                                                     Value
AI cache hits                                                      0
AI cache hits by nested application                                0
AI cache misses                                                    0
AI matches                                                         0
AI uni-matches                                                     0
AI no-matches                                                      0
AI partial matches                                                 0
AI no-partial matches                                              0
Sessions that triggered Appid create session API                   0
Sessions that do not incur signature match or decoding             0
Sessions that incur signature match or decoding                    0
Client-to-server packets processed                                 0
Server-to-client packets processed                                 0
Client-to-server layer-7 bytes processed                           0
Server-to-client layer-7 bytes processed                           0
Terminal first data packets on both direction                      0
pic: 1/1
Counter type                                                   Value
AI cache hits                                                      0
AI cache hits by nested application                                0
AI cache misses                                                    0
AI matches                                                         0
```


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```
AI uni-matches                                                        0
AI no-matches                                                         0
AI partial matches                                                    0
AI no-partial matches                                                 0
Sessions that triggered Appid create session API                      0
Sessions that do not incur signature match or decoding                0
Sessions that incur signature match or decoding                       0
Client-to-server packets processed                                    0
Server-to-client packets processed                                    0
Client-to-server layer-7 bytes processed                              0
Server-to-client layer-7 bytes processed                              0
Terminal first data packets on both direction                         0
```

show services application-identification counter logical-system all

user@host> **show services application-identification counter logical-system all**

```
Logical System: root-logical-systempic: 0/0
  Counter type                                                    Value
 Unknown applications                                                 0
 Encrpted unknown applications                                        0
 Cache hits pkt-plugin                                                0
 Cache hits stream-plugin                                             0
 Cache misses pkt-plugin                                              0
 Cache misses stream-plugin                                           0
 Client-to-server packets processed                                   0
 Server-to-client packets processed                                   0
 Client-to-server bytes processed                                     0
 Server-to-client bytes processed                                     0
 Client-to-server encrypted packets processed                         0
 Server-to-client encrypted packets processed                         0
 Client-to-server encrypted bytes processed                           0
 Server-to-client encrypted bytes processed                           0
 Sessions bypassed due to resource allocation failure                 0
 Segment case 1 - New segment to left                                 0
 Segment case 2 - New segment overlap right                           0
 Segment case 3 - Old segment overlapped                              0
 Segment case 4 - New segment overlapped                              0
 Segment case 5 - New segment overlap left                            0
 Segment case 6 - New segment to right                                0
```

show services application-identification group

Syntax

show services application-identification group [detail *application-group name* | summary]

Release Information

Command introduced in Junos OS Release 11.4.

Description

Display detailed or summary information about a specified application signature group or all application signature groups. Both custom and predefined application signature groups can be displayed.

Options

detail *application-group name*—(Optional) Display detailed information for the specified application signature group.

summary—(Optional) Display summary information for all application signature groups.

Required Privilege Level

view

Related Documentation

- request services application-identification group on page 464

List of Sample Output

show services application-identification group summary on page 561
show services application-identification group detail on page 561

Output Fields

Table 68 on page 560 lists the output fields for the **show services application-identification group** command. Output fields are listed in the approximate order in which they appear.

Table 68: show services application-identification group Output Fields

Field Name	Field Description
Description	Description of the specified application in the detailed display.
Group ID or **ID**	The unique ID number of an application signature or application signature group. ID numbers 1 through 32,767 are automatically generated for predefined application signatures and application signature groups; these IDs do not change. ID numbers for custom application signatures and application signature groups use ID numbers 32,768 to 65,534.
Disabled	The status of the application signature group and whether the signature method is currently used to identify this application. The default is No.
Application Group(s)	The application signature groups present.
Applications	The application signatures associated with this application signature group.

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Sample Output

show services application-identification group summary

user@host> **show services application-identification group summary**

```
Application Group(s): 24
Application Groups                                  Disabled  ID
  my:enterprise                                      No        32770
  junos:enterprise:voip                              No        25
  junos:peer-to-peer:voip                            No        24
  junos:peer-to-peer:chat                            No        23
  junos:peer-to-peer:file-sharing                    No        22
...
```

show services application-identification group detail

user@host> **show services application-identification group detail junos:social-networking**

```
Group Name: junos:social-networking
Group ID: 36
Description: N/A
Disabled: No
Number of Applications: 0
Number of Sub-Groups: 2
Number of Parent-Groups: 1
Sub Groups:
    junos:social-networking:applications
    junos:social-networking:business
```

show services application-identification statistics applications

Syntax

```
show services application-identification statistics applications
interval
logical-system
```

Release Information

Command introduced in Junos OS Release 11.4. Command updated in Junos OS Release 12.1.
The **logical-system** option is introduced in Junos OS Release 18.3R1.

Description

Displays application usage statistics.

Options

interval— Displays interval statistics per application. Interval statistics are displayed in Top-N format, such that the first application displayed has the largest byte count. The default interval is 1, if no parameter is specified. The current interval is 1.

logical-system— Name of the logical system.

Required Privilege Level

view

Related Documentation

- statistics (Services) on page 422
- clear services application-identification application-statistics on page 450

List of Sample Output

show services application-identification statistics applications on page 563
show services application-identification statistics applications interval 1 on page 563
show services application-identification statistics applications logical-system all on page 563

Output Fields

Table 69 on page 562 lists the output fields for the **show services application-identification statistics applications** command. Output fields are listed in the approximate order in which they appear.

Table 69: show services application-identification statistics applications Output Fields

Field Name	Field Description
Application	Name of the application.
Sessions	Number of sessions for the application.

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Table 69: show services application-identification statistics applications Output Fields (continued)

Field Name	Field Description
Bytes	Size of the application in bytes. NOTE: When an SRX Series device is operating in chassis cluster mode (Active/Active mode - Z mode), the **show services application-identification statistics applications** command output does not provide complete statistics for bytes count for the session in application/application group statistics. This is because, ingress and egress traffic byte counts are updated separately on the primary and secondary nodes in the chassis cluster setup for a given application.
Encrypted	Yes or No identifying the traffic as encrypted or not.
Last Reset	Displays date, time, and how long ago the statistics for the sessions were cleared. The format None specified is in*year-month-day hour:minute:second timezone*. If you did not clear the statistics previously at any point, **Never** is displayed.

Sample Output

show services application-identification statistics applications

```
user@host> show services application-identification statistics applications

Last Reset: 2014-02-19 00:38:01 PST
                     Application           Sessions              Bytes
Encrypted
                          SYSLOG                  2              18610
  No
```

show services application-identification statistics applications interval 1

```
user@host> show services application-identification statistics applications interval 1

Logical System: root-logical-system
Interval Start: 2018-07-16 16:11:27 PDT
Elapsed time: 04:47:50
```

show services application-identification statistics applications logical-system all

```
user@host> show services application-identification statistics applications logical-system all

Logical System: root-logical-system
Last Reset: 2018-06-21 16:11:21 PDT
```

show services application-identification statistics application-groups

Syntax

```
show services application-identification statistics applications
interval
logical-system
```

Release Information

Command introduced in Junos OS Release 11.4.
The **logical-system** option is introduced in Junos OS Release 18.3R1.

Description

Displays application group usage statistics.

Options

interval— Displays interval statistics per application group. Interval statistics are displayed in Top-N format, such that the first application group displayed has the largest byte count. The default interval is 1, if no parameter is specified. The current interval is 1.

logical-system— Name of the logical system.

Required Privilege Level

view

Related Documentation

- statistics (Services) on page 422
- clear services application-identification application-statistics on page 450

List of Sample Output

show services application-identification statistics application-groups on page 565
show services application-identification statistics application-groups interval 1 on page 565
show services application-identification statistics application-groups logical-system all on page 565

Output Fields

Table 70 on page 564 lists the output fields for the **show services application-identification statistics application-groups** command. Output fields are listed in the approximate order in which they appear.

Table 70: show services application-identification statistics application-groups Output Fields

Field Name	Field Description
Last Reset	Displays date, time, and how long ago the statistics for the sessions were cleared. The format None specified is in*year-month-day hour:minute:second timezone*. If you did not clear the statistics previously at any point, **Never** is displayed.
Application Group	Displays the name of the application group.
Sessions	Displays the number of sessions for the application group.

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Table 70: show services application-identification statistics application-groups Output Fields (continued)

Field Name	Field Description
Kilo Bytes	Displays the size of the application group in kilobytes. NOTE: When an SRX Series device is operating in Chassis Cluster mode (Active/Active mode - Z mode), the **show services application-identification statistics application-groups** command output does not provide complete statistics for bytes count for the session in application/application group statistics. This is because, ingress and egress traffic byte counts are updated separately on the primary and secondary nodes in the chassis cluster setup for a given application.

Sample Output

show services application-identification statistics application-groups

`user@host>` **show services application-identification statistics application-groups**

```
Last Reset: 2014-02-19 00:38:01 PST
                Application Group           Sessions         Kilo Bytes
             junos:infrastructure                  2                 18
             junos:encryption                      1                 2
  junos:infrastructure:monitoring                  2                 18
```

show services application-identification statistics application-groups interval 1

`user@host>` **show services application-identification statistics application-groups interval 1**

```
Logical System: root-logical-system
Interval Start: 2018-07-16 16:11:27 PDT
Elapsed time: 04:56:01
```

show services application-identification statistics application-groups logical-system all

`user@host>` **show services application-identification statistics application-groups logical-system all**

```
Logical System: root-logical-system
Last Reset: 2018-06-21 16:11:21 PDT
```

show services application-identification status

Syntax

show services application-identification status

Release Information

Command introduced in Junos OS Release 12.1X47-D10.
Command introduced in Junos OS Release 18.3R1 for logical systems.

Description

Displays detailed information about application identification status.

Required Privilege Level

view

Related Documentation

- request services application-identification application on page 461

List of Sample Output

show services application-identification status on page 567
show services application-identification status (DPI Performance Mode Enabled) on page 568
show services application-identification status (Logical Systems) on page 570

Output Fields

Table 71 on page 566 lists the output fields for the **show services application-identification status** command. Output fields are listed in the approximate order in which they appear.

Table 71: show services application-identification status Output Fields

Field Name	Field Description
Status	Status of application identification: **Enabled** or **Disabled**.
Sessions under app detection	Sessions undergoing application identification detection.
Engine Version	Application identification detector engine version.
Max TCP session packet memory	Maximum number of TCP sessions that application identification maintains.
Force packet plugin	Force packet plugin status: **Enabled** or **Disabled**.
Force stream plugin	Force stream plugin status: **Enabled** or **Disabled**.
DPI Performance mode	DPI performance mode status. This field is displayed only if the DPI performance mode is enabled.
Statistics collection interval	Frequency (in minutes) for collecting statistics.
Status	Status of application system cache: **Enabled** or **Disabled**.

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Table 71: show services application-identification status Output Fields (continued)

Field Name	Field Description
Negative cache status	Status on the number of sessions that reach the Unknown cache entry: **Enabled** or **Disabled**.
Max Number of entries in cache	Maximum number of cache entries.
Cache timeout	Idle timeout after which the cache entries expires.
Download Server CGI	Name of the server from where protocol bundle was downloaded.
Auto Update	Status of auto update to receive protocol bundle updates from the server: **Enabled** or **Disabled**.
Status	Status of protocol bundle: **Active** or **Free**.
Version Or **PB Version**	Version of protocol bundle. NOTE: Starting from Junos OS Release 17.4R1, the field **PB Version** is used for displaying version of the protocol bundle.
Proxy Profile	Display the proxy profile name. If you have disabled proxy server for downloading application signature package, the **Proxy Profile** displays **Not Configured**.
Proxy Address	Display the IP address and the port number of the proxy server.
Session	The number of active sessions.

Starting from Junos OS Release 17.4R1, Juniper Networks Deep Packet Inspection-Decoder (JDPI-Decoder) engine, is packaged along with the application signature package version 534 that includes protobundle version 1.270.0.48.005. When you upgrade to Junos OS Release 17.4R1 or later from the earlier versions of Junos OS, the application identification security package installed is of version 534.

However, if you require latest versions of the protocol bundle, you must download and install the application signature package separately.

Sample Output

show services application-identification status

```
user@host> show services application-identification status
pic: 5/0

Application Identification
 Status                           Enabled
 Sessions under app detection     0
```

```
 Engine Version                    4.18.1-20 (build date Feb 15 2014)
 Max TCP session packet memory     30000
 Force packet plugin               Disabled
 Force stream plugin               Disabled
 Statistics collection interval    1 (in minutes)

Application System Cache
 Status                            Enabled
 Negative cache status             Disabled
 Max Number of entries in cache    131072
 Cache timeout                     3600 (in seconds)

Protocol Bundle
 Download Server                https://services.netscreen.com/cgi-bin/index.cgi

 AutoUpdate                        Disabled
Slot 1:
 Status                            Active
 Version                           1.30.4-22.005 (build date Jan 17 2014)
 Sessions                          0
Slot 2
 Status                            Free
```

Sample Output

show services application-identification status (DPI Performance Mode Enabled)

user@host> **show services application-identification status**

```
pic: 2/1

Application Identification
Status                            Enabled
Sessions under app detection      0
Engine Version                    4.18.2-24.006 (build date Jul 30 2014)
Max TCP session packet memory     30000
Force packet plugin               Disabled
Force stream plugin               Disabled
DPI Performance mode:             Enabled
Statistics collection interval    1 (in minutes)

Application System Cache
Status                            Enabled
Negative cache status             Disabled
Max Number of entries in cache    262144
Cache timeout                     3600 (in seconds)

Protocol Bundle
Download Server                https://services.netscreen.com/cgi-bin/index.cgi
AutoUpdate                        Disabled
Slot 1:
Application package version       2399
Status                            Active
Version                           1.40.0-26.006 (build date May 1 2014)
Sessions                          0
Slot 2
Application package version       0
Status                            Free
Version
Sessions                          0
```


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show services application-identification status (Application Identification Detector Engine Version)

```
Application Identification
 Status                             Enabled
 Sessions under app detection       0
 Max TCP session packet memory      0
 Force packet plugin                Disabled
 Force stream plugin                Disabled
 Statistics collection interval     1 (in minutes)

Application System Cache
 Status                             Enabled
 Max Number of entries in cache     131072
 Cache timeout                      3600 (in seconds)

Protocol Bundle
 Download Server
https://indiavm-sigdb2.englab.juniper.net/cgi-bin/index.cgi
 AutoUpdate                         Disabled
Slot 1:
 Application package version        534
 Status                             Active
 PB Version                         1.270.0-48.005 (build date May 22 2017)
 Engine version                     4.20.0-49.005 (build date May 22 2017)
 Sessions                           0
```

show services application-identification status (Download Through Proxy Server)

user@host> show services application-identification status

```
Application Identification
 Status                             Enabled
 Sessions under app detection       0
 Max TCP session packet memory      0
 Force packet plugin                Disabled
 Force stream plugin                Disabled
 DPI Performance mode:              Enabled
 Statistics collection interval     1440 (in minutes)

Application System Cache
 Status                             Enabled
  Cache lookup security-services    Enabled
  Cache lookup miscellaneous-services Enabled
 Max Number of entries in cache     131072
 Cache timeout                      3600 (in seconds)

Protocol Bundle
 Download Server                https://signatures.juniper.net/cgi-bin/index.cgi

 AutoUpdate                         Disabled

Proxy Details
 Proxy Profile                      p1
 Proxy Address                      http://5.0.0.1:3128
Slot 1:
 Application package version        3058
 Status                             Active
```

```
 PB Version                        1.340.0-57.005 (build date Apr 19 2018)
 Engine version                    4.20.0-91 (build date Feb 27 2018)
 Sessions                          0
```

show services application-identification status (Logical Systems)

user@host> show services application-identification status

```
Application Identification
 Status                            Enabled
 Sessions under app detection      0
 Max TCP session packet memory     0
 Force packet plugin               Disabled
 Force stream plugin               Disabled
DPI Performance mode:              Enabled
 Statistics collection interval    1440 (in minutes)

Application System Cache
 Status                            Enabled
Cache lookup security-services     Enabled
Cache lookup miscellaneous-services Enabled
 Max Number of entries in cache    131072
 Cache timeout                     3600 (in seconds)

Protocol Bundle
 Download Server                https://services.netscreen.com/cgi-bin/index.cgi

 AutoUpdate                        Disabled
Proxy Details
Proxy Profile                      Not Configured
Slot 1:
 Application package version       534
 Status                            Active
 PB Version                        1.270.0-48.005 (build date May 22 2017)
 Engine version                    4.20.0-49.005 (build date May 22 2017)
 Sessions                          0
```


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show services application-identification version

Syntax

```
show services application-identification version
```

Release Information

Command introduced in Junos OS Release 10.2.
Command introduced in Junos OS Release 18.3R1 for logical systems.

Description

Displays the Junos OS application package version.

Required Privilege Level

view

Related Documentation

- request services application-identification download on page 462

List of Sample Output

show services application-identification version on page 571
show services application-identification version (Logical Systems) on page 571

Sample Output

show services application-identification version

The following output shows that the application package version is 1608.

```
user@host> show services application-identification version
Application package version: 1608
```

show services application-identification version (Logical Systems)

The following output shows that the application package version is 534.

```
user@host> show services application-identification version
Application package version: 534
```

show services icap-redirect server status

Syntax show services icap-redirect server status

Release Information Command introduced in Junos OS Release 18.1R1.
The logical system option is introduced in Junos OS Release 18.3R1.

Description Display the status of On-Premises in DLP.

Required Privilege Level view

Sample Output

show services icap-redirect server status

user@host> **show services icap-redirect server status**

```
 ICAP Status :
         Spu-1 Profile: icap-pf1 Server: icap-svr1 : UP
ICAP Status :
         Spu-1 Profile: icap-pf1 Server: icap-svr2 : UP
ICAP Status :
         Spu-2 Profile: icap-pf1 Server: icap-svr1 : UP
ICAP Status :
         Spu-2 Profile: icap-pf1 Server: icap-svr2 : UP
ICAP Status :
         Spu-3 Profile: icap-pf1 Server: icap-svr1 : UP
ICAP Status :
         Spu-3 Profile: icap-pf1 Server: icap-svr2 : UP
```

show services icap-redirect server status logical-system

user@host> **show services icap-redirect server status logical-system LSYS1**

```
 ICAP Status :
         spu-1 Profile: icap-pf1 Server: icap-svr1 : UP
ICAP Status :
         spu-2 Profile: icap-pf1 Server: icap-svr1 : UP
ICAP Status :
         spu-3 Profile: icap-pf1 Server: icap-svr1 : UP
```


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show services service-redirect statistic

Syntax show services service-redirect statistic

Release Information Command introduced in Junos OS Release 18.1R1.
The logical system option is introduced in Junos OS Release 18.3R1.

Description Display the Service Redirect statistic.

Required Privilege Level view

Sample Output

show services service-redirect statistic

```
user@host> show services service-redirect statistic
ICAP Redirect statistic:
  Message Redirected                  : 4
      Message REQMOD Redirected       : 2
      Message RESPMOD Redirected      : 2
  Message Received                    : 4
      Message REQMOD Received         : 2
      Message RESPMOD Received        : 2
Fallback:      permit           log-permit       reject
  Timeout         0                 0                0
  Connectivity    0                 0                0
  Default         0                 0                0
```

Sample Output

show services icap-redirect statistic logical-system

```
user@host> show services icap-redirect statistic logical-system LSYS1
ICAP Redirect statistic:
  Message Redirected                  : 12
      Message REQMOD Redirected       : 6
      Message RESPMOD Redirected      : 6
  Message Received                    : 12
      Message REQMOD Received         : 6
      Message RESPMOD Received        : 6
Fallback:      permit           log-permit       reject
  Timeout         0                 0                0
  Connectivity    0                 0                0
  Default         0                 0                0
```

show services ssl proxy statistics

Syntax **show services ssl proxy statistics**

Release Information Command introduced in Junos OS Release 12.1.

Description Display information about the SSL proxy statistics.

NOTE: When devices are operating in chassis cluster mode, the SSL proxy statistics increment only on the active node of the chassis cluster setup.

Options **none**—Display summary information about SSL proxy.

Required Privilege Level view

Related Documentation

- clear services ssl proxy statistics on page 455

List of Sample Output show services ssl proxy statistics on page 575

Output Fields Table 72 on page 574 describes the output fields for the **show services ssl proxy statistics** command. Output fields are listed in the approximate order in which they appear.

Table 72: show services ssl proxy statistics Output Fields

Field Name	Field Description
Sessions matched	The number of proxy sessions that are matched.
Sessions bypassed: non SSL	The number of proxy sessions that are bypassed because the non SSL sessions limit was exceeded
Sessions bypassed: memory overflow	The number of proxy sessions that are bypassed because the memory usage limit per session was reached.
sessions bypassed: low memory	The number of proxy sessions that are bypassed because of low memory on Packet Forwarding Engine.
Sessions created	The number of proxy sessions that are newly created.
Sessions ignored	The number of proxy sessions that are ignored.
Sessions active	The number of proxy sessions that are active.

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Table 72: show services ssl proxy statistics Output Fields (continued)

Field Name	Field Description
Sessions dropped	The number of proxy sessions that are dropped.
Sessions whitelisted	The number of sessions that are whitelisted. Whitelists comprise addresses or domain names that you want to exempt from the SSL proxy processing.
whitelisted url category match	Whitelists comprise url hostnames that you want to exempt from the SSL proxy processing.

Sample Output

show services ssl proxy statistics

```
user@host> show services ssl proxy statistics

PIC:fwdd0 fpc[0] pic[0] ------
        sessions matched                      30647
        sessions bypassed:non-ssl                 0
        sessions bypassed:mem overflow            0
      sessions bypassed:low memory               0
        sessions created                      25665
        sessions ignored                          6
        sessions active                           0
        sessions dropped                          0
  sessions whitelisted                          0
        whitelisted url category match             0
```

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