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Junos® OS

Securing GTP and SCTP Traffic User Guide for Security Devices

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junos

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

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About the Documentation

IN THIS SECTION

Use this guide to configure General Packet Radio Switching (GPRS) Tunneling Protocol (GTP) and Stream Control Transmission Protocol (SCTP) in Junos OS on the SRX Series devices to secure GTP and SCTP traffic flow to external networks. The GTP firewall features such as policy-based GTP, GTP inspection, and GTP handover techniques address key security issues in mobile operators networks.

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; }
   ```

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 xii 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 xii defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

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

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

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

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

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

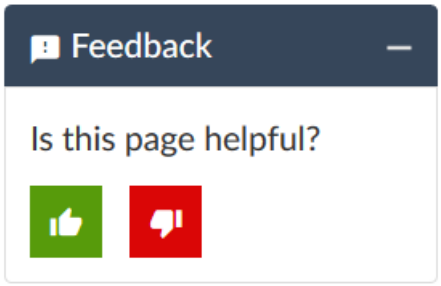
Table 2: Text and Syntax Conventions *(continued)*

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

Documentation Feedback

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

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



  - Click the thumbs-up icon if the information on the page was helpful to you.
  - Click the thumbs-down icon if the information on the page was not helpful to you or if you have suggestions for improvement, and use the pop-up form to provide feedback.
- E-mail—Send your comments to techpubs-comments@juniper.net. Include the document or topic name, URL or page number, and software version (if applicable).

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- Product warranties—For product warranty information, visit https://www.juniper.net/support/warranty/.
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- 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/
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- 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/

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

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

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

1

CHAPTER

General Packet Radio Service (GPRS) Overview

Introduction to GPRS

IN THIS SECTION

GPRS Overview

IN THIS SECTION

General Packet Radio Service (GPRS) networks connect to several external networks including those of roaming partners, corporate customers, GPRS Roaming Exchange (GRX) providers, and the public Internet. GPRS network operators face the challenge of protecting their network while providing and controlling access to and from these external networks. Juniper Networks provides solutions to many of the security problems plaguing GPRS network operators.

In the GPRS architecture, the fundamental cause of security threats to an operator's network is the inherent lack of security in the GPRS tunneling protocol (GTP). GTP is the protocol used between GPRS support nodes (GSNs). GTP is used to establish a GTP tunnel for individual user endpoints (UEs) and between a Service Gateway (S-GW) and a PDN Gateway (P-GW) in 4G. A GTP tunnel is a channel between GSNs through which two hosts exchange data. The SGSN (S-GW) receives packets from the user endpoints and encapsulates them within a GTP header before forwarding them to the GGSN through the GTP tunnel. When the GGSN receives the packets, it decapsulates them and forwards them to the external host.

Communication between different GPRS networks is not secure because GTP does not provide any authentication, data integrity, or confidentiality protection. Implementing IP Security (IPsec) for connections between roaming partners, setting traffic rate limits, and using stateful inspection can eliminate a majority

of the GTP's security risks. The GTP firewall features in Junos OS address key security issues in mobile operators' networks.

Juniper Networks security devices mitigate a wide variety of attacks on the following types of GPRS interfaces:

- Gn—The Gn interface is the connection between an SGSN (S-GW) and a GGSN within the same public land mobile network (PLMN).

  S5 - The S5 interface is the connection between a S-GW and P-GW within the PLMN in 4G networks.

- Gp—The Gp interface is the connection between two PLMNs.

  S8 -The S8 interface is the bearer plane connection between home and visited PLMNs in 4G networks.

- Gi—The Gi interface is the connection between a GGSN and the Internet or destination networks connected to a PLMN.

  SGi - The SGi interface is the connection between a P-GW and the Internet or destination networks connected to a PLMN in 4G networks.

The term *interface* has different meanings in Junos OS and in GPRS technology. In Junos OS, an interface is a doorway to a security zone that allows traffic to enter and exit the zone. In GPRS, an interface is a connection, or a reference point, between two components of a GPRS infrastructure, for example, an SGSN (S-GW) and a GGSN (P-GW).

Starting in Junos OS Release 18.4R1, GPRS tunneling protocol (GTP) traffic security inspection is supported on IPv6 addresses along with existing IPv4 support. With this enhancement, a GTP tunnel using either IPv4 and IPv6 addresses is established for individual user endpoints (UEs) between a Serving GPRS Support Node (SGSN) in 3G or a Service Gateway (S-GW) and a Gateway GPRS Support Node (GGSN) in 3G or a PDN Gateway (P-GW) in 4G. With IPv6 support, GTP Application Layer Gateway (ALG) inspects or ignores IPv6 GTP sessions according to the policy configurations. All ALG functions on IPv4 are supported on IPv6. You can Inspect GTP signaling or data messages transmitted over IPv6 based on the policy configurations.

This topic contains the following sections:

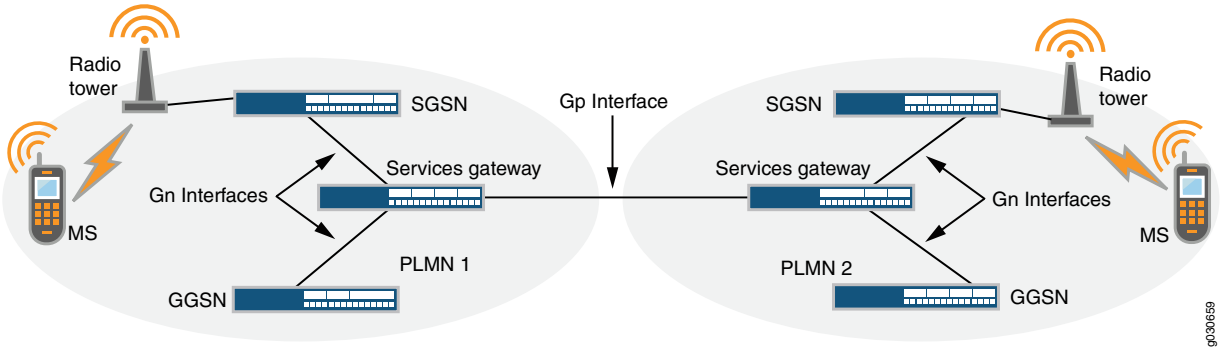
Gp and Gn Interfaces

You implement a security device on the Gn interface to protect core network assets such as the SGSN (S-GW) and GGSN (P-GW). To secure GTP tunnels on the Gn interface, you place the security device between SGSNs (S-GW) and GGSNs (P-GW) within a common PLMN.

When you implement a security device to the Gp interface, you protect a PLMN from another PLMN. To secure GTP tunnels on the Gp interface, you place the SGSNs (S-GW) and GGSNs(P-GW) of a PLMN behind the security device so that all traffic, incoming and outgoing, goes through the firewall.

Figure 1 on page 19 illustrates the placement of Juniper Networks SRX Series devices used to protect PLMNs on the Gp and Gn interfaces.

Figure 1: Gp and Gn Interfaces



Gi Interface

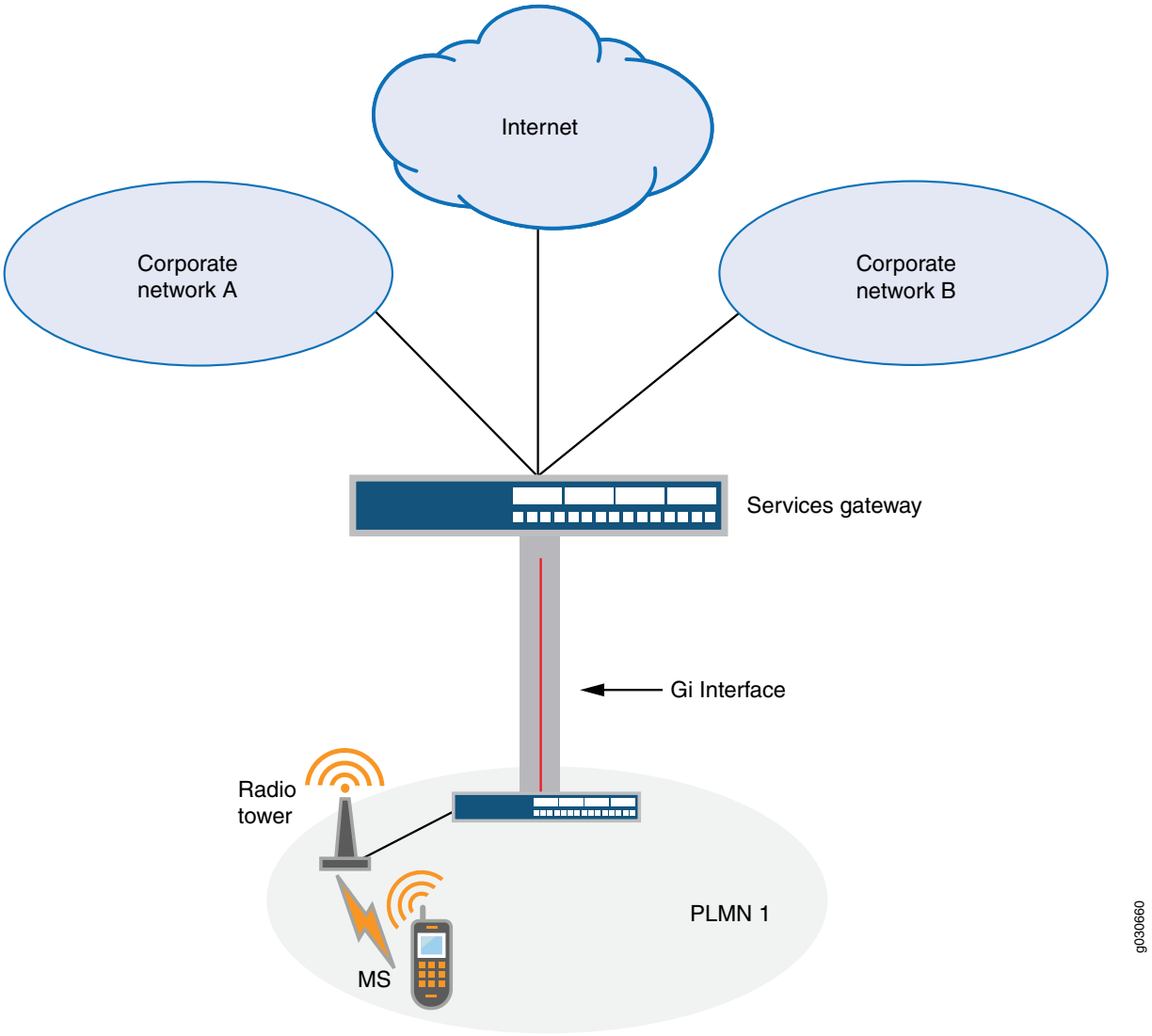
When you implement a security device on the Gi interface, you can simultaneously control traffic for multiple networks, protect a PLMN against the Internet and external networks, and protect mobile users from the Internet and other networks. Junos OS provides a great number of virtual routers, making it possible for you to use one virtual router per customer network and thereby allow the separation of traffic for each customer network.

The security device can securely forward packets to the Internet or destination networks using the Layer 2 Tunneling Protocol (L2TP) for IPsec virtual private network (VPN) tunnels.

SRX Series devices do not support full L2TP.

Figure 2 on page 20 illustrates the implementation of a security device to protect a PLMN on the Gi interface.

Figure 2: Gi Interface



Operational Modes

Junos OS supports two interface operational modes with GTP: transparent mode and route mode. If you want the security device to participate in the routing infrastructure of your network, you can run it in route mode. This requires a certain amount of network redesign. Alternatively, you can implement the security device into your existing network in transparent mode without having to reconfigure the entire network. In transparent mode, the security device functions as a Layer 2 switch or bridge, and the IP addresses of interfaces are set at 0.0.0.0, making the presence of the security device invisible, or *transparent*, to users.

Junos OS supports NAT on interfaces and policies that do not have GTP inspection enabled.

Currently in Junos OS, route mode supports active/passive, and active/active chassis cluster. Transparent mode supports active/passive only.

GTP In-Service Software Upgrade

GTP supports unified in-service software upgrade (ISSU) between two SRX Series devices running two different Junos OS releases. Unified ISSU is performed on a chassis cluster, enabling a software upgrade between two different Junos OS releases with no disruption on the control plane and with minimal disruption of traffic.

On SRX5400, SRX5600, and SRX5800 devices, ISSU is supported from Junos OS Release 12.1X45 through Junos OS Release 12.1X46 and from Junos OS Release 12.1X46 through Junos OS Release 12.3X48-D10. ISSU is not supported from Junos OS Release 12.1X45 through Junos OS Release 12.3X48-D10.

Understanding GTP Support for Central Point Architecture

User equipment (for example, a cellphone) attaches to a Serving GPRS Support Node (SGSN) or S-GW (Serving Gateway) for General Packet Radio Service (GPRS) data service. The SGSN (S-GW) connects to a gateway GPRS support node to access the Internet. The user equipment requests the SGSN to create one or multiple GPRS tunneling protocol (GTP) tunnels to the GGSN or P-GW (PDN Gateway) for Internet access. In situations where the user equipment moves to a new location, the user equipment has to attach to another SGSN. The new SGSN notifies the GGSN to update the new SGSN information in the original tunnel.

The GTP Application Layer Gateway (ALG) maintains the status of the tunnels and permits tunnel update request packets only for the existing tunnels. When the user equipment moves to a new location and attaches to another SGSN, the new SGSN information must be updated in the original tunnel. Because few GTP-C messages are bidirectional, and messages can be sent either sent by the SGSN or the GGSN, correct session distribution is not guaranteed. That is, the GTP ALG stops creating a session if the first packet originates from an unknown direction. In this case, the first packet and the other pending packets are dropped.

To prevent GTP-C packets from being dropped, a new flow session is created and the GTP-C traffic is allowed to pass even if the GGSN or SGSN direction is not determined. Later, the GGSN IP is determined using the correct SPU to create the flow session; otherwise, the session is migrated to the designated SPU.

Starting from Junos OS Release 18.4R1, the GTP-C tunnel is enhanced to support the tunnel-based session distribution to speed up the tunnel set up process and load balance the sessions between the SPUs. The tunnel-based session guarantees that the GTP-C tunnel messages reach the control tunnel and finish the stateful inspection. If the GTP-C distribution is enabled, the GTP-C tunnels and the GTP-C tunnel sessions are distributed by the SGSN tunnel endpoint identifier (TEID) of the tunnel. Use the **set security forwarding-process application-services enable-gtpu-distribution** command to enable the tunnel-based session distribution where the GTP-C traffic of different tunnels are spread across different SPUs.

Starting in Junos OS Release 15.1X49-D40 and Junos OS Release 17.3R1, the central point architecture is enhanced. Enhancements are as follows:

- Prevent GTP-C packet drop issues during the SGSN handover.
- Support the GTP-C message rate-limiting to protect the GGSN from flooding of GTP-C messages.
- Distribute GTP-C and GTP-U traffic handled by a GGSN and SGSN pair on all SPUs by switching to tunnel-based session distribution in which the GTP-C and GTP-U traffic of different tunnels is spread across different SPUs. Use the **enable-gtpu-distribution** command to enable GTP-C or GTP-U session distribution.

GTP Tunnel Management

GTP is used to establish a GTP tunnel for individual user endpoints (UEs) and between a Serving GPRS Support Node (SGSN) and a Gateway GPRS Support Node (GGSN). A GTP tunnel is a channel between GSNs through which two hosts exchange data. The SGSN receives packets from the user endpoints (UEs) and encapsulates them within a GTP header before forwarding them to the GGSN through the GTP tunnel. When the GGSN receives the packets, it decapsulates them and forwards them to the external host.

Tunnel Object: The Client endpoints contain information for downstream GSN (SGSN), the Server endpoints hold information for upstream GSN (GGSN). Each tunnel endpoint reserves the fields one for IPv4 address and one for IPv6 address. The tunnel endpoint saves the addresses learned in the tunnel creation or update messages.

Redirect Entry: Redirect entries (also called redirect tunnels) are installed to help finding the anchor SPU. Redirect endpoints are created by means of the creation of normal GTP tunnels. A redirect entry is mapped to one tunnel endpoint and it copies IP address(es), TEID value, and the anchor SPU ID from the tunnel. With IPv6 tunnel support, redirect entry is expanded like tunnel object.

GSN

The gateway GPRS support node (GGSN) or P-GW (PDN Gateway) converts the incoming data traffic coming from the mobile users through the Service gateway GPRS support node (SGSN) and forwards it to the relevant network, and vice versa. The GGSN and the SGSN together form the GPRS support nodes (GSN).

GSN Object: The GTP ALG maintains a GSN table. Each GSN node in a GSN table will record one GSN IP address, (IPv4 or IPv6), GSN restart counter, and GSN-based rate-limiting counter, and so on. If a GSN node has both IPv4 and IPv6 address, The GTP ALG will generate two GSN entries, one for IPv4 address and the other for IPv6 address and the two GSN entries in the same GSN node counts the rate-limit signaling messages independently, and ages out separately.

GSN Reboot: If a GSN reboots, the restart counter changes and the related tunnels will get deleted. For example, if a GSN node is enabled with two IP addresses on tunnels. then the GSN restart is found by only one IP address (IPv4 or IPv6). The tunnels with both IP addresses are removed, and vice versa.

Path Object Management

A path object contains two GSN address and it supports both IPv4 and IPv6 addresses. A path object records the information between the GSN addresses such as message counter, the last time, and so on. For a GSN that has both IPv4 and IPv6 address, the two addresses have their separated paths. Each path performs its own rate-limitation, and ages out separately.

Release History Table

Release	Description
18.4R1	Starting in Junos OS Release 18.4R1, GPRS tunneling protocol (GTP) traffic security inspection is supported on IPv6 addresses along with existing IPv4 support. With this enhancement, a GTP tunnel using either IPv4 and IPv6 addresses is established for individual user endpoints (UEs) between a Serving GPRS Support Node (SGSN) in 3G or a Service Gateway (S-GW) and a Gateway GPRS Support Node (GGSN) in 3G or a PDN Gateway (P-GW) in 4G. With IPv6 support, GTP Application Layer Gateway (ALG) inspects or ignores IPv6 GTP sessions according to the policy configurations. All ALG functions on IPv4 are supported on IPv6. You can Inspect GTP signaling or data messages transmitted over IPv6 based on the policy configurations.
15.1X49-D40	Starting in Junos OS Release 15.1X49-D40 and Junos OS Release 17.3R1, the central point architecture is enhanced.

RELATED DOCUMENTATION

Chassis Cluster Overview

Day One: SRX Series Up and Running with Advanced Security Services

2
CHAPTER

Securing GTP Traffic

Policy-Based GTP

IN THIS SECTION

The GPRS tunneling protocol (GTP) policies contain rules that permit, deny, or tunnel traffic. The device performs GTP policy filtering by checking every GTP packet against policies that regulate GTP traffic and by then forwarding, dropping, or tunneling the packet based on these policies.

Understanding Policy-Based GTP

By default, the public land mobile network (PLMN) that the Juniper Networks device protects is in the Trust zone. The device protects the PLMN in the Trust zone against other PLMNs in other zones. You can place all the PLMNs against which you are protecting your PLMN in the Untrust zone, or you can create user-defined zones for each PLMN. A PLMN can occupy one security zone or multiple security zones.

You must create policies to enable traffic to flow between zones and PLMNs. Policies contain rules that permit, deny, or tunnel traffic. The device performs GPRS tunneling protocol (GTP) policy filtering by checking every GTP packet against policies that regulate GTP traffic and by then forwarding, dropping, or tunneling the packet based on these policies.

By selecting the GTP service in a policy, you enable the device to permit, deny, or tunnel GTP traffic. However, this does not enable the device to inspect GTP traffic. For the device to inspect GTP traffic, you must apply a GTP configuration, also referred to as a *GTP inspection object*, to a policy.

You can apply only one GTP inspection object per policy, but you can apply a GTP inspection object to multiple policies. Using policies, you can permit or deny the establishment of GTP tunnels from certain peers such as a Serving GPRS Support Node (SGSN).

Starting in Junos OS Release 19.4R1, to accommodate IoT (Internet of Things) and roaming firewall use cases, the GTP tunnel scale per SPU is increased for the following SRX5000 (SRX5400, SRX5600, SRX5800), and SRX4600 devices:

Table 3:

Platform	SRX5000 SPC2	SRX5000 SPC3	SRX4600
Pre 19.4 Tunnel Scale per SPU	600K	1.2M	400K
Pre 19.4 Tunnel Scale per SPC	600K * 4	1.2M * 2	400k
19.4 onwards Tunnel Scale per SPU	3M	12M	4M
19.4 onwards Tunnel Scale per SPC	3M * 4	12M * 2	4M

Starting in Junos OS Release 20.1R1, to enable IoT (Internet of Things) and roaming firewall use cases, the GTP tunnel scale is increased for the following SRX devices:

Table 4:

Platform	SRX1500	SRX4100	SRX4200
Pre 20.1 Tunnel Scale per system	204800	409600	819200
20.1 onwards Tunnel Scale per system	1024000	4096000	4096000

For vSRX instances, the number of tunnels supported depends on the available system memory.

Table 5:

Platform	Memory	Tunnel Number
vSRX	4G/6G	40K
	8G/10G/12G/14G	200K
	16G/20G/24G/28G	400K
	32G/40G/48G	800K
	56G/64G	1600K (1.6M)

You can configure policies that specify “Any” as the source or destination zone (thereby including all hosts in the zone), and you can configure policies that specify multiple source and destination addresses.

In policies, you can enable traffic logging.

Example: Enabling GTP Inspection in Policies

IN THIS SECTION

This example shows how to enable GTP inspection in policies.

Requirements

Before you begin, the device must be restarted after GTP is enabled. By default, GTP is disabled on the device.

Overview

In this example, you configure interfaces as ge-0/0/1 and ge-0/0/2, the addresses are 2.0.0.254/8 and 3.0.0.254/8. You then configure the security zone and specify address as 2.0.0.5/32 and 3.0.0.6/32. You enable the GTP service in the security policies to allow bidirectional traffic between two networks within the same PLMN.

Configuration

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 security gprs gtp profile gtp1
set interfaces ge-0/0/1 unit 0 family inet address 2.0.0.254/8
set interfaces ge-0/0/2 unit 0 family inet address 3.0.0.254/8
```

```
set security zones security-zone sgsn interfaces ge-0/0/1.0 host-inbound-traffic system-services all
set security zones security-zone sgsn host-inbound-traffic protocols all
set security zones security-zone ggsn interfaces ge-0/0/2.0 host-inbound-traffic system-services all
set security zones security-zone ggsn host-inbound-traffic protocols all
set security address-book global address local-sgsn 2.0.0.5/32
set security address-book global address remote-ggsn 3.0.0.6/32
set security policies from-zone sgsn to-zone ggsn policy sgsn_to_ggsn match source-address local-sgsn
    destination-address remote-ggsn application junos-gprs-gtp
set security policies from-zone sgsn to-zone ggsn policy sgsn_to_ggsn then permit application-services
    gprs-gtp-profile gtp1
set security policies from-zone ggsn to-zone sgsn policy ggsn_to_sgsn match source-address remote-ggsn
    destination-address local-sgsn application junos-gprs-gtp
set security policies from-zone ggsn to-zone sgsn policy ggsn_to_sgsn then permit application-services
    gprs-gtp-profile gtp1
```

Step-by-Step Procedure

To configure GTP inspection in policies:

1. Create the GTP inspection object.

```
[edit]
user@host# set security gprs gtp profile gtp1
```

2. Configure interfaces.

```
[edit interfaces]
user@host# set ge-0/0/1 unit 0 family inet address 2.0.0.254/8
user@host# set ge-0/0/2 unit 0 family inet address 3.0.0.254/8
```

3. Configure security zones.

```
[edit security zones]
user@host# set security-zone sgsn interfaces ge-0/0/1.0
user@host# set security-zone sgsn host-inbound-traffic system-services all
user@host# set security-zone sgsn host-inbound-traffic protocols all
user@host# set security-zone ggsn interfaces ge-0/0/2.0
user@host# set security-zone ggsn host-inbound-traffic system-services all
user@host# set security-zone ggsn host-inbound-traffic protocols all
```

4. Specify addresses.

```
[edit security address-book global]
user@host# set address local-sgsn 2.0.0.5/32
user@host# set address remote-ggsn 3.0.0.6/32
```

5. Enable the GTP service in the security policies.

```
[edit security policies]
user@host# set from-zone sgsn to-zone ggsn policy sgsn_to_ggsn match source-address local-sgsn
   destination-address remote-ggsn application junos-gprs-gtp
user@host# set from-zone sgsn to-zone ggsn policy sgsn_to_ggsn then permit application-services
   gprs-gtp-profile gtp1
user@host# set from-zone ggsn to-zone sgsn policy ggsn_to_sgsn match source-address remote-ggsn
   destination-address local-sgsn application junos-gprs-gtp
user@host# set from-zone ggsn to-zone sgsn policy ggsn_to_sgsn then permit application-services
   gprs-gtp-profile gtp1
```

Results

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

For brevity, this **show** 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
```

```
...
gprs {
gtp {
profile gtp1;
  }
}
zones {
security-zone Trust {
host-inbound-traffic {
system-services {
all;
}
protocols {
all;
```

```
  }
}
interfaces {
ge-0/0/1.0;
  }
}
...

host-inbound-traffic {
system-services {
all;
}
protocols {
all;
  }
}
interfaces {
ge-0/0/1.0;
  }
}
host-inbound-traffic {
system-services {
all;
}
protocols {
all;
  }
}
interfaces {
ge-0/0/2.0;
   }
}
}
address-book {
global {
address local-sgsn 2.0.0.5/32;
address remote-ggsn 3.0.0.6/32;
   }
}
policies {
from-zone sgsn to-zone ggsn {
policy sgsn_to_ggsn {
match {
source-address local-sgsn;
```

```
destination-address remote-ggsn;
application junos-gprs-gtp;
}
then {
permit {
application-services {
gprs-gtp-profile gtp1;
   }
   }
  }
  }
}
from-zone ggsn to-zone sgsn {
policy ggsn_to_sgsn {
match {
source-address remote-ggsn;
destination-address local-sgsn;
application junos-gprs-gtp;
}
}
then {
permit {
application-services {
gprs-gtp-profile gtp1;
     }
     }
  }
  }
default-policy {
permit-all;
}
}
...
```

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

Verification

Confirm that the configuration is working properly.

Verifying GTP Inspection in Policies

Purpose

Verify that GTP inspection is enabled.

Action

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

Understanding GTP Inspection Objects

For the device to perform the inspection of GPRS tunneling protocol (GTP) traffic, you must create a GTP inspection object and then apply it to a policy. Use the following command to create a GTP inspection object named **la-ny**: **set security gprs gtp profile la-ny**. GTP inspection objects provide more flexibility in that they allow you to configure multiple policies that enforce different GTP configurations. You can configure the device to control GTP traffic differently based on source and destination zones and addresses, action, and so on.

To configure GTP features, you must enter the context of a GTP configuration. To save your settings in the CLI, you must first exit the GTP configuration, then enter the **commit** command.

Example: Creating a GTP Inspection Object

IN THIS SECTION

This example shows how to create a GTP inspection object.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you create a GTP inspection object named LA-NY. You preserve most of the default values, and enable the sequence number validation feature.

Configuration

Step-by-Step Procedure

To configure a GTP inspection object:

1. Create a GTP inspection object.

```
[edit]
user@host# set security gprs gtp profile la-ny
```

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

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

Verification

To verify the configuration is working properly, enter the **show security gprs** command.

Understanding GTPv2

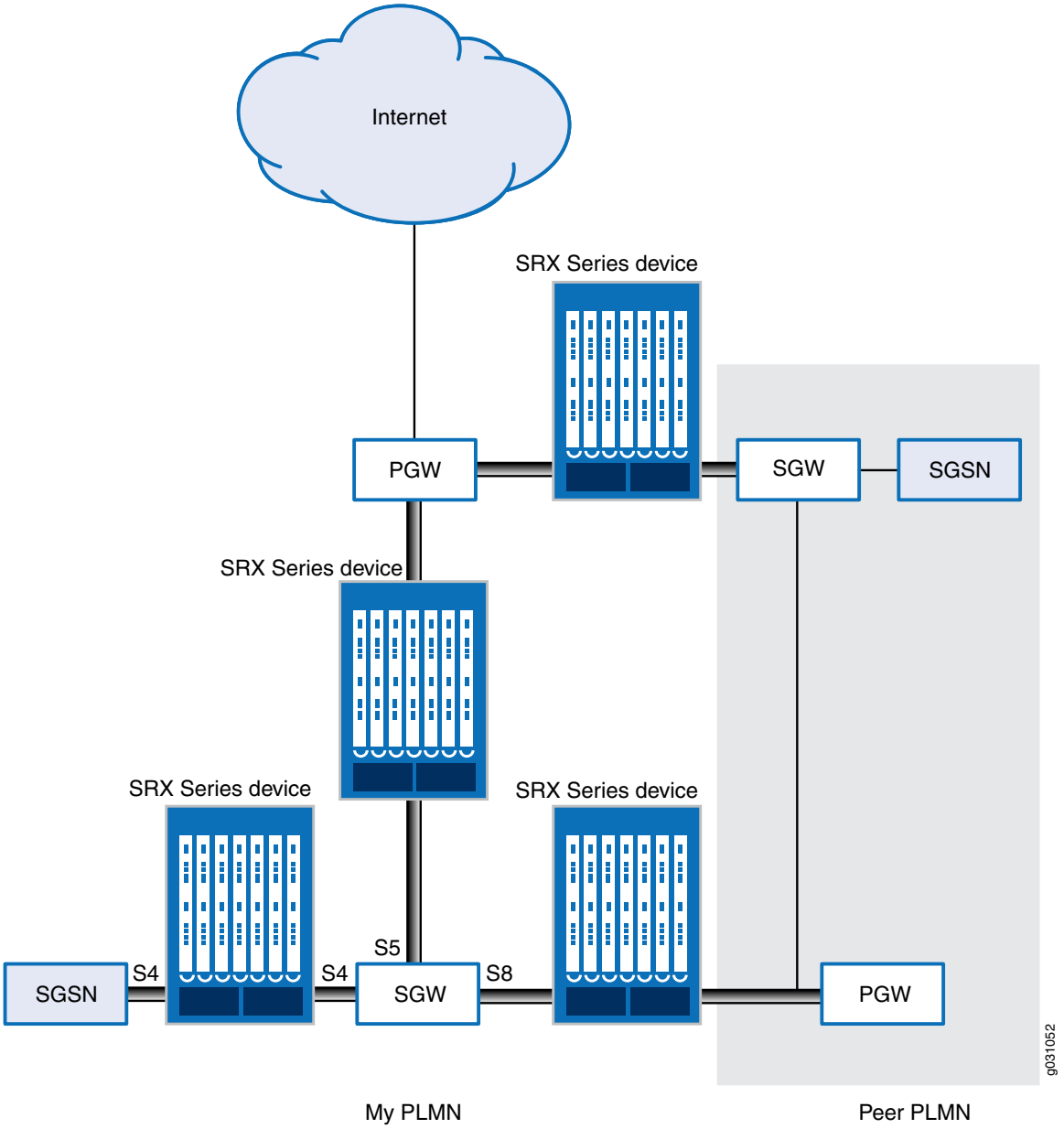
The GPRS tunneling protocol (GTP) establishes a GTP tunnel between a Serving GPRS Support Node (SGSN) and a Gateway GPRS Support Node (GGSN) for individual Mobile Stations (MS). GTP version 2 (GTPv2) is supported from Junos OS Release 11.4.

GTPv2 is part of Long Term Evolution (LTE), a fourth generation (4G) wireless broadband technology developed by Third-Generation Partnership Project (3GPP). 3GPP is the standard body for developing GPRS standards. LTE is designed to increase the capacity and speed of mobile telephone networks. GTPv2 is a protocol designed for LTE networks. An LTE network comprises network elements, LTE interfaces, and protocols.

GTPv0 and GTPv1 are implemented using SGSNs and GGSNs. However, in GTPv2, the traditional SGSNs and GGSNs are replaced by three logical nodes—a serving gateway (SGW), a packet data network gateway (PGW), and a mobility management entity (MME).

Figure 3 on page 35 shows the following LTE interfaces where SRX Series devices are deployed in the public land mobile network (PLMN).

Figure 3: LTE Interfaces



- S5—This interface connects an SGW and a PGW. It provides user plane tunneling and tunnel management capability between the SGW and the PGW. It is also used for SGW relocation that happens because of user equipment mobility or SGW connection to a non-collocated PGW. The S5 interface is equivalent to the Gn interface in a Third Generation (3G) mobile network.
- S8—This interface connects an SGW in a visited PLMN (VPLM) and a PGW in a home PLMN (HPLMN). S8 is the inter-PLMN variant of S5. The S8 interface is equivalent to the Gp interface in a 3G mobile network.
- S4—This interface connects an S4 SGSN and an SGW. It provides related control and mobility support between GPRS core network and 3GPP Anchor function. It also provides user plane tunneling if direct

tunneling is not established. The S4 interface does not have any equivalent interface in the 3G mobile network, because it provides interoperability between 3G and 4G networks.

Understanding Policy-Based GTPv2

GPRS tunneling protocol version 2 (GTPv2) implements a policy mechanism that checks every GTPv2 packet against security policies that regulate GTPv2 traffic. Based on the security policy, the packet is then forwarded, dropped, or tunneled.

A GTPv2 security policy allows you to forward, deny, or tunnel GTPv2 traffic. However, the security policy does not enable GTPv2 traffic inspection on the device. To enable traffic inspection, you must apply a GTPv2 inspection object to a security policy. A GTPv2 inspection object is a set of configuration parameters for processing GTPv2 traffic.

You can apply only one GTPv2 inspection object per security policy. However, you can apply an inspection object to multiple security policies.

By default, a GTPv2 inspection object is not applied to a security policy. You need to explicitly apply an inspection object to a security policy.

Using GTPv2 security policies, you can permit or deny GTPv2 tunnel establishment from certain peers, such as a serving gateway (SGW). You can configure GTPv2 security policies that specify multiple source and destination addresses, address groups, or an entire zone.

Example: Enabling GTPv2 Inspection in Policies

IN THIS SECTION

This example shows how to enable GTPv2 inspection in policies.

Requirements

Before you begin, the device must be restarted after GTPv2 is enabled. By default, GTPv2 is disabled on the device.

Overview

In this example, you configure interfaces as ge-0/0/1 and ge-0/0/2, and assign them the interface addresses 4.0.0.254/8 and 5.0.0.254/8, respectively. You then configure the security zones and specify the global addresses as 4.0.0.5/32 and 5.0.0.6/32, respectively. You enable GTPv2 inspection in security policies to allow bidirectional traffic between two networks within the same public land mobile network (PLMN).

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 gprs gtp profile gtp2
set interfaces ge-0/0/1 unit 0 family inet address 4.0.0.254/8
set interfaces ge-0/0/2 unit 0 family inet address 5.0.0.254/8
set security zones security-zone sgw1 interfaces ge-0/0/1.0 host-inbound-traffic system-services all
set security zones security-zone sgw1 host-inbound-traffic protocols all
set security zones security-zone pgw1 interfaces ge-0/0/2.0 host-inbound-traffic system-services all
set security zones security-zone pgw1 host-inbound-traffic protocols all
set security address-book global address local-sgw1 4.0.0.5/32
set security address-book global address remote-pgw1 5.0.0.6/32
set security policies from-zone sgw1 to-zone pgw1 policy sgw1_to_pgw1 match source-address local-sgw1
    destination-address remote-pgw1 application junos-gprs-gtp
set security policies from-zone sgw1 to-zone pgw1 policy sgw1_to_pgw1 then permit application-services
    gprs-gtp-profile gtp2
set security policies from-zone pgw1 to-zone sgw1 policy pgw1_to_sgw1 match source-address remote-pgw1
    destination-address local-sgw1 application junos-gprs-gtp
set security policies from-zone pgw1 to-zone sgw1 policy pgw1_to_sgw1 then permit application-services
    gprs-gtp-profile gtp2
```

Step-by-Step Procedure

To configure GTPv2 inspection in policies:

1. Create the GTPv2 inspection object.

   ```
   [edit]
   ```

```
user@host# set security gprs gtp profile gtp2
```

2. Configure the interfaces.

```
[edit interfaces]
user@host# set ge-0/0/1 unit 0 family inet address 4.0.0.254/8
user@host# set ge-0/0/2 unit 0 family inet address 5.0.0.254/8
```

3. Configure the security zones.

```
[edit security zones]
user@host# set security-zone sgw1 interfaces ge-0/0/1.0
user@host# set security-zone sgw1 host-inbound-traffic system-services all
user@host# set security-zone sgw1 host-inbound-traffic protocols all
user@host# set security-zone pgw1 interfaces ge-0/0/2.0
user@host# set security-zone pgw1 host-inbound-traffic system-services all
user@host# set security-zone pgw1 host-inbound-traffic protocols all
```

4. Specify the addresses.

```
[edit security address-book global]
user@host# set address local-sgw1 4.0.0.5/32
user@host# set address remote-pgw1 5.0.0.6/32
```

5. Enable GTPv2 inspection in the security policies.

```
[edit security policies]
user@host# set from-zone sgw1 to-zone pgw1 policy sgw1_to_pgw1 match source-address local-sgw1
   destination-address remote-pgw1 application junos-gprs-gtp
user@host# set from-zone sgw1 to-zone pgw1 policy sgw1_to_pgw1 then permit application-services
   gprs-gtp-profile gtp2
user@host# set from-zone pgw1 to-zone sgw1 policy pgw1_to_sgw1 match source-address remote-pgw1
   destination-address local-sgw1 application junos-gprs-gtp
user@host# set from-zone pgw1 to-zone sgw1 policy pgw1_to_sgw1 then permit application-services
   gprs-gtp-profile gtp2
```

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.

```
[edit]
user@host# show security policies
from-zone sgw1 to-zone pgw1 {
    policy sgw1_to_pgw1 {
    match {
    source-address local-sgw1;
        destination-address remote-pgw1;
        application junos-gprs-gtp;
        }
        then {
            permit {
            application-services {
            gprs-gtp-profile gtp2;
        }
        }
    }
    }
}
from-zone pgw1 to-zone sgw1 {
    policy pgw1_to_sgw1 {
    match {
    source-address remote-pgw1;
        destination-address local-sgw1;
        application junos-gprs-gtp;
    }
        then {
            permit {
            application-services {
            gprs-gtp-profile gtp2;
        }
    }
    }
    }
}
default-policy {
    permit-all;
}
```

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

Verification

Confirm that the configuration is working properly.

Verifying GTPv2 Inspection in Policies

Purpose

Verify that GTPv2 inspection is enabled.

Action

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

Understanding GTP Path Restart

Restarting a GPRS tunneling protocol (GTP) path terminates all GTP tunnels between two devices. Each GTP gateway is associated with a restart number. You can obtain a restart number from the Recovery information element (IE) of a GTP message.

You can detect a restart by comparing the locally stored restart number with the newly obtained one. The locally stored restart number is a nonzero value and does not match with the new restart number.

You can use the **set security gprs gtp profile name restart-path (echo | create | all)** configuration statement to restart a GTP path.

After you configure this command, the device detects the changed restart number obtained from the Recovery IE in the messages. You can use the **echo** option to obtain a new restart number from echo messages, the **create** option to obtain a restart number from create-session messages, or the **all** option to obtain a new restart number from all types of GTP messages.

Example: Restarting a GTPv2 Path

IN THIS SECTION

This example shows how to restart a GTPv2 path.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

For brevity, this example uses GTPv2.

In this example, you restart the GTPv2 path for the GTPv2 inspection object named gtp2. You obtain a new restart number from the Recovery information element (IE) in an echo message.

Configuration

Step-by-Step Procedure

To restart the GTPv2 path:

1. Specify the GTPv2 profile.

```
[edit]
user@host# set security gprs gtp profile gtp2
```

2. Restart the path.

```
[edit]
user@host# set security gprs gtp profile gtp2 restart-path echo
```

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

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

Verification

To verify the configuration is working properly, enter the **show security gprs** command.

Understanding GTPv2 Tunnel Cleanup

A GPRS tunneling protocol version 2 (GTPv2) tunnel enables transmission of GTPv2 traffic between GPRS support nodes (GSNs).

While transmitting traffic, GTPv2 tunnels might hang for a number of reasons. For example, delete-pdp-request messages might get lost in the network, or a GSN might not shut down properly. In such a case, you can remove hanging GTPv2 tunnels either automatically or manually.

To remove a hanging GTPv2 tunnel automatically, you need to set a GTPv2 tunnel timeout value on the device. The device automatically identifies and removes a tunnel that is idle for the period specified by the timeout value. The default GTPv2 tunnel timeout value is 36 hours.

You can use the **set security gprs gtp profile name timeout** configuration statement to configure this value on the device. The timeout range is 1 through 1000 hours.

To remove a hanging GTPv2 tunnel manually, you need to use the **clear security gprs gtp tunnel** operational mode command.

Example: Setting the Timeout Value for GTPv2 Tunnels

IN THIS SECTION

This example shows how to set the timeout value for GTPv2 tunnels.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you set the tunnel timeout value to 40 hours for the GTPv2 inspection object named gtp2.

Configuration

Step-by-Step Procedure

To configure the GTPv2 tunnel timeout value:

1. Specify the GTPv2 profile.

```
[edit]
user@host# set security gprs gtp profile gtp2
```

2. Specify the timeout value.

```
[edit]
user@host# set security gprs gtp profile gtp2 timeout 40
```

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

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

Verification

To verify the configuration is working properly, enter the **show security gprs** command.

Understanding GTPv2 Traffic Logging

You can use the console or syslog to view GPRS tunneling protocol version 2 (GTPv2) traffic logs. You can configure the device to log GTPv2 packets based on their status. GTPv2 packet status can be any of the following:

- Forwarded—GTPv2 packet was forwarded because it was valid.
- State-invalid—GTPv2 packet was dropped because it failed stateful inspection or a sanity check. In case of a sanity check failure, the packet is marked as sanity.
- Prohibited—GTPv2 packet was dropped because it failed message length, message type, or International Mobile Subscriber Identity (IMSI) prefix checks.
- Rate-limited—GTPv2 packet was dropped because it exceeded the maximum rate limit of the destination GPRS support node (GSN).

By default, GTPv2 logging is disabled on the device. You can use the **set security gprs gtp profile name log** configuration statement to enable GTPv2 logging on the device.

Example: Enabling GTPv2 Traffic Logging

IN THIS SECTION

This example shows how to enable GTPv2 traffic logging on a device.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you enable GTPv2 traffic logging for forwarded GTPv2 packets.

Configuration

Step-by-Step Procedure

To enable GTPv2 traffic logging for forwarded GTPv2 packets:

1. Specify the GTPv2 profile.

```
[edit]
user@host# set security gprs gtp profile gtp2
```

2. Enable logging for GTPv2 forwarded packets.

```
[edit]
user@host# set security gprs gtp profile gtp2 log forwarded basic
```

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

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

Verification

To verify the configuration is working properly, enter the **show security gprs** command.

RELATED DOCUMENTATION

Monitoring GTP Traffic | 86

GTPv1 Message Filtering

IN THIS SECTION

A GTP packet contains a message body and the GTP, UDP, and the IP headers. A GTP packet is passed or dropped based on the GTP message filters. The GTP messages are filtered based on the message-length and message-type.

Understanding GTP Message Filtering

When the device receives a GPRS tunneling protocol (GTP) packet, it checks the packet against policies configured on the device. If the packet matches a policy, the device inspects the packet according to the GTP configuration applied to the policy. If the packet fails to meet any of the GTP configuration parameters, the device will pass or drop the packets based on the configuration of the GTP inspection object.

A GTP packet consists of the message body and three headers: GTP, UDP, and IP. If the resulting IP packet is larger than the maximum transmission unit (MTU) on the transferring link, the sending Serving GPRS Support Node (SGSN) or gateway GPRS support node (GGSN) performs an IP fragmentation.

By default, the device buffers IP fragments until it receives a complete GTP message, and then inspects the GTP message.

Understanding GTP Message-Length Filtering

You can configure the device to drop packets that do not meet your specified minimum or maximum message lengths. In the GPRS tunneling protocol (GTP) header, the message length field indicates the length, in octets, of the GTP payload. It does not include the length of the GTP header itself, the UDP header, or the IP header. The default minimum and maximum GTP message lengths are 0 and 65,535 bytes, respectively.

Understanding GTP Message-Type Filtering

You can configure the device to filter GPRS tunneling protocol (GTP) packets and permit or deny them based on their message type. By default, the device permits all GTP message types.

A GTP message type includes one or many messages. When you permit or deny a message type, you automatically permit or deny all messages of the specified type. For example, if you select to drop the sgsn-context message type, you thereby drop sgsn-context-request, sgsn-context-response, and sgsn-context-acknowledge messages.

You permit and deny message types based on the GTP version number. For example, you can deny message types for one version while you permit them for the other version.

Example: Setting the GTP Message-Length Filtering

IN THIS SECTION

This example shows how to set the GTP message lengths.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you configure the minimum GTP message length to 8 octets and the maximum GTP message length to 1200 octets for the GTP inspection object.

Configuration

Step-by-Step Procedure

To configure the GTP message lengths:

1. Specify the GTP profile.

```
[edit]
user@host# set security gprs gtp profile gtp1
```

2. Specify the minimum message length.

```
[edit]
user@host# set security gprs gtp profile gtp1 min-message-length 8
```

3. Specify the maximum message length.

```
[edit]
user@host# set security gprs gtp profile gtp1 max-message-length 1200
```

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

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

Verification

To verify the configuration is working properly, enter the **show security gprs** command.

Supported GTP Message Types

Table 6 on page 48 lists the GTP messages supported in GTP Releases 1997 and 1999 (including charging messages for GTP) and the message types that you can use to configure GTP message-type filtering.

Table 6: GTP Messages

Message	Message Type	Version 0	Version 1
create AA pdp context request	create-aa-pdp	b	
create AA pdp context response	create-aa-pdp	b	
create pdp context request	create-pdp	b	b
create pdp context response	create-pdp	b	b
data record request	data-record	b	b
data record response	data-record	b	b
delete AA pdp context request	delete-aa-pdp	b	
delete AA pdp context response	delete-aa-pdp	b	
delete pdp context request	delete-pdp	b	b
delete pdp context response	delete-pdp	b	b

Table 6: GTP Messages *(continued)*

Message	Message Type	Version 0	Version 1
echo request	echo	b	b
echo response	echo	b	b
error indication	error-indication	b	b
failure report request	failure-report	b	b
failure report response	failure-report	b	b
forward relocation request	fwd-relocation	b	b
forward relocation response	fwd-relocation	b	b
forward relocation complete	fwd-relocation	b	b
forward relocation complete acknowledge	fwd-relocation	b	b
forward SRNS context	fwd-srns-context	b	b
forward SRNS context acknowledge	fwd-srns-context	b	b
identification request	identification	b	b
identification response	identification	b	b
node alive request	node-alive	b	b
node alive response	node-alive	b	b
note MS GPRS present request	note-ms-present	b	b
note MS GPRS present response	note-ms-present	b	b
pdu notification request	pdu-notification	b	b
pdu notification response	pdu-notification	b	b
pdu notification reject request	pdu-notification	b	b

Table 6: GTP Messages *(continued)*

Message	Message Type	Version 0	Version 1
pdu notification reject response	pdu-notification	b	b
RAN info relay	ran-info	b	b
redirection request	redirection	b	b
redirection response	redirection	b	b
relocation cancel request	relocation-cancel	b	b
relocation cancel response	relocation-cancel	b	b
send route info request	send-route	b	b
send route info response	send-route	b	b
sgsn context request	sgsn-context	b	b
sgsn context response	sgsn-context	b	b
sgsn context acknowledge	sgsn-context	b	b
supported extension headers notification	supported-extension	b	b
g-pdu	gtp-pdu	b	b
update pdp context request	update-pdp	b	b
updated pdp context response	update-pdp	b	b
version not supported	version-not-supported	b	b

Example: Filtering GTP Message Types

IN THIS SECTION

This example shows how to permit and deny GTP message types.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, for the gtp1 profile, you configure the device to drop the error-indication and failure-report message types for version 1.

Configuration

Step-by-Step Procedure

To permit and deny GTP message types:

1. Configure the device.

```
[edit]
user@host# set security gprs gtp profile gtp1
```

2. Drop the error indication.

```
[edit]
user@host# set security gprs gtp profile gtp1 drop error-indication 1
```

3. Drop the failure report messages.

```
[edit]
user@host# set security gprs gtp profile gtp1 drop failure-report 1
```

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

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

Verification

To verify the configuration is working properly, enter the **show security gprs** command.

Understanding Rate Limiting for GTP Control Messages

You can configure the device to limit the rate of network traffic going to a GPRS support node (GSN). You can set separate thresholds, in packets per second, for GGSN tunneling protocol, control (GTP-C) messages. Because GTP-C messages require processing and replies, they can potentially overwhelm a GSN. By setting a rate limit on GTP-C messages, you can protect your GSNs from possible denial-of-service (DoS) attacks such as the following:

- Border gateway bandwidth saturation—A malicious operator connected to the same GPRS Roaming Exchange (GRX) as your public land mobile network (PLMN) can direct so much network traffic at your Border Gateway that legitimate traffic is starved for bandwidth in or out of your PLMN, thus denying roaming access to or from your network.
- GTP flood—GPRS tunneling protocol (GTP) traffic can flood a GSN, forcing it to spend its CPU cycles processing illegitimate data. This can prevent subscribers from roaming and forwarding data to external networks, and it can prevent a General Packet Radio Service (GPRS) from attaching to the network.

This feature limits the rate of traffic sent to each GSN from the Juniper Networks device. The default rate is unlimited.

Understanding Path Rate Limiting for GTP Control Messages

You can restrict the maximum packets per second for specific control messages on a path on SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices. These GPRS tunneling protocol (GTP) messages include **create-req**, **delete-req**, and other GTP messages. However, you can restrict the maximum packets per minute for an **echo-req** GTP message.

The **path-rate-limit** function controls specific GTP messages in both the forward and reverse directions. A drop threshold and an alarm threshold can be configured for each control message in the forward and reverse direction for one path. If the control messages on one path reach the alarm threshold, an alarm log is generated. If the number of control messages received reaches the drop threshold, a packet drop log is generated and all other control messages of this type received later are dropped.

To control message traffic in the forward and reverse directions, configure a policy on the device such that the direction that is consistent with the configured policy is defined as forward, and the opposite direction is defined as reverse. Use the **set security gprs gtp profile <profile-name> path-rate-limit** statement to restrict the maximum packets per second for specific control messages on a path.

You can configure both the **rate-limit** and the **path-rate-limit** options at the same time.

Example: Limiting the Message Rate and Path Rate for GTP Control Messages

IN THIS SECTION

This example shows how to limit the message rate and the path rate for GTP control messages. The **rate-limit** option limits the GTP messages per second and the **path-rate-limit** option controls specific GTP messages in both the forward and reverse directions.

Requirements

This example uses the following hardware and software components:

- SRX5400 device
- Junos OS Release 12.1X45-D10

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you limit the rate of incoming GTP messages to 300 packets per second and you limit the path rate for GTP control messages in both the forward and reverse directions. You configure the device to limit the rate of network traffic going to a GPRS support node (GSN), and you restrict the maximum packets per second or per minute for specific control messages on a path. For **create-req**, **delete-req**, and **other** GTP messages you restrict the maximum packets per second. However, for an **echo-req** GTP message, you restrict the maximum packets per minute.

The **path-rate-limit** function controls specific GTP messages in both the forward and reverse directions. Configure the **alarm-threshold** parameter to configure the device to raise an alarm when the GTP control messages on a path have reached the configured limit. Configure the **drop-threshold** to drop traffic when the number of packets per second or per minute exceeds the configured limit.

Configuration

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 security gprs gtp profile gtp1 rate-limit 300
set security gprs gtp profile gtp1 path-rate-limit message-type create-req alarm-threshold forward 50 reverse
  50
set security gprs gtp profile gtp1 path-rate-limit message-type delete-req alarm-threshold forward 50 reverse
  50
set security gprs gtp profile gtp1 path-rate-limit message-type echo-req alarm-threshold forward 50 reverse
  50
set security gprs gtp profile gtp1 path-rate-limit message-type other alarm-threshold forward 50 reverse 50
set security gprs gtp profile gtp1 path-rate-limit message-type create-req drop-threshold forward 80 reverse
  80
set security gprs gtp profile gtp1 path-rate-limit message-type delete-req drop-threshold forward 80 reverse
  80
```

```
set security gprs gtp profile gtp1 path-rate-limit message-type echo-req drop-threshold forward 80 reverse 80
set security gprs gtp profile gtp1 path-rate-limit message-type other drop-threshold forward 80 reverse 80
```

Step-by-Step Procedure

To configure the GTP message rate and path rate limit:

1. Specify the GTP profile.

```
[edit]
user@host# set security gprs gtp profile gtp1
```

2. Set the GTP message rate limit.

```
[edit security gprs gtp profile gtp1]
user@host# set rate-limit 300
```

3. Specify the message type to set the path rate limit for GTP control messages.

```
[edit security gprs gtp profile gtp1]
user@host# set path-rate-limit message-type
```

4. Select GTP control message types.

```
[edit security gprs gtp profile gtp1]
user@host# set path-rate-limit message-type create-req
user@host# set path-rate-limit message-type delete-req
user@host# set path-rate-limit message-type echo-req
user@host# set path-rate-limit message-type other
```

5. Set the alarm threshold for the GTP control message types.

```
[edit security gprs gtp profile gtp1 path-rate-limit]
user@host# set message-type create-req alarm threshold
user@host# set message-type delete-req alarm threshold
user@host# set message-type echo-req alarm threshold
user@host# set message-type other alarm threshold
```

6. Limit the control messages in the forward direction.

```
[edit security gprs gtp profile gtp1 path-rate-limit message-type]
user@host# set create-req alarm threshold forward 50
user@host# set delete-req alarm threshold forward 50
user@host# set echo-req alarm threshold forward 50
user@host# set other alarm threshold forward 50
```

7. Limit the control messages in the reverse direction.

```
[edit security gprs gtp profile gtp1 path-rate-limit message-type]
user@host# set create-req alarm threshold reverse 50
user@host# set delete-req alarm threshold reverse 50
user@host# set echo-req alarm threshold reverse 50
user@host# set other alarm threshold reverse 50
```

8. Set the drop threshold for the GTP control message types.

```
[edit security gprs gtp profile gtp1 path-rate-limit]
user@host# set message-type create-req drop threshold
user@host# set message-type delete-req drop threshold
user@host# set message-type echo-req drop threshold
user@host# set message-type other drop threshold
```

9. Limit the control messages in the forward direction.

```
[edit security gprs gtp profile gtp1 path-rate-limit message-type]
user@host# set create-req drop threshold forward 80
user@host# set delete-req drop threshold forward 80
user@host# set echo-req drop threshold forward 80
user@host# set other drop threshold forward 80
```

10. Limit the control messages in the reverse direction.

```
[edit security gprs gtp profile gtp1 path-rate-limit message-type]
user@host# set create-req drop threshold reverse 80
user@host# set delete-req drop threshold reverse 80
user@host# set echo-req drop threshold reverse 80
user@host# set other drop threshold reverse 80
```

Results

From configuration mode, confirm your configuration by entering the **show security gprs gtp profile *profile-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 security gprs gtp profile p1
    rate-limit 300;
    path-rate-limit {
        message-type create-req {
            drop-threshold {
                forward 80;
                reverse 80;
            }
            alarm-threshold {
                forward 50;
                reverse 50;
            }
        }
        message-type delete-req {
            drop-threshold {
                forward 80;
                reverse 80;
            }
            alarm-threshold {
                forward 50;
                reverse 50;
            }
        }
        message-type echo-req {
            drop-threshold {
                forward 80;
                reverse 80;
            }
            alarm-threshold {
                forward 50;
                reverse 50;
            }
        }
        message-type other {
            drop-threshold {
                forward 80;
                reverse 80;
            }
```

```
            alarm-threshold {
               forward 50;
               reverse 50;
            }
         }
   }
```

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

Verification

Confirm that the configuration is working properly.

Verifying the Configuration

Purpose

Verify that the GTP message rate and path rate limit configuration is correct.

Action

From operational mode, enter the **show security gprs gtp counters path-rate-limit** command.

```
Path-rate-limit counters:
                                   Drop                          Alarm
Create Request                      20                            50
Delete Request                      20                            50
Echo Request                        20                            50
Others                              20                            50
```

Meaning

The **show security gprs gtp counters path-rate-limit** command displays the number of packets received since the alarm threshold or the drop threshold value was reached. If you configure the **alarm-threshold** value as 50 and the **drop-threshold** value as 80 for the Create Request message, and if the device receives 100 packets in a second or minute, then the Drop number will be 20 and the Alarm number will be 50.

Example: Enabling GTP Sequence Number Validation

IN THIS SECTION

This example shows how to enable GTP sequence number validation feature.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you set the gtp profile as gtp1 and you also enable the sequence number validation feature.

Configuration

Step-by-Step Procedure

To enable GTP sequence number validation feature:

1. Set the GTP profile.

```
[edit]
user@host# set security gprs gtp profile gtp1
```

2. Enable the sequence number validation.

```
[edit]
user@host# set security gprs gtp profile gtp1 seq-number-validated
```

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

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

Verification

To verify the configuration is working properly, enter the **show security gprs** command.

Configuring GTP Handover Group

IN THIS SECTION

A GPRS tunneling protocol (GTP) handover group is a set of SGSNs or serving gateway (SGW) with a common address-book library.

GTP Handover Group Overview

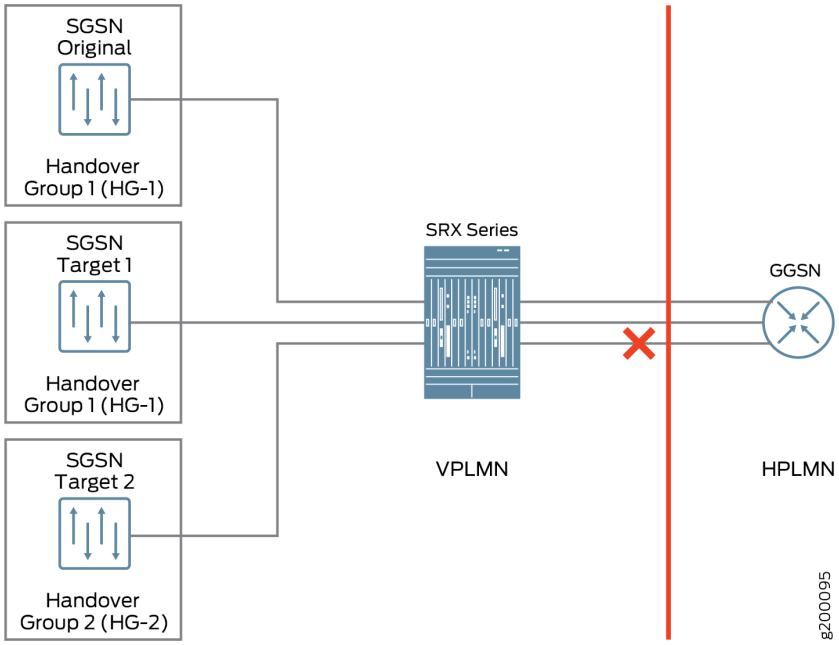
A GPRS tunneling protocol (GTP) handover group is a set of SGSNs or serving gateway (SGW) with a common address-book library. An administrator can configure a GTP profile and associate an GTP handover group to the GTP profile. When a GTP handover group name is referenced by a GTP profile, the device checks to see if the current SGSN/SGW address and the proposed SGSN/SGW address are both contained within the same GTP handover group. If both SGSN/SGW addresses are contained within the same GTP handover group, then the handover is allowed. If both the current and proposed SGSN/SGW addresses are not within the same GTP handover group, then the profile for the default handover group is used.

GTP handover across different GTP handover groups is not allowed.

You can configure the handover group using the **set security gprs gtp profile profile-name handover-group** command. If there is no handover group defined in the GTP profile, and if the traffic reaches the policy configured with this profile, handover between all GTPs matching this policy is permitted by default.

Handover is denied if the configuration command is set using the **set security gprs gtp handover-default deny** command.

Figure 4: GTP Handover Group



For example, the user equipment accesses the Internet through the GTP tunnels built over the SGSN and the gateway GPRS support node (GGSN). The SGSN builds GTP tunnels to the GGSN to transfer the user equipment data, which attaches to the SGSN. In a home-routed roaming architecture, a roaming user equipment device roams back to the GGSN of a home PLMN (HPLMN) through a visited SGSN (VSGSN) of a visited PLMN (VPLMN). If the original SGSN and the SGSN target 1 as shown in Figure 4 on page 61 belong to the same handover group (HG-1), then handover occurs. If the SGSN original seeks to handover to SGSN target 2, which is in a different handover group (HG-2), then handover is denied.

Understanding GTP Handover Messages

Starting in Junos OS Release 15.1X49-D40 and Junos OS Release 17.3R1, support for GTP handover messages is provided. During handover procedures, Serving GPRS Support Node (SGSN) context messages (request, response, and acknowledge) or forward relocation messages are sent between the new and the old mobility management entity (MME) and SGSN. For GPRS tunneling protocol (GTP) version 2, the messages should be context messages or forward relocation messages. For simplicity, these types of messages are uniformly referred as handover messages. The packet data protocol (PDP) context information is acquired from these messages. The PDP context is set up on the SRX Series device when these messages

are received, and then subsequent GTP messages can be normally inspected according to the new PDP context.

Use the **set security gprs gtp profile <*profile-name*> handover-on-roaming-intf** command to enable PDP context setup by handover messages. Use the **delete security gprs gtp profile <*profile-name*> handover-on-roaming-intf** command to disable PDP context setup by handover messages.

The addresses and tunnel endpoint identifiers (TEIDs) for forwarding data traffic are also acquired from handover messages. In addition, the forward tunnel can be set up on SRX Series devices for forwarding GPRS tunneling protocol, user plane (GTP-U) stateful check.

Handover between different GTP versions is supported.

Key features of GTP handover are:

- Support for GTP inter-MME/SGSN handover messages for GTPv0, v1, and v2
- Inter-MME/SGSN handover messages inspection
- GTP PDP context and forwarding tunnel setup according to the information in handover messages
- GTP-U inspection for forwarding data traffic
- Support for PDP context update by updating and modifying messages with different versions
- System log and counter for handover messages

Starting in Junos OS Release 15.1X49-D70 and Junos OS Release 17.3R1, the Serving GPRS Support Node (SGSN) and a Gateway GPRS Support Node (GGSN) of the GTPv1 or GTPv2 nodes cannot communicate with the GTPv0 node. If a device sends a GTPv1 or GTPv2 message to update the tunnels created by GTPv0, these messages are dropped and the GTPv0 tunnel will not be updated.

Example: Configuring Handover Groups

IN THIS SECTION

This example shows how to configure GTP handover groups on GTP profiles.

Requirements

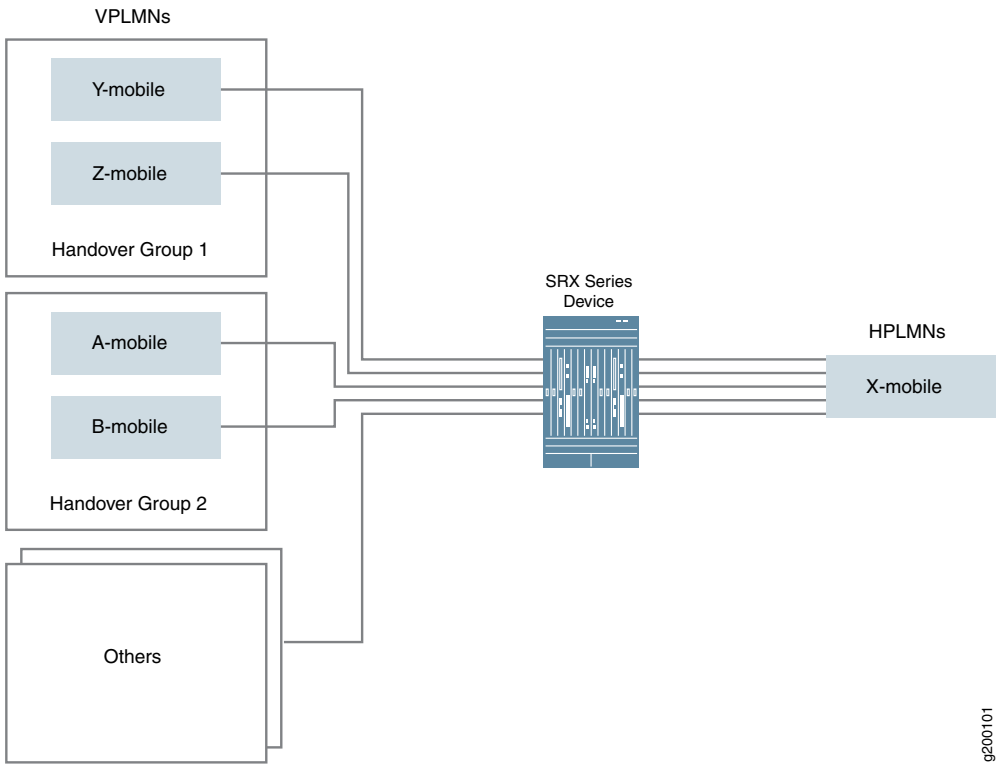
Before you begin, you need an SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, or SRX5800 device or a vSRX instance and user equipment that needs to connect to the Internet. You will also need a 3G or 4G mobile core network and a home and visited network.

Overview

A user equipment accesses the Internet through SGSN or Serving Gateway (SGW) and GGSN or packet data network gateway (PGW) in a 3G or 4G core network. The SGSN/SGW builds GTP tunnels to the GGSN/PGW to transfer the user equipment data, which attaches to the SGSN/SGW. In a home-routed roaming architecture, a roaming user equipment roams back to its GGSN of home PLMN (HPLMN) through a visited SGSN (VSGSN) of a visited PLMN (VPLMN). If the user equipment device moves out of the coverage area of the visited SGSN/SGW, it is handed over to another visited SGSN/SGW.

In this example, see Figure 5 on page 63 X-mobile is the home PLMN and the visited PLMN is the Y-mobile and the Z-mobile. You can configure GTP handover groups for the X-mobile and perform the handover within the same handover group.

Figure 5: Handover Group Configuration



Configuration

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 security address-book global address X-mobile-hMME 10.10.10.1/32
set security address-book global address X-mobile-hPGW 10.10.10.2/32
set security address-book global address-set X-mobile address X-mobile-hMME
set security address-book global address-set X-mobile address X-mobile-hPGW
set security address-book global address-set X-mobile description hPLMN
set security address-book global address Y-mobile-vMME-2a 20.20.20.1/32
set security address-book global address Y-mobile-vMME-2b 20.20.20.2/32
set security address-book global address Y-mobile-vSGW-2a 20.20.20.10/32
set security address-book global address Y-mobile-vSGW-2b 20.20.20.11/32
set security address-book global address-set Y-mobile address Y-mobile-vMME-2a
set security address-book global address-set Y-mobile address Y-mobile-vMME-2b
set security address-book global address-set Y-mobile address Y-mobile-vSGW-2a
set security address-book global address-set Y-mobile address Y-mobile-vSGW-2b
set security address-book global address-set Y-mobile description vPLMN2
set security address-book global address Z-mobile-vMME-3a 30.30.30.1/32
set security address-book global address Z-mobile-vMME-3b 30.30.30.2/32
set security address-book global address Z-mobile-vSGW-3a 30.30.30.10/32
set security address-book global address Z-mobile-vSGW-3b 30.30.30.11/32
set security address-book global address-set Z-mobile address Z-mobile-vMME-3a
set security address-book global address-set Z-mobile address Z-mobile-vMME-3b
set security address-book global address-set Z-mobile address Z-mobile-vSGW-3a
set security address-book global address-set Z-mobile address Z-mobile-vSGW-3b
set security address-book global address-set Z-mobile description vPLMN3
set security address-book global address-set as-AT address-set Z-mobile
set security address-book global address-set as-AT address-set Y-mobile
set security address-book global address-set as-AT address-set X-mobile
set security gprs gtp handover-group hg-AT address-book global address-set as-AT
set security gprs gtp profile Scenario-1 handover-on-roaming-intf
set security gprs gtp profile Scenario-1 handover-group hg-AT
set security zones security-zone vplmn
set security zones security-zone hplmn
set security policies from-zone vplmn to-zone hplmn policy ply-vh1 match source-address Y-mobile
set security policies from-zone vplmn to-zone hplmn policy ply-vh2 match source-address Z-mobile
set security policies from-zone vplmn to-zone hplmn policy ply-vh match destination-address X-mobile
set security policies from-zone vplmn to-zone hplmn policy ply-vh match application junos-gprs-gtp
```

```
set security policies from-zone vplmn to-zone hplmn policy ply-vh then permit application-services
    gprs-gtp-profile Scenario-1
set security policies from-zone hplmn to-zone vplmn policy ply-vh-r match source-address X-mobile
set security policies from-zone hplmn to-zone vplmn policy ply-vh-r match destination-address Y-mobile
set security policies from-zone hplmn to-zone vplmn policy ply-vh-r match destination-address Z-mobile
set security policies from-zone hplmn to-zone vplmn policy ply-vh-r match application junos-gprs-gtp
set security policies from-zone hplmn to-zone vplmn policy ply-vh-r then permit application-services
    gprs-gtp-profile Scenario-1
```

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 *Junos OS CLI User Guide*.

To configure GTP handover group in a GTP profile:

1. Specify the addresses in the address book.

```
[edit]
user@host# set security address-book global address X-mobile-hMME 10.10.10.1/32
user@host# set security address-book global address X-mobile-hPGW 10.10.10.2/32
user@host# set security address-book global address-set X-mobile address X-mobile-hMME
user@host# set security address-book global address-set X-mobile address X-mobile-hPGW
user@host# set security address-book global address-set X-mobile description hPLMN
user@host# set security address-book global address Y-mobile-vMME-2a 20.20.20.1/32
user@host# set security address-book global address Y-mobile-vMME-2b 20.20.20.2/32
user@host# set security address-book global address Y-mobile-vSGW-2a 20.20.20.10/32
user@host# set security address-book global address Y-mobile-vSGW-2b 20.20.20.11/32
user@host# set security address-book global address-set Y-mobile address Y-mobile-vMME-2a
user@host# set security address-book global address-set Y-mobile address Y-mobile-vMME-2b
user@host# set security address-book global address-set Y-mobile address Y-mobile-vSGW-2a
user@host# set security address-book global address-set Y-mobile address Y-mobile-vSGW-2b
user@host# set security address-book global address-set Y-mobile description vPLMN2
user@host# set security address-book global address Z-mobile-vMME-3a 30.30.30.1/32
user@host# set security address-book global address Z-mobile-vMME-3b 30.30.30.2/32
user@host# set security address-book global address Z-mobile-vSGW-3a 30.30.30.10/32
user@host# set security address-book global address Z-mobile-vSGW-3b 30.30.30.11/32
user@host# set security address-book global address-set Z-mobile address Z-mobile-vMME-3a
user@host# set security address-book global address-set Z-mobile address Z-mobile-vMME-3b
user@host# set security address-book global address-set Z-mobile address Z-mobile-vSGW-3a
user@host# set security address-book global address-set Z-mobile address Z-mobile-vSGW-3b
user@host# set security address-book global address-set Z-mobile description vPLMN3
user@host# set security address-book global address-set as-AT address-set X-mobile
user@host# set security address-book global address-set as-AT address-set Y-mobile
user@host# set security address-book global address-set as-AT address-set Z-mobile
```

2. Specify the handover group.

```
user@host# set security gprs gtp handover-group hg-AT address-book global address-set as-AT
```

3. Configure the handover groups on the GTP profile.

```
user@host# set security gprs gtp profile Scenario-1 handover-on-roaming-intf
user@host# set security gprs gtp profile Scenario-1 handover-group hg-AT
```

4. Configure security zones for the GTP profile.

```
user@host# set security zones security-zone vplmn
user@host# set security zones security-zone hplmn
```

5. Define security policies for the GTP profile.

```
set security policies from-zone vplmn to-zone hplmn policy ply-vh1 match source-address Y-mobile
set security policies from-zone vplmn to-zone hplmn policy ply-vh2 match source-address Z-mobile
user@host# set security policies from-zone vplmn to-zone hplmn policy ply-vh match destination-address
   X-mobile
user@host# set security policies from-zone vplmn to-zone hplmn policy ply-vh then permit application-services
   gprs-gtp-profile Scenario-1
user@host# set security policies from-zone hplmn to-zone vplmn policy ply-vh-r match source-address
   X-mobile
set security policies from-zone hplmn to-zone vplmn policy ply-vh-r match destination-address Y-mobile
set security policies from-zone hplmn to-zone vplmn policy ply-vh-r match destination-address Z-mobile
user@host# set security policies from-zone hplmn to-zone vplmn policy ply-vh-r match application
   junos-gprs-gtp
user@host# set security policies from-zone hplmn to-zone vplmn policy ply-vh-r then permit
   application-services gprs-gtp-profile Scenario-1
```

Results

From configuration mode, confirm your configuration by entering the **show security gprs gtp profile**, **show security address-book**, and **show security policies** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]

user@host# show security gprs gtp
```

```
profile Scenario-1 {
    handover-on-roaming-intf;
    handover-group {
        hg-AT;
    }
}
handover-group hg-AT {
    address-book global {
        address-set {
            as-AT;
        }
    }
}
```

[edit]

user@host# **show security address-book**

```
global {
    address X-mobile-hMME 10.10.10.1/32;
    address X-mobile-hPGW 10.10.10.2/32;
    address Y-mobile-vMME-2a 20.20.20.1/32;
    address Y-mobile-vMME-2b 20.20.20.2/32;
    address Y-mobile-vSGW-2a 20.20.20.10/32;
    address Y-mobile-vSGW-2b 20.20.20.11/32;
    address Z-mobile-vMME-3a 30.30.30.1/32;
    address Z-mobile-vMME-3b 30.30.30.2/32;
    address Z-mobile-vSGW-3a 30.30.30.10/32;
    address Z-mobile-vSGW-3b 30.30.30.11/32;
    address-set X-mobile {
        description hPLMN;
        address X-mobile-hMME;
        address X-mobile-hPGW;
    }
    address-set Y-mobile {
        description vPLMN2;
        address Y-mobile-vMME-2a;
        address Y-mobile-vMME-2b;
        address Y-mobile-vSGW-2a;
        address Y-mobile-vSGW-2b;
    }
    address-set Z-mobile {
        description vPLMN3;
```

```
        address Z-mobile-vMME-3a;
        address Z-mobile-vMME-3b;
        address Z-mobile-vSGW-3a;
        address Z-mobile-vSGW-3b;
    }
    address-set as-AT {
        address-set Z-mobile;
        address-set Y-mobile;
        address-set X-mobile;
    }
}
```

[edit]

user@host# **show security policies**

```
from-zone vplmn to-zone hplmn {
    policy ply-vh {
        match {
            source-address [ Y-mobile Z-mobile ];
            destination-address X-mobile;
            application junos-gprs-gtp;
        }
        then {
            permit {
                application-services {
                    gprs-gtp-profile Scenario-1;
                }
            }
        }
    }
}
from-zone hplmn to-zone vplmn {
    policy ply-vh-r {
        match {
            source-address X-mobile;
            destination-address [ Y-mobile Z-mobile ];
            application junos-gprs-gtp;
        }
        then {
            permit {
                application-services {
                    gprs-gtp-profile Scenario-1;
```

```
                }
            }
        }
    }
}
```

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

Verification

Confirm that the configuration is working properly. The **show security gprs gtp** command displays all the handover groups configured for the GTP profile Scenario-1.

Release History Table

Release	Description
15.1X49-D70	Starting in Junos OS Release 15.1X49-D70 and Junos OS Release 17.3R1, the Serving GPRS Support Node (SGSN) and a Gateway GPRS Support Node (GGSN) of the GTPv1 or GTPv2 nodes cannot communicate with the GTPv0 node.
15.1X49-D40	Starting in Junos OS Release 15.1X49-D40 and Junos OS Release 17.3R1, support for GTP handover messages is provided.

Enabling GTP Interoperability between 2G and 3G Networks

IN THIS SECTION

The GPRS Tunneling Protocol (GTP) is defined by the third-generation partnership project (3GPP) standards to carry General Packet Radio Service (GPRS) within third generation (3G) or fourth generation (4G) networks. The information elements (IEs) provide information about GPRS tunneling protocol (GTP) tunnels, such as creation, modification, deletion, and status. The IEs are included in all GTP control message packets.

Understanding GTP Information Elements

Information elements (IEs) are included in all GPRS tunneling protocol (GTP) control message packets. IEs provide information about GTP tunnels, such as creation, modification, deletion, and status. Junos OS supports IEs consistent with Third–Generation Partnership Project (3GPP) Release 6, Release 7, Release 8, and Release 9. If you have contractual agreements with operators running earlier releases of 3GPP, you can reduce network overhead by restricting control messages containing unsupported IEs.

If a new information element (IE) is introduced, there will be no drop in GTP messages because GTP passes the messages even if it encounters unknown new IEs.

Understanding R6, R7, R8, and R9 Information Elements Removal

The Third-Generation Partnership Project (3GPP) R6, R7, R8, and R9 information elements (IEs) removal feature allows you to retain interoperability in roaming between Second-Generation Partnership Project (2GPP) and 3GPP networks. You can configure the GPRS tunneling protocol (GTP)-aware Juniper Networks device, residing on the border of a public land mobile network (PLMN) and a GPRS Roaming Exchange (GRX) and acting as a Gp firewall, to remove 3GPP-specific attributes from the GTP packet header when the packet passes into a 2GPP network. You can configure the device to remove the RAT, RAI, Common Flags, ULI, MS Time Zone, IMEI-SV, and access point name (APN) restriction IEs from GTP messages prior to forwarding these messages to the gateway GPRS support node (GGSN).

Supported R6, R7, R8, and R9 Information Elements

Junos OS supports all 3GPP R6 IEs for GTP), as listed in Table 7 on page 71.

Table 7: Supported Information Elements

IE Type Value	Information Element
1	Cause
2	International Mobile Subscriber Identity (IMSI)
3	Routing Area Identity (REI)
4	Temporary Logical Link Identity (TLLI)
5	Packet TMSI (P-TMSI)
8	Reordering Required
9	Authentication Triplet
11	MAP Cause
12	P-TMSI Signature
13	MS Validated
14	Recovery
15	Selection Mode
16	Tunnel Endpoint Identifier Data I
17	Tunnel Endpoint Identifier Control Plane
18	Tunnel Endpoint Identifier Data II
19	Teardown ID
20	NSAPI
21	RANAP Cause

Table 7: Supported Information Elements *(continued)*

IE Type Value	Information Element
22	RAB Context
23	Radio Priority SMS
24	Radio Priority
25	Packet Flow ID
26	Charging Characteristics
27	Trace Reference
28	Trace Type
29	MS Not Reachable Reason
127	Charging ID
128	End User Address
129	MM Context
130	PDP Context
131	Access Point Name
132	Protocol Configuration Options
133	GSN Address
134	MS International PSTN/ISDN Number (MSISDN)
135	Quality of Service Profile
136	Authentication Quintuplet
137	Traffic Flow Template
138	Target Identification

Table 7: Supported Information Elements *(continued)*

IE Type Value	Information Element
139	UTRAN Transparent Container
140	RAB Setup Information
141	Extension Header Type List
142	Trigger Id
143	OMC Identity
144	RAN Transparent Container
145	PDP Context Prioritization
146	Additional RAB Setup Information
147	SGSN Number
148	Common Flags
149	APN Restriction
150	Radio Priority LCS
151	RAT Type
152	User Location Information
153	MS Time Zone
154	IMEI-SV
155	CAMEL Charging Information Container
156	MBMS UE Context
157	Temporary Mobile Group Identity (TMGI)
158	RIM Routing Address

Table 7: Supported Information Elements *(continued)*

IE Type Value	Information Element
159	MBMS Protocol Configuration Options
160	MBMS Service Area
161	Source TNC PDCP context Information
162	Additional Trace Information
163	Hop Counter
164	Selected PLMN ID
165	MBMS Session Identifier
166	MBMS2G/3G Indicator
167	Enhanced NSAPI
168	MBMS Session Duration
169	Additional MBMS Trace Information
173	BSS Container
174	Cell Identification
175	PDU Numbers
176	BSSGP Cause
178	RIM Routing Address Discriminator
179	List of setup PFCS
180	PS Hand-over XID Parameters
188	Reliable INTER RAT HANDOVER INFO
251	Charging Gateway Address

Table 7: Supported Information Elements *(continued)*

IE Type Value	Information Element
255	Private Extension

Junos OS supports all 3GPP R7 IEs for GTP, as listed in Table 8 on page 75.

Table 8: Supported Information Elements

IE Type Value	Information Element
172	PS Handover Request Context
181	MS Info Change Reporting Action
182	Direct Tunnel Flags
183	Correlation-ID
184	Bearer Control Mode

Junos OS supports all 3GPP R8 IEs for GTP, as listed in Table 9 on page 75.

Table 9: Supported Information Elements

IE Type Value	Information Element
189	RFSP Index

Junos OS supports all 3GPP R9 IEs for GTP, as listed in Table 10 on page 75.

Table 10: Supported Information Elements

IE Type Value	Information Element
190	Fully Qualified Domain Name (FQDN)
191	Evolved Allocation/Retention Priority 1
192	Evolved Allocation/Retention Priority 2

Table 10: Supported Information Elements *(continued)*

IE Type Value	Information Element
193	Extended Common Flags
194	User CSG Information (UCI)
195	CSG Information Reporting Action
196	CSG ID
197	CSG Membership Indication (CMI)
198	Aggregate Maximum Bit Rate (AMBR)

Example: Removing R6, R7, R8, and R9 Information Elements from GTP Messages

IN THIS SECTION

This example shows how to remove R6 information elements from GTP messages.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you configure the Gp interface of the security device to remove newly added R6 IEs (RAT, Common Flags, ULI, IMEI-SV, MS Time Zone, and APN restrictions) from the GTP message.

Configuration

Step-by-Step Procedure

To remove R6 information elements from GTP messages:

1. Specify the GTP profile.

```
[edit]
user@host# set security gprs gtp profile gtp1
```

2. Specify the information element.

```
[edit]
user@host# set security gprs gtp profile gtp1 remove-ie version v1 release R6
user@host# set security gprs gtp profile gtp1 remove-ie version v1 release R7
user@host# set security gprs gtp profile gtp1 remove-ie version v1 release R8
user@host# set security gprs gtp profile gtp1 remove-ie version v1 release R9
```

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

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

Verification

To verify the configuration is working properly, enter the **show security gprs** command.

Understanding GTPv1 Information Element Removal

The number of network elements in a mobile network is expanding with the introduction of multiple releases of 3GPP specifications. Every release introduces newer information elements (IEs) that are not defined in the prior releases. Therefore mobile networks have diverse set of network elements creating inter operability problems between different releases of the devices. You can configure the GPRS tunneling protocol (GTP) firewall to remove information elements (IE) by release with the following command.

set security gprs gtp profile *gtp1* remove-ie.

However newer IEs that will be introduced in the future releases might also cause inter operability problems. Each information element has a unique ID, the IE number. IE numbers range from 1 to 255. You can configure the GTP firewall to remove specific IEs using the user-configured IE number.

When you configure the IE removal, the GTP firewall deletes the corresponding IEs of the GTPv1 messages; updates the length of the GTP, the UDP, and the IP; and then passes the GTPv1 message. The GTP firewall also updates the cyclic redundancy check (CRC) code. IE removal by IE number supports all IEs, ranging from 1 to 255.

You can remove the IE removal configuration with the following commands:

delete security gprs gtp profile *gtp1* remove-ie—Deletes the IE removal configuration for the GTP profile GTP1.

delete security gprs gtp profile *gtp1* remove-ie version *v1* number *4*—Deletes the IE removal configuration for GTP profile with version v1 and IE number 4.

The IE removal feature supports GTPv1 only.

Example: Removing GTPv1 Information Elements Using IE Number

IN THIS SECTION

This example shows how to configure the GPRS tunelling protocol (GTP) interface of the security device to remove user-configured IEs from GTP messages.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you configure IE removal for the GTP profile called gtp1. The IEs are removed using the user-configured IE number 4.

Configuration

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 security gprs gtp profile gtp1
set security gprs gtp profile gtp1 remove-ie version v1 number 4
```

Step-by-Step Procedure

To configure the GTP interface of the security device to remove user-configured IEs from the GTP message:

1. Specify the GTP profile.

   [edit]

   user@host# **set security gprs gtp profile gtp1**

2. Specify the IE number.

   [edit security gprs gtp profile gtp1]

   user@host# **set remove-ie version v1 number 4**

Results

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

```
gtp {
    profile gtp1 {
        remove-ie {
            version v1 {
                number 4;
            }
        }
    }
}
```

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

Understanding GTPv2 Information Elements

Information elements (IEs) are included in all GPRS tunneling protocol version 2 (GTPv2) control message packets. IEs provide information about GTPv2 tunnels, such as creation, modification, deletion, and status. The Junos operating system (Junos OS) supports IEs consistent with the Third-Generation Partnership Project (3GPP) Release 8.

Understanding GTP APN Filtering

An access point name (APN) is an information element (IE) included in the header of a GPRS tunneling protocol (GTP) packet that provides information about how to reach a network. An APN comprises two elements:

- Network ID—Identifies the name of an external network such as example.com.
- Operator ID—Uniquely identifies the operators' public land mobile network (PLMN) such as mnc123.mcc456.

By default, the device permits all APNs. However, you can configure the device to perform APN filtering to restrict access to roaming subscribers to external networks.

To enable APN filtering, you must specify one or more APNs. To specify an APN, you need to know the domain name of the network (for example, example.com) and, optionally, the operator ID. Because the domain name (network ID) portion of an APN can potentially be very long and contain many characters, you can use the wildcard (*) as the first character of the APN. The wildcard indicates that the APN is not limited only to example.com but also includes all the characters that might precede it.

You may also set a *selection mode* for the APN. The selection mode indicates the origin of the APN and whether or not the Home Location Register (HLR) has verified the user subscription. You set the selection mode according to the security needs of your network. Possible selection modes include the following:

- Mobile Station—Mobile station-provided APN, subscription not verified.

  This selection mode indicates that the mobile station (MS) provided the APN and that the HLR did not verify the user's subscription to the network.

- Network—Network-provided APN, subscription not verified.

  This selection mode indicates that the network provided a default APN because the MS did not specify one, and that the HLR did not verify the user's subscription to the network.

- Verified—MS or network-provided APN, subscription verified.

  This selection mode indicates that the MS or the network provided the APN and that the HLR verified the user's subscription to the network.

APN filtering applies only to create-pdp-request messages. When performing APN filtering, the device inspects GTP packets to—look for APNs that match APNs that you set. If the APN of a GTP packet matches an APN that you specified, the device then verifies the selection mode and only forwards the GTP packet if both the APN and the selection mode match the APN and the selection mode that you specified. Because APN filtering is based on perfect matches, using the wildcard (*) when setting an APN suffix can prevent the inadvertent exclusion of APNs that you would otherwise authorize.

Additionally, the device can filter GTP packets based on the combination of an International Mobile Subscriber Identity (IMSI) prefix and an APN. When you filter GTP packets based on an IMSI prefix, you must also specify an APN.

An APN string is case-insensitive. For instance, in the following example you set two APN strings, WWW.EXAMPLE.COM and www.example.com, with the same IMSI prefix value. In this configuration, the lowercase string will display after the uppercase string, and the packet will be dropped.

user@host# show configuration security gprs gtp | display set

set security gprs gtp profile test apn WWW.EXAMPLE.COM imsi-prefix * action pass

set security gprs gtp profile test apn www.example.com imsi-prefix * action drop

If an APN is configured with two IMSI prefix entries, then the IMSI prefix with the longest match takes priority. For example, see the following configuration:

user@host# show configuration security gprs gtp | display set

set security gprs gtp profile test apn WWW.EXAMPLE.COM imsi-prefix 12345678 action pass

set security gprs gtp profile test apn www.example.com imsi-prefix 12345 action drop

If an incoming packet value matches the IMSI prefix value 12345678, then the packet will pass. The IMSI prefix value 12345678 takes precedence over the IMSI prefix value 12345, as the longest matched IMSI prefix takes priority.

Example: Setting a GTP APN and a Selection Mode

IN THIS SECTION

This example shows how to set a GTP APN and a selection mode.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you set a GTP APN as example.com.mnc123.mcc456.gprs and use the wildcard (*) character. You also set the IMSI prefix and set the selection mode as network.

Configuration

Step-by-Step Procedure

To configure a GTP APN and a selection mode:

1. Specify the GTP profile.

```
[edit]
user@host# set security gprs gtp profile gtp1
```

2. Set a selection mode for the APN.

```
[edit]
user@host# set security gprs gtp profile gtp1 apn *example.com.mnc123.mcc456.gprs imsi-prefix * action
    selection net
```

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

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

Verification

To verify the configuration is working properly, enter the **show security gprs** command.

Understanding IMSI Prefix Filtering of GTP Packets

A GPRS support node (GSN) identifies a mobile station (MS) by its International Mobile Station Identity (IMSI). An IMSI consists of three elements: the mobile country code (MCC), the mobile network code (MNC), and the Mobile Subscriber Identification Number (MSIN). The MCC and MNC combined constitute the IMSI prefix and identify the mobile subscriber's home network, or public land mobile network (PLMN).

By setting IMSI prefixes, you can configure the device to deny GPRS tunneling protocol (GTP) traffic coming from nonroaming partners. By default, a device does not perform IMSI prefix filtering on GTP packets. By setting IMSI prefixes, you configure the device to filter create-pdp-request messages and permit only GTP packets with IMSI prefixes that match the ones you set. The device allows GTP packets with IMSI prefixes that do not match any of the IMSI prefixes that you set. To block GTP packets with IMSI prefixes that do not match any of the IMSI prefixes set, use an explicit wildcard for the IMSI filter, and the drop action should be the last IMSI prefix filtering policy.

When you filter GTP packets based on an IMSI prefix, you must also specify an APN.

Example: Setting a Combined IMSI Prefix and APN Filter

IN THIS SECTION

This example shows how to set and combine IMSI prefix and APN filter.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you set example.com.mnc123.mcc456.gprs as an APN and use the wildcard(*). You permit all selection modes for this APN. You also set the IMSI prefix for a known PLMN, which is 246565. The MCC-MNC pair can be five or six digits.

Configuration

Step-by-Step Procedure

To set and combine IMSI prefix and APN filter:

1. Set the GTP profile.

```
[edit]
user@host# set security gprs gtp profile gtp1
```

2. Set the selection mode for APN.

```
[edit]
user@host# set security gprs gtp profile gtp1 apn *example.com.mnc123.mcc456.gprs imsi-prefix 246565*
   action pass
```

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

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

Verification

To verify the configuration is working properly, enter the **show security gprs** command.

Understanding GTPv2 IMSI Prefix and APN Filtering

A GPRS support node (GSN) identifies a Mobile Station (MS) by its International Mobile Subscriber Identity (IMSI). An IMSI comprises three elements: the mobile country code (MCC), the mobile network code (MNC), and the Mobile Subscriber Identification Number (MSIN). The MCC is a three-digit number, and the MNC is a two-digit or three-digit number. The MCC and MNC combined constitute the IMSI prefix and identify the mobile subscriber's home network or public land mobile network (PLMN). Therefore, the IMSI prefix acts as the PLMN identifier and is used to identify valid roaming partners.

By default, a device does not perform IMSI prefix filtering on GPRS tunneling protocol version 2 (GTPv2) packets. By setting IMSI prefixes, you configure the device to filter create-session-request messages and permit only GTPv2 packets with IMSI prefixes that match the ones you set.

When you filter GTPv2 packets based on an IMSI prefix, you must also specify an access point name (APN).

An APN is an information element (IE) included in the header of a GTPv2 packet that provides information about how to reach a network. An APN comprises two elements:

- Network ID—Identifies the name of an external network, such as example.com.
- Operator ID—Uniquely identifies the operators' PLMN, such as mnc123.mcc789.gprs.

For example, example.com.mnc123.mcc789.gprs is an APN for reaching the example.com network through the mnc123.mcc789.gprs operator.

By default, a device does not perform APN filtering on GTPv2 packets. However, you can configure the device to perform APN filtering to restrict access to roaming subscribers to external networks.

You can use the **set security gprs gtp profile profile name apn pattern-string imsi-prefix imsi-prefix-digits action (pass |drop |selection)** configuration statement to filter packets based on the combination of an IMSI prefix and an APN.

To specify an APN, you need to know the network ID or the domain name of the network (for example, example.com) and, optionally, the operator ID. Because the network ID portion of an APN can be very long, you can use the wildcard (*) as the first character of the APN string. For example, if you use *.example.com as the network ID, the wildcard indicates that the APN is not limited only to example.com but also includes all the characters that might precede it.

You can use the **selection** option to set a *selection mode* for the APN. The selection mode indicates the origin of the APN and whether or not the Home Location Register (HLR) has verified the user subscription. You set the selection mode according to the security needs of your network. Possible selection modes include the following:

- ms—MS-provided APN, subscription is not verified.
- net—Network-provided APN, subscription is not verified.
- vrf—MS-provided or network-provided APN, subscription is verified.

You can use the **drop** option to drop all APNs and the **pass** option to pass all APNs for any selection mode.

When performing APN filtering, the device inspects packets to look for APNs that match APNs that you set. If the APN of a packet matches an APN that you specified, then the device verifies the selection mode and forwards the GTPv2 packet.

The device only forwards the GTPv2 packet if both the APN and the selection mode match the APN and the selection mode that you specified.

Because APN filtering is based on perfect matches, using the wildcard (*) when setting an APN suffix can prevent the inadvertent exclusion of APNs that you would otherwise authorize.

IMSI prefix and APN filtering apply to create-session-request messages only.

RELATED DOCUMENTATION

Policy-Based GTP | 25

Monitoring GTP Traffic

IN THIS SECTION

The GPRS Tunneling Protocol (GTP) establishes a GTP tunnel for a user equipment, between a Service gateway GPRS support node (SGSN) and gateway GPRS support node (GGSN), and an SGSN and mobility management entity (MME). The SGSN receives packets from the user equipment and encapsulates them within a GTP header before forwarding them to the GGSN through the GTP tunnel. When the GGSN receives the packets, it decapsulates the packets and forwards the packets to the external host.

Understanding GTP-U Inspection

The GPRS tunneling protocol user plane (GTP-U) inspection performs security checks on GTP-U packets. When GTP-U inspection is enabled, the invalid GTP-U packets are blocked and the GPRS support node (GSN) is protected from a GTP-U attack.

Once GTP-U inspection is enabled and depending on the device configuration, GTP-U inspection might include checks on GTP-in-GTP packets, end-user authorization, packet sequence validity, and tunnel validity. If any configured check fails, the GTP-U packet is dropped.

If the GTP-U inspection is enabled while the GTP-U distribution is disabled then the following message is displayed: **GTP-U inspection is enabled, please enable GTP-U distribution to ensure that GTP-U packets are inspected by the proper inspectors, and avoid dropping GTP-U packets wrongly. Execute CLI “set security forwarding-process application-services enable-gtpu-distribution" to enable GTP-U distribution.** It is strongly recommended that when you enable GTP-U inspection, GTP-U distribution should also be enabled.

Starting in Junos OS Release 15.1X49-D100 and Junos OS Release 17.3R1, on SRX5400, SRX5600, and SRX5800 devices, if the GTP profile is configured then the GTP module will select the anchor SPU for distributing the UDP traffic coming on port 2123 and 2152. If you do not configure the GTP profile, then the GTP module will not work and it will not select the anchor SPU for the UDP traffic on port 2123 and 2152.

The following list describes the various types of GTP-U inspections that are performed on the traffic:

- **GTP-U tunnel check**—The GTP-U module checks that the GTP-U packet matches a GTP tunnel. If no tunnel matches the GTP-U packet, then the GTP-U packet is dropped.
- **GTP-in-GTP check**—In the SPU, the GTP module checks to ensure that the GTP-U payload is not a GTP packet. If the payload is a GTP packet, then the GTP packet is dropped.
- **End-user address check**—If the user tunnel is found for the GTP-U packet, then the GTP-U module checks for the end-user address. If the GTP-U payload address does not match the end-user address, then the GTP-U packet is dropped.

  Starting in Junos OS Release 15.1X49-D40 and Junos OS Release 17.3R1, the end-user address in certain scenarios is not carried in GTP create messages. For example, if DHCPv4 is used for IPv4 address allocation, the IPv4 address field in the GTP create message will be set to **0.0.0.0**. The user equipment and GGSN/PGW get the address from the DHCP server. In this scenario, the GTP module cannot get the address for the end-user address check. Subsequently, if this configuration is enabled, the GTP create message will be dropped.
- **Sequence number check**—The GTP-U module compares the GTP-U packet sequence number with the sequence number stored in the GTP-U tunnel. If it is not in the specified range, then the GTP-U packet is dropped. If it is in the range, then the GTP-U tunnel refreshes the sequence number and allows the GTP-U packet to pass.

At the end of the GTP-U inspection, the GTP-U tunnel refreshes the timers and counters.

Understanding GTP Tunnel Enhancements

A GPRS tunneling protocol (GTP) tunnel is a channel between two GPRS support nodes through which two hosts exchange data. The GTP tunnel consists of the GTP control plane (GTP-C) and GTP user plane (GTP-U). GTP-C is used to signaling between the gateway GPRS support node (GGSN) and the serving GPRS support node (SGSN), while the GTP-U tunnel is used to encapsulate and route the user plane traffic across multiple signaling interfaces.

GTP handling is enhanced to update the GTP tunnel and session lifetime to avoid GTP tunnel timeout issues. The GTP tunnel timeout value is configured in the GTP profile and bound to the GTP user plane (GTP-U) tunnel. The timer value is refreshed when the data traffic reaches the GTP-U tunnel and the timer value decreases when the GTP-U tunnel is in idle state. The GTP-U tunnel is deleted when the timer value decreases to zero and the corresponding GTP-C tunnel is also deleted when all GTP-U tunnels bound to the GTP-C tunnels are deleted.

When GTP-U inspection is disabled, data traffic is unable to refresh the GTP-U tunnel after the timer value expires and all GTP tunnels timeout even though data traffic flows across the tunnels. In this scenario, since the GTP tunnels need to be updated, the device drops the update request as the GTP-U tunnel is not present.

To avoid GTP tunnel timeout issues, even if the GTP user validation is disabled, the GTP-U traffic can refresh the GTP tunnel. GTP-U traffic can refresh only GTPv1 and GTPv2 tunnels, and not GTPv0 tunnels. You need to configure the **set security forwarding-process application-services enable-gtpu-distribution** command to avoid aging of or expiry of the GTP tunnels.

The GTP-U tunnel has a session attach flag that is checked when scanning the GTP-U tunnels. If the session attach flag is present in the tunnel, the timer value does not decrease and prevents the tunnel from being deleted while the tunnel is in service.

On SRX5400, SRX5600, and SRX5800 devices, the number of GTP tunnels supported per SPU is increased from 200,000 tunnels to 600,000 tunnels per SPU, for a total of 2,400,000 tunnels per SPC2 card.

Understand Validation of IP Address in GTP Messages

IP addresses in GPRS tunneling protocol (GTP) message on Gp or the S8 interface are validated with the configured IP group list to prevent attacks. IP group list is a list of IP addresses that belongs to all kinds of network equipment. You must configure the IP addresses that belongs to network equipment in the IP group list.

S8 - This interface connects an SGW in a visited PLMN (VPLM) and a PGW in a home PLMN (HPLMN). S8 is the inter-PLMN variant of S5. The S8 interface is equivalent to the Gp interface in a 3G mobile network.

The GTP firewall determines if the IP addresses in GTP messages and matches with the configured IP group list, and following action takes place-

- If the IP addresses are found in the IP group list, the GTP messages are considered valid and forwarded to Packet and Forwarding Engine.
- If the IP addresses are not found in the IP group list, the GTP messages are dropped.

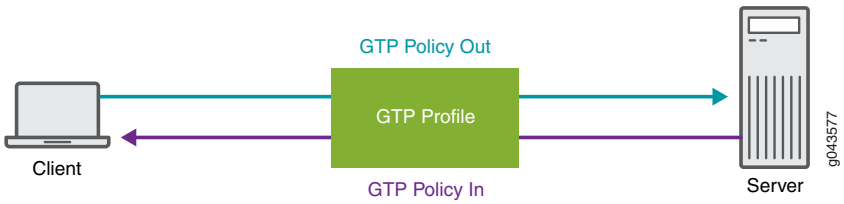
IP Group Setup in GTP Message

IP group is a list of IP addresses that belongs to all kinds of network equipment. IP group name(s) are referenced in GTP profiles. The GTP firewall applies configured policies in incoming and outgoing IP addresses in GPRS tunneling protocol (GTP) message mentioned in Table 12 on page 90 and Table 13 on page 91.

For example, the traffic between client and server in Figure 6 on page 89, there are two policies configured.

- *GTP Policy Out* is for the traffic from client to server.
- *GTP Policy In* is for the traffic from server to client.

Figure 6: GTP Profile for incoming and outgoing GTP messages



All the IP addresses of client and server must be configured in the IP group list and bound to the *GTP Policy Out* and *GTP Policy In* policies.

There are two different types of groups are introduced for different IP addresses. One is for NE IP addresses group, and the other is for User Equipment (UE) IP addresses group listed as in Table 11 on page 89.

Table 11: Network Equipment and User Equipment IP Address Support on Various Networks

Network Types	Network Equipment IP Address	User Equipment IP Address
2G(GPRS) and 3G(UMTS)	RNC, SGSN and GGSN	End User Address

Table 11: Network Equipment and User Equipment IP Address Support on Various Networks *(continued)*

Network Types	Network Equipment IP Address	User Equipment IP Address
4G(LTE)	eNodeB, MME, SGW and PGW	PDN Address Allocation (PAA)

When GTP messages comes to message handler stage, network equipment IP addresses group and user equipment IP addresses group are validated respectively based on the parsed information elements and IP address header information.

- Network equipment IP addresses group: IP address header and information element IP address in GTP message are compared against the configured network equipment IP addresses group list (if exist). If the NE IP address is found in the configured NE IP addresses group, pass the data packet to UE IP addresses group else drop the packet.
- User equipment IP addresses group: All end user IP addresses are validated against the configured user equipment IP addresses group list. If the user equipment IP address is found in the configured user equipment IP addresses group, pass the data packet else drop the packet.

Supported GTP messages

There are many types of messages pass through Gp or S8 interfaces, some of the supported GTP messages are following.

Table 12: GTPv0 Messages

Message Type	GTP Message	Reference in TS 29.060
1	Echo Request	7.4.1
2	Echo Response	7.4.2
16	Create PDP Context Request	7.5.1
17	Create PDP Context Response	7.5.2
18	Update PDP Context Request	7.5.3
19	Update PDP Context Response	7.5.4
20	Delete PDP Context Request	7.5.5
21	Delete PDP Context Response	7.5.6
22	Create AA PDP Context Request	7.5.7

Table 12: GTPv0 Messages *(continued)*

Message Type	GTP Message	Reference in TS 29.060
23	Create AA PDP Context Response	7.5.8
24	Delete AA PDP Context Request	7.5.9
25	Delete AA PDP Context Response	7.5.10

Table 13: GTPv1 Messages

Message Type	GTP Message	Reference in TS 29.060
1	Echo Request	7.2.1
2	Echo Response	7.2.2
16	Create PDP Context Request	7.3.1
17	Create PDP Context Response	7.3.2
18	Update PDP Context Request	7.3.3
19	Update PDP Context Response	7.3.4
20	Delete PDP Context Request	7.3.5
21	Delete PDP Context Response	7.3.6

Table 14: GTPv2 Messages

Message Type	GTP Message	Reference 3GPP TS 29.274
1	Echo Request	23.007
2	Echo Response	23.007
32	Create Session Request	29.274
33	Create Session Response	29.274
36	Delete Session Request	29.274
37	Delete Session Response	29.274

Table 14: GTPv2 Messages *(continued)*

Message Type	GTP Message	Reference 3GPP TS 29.274
34	Modify Bearer Request	29.274
35	Modify Bearer Response	29.274
95	Create Bearer Request	29.274
96	Create Bearer Response	29.274
97	Update Bearer Request	29.274
98	Update Bearer Response	29.274
99	Delete Bearer Request	29.274
100	Delete Bearer Response	29.274

IEs involved in IP validity

The following are the information elements (IE) messages belonging to 3GPP Gp or S8 interface.

IEs are configured on Gp or the S8 interface, if an unexpected IE appears in the message, it might be ignored and not be checked even if it is an NE IP address.

Table 15: IEs in GTPv0 messages

GTP Message	Address Type	IE Type
Create PDP Context Request Create AA PDP Context Request	End User Address SGSN Address for signalling SGSN Address for user traffic	End User Address GSN Address GSN Address
Create PDP Context Response Create AA PDP Context Response	End user address GGSN Address for signalling GGSN Address for user traffic	End User Address GSN Address GSN Address
Update PDP Context Request	SGSN Address for signalling SGSN Address for user traffic	GSN Address GSN Address
Update PDP Context Response	GGSN Address for signalling GGSN Address for user traffic	GSN Address GSN Address

Table 16: GTPv1 messages

GTP Message	Address Type	IE Type
Create PDP Context Request	End User Address SGSN Address for signalling SGSN Address for user traffic	End User Address GSN Address GSN Address
Create PDP Context Response	End user address GGSN Address for signalling GGSN Address for user traffic Alternative GGSN Address for Control Plane Alternative GGSN Address for user traffic	End User Address GSN Address GSN Address GSN Address GSN Address
Update PDP Context Request (SGSN-initiated)	SGSN Address for signalling SGSN Address for user traffic Alternative SGSN Address for Control Plane Alternative SGSN Address for user traffic	GSN Address GSN Address GSN Address GSN Address
Update PDP Context Request (GGSN-initiated)	End User Address	End User Address
Update PDP Context Response (by GGSN)	GGSN Address for signalling GGSN Address for user traffic Alternative GGSN Address for Control Plane Alternative GGSN Address for user traffic	GSN Address GSN Address GSN Address GSN Address
Update PDP Context Response (by SGSN)	SGSN Address for User Traffic	GSN Address

Table 17: GTPv2 messages

GTP Message/Bearer Context	Address Type	IE Type
Create Session Request	Sender Address for Control Plane PDN Address Allocation H(e)NB Local IP Address MME/S4-SGSN Identifier	F-TEID PAA IP Address IP Address
Create Session Request (Bearer context to be created)	S5/S8-U SGW F-TEID	F-TEID
Create Session Response	PGW S5/S8 F-TEID for Control Plane interface PDN Address Allocation	F-TEID PAA

Table 17: GTPv2 messages *(continued)*

GTP Message/Bearer Context	Address Type	IE Type
Create Session Response (Bearer context to be created)	S5/S8-U PGW F-TEID	F-TEID
Create Bearer Request (Bearer context)	S5/8-U PGW F-TEID	F-TEID
Create Bearer Response	MME/S4-SGSN Identifier	IP Address
Create Bearer Response (Bearer context)	S5/8-U SGW F-TEID S5/8-U PGW F-TEID	F-TEID F-TEID
Modify Bearer Request	Sender Address for Control Plane H(e)NB Local IP Address MME/S4-SGSN Identifier	F-TEID IP Address IP Address
Modify Bearer Request (Bearer context)	S5/8-U SGW F-TEID	F-TEID
Delete Session Request	Sender Address for Control Plane	F-TEID
Delete Bearer Response	MME/S4-SGSN Identifier	IP Address
Update Bearer Response	MME/S4-SGSN Identifier	IP Address

Example: Configure the Validity of IP Address in GTP Messages

IN THIS SECTION

This example shows how you configure IP address validity in GPRS tunneling protocol (GTP) message.

Requirements

SRX Series device with Junos OS Release 19.3R1 or later. This configuration example is tested on Junos OS Release 19.3R1.

This example uses the following hardware and software components:

- You need any one of the SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, SRX5800, and vSRX instance.
- User equipment that needs to connect to the Internet. You will also need a 3G or 4G mobile core network and a home and visited network.

Overview

In this example, you configure the validity of the IP address in GPRS tunneling protocol (GTP) message.

You can prevent a variety of attacks by validating the IP addresses of incoming and outgoing packets in GTP messages against the IP addresses configured in the IP group list. IP group is a list of IP addresses that belongs to all kinds of network equipment. IP group name(s) are referenced in GTP profiles. The GTP firewall applies configured policies in incoming and outgoing IP addresses in GPRS tunneling protocol (GTP) messages.

Configure IP Address in GTP Messages

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.

CLI Quick Configuration

```
set security gprs gtp profile gtp1 timeout 1
set security gprs gtp profile gtp1 log forwarded detail
set security gprs gtp profile gtp1 log state-invalid detail
set security gprs gtp profile gtp1 log prohibited detail
set security gprs gtp profile gtp1 log gtp-u all
set security gprs gtp profile gtp1 log gtp-u dropped
set security gprs gtp profile gtp1 restart-path echo
set security gprs gtp profile gtp1 req-timeout 30
set security gprs gtp traceoptions file debug_gtp
set security gprs gtp traceoptions file size 1000m
security gprs gtp traceoptions flag all
```

```
set security gprs gtp gsn timeout 1
set security zones security-zone SGSN_1
set security zones security-zone SGSN_0
set security zones security-zone SGSN_2
set security address-book global address att-mme 192.0.2.0/24
set security address-book global address att-sgw 192.51.100.0/24
set security address-book global address china-mobile-pgw 203.0.113.0/24
set security address-book global address ue-mobile 203.0.113.1/24
set security address-book global address-set ne-group-as address china-mobile-pgw
set security address-book global address-set ne-group-as address att-mme
set security address-book global address-set ne-group-as address att-sgw
set security address-book global address-set ue-group-as address ue-mobile
set security gprs gtp ip-group ng1 address-book global address-set ne-group-as
set security gprs gtp ip-group ug1 address-book global address-set ue-group-as
set security gprs gtp profile gtp1 ne-group ng1
set security gprs gtp profile gtp1 ue-group ug1
set security policies from-zone SGSN_1 to-zone SGSN_0 policy HSGSN_VSGSN1 match source-address any
set security policies from-zone SGSN_1 to-zone SGSN_0 policy HSGSN_VSGSN1 match destination-address
    any
set security policies from-zone SGSN_1 to-zone SGSN_0 policy HSGSN_VSGSN1 match application any
set security policies from-zone SGSN_1 to-zone SGSN_0 policy HSGSN_VSGSN1 then permit application-services
    gprs-gtp-profile gtp1
set security policies from-zone SGSN_2 to-zone SGSN_0 policy VSGSN1_HSGSN match source-address any
set security policies from-zone SGSN_2 to-zone SGSN_0 policy VSGSN1_HSGSN match destination-address
    any
set security policies from-zone SGSN_2 to-zone SGSN_0 policy VSGSN1_HSGSN match application any
set security policies from-zone SGSN_2 to-zone SGSN_0 policy VSGSN1_HSGSN then permit application-services
    gprs-gtp-profile gtp1
set security policies from-zone SGSN_2 to-zone SGSN_1 policy HSGSN_VSGSN2 match source-address any
set security policies from-zone SGSN_2 to-zone SGSN_1 policy HSGSN_VSGSN2 match destination-address
    any
set security policies from-zone SGSN_2 to-zone SGSN_1 policy HSGSN_VSGSN2 match application any
set security policies from-zone SGSN_2 to-zone SGSN_1 policy HSGSN_VSGSN2 then permit application-services
    gprs-gtp-profile gtp1
```

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 IP address in the GTP messages:

Step-by-Step Procedure

1. Configure a GTP profile.to process the traffic that goes to the GTP firewall.

```
[edit security gprs]
```

```
user@host# set gtp profile gtp1 timeout 1
user@host# set gtp profile gtp1 log forwarded detail
user@host# set gtp profile gtp1 log state-invalid detail
user@host# set gtp profile gtp1 log prohibited detail
user@host# set gtp profile gtp1 log gtp-u all
user@host# set gtp profile gtp1 log gtp-u dropped
user@host# set gtp profile gtp1 restart-path echo
user@host# set gtp profile gtp1 req-timeout 30
user@host# set gtp traceoptions file debug_gtp
user@host# set gtp traceoptions file size 1000m
user@host# set gtp traceoptions flag all
user@host# set gtp gsn timeout 1
```

2. Configure the security zone to support inbound and outbound traffic for all system services for all interfaces connected.

```
[edit security zones]
user@host# set security-zone SGSN_1
user@host# set security-zone SGSN_0
user@host# set security-zone SGSN_2
```

3. Specify the IP address in the global address book, these IP addresses are used for validating IP addresses in incoming or outgoing GTP messages.

```
[edit security address-book global]
user@host# set address att-mme 192.0.2.0/24
user@host# set address att-sgw 192.51.100.0/24
user@host# set address china-mobile-pgw 203.0.113.0/24
user@host# set address ue-mobile 203.0.113.1/24
user@host# set address-set ne-group-as address china-mobile-pgw
user@host# set address-set ne-group-as address att-mme
user@host# set address-set ne-group-as address att-sgw
user@host# set ddress-set ue-group-as address ue-mobile
```

4. Configure the defined network equipment and user equipment IP address group to IP group list, this IP group list is used in GTP messages.

```
[edit security gprs]
user@host# set gtp ip-group ng1 address-book global address-set ne-group-as
user@host# set gtp ip-group ug1 address-book global address-set ue-group-as
```

5. Apply GTP profile to network equipment and user equipment groups.

```
[edit security gprs]
user@host# set gtp profile gtp1 ne-group ng1
user@host# set gtp profile gtp1 ue-group ug1
```

6. Enable the GTP service in the security policies.

```
[edit security]
user@host# set policies from-zone SGSN_1 to-zone SGSN_0 policy HSGSN_VSGSN1 match source-address
   any
user@host# set policies from-zone SGSN_1 to-zone SGSN_0 policy HSGSN_VSGSN1 match
   destination-address any
user@host# set policies from-zone SGSN_1 to-zone SGSN_0 policy HSGSN_VSGSN1 match application any
user@host# set policies from-zone SGSN_1 to-zone SGSN_0 policy HSGSN_VSGSN1 then permit
   application-services gprs-gtp-profile gtp1
user@host# set policies from-zone SGSN_2 to-zone SGSN_0 policy VSGSN1_HSGSN match source-address
   any
user@host# set policies from-zone SGSN_2 to-zone SGSN_0 policy VSGSN1_HSGSN match
   destination-address any
user@host# set policies from-zone SGSN_2 to-zone SGSN_0 policy VSGSN1_HSGSN match application any
user@host# set policies from-zone SGSN_2 to-zone SGSN_0 policy VSGSN1_HSGSN then permit
   application-services gprs-gtp-profile gtp1
user@host# set policies from-zone SGSN_2 to-zone SGSN_1 policy HSGSN_VSGSN2 match source-address
   any
user@host# set policies from-zone SGSN_2 to-zone SGSN_1 policy HSGSN_VSGSN2 match
   destination-address any
user@host# set policies from-zone SGSN_2 to-zone SGSN_1 policy HSGSN_VSGSN2 match application any
user@host# set policies from-zone SGSN_2 to-zone SGSN_1 policy HSGSN_VSGSN2 then permit
   application-services gprs-gtp-profile gtp1
```

Results

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

```
[edit]
user@host# show security gprs
gtp {
   profile GTP {
      timeout 1;
      log {
```

```
            forwarded detail;
            state-invalid detail;
            prohibited detail;
            gtp-u all;
            gtp-u dropped;
        }
        restart-path echo;
        req-timeout 30;
    }
    profile gtp1 {
        ne-group {
            ng1;
        }
        ue-group {
            ug1;
        }
    }
    traceoptions {
        file debug_gtp size 1000m;
        flag all;
    }
    gsn {
        timeout 1;
    }
    ip-group ng1 {
        address-book global {
            address-set {
                ne-group-as;
            }
        }
    }
    ip-group ug1 {
        address-book global {
            address-set {
                ue-group-as;
            }
        }
    }
}
```

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

```
[edit]
user@host# show security zones
security-zone SGSN_1;
security-zone SGSN_0;
security-zone SGSN_2;
```

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

```
[edit]
user@host# show security address-book
global {
    address att-mme 192.0.2.0/24;
    address att-sgw 192.51.100.0/24;
    address china-mobile-pgw 192.51.100.0/24;
    address ue-mobile 203.0.113.1/24;
    address-set ne-group-as {
        address china-mobile-pgw;
        address att-mme;
        address att-sgw;
    }
    address-set ue-group-as {
        address ue-mobile;
    }
}
```

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.

```
[edit]
user@host# show security policies
from-zone SGSN_1 to-zone SGSN_0 {
    policy HSGSN_VSGSN1 {
        match {
            source-address any;
            destination-address any;
            application any;
        }
        then {
            permit {
                application-services {
```

```
                gprs-gtp-profile GTP;
            }
        }
    }
}
from-zone SGSN_2 to-zone SGSN_0 {
    policy VSGSN1_HSGSN {
        match {
            source-address any;
            destination-address any;
            application any;
        }
        then {
            permit {
                application-services {
                    gprs-gtp-profile GTP;
                }
            }
        }
    }
}
from-zone SGSN_2 to-zone SGSN_1 {
    policy HSGSN_VSGSN2 {
        match {
            source-address any;
            destination-address any;
            application any;
        }
        then {
            permit {
                application-services {
                    gprs-gtp-profile GTP;
                }
            }
        }
    }
}
```

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

Verification

IN THIS SECTION

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

Verify the IP Group

Purpose

Verify the IP Group is configured.

Action

Use the **show security gprs gtp ip-group** command to get the details of the configured IP group.

```
All configured IP group:
    Group name              Address book name        Address set name
    ng1                     global                   ne-group-as
    ug1                     global                   ue-group-as
```

Verify the GTP profile

Purpose

Verify the GTP profile is configured.

Action

Use the **show security gprs gtp configuration 1** command to get the details of the configured IP group.

```
  Profile Details:

        Index                       : 2
        Min Message Length          : 0
        Max Message Length          : 65535
        Timeout                     : 24
        Rate Limit                  : 0
        Request Timeout             : 5
        Remove R6                   : 0
```

```
Remove R7                   : 0
Remove R8                   : 0
Remove R9                   : 0
Deny Nested GTP             : 0
Validated                   : 0
Passive learning enable     : 0
Restart Path                : 0
Log Forwarded               : 0
Log State Invalid           : 0
Log Prohibited              : 0
Log Ratelimited             : 0
Frequency Number            : 0
Drop AA Create PDU          : 0
Drop AA Delete PDU          : 0
Drop Bearer Resource        : 0
Drop Change Notification    : 0
Drop Config Transfer        : 0
Drop Context                : 0
Drop Create Bear            : 0
Drop Create Data Forwarding : 0
Drop Create PDU             : 0
Drop Create Session         : 0
Drop Create Forwarding Tnl  : 0
Drop CS Paging              : 0
Drop Data Record            : 0
Drop Delete Bearer          : 0
Drop Delete Command         : 0
Drop Delete Data Forwarding : 0
Drop Delete PDN             : 0
Drop Delete PDP             : 0
Drop Delete Session         : 0
Drop Detach                 : 0
Drop Downlink Notification  : 0
Drop Echo                   : 0
Drop Error Indication       : 0
Drop Failure Report         : 0
Drop FWD Access             : 0
Drop FWD Relocation         : 0
Drop FWD SRNS Context       : 0
Drop G-PDU                  : 0
Drop Identification         : 0
Drop MBMS Sess Start        : 0
Drop MBMS Sess Stop         : 0
Drop MBMS Sess Update       : 0
```

```
        Drop Modify Bearer          : 0
        Drop Modify Command         : 0
        Drop Node Alive             : 0
        Drop Note MS Present        : 0
        Drop PDU Notification       : 0
        Drop Ran Info               : 0
        Drop Redirection            : 0
        Drop Release Access         : 0
        Drop Relocation Cancel      : 0
        Drop Resume                 : 0
        Drop Send Route             : 0
        Drop SGSN Context           : 0
        Drop Stop Paging            : 0
        Drop Supported Extension    : 0
        Drop Suspend                : 0
        Drop Trace Session          : 0
        Drop Update Bearer          : 0
        Drop Update PDN             : 0
        Drop Update PDP             : 0
        Drop Ver Not Supported      : 0
        Handover group name         : N/A
        NE group name               : ng1
        UE group name               : ug1
```

Release History Table

Release	Description
15.1X49-D40	Starting in Junos OS Release 15.1X49-D40 and Junos OS Release 17.3R1, the end-user address in certain scenarios is not carried in GTP create messages.
15.1X49-D100	Starting in Junos OS Release 15.1X49-D100 and Junos OS Release 17.3R1, on SRX5400, SRX5600, and SRX5800 devices, if the GTP profile is configured then the GTP module will select the anchor SPU for distributing the UDP traffic coming on port 2123 and 2152. If you do not configure the GTP profile, then the GTP module will not work and it will not select the anchor SPU for the UDP traffic on port 2123 and 2152.

RELATED DOCUMENTATION

Policy-Based GTP | 25

NAT for GTP

IN THIS SECTION

The Network Address Translation (NAT) protocol is used to inspect the GTP traffic between the internal GPRS network and the Internet (external network) and vice versa.

Understanding NAT for GTP

A General Packet Radio Service (GPRS) interface supports both GPRS tunneling protocol (GTP) inspection and Network Address Translation (NAT) simultaneously in the same routing instance. When GTP packets configured with static NAT are inspected in a network, only addresses within IP headers are translated. The addresses within their payloads are not translated. For each endpoint, the related GTP session must belong to the same zone and virtual router. This means the header source IP, C-tunnel IP, and U-tunnel IP in the payload are defined in the same scope for a packet.

When you enable NAT, only the outer IP packet has to be translated. The embedded IP addresses are not translated.

During a GTP packet flow, the source IP address and destination IP address cannot be translated to NAT simultaneously. When you delete or deactivate NAT rule configuration on a device, the NAT rule related GSN and GTP tunnels are deleted. If the NAT rule related GSN number and tunnel number are huge, this deleting process will take several minutes.

Example: Configuring GTP Inspection in NAT

IN THIS SECTION

This example shows how to configure a NAT rule to map a private IP (one that is inside the network and not routable) to a public IP (one that is outside of the network and is routable). It also shows how to inspect GTP traffic between an internal and external network.

Requirements

Before you begin, the device must be restarted after GTP is enabled. By default, GTP is disabled on the device.

Overview

In this example, you configure interfaces as ge-0/0/0 and ge-0/0/1, with addresses 10.0.0.254/8 and 123.0.0.254/8. You then configure the security zone and static NAT. You enable the GTP service in the security policies to allow bidirectional traffic between two networks, and you check the traffic between the internal and external network.

Configuration

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 interfaces ge-0/0/0 unit 0 family inet address 10.0.0.254/8
set interfaces ge-0/0/1 unit 0 family inet address 123.0.0.254/8
set security zones security-zone zone1 interfaces ge-0/0/0.0 host-inbound-traffic system-services all
set security zones security-zone zone1 host-inbound-traffic protocols all
```

```
set security zones security-zone other-zone interfaces ge-0/0/1.0 host-inbound-traffic system-services all
set security zones security-zone other-zone host-inbound-traffic protocols all
set security address-book global address gsn1 10.0.0.1/8
set security address-book global address other-gsn 20.0.0.1/8
set security nat static rule-set rs1 from zone other-zone
set security nat static rule-set rs1 rule r1 match destination-address 123.0.0.1/32
set security nat static rule-set rs1 rule r1 then static-nat prefix 10.0.0.1/32
set security nat proxy-arp interface ge-0/0/0.0 address 123.0.0.1/32
set security gprs gtp profile gtp1
set security gprs gtp profile gtp1 timeout 1
set security gprs gtp profile gtp1 seq-number-validated
set security policies from-zone zone1 to-zone other-zone policy out-gtp match source-address gsn1
set security policies from-zone zone1 to-zone other-zone policy out-gtp match destination-address other-gsn
set security policies from-zone zone1 to-zone other-zone policy out-gtp match application junos-gprs-gtp
set security policies from-zone zone1 to-zone other-zone policy out-gtp then permit application-services
   gprs-gtp-profile gtp1
set security policies from-zone other-zone to-zone zone1 policy in-gtp match source-address other-gsn
set security policies from-zone other-zone to-zone zone1 policy in-gtp match destination-address gsn1
set security policies from-zone other-zone to-zone zone1 policy in-gtp match application junos-gprs-gtp
set security policies from-zone other-zone to-zone zone1 policy in-gtp then permit application-services
   gprs-gtp-profile gtp1
```

Step-by-Step Procedure

To configure GTP inspection in NAT:

1. Configure interfaces.

```
[edit]
user@host# set interfaces ge-0/0/0 unit 0 family inet address 10.0.0.254/8
user@host# set interfaces ge-0/0/1 unit 0 family inet address 123.0.0.254/8
```

2. Configure and security zones

```
[edit security]
user@host# set zones security-zone zone1 interfaces ge-0/0/0.0 host-inbound-traffic system-services all
user@host# set zones security-zone zone1 host-inbound-traffic protocols all
user@host# set zones security-zone other-zone interfaces ge-0/0/1.0 host-inbound-traffic system-services
   all
user@host# set zones security-zone other-zone host-inbound-traffic protocols all
```

3. Define the address book.

```
[edit security]
user@host# set address-book global address gsn1 10.0.0.1/8
user@host# set address-book global address other-gsn 20.0.0.1/8
```

4. Define NAT rule.

```
[edit security nat]
user@host# set static rule-set rs1 from zone other-zone
user@host# set static rule-set rs1 rule r1 match destination-address 123.0.0.1/32
user@host# set static rule-set rs1 rule r1 then static-nat prefix 10.0.0.1/32
user@host# set proxy-arp interface ge-0/0/0.0 address 123.0.0.1/32
```

5. Enable GTP profile.

```
[edit security gprs gtp]
user@host# set profile gtp1
user@host# set profile gtp1 timeout 1
user@host# set profile gtp1 seq-number-validated
```

6. Check GTP traffic.

```
[edit security policies]
user@host# set from-zone zone1 to-zone other-zone policy out-gtp match source-address gsn1
user@host# set from-zone zone1 to-zone other-zone policy out-gtp match destination-address other-gsn
user@host# set from-zone zone1 to-zone other-zone policy out-gtp match application junos-gprs-gtp
user@host# set from-zone zone1 to-zone other-zone policy out-gtp then permit application-services
   gprs-gtp-profile gtp1
user@host# set from-zone other-zone to-zone zone1 policy in-gtp match source-address other-gsn
user@host# set from-zone other-zone to-zone zone1 policy in-gtp match destination-address gsn1
user@host# set from-zone other-zone to-zone zone1 policy in-gtp match application junos-gprs-gtp
user@host# set from-zone other-zone to-zone zone1 policy in-gtp then permit application-services
   gprs-gtp-profile gtp1
```

Results

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

```
[edit]
user@host# show security
gprs {
    gtp {
        profile gtp1 {
            timeout 1;
            seq-number-validated;
        }
    }
}
address-book {
    global {
        address gsn1 10.0.0.1/8;
        address other-gsn 20.0.0.1/8;
    }
}
nat {
    static {
        rule-set rs1 {
            from zone other-zone;
            rule r1 {
                match {
                    destination-address 123.0.0.1/32;
                }
                then {
                    static-nat {
                        prefix {
                            10.0.0.1/32;
                        }
                    }
                }
            }
        }
    }
    proxy-arp {
        interface ge-0/0/0.0 {
            address {
                123.0.0.1/32;
            }
```

```
        }
    }
}
policies {
    from-zone zone1 to-zone other-zone {
        policy out-gtp {
            match {
                source-address gsn1;
                destination-address other-gsn;
                application junos-gprs-gtp;
            }
            then {
                permit {
                    application-services {
                        gprs-gtp-profile gtp1;
                    }
                }
            }
        }
    }
    from-zone other-zone to-zone zone1 {
        policy in-gtp {
            match {
                source-address other-gsn;
                destination-address gsn1;
                application junos-gprs-gtp;
            }
            then {
                permit {
                    application-services {
                        gprs-gtp-profile gtp1;
                    }
                }
            }
        }
    }
}
zones {
    security-zone trust {
        host-inbound-traffic {
            system-services {
                all;
            }
            protocols {
```

```
                all;
            }
        }
        interfaces {
            ge-0/0/0.0;
        }
    }
    security-zone zone1 {
        host-inbound-traffic {
            protocols {
                all;
            }
        }
        interfaces {
            ge-0/0/0.0;
        }
    }
    security-zone other-zone {
        host-inbound-traffic {
            protocols {
                all;
            }
        }
        interfaces {
            ge-0/0/1.0 {
                host-inbound-traffic {
                    system-services {
                        all;
                    }
                }
            }
        }
    }
}
```

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

Verification

Confirm that the configuration is working properly.

Verifying GTP Inspection on NAT

Purpose

Verify the GTP traffic between the internal network and the external network.

Action

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

Understanding Network Address Translation-Protocol Translation

Network Address Translation-Protocol Translation (NAT-PT) is a protocol translation mechanism that can be done in two directions, from IPv4 address format to IPv6 address format and vice versa. NAT-PT binds the addresses in the IPv6 network with addresses in the IPv4 network and vice versa to provide transparent routing for the datagrams traversing between address realms.

In each direction, the static NAT defines a one-to-one mapping from one IP subnet to another IP subnet. The mapping includes a destination IP address translation in one direction and a source IP address translation in the opposite direction.

The main advantage of NAT-PT is that the end devices and networks can run either IPv4 addresses or IPv6 addresses and traffic can be started from any side.

Example: Enhancing Traffic Engineering by Configuring NAT-PT Between an IPv4 and an IPv6 Endpoint with SCTP Multihoming

IN THIS SECTION

This example shows how to enhance traffic engineering by configuring NAT-PT between an IPv4 endpoint and an IPv6 endpoint. NAT-PT is a protocol translation mechanism that allows communication between IPv6-only and IPv4-only nodes through protocol-independent translation of IPv4 and IPv6 datagrams, requiring no state information for the session. NAT-PT binds the addresses in the IPv6 network with addresses in the IPv4 network and vice versa to provide transparent routing for the datagrams traversing

between address realms. The main advantage of NAT-PT is that the end devices and networks can run either IPv4 addresses or IPv6 addresses and traffic can be started from any side.

Requirements

This example uses the following hardware and software components:

- SRX5400 device
- Endpoint A connected to an SRX5400 device using two IPv6 addresses
- Endpoint B connected to an SRX5400 device using two IPv4 addresses

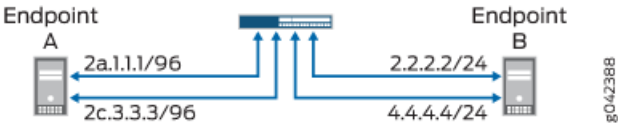
Overview

In this example, you configure NAT-PT between an IPv4 endpoint and an IPv6 endpoint. Endpoint A is connected to the SRX5400 device using two IPv6 addresses and endpoint B is connected to the SRX5400 device using two IPv4 addresses.

You can configure the SRX5400 device to translate the IP header and IP address list (located in the INIT/INT-ACK message) between an IPv4 address format and an IPv6 address format. In each direction, static NAT defines a one-to-one mapping from one IP subnet to another IP subnet. The mapping includes destination IP address translation in one direction and source IP address translation in the opposite direction.

Figure 7 on page 113 illustrates the network topology used in this example.

Figure 7: NAT-PT Between an IPv4 Endpoint and an IPv6 Endpoint



For configuring NAT-PT details between IPv4 and IPv6 endpoints, seeTable 18 on page 113.

Table 18: Configuring NAT-PT Details Between IPv4 and IPv6 Endpoints

Endpoints	Address One	Address Two
A (IPv6)	2a.1.1.1/96	2c.3.3.3/96
B (IPv4)	2.2.2.2/24	4.4.4.4/34

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 interfaces ge-4/0/0 unit 0 family inet address 1.1.1.100/24
set interfaces ge-4/0/0 unit 0 family inet6 address 2a::1:1:100/96
set interfaces ge-4/0/1 unit 0 family inet address 2.2.2.100/24
set interfaces ge-4/0/1 unit 0 family inet6 address 2b::2:2:100/96
set interfaces ge-4/0/2 unit 0 family inet address 3.3.3.100/24
set interfaces ge-4/0/2 unit 0 family inet6 address 2c::3:3:100/96
set interfaces ge-4/0/3 unit 0 family inet address 4.4.4.100/24
set interfaces ge-4/0/3 unit 0 family inet6 address 2d::4:4:100/96
set security zones security-zone sctp_zone1 host-inbound-traffic system-services all
set security zones security-zone sctp_zone1 host-inbound-traffic protocols all
set security zones security-zone sctp_zone1 interfaces ge-4/0/0.0
set security zones security-zone sctp_zone1 interfaces ge-4/0/2.0
set security zones security-zone sctp_zone2 host-inbound-traffic system-services all
set security zones security-zone sctp_zone2 host-inbound-traffic protocols all
set security zones security-zone sctp_zone2 interfaces ge-4/0/1.0
set security zones security-zone sctp_zone2 interfaces ge-4/0/3.0
set security nat static rule-set sctp-natpt-from-zone1 from zone sctp_zone1
set security nat static rule-set sctp-natpt-from-zone1 rule r1-dst match destination-address 2b::2:2:2/128
set security nat static rule-set sctp-natpt-from-zone1 rule r1-dst then static-nat prefix 2.2.2.2/32
set security nat static rule-set sctp-natpt-from-zone1 rule r3-dst match destination-address 2d::4:4:4/128
set security nat static rule-set sctp-natpt-from-zone1 rule r3-dst then static-nat prefix 4.4.4.4/32
set security nat static rule-set sctp-natpt-from-zone2 from zone sctp_zone2
set security nat static rule-set sctp-natpt-from-zone2 rule r2-dst match destination-address 1.1.1.1/32
set security nat static rule-set sctp-natpt-from-zone2 rule r2-dst then static-nat prefix 2a::1:1:1/128
set security nat static rule-set sctp-natpt-from-zone2 rule r4-dst match destination-address 3.3.3.3/32
set security nat static rule-set sctp-natpt-from-zone2 rule r4-dst then static-nat prefix 2c::3:3:3/128
```

Step-by-Step Procedure

To configure NAT-PT between an IPv4 endpoint and an IPv6 endpoint:

1. Configure interfaces.

```
[edit interfaces]
user@host# set ge-4/0/0 unit 0 family inet address 1.1.1.100/24
user@host# set ge-4/0/0 unit 0 family inet6 address 2a::1:1:100/96
user@host# set ge-4/0/1 unit 0 family inet address 2.2.2.100/24
user@host# set ge-4/0/1 unit 0 family inet6 address 2b::2:2:100/96
```

```
user@host# set ge-4/0/2 unit 0 family inet address 3.3.3.100/24
user@host# set ge-4/0/2 unit 0 family inet6 address 2c::3:3:100/96
user@host# set ge-4/0/3 unit 0 family inet address 4.4.4.100/24
user@host# set ge-4/0/3 unit 0 family inet6 address 2d::4:4:100/96
```

2. Configure zones.

```
[edit security zones]
user@host# set security-zone sctp_zone1 host-inbound-traffic system-services all
user@host# set security-zone sctp_zone1 host-inbound-traffic protocols all
user@host# set security-zone sctp_zone1 interfaces ge-4/0/0.0
user@host# set security-zone sctp_zone1 interfaces ge-4/0/2.0
user@host# set security-zone sctp_zone2 host-inbound-traffic system-services all
user@host# set security-zone sctp_zone2 host-inbound-traffic protocols all
user@host# set security-zone sctp_zone2 interfaces ge-4/0/1.0
user@host# set security-zone sctp_zone2 interfaces ge-4/0/3.0
```

3. Configure rules for the first static NAT zone.

```
[edit security nat]
user@host# set static rule-set sctp-natpt-from-zone1 from zone sctp_zone1
```

4. Specify the static NAT rule match criteria for the traffic coming from zone 1.

```
[edit security nat]
user@host# set static rule-set sctp-natpt-from-zone1 rule r1-dst match destination-address 2b::2:2:2/128
user@host# set static rule-set sctp-natpt-from-zone1 rule r1-dst then static-nat prefix 2.2.2.2/32
user@host# set static rule-set sctp-natpt-from-zone1 rule r3-dst match destination-address 2d::4:4:4/128
user@host# set static rule-set sctp-natpt-from-zone1 rule r3-dst then static-nat prefix 4.4.4.4/32
```

5. Configure rules for the second static NAT zone.

```
[edit security nat]
user@host# set static rule-set sctp-natpt-from-zone2 from zone sctp_zone2
```

6. Specify the static NAT rule match criteria for the traffic coming from zone 2.

```
[edit security nat]
user@host# set static rule-set sctp-natpt-from-zone2 rule r2-dst match destination-address 1.1.1.1/32
```

```
user@host# set static rule-set sctp-natpt-from-zone2 rule r2-dst then static-nat prefix 2a::1:1:1/128
user@host# set static rule-set sctp-natpt-from-zone2 rule r4-dst match destination-address 3.3.3.3/32
user@host# set static rule-set sctp-natpt-from-zone2 rule r4-dst then static-nat prefix 2c::3:3:3/128
```

Results

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

```
[edit]
   user@host# show interfaces
   ge-4/0/0 {
   unit 0 {
      family inet {
         address 1.1.1.100/24;
      }
      family inet6 {
         address 2a::1:1:100/96;
      }
   }
}
ge-4/0/1 {
   unit 0 {
      family inet {
         address 2.2.2.100/24;
      }
      family inet6 {
         address 2b::2:2:100/96;
      }
   }
}
ge-4/0/2 {
   unit 0 {
      family inet {
         address 3.3.3.100/24;
      }
      family inet6 {
         address 2c::3:3:100/96;
      }
   }
}
ge-4/0/3 {
   unit 0 {
```

```
        family inet {
            address 4.4.4.100/24;
        }
        family inet6 {
            address 2d::4:4:100/96;
        }
    }
}
```

```
[edit]
user@host# show security zones
security-zone sctp_zone1 {
    host-inbound-traffic {
        system-services {
            all;
        }
        protocols {
            all;
        }
    }
    interfaces {
        ge-4/0/0.0;
        ge-4/0/2.0;
    }
}
security-zone sctp_zone2 {
    host-inbound-traffic {
        system-services {
            all;
        }
        protocols {
            all;
        }
    }
    interfaces {
        ge-4/0/1.0;
        ge-4/0/3.0;
    }
}
```

```
[edit]
user@host# show security nat static
rule-set sctp-natpt-from-zone1 {
```

```
    from zone sctp_zone1;
    rule r1-dst {
        match {
            destination-address 2b::2:2:2/128;
        }
        then {
            static-nat {
                prefix {
                    2.2.2.2/32;
                }
            }
        }
    }
    rule r3-dst {
        match {
            destination-address 2d::4:4:4/128;
        }
        then {
            static-nat {
                prefix {
                    4.4.4.4/32;
                }
            }
        }
    }
}
rule-set sctp-natpt-from-zone2 {
    from zone sctp_zone2;
    rule r2-dst {
        match {
            destination-address 1.1.1.1/32;
        }
        then {
            static-nat {
                prefix {
                    2a::1:1:1/128;
                }
            }
        }
    }
    rule r4-dst {
        match {
            destination-address 3.3.3.3/32;
        }
```

```
        then {
            static-nat {
                prefix {
                    2c::3:3:3/128;
                }
            }
        }
    }
}
```

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

Verification

Verifying the Configuration

Purpose

Verify that the NAT-PT configuration between an IPv4 endpoint and an IPv6 endpoint is correct.

Action

From operational mode, enter the **show security zones** and **show security nat static rule all** commands.

`user@host>` **show security zones**

```
Security zone: sctp_zone1
  Send reset for non-SYN session TCP packets: Off
  Policy configurable: Yes
  Interfaces bound: 2
  Interfaces:
    ge-4/0/0.0
    ge-4/0/2.0

Security zone: sctp_zone2
  Send reset for non-SYN session TCP packets: Off
  Policy configurable: Yes
  Interfaces bound: 2
  Interfaces:
    ge-4/0/1.0
    ge-4/0/3.0
```

`user@host>` **show security nat static rule all**

```
Total static-nat rules: 4
Total referenced IPv4/IPv6 ip-prefixes: 4/4

Static NAT rule: r1-dst               Rule-set: sctp-natpt-from-zone1
  Rule-Id                   : 1
  Rule position             : 1
  From zone                 : sctp_zone1
  Destination addresses     : 2b::2:2:2
  Host addresses            : 2.2.2.2
  Netmask                   : 128
  Host routing-instance     : N/A
  Translation hits          : 0
    Successful sessions     : 0
    Failed sessions         : 0
  Number of sessions        : 0

Static NAT rule: r3-dst               Rule-set: sctp-natpt-from-zone1
  Rule-Id                   : 2
  Rule position             : 2
  From zone                 : sctp_zone1
  Destination addresses     : 2d::4:4:4
  Host addresses            : 4.4.4.4
  Netmask                   : 128
  Host routing-instance     : N/A
  Translation hits          : 0
    Successful sessions     : 0
    Failed sessions         : 0
  Number of sessions        : 0

Static NAT rule: r2-dst               Rule-set: sctp-natpt-from-zone2
  Rule-Id                   : 3
  Rule position             : 3
  From zone                 : sctp_zone2
  Destination addresses     : 1.1.1.1
  Host addresses            : 2a::1:1:1
  Netmask                   : 32
  Host routing-instance     : N/A
  Translation hits          : 0
    Successful sessions     : 0
    Failed sessions         : 0
  Number of sessions        : 0

Static NAT rule: r4-dst               Rule-set: sctp-natpt-from-zone2
  Rule-Id                   : 4
```

```
Rule position             : 4
From zone                 : sctp_zone2
Destination addresses     : 3.3.3.3
Host addresses            : 2c::3:3:3
Netmask                   : 32
Host routing-instance     : N/A
Translation hits          : 0
  Successful sessions     : 0
  Failed sessions         : 0
Number of sessions        : 0
```

Meaning

The **show security zones** command displays all the zones configured and the interfaces associated with the zone. The **show security nat static rule all** command displays all the static NAT rules configured.

RELATED DOCUMENTATION

NAT Overview

PMI Flow Based CoS functions for GTP-U

IN THIS SECTION

Power-Mode IPsec (PMI) is a new mode of operation that provides IPsec performance improvements.

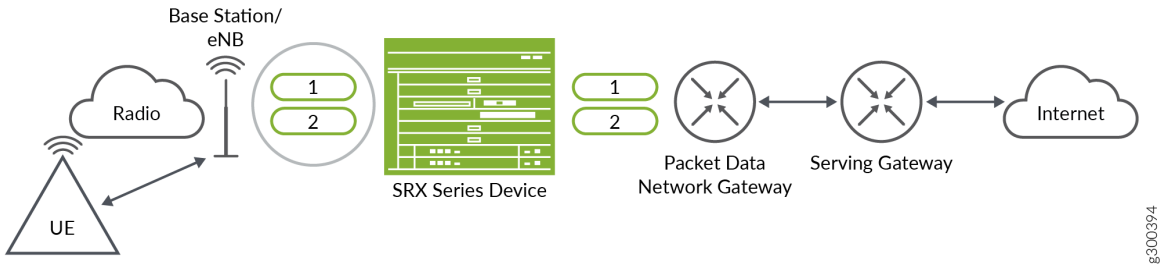
PMI Flow Based CoS functions for GTP-U scenario with TEID Distribution and Asymmetric Fat Tunnel Solution

With non-GTP traffic, the per-flow CoS solution assumes that all the packets of the same session should have same DSCP value. This won't work for GTP -U because it carries different user data. Therefore, there will be different DSCP code points for the same 5-tuple GTP session. If you combine the GTP-U session distribution solution together with per-flow CoS solution, you can provide a per-flow CoS solution for GTP-U scenario even if it carries multiple streams with different DSCP code inside one GTP tunnel.

The following information gives an overview on TEID based hash distributions and asymmetric fat tunnel solution.

TEID based hash distributions: GTP-U uses a fixed UDP port-2152 as its source port and destination port. There may be data streams from different users multiplexed within a single flow session, so 5-tuple is not enough to separate these data streams. There is a 4-byte field inside GTP payload called tunnel endpoint identifier (TEID), which is used to identify different connections in the same GTP tunnel. In order to migrate the GTP sessions to the anchor PIC, you need IPsec session affinity. Hence, a 6-tuple (including TEID) hash distribution is introduced for creating GTP-U sessions to different cores on anchor PIC, instead of creating GTP-U sessions only on the Anchor PIC.

Figure 8: LTE Networking Architecture



The Figure 8 on page 122 shows a typical LTE network architecture where an SRX Series device is deployed as security gateway. A fat GTP tunnel carries data from different users. IPsec tunnels on the security gateway could be a fat tunnel due to the fat GTP tunnel. The SRX Series device can create one GTP session with a high-bandwidth of GTP traffic. However, the throughput is limited to one core processor's performance.

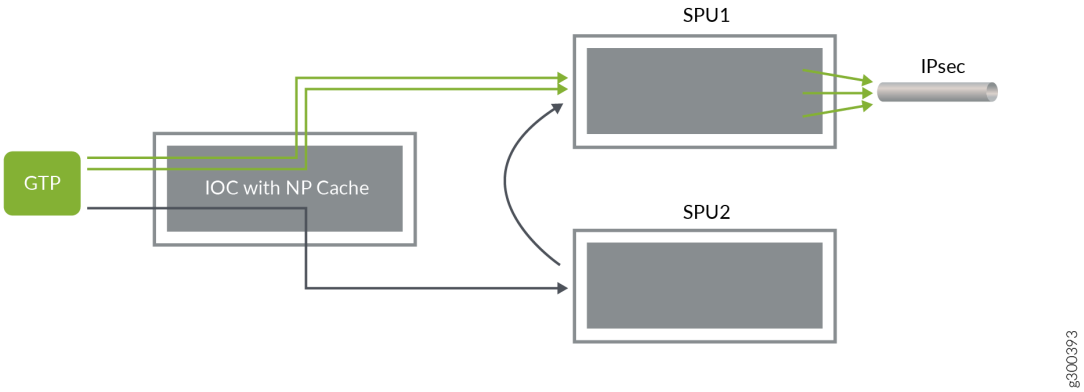
If you use TEID-based hash distribution for creating GTP-U sessions when PMI and IPsec session affinity are enabled, following events take place:

You can an enable SRX Series device to process asymmetric fat tunnels (Example: 30Gbps on encryption direction / 3 Gbps on decryption direction) because PMI provides parallel encryption on multiple cores for one tunnel.

You can split a fat GTP session to multiple sessions and distribute them to different cores. This helps to increase the bandwidth for fat GTP tunnel on the SRX Series Devices.

Asymmetric fat tunnel solution: An SRX Series Devices support asymmetric fat tunnels because PMI provides parallel encryption on multiple cores for one tunnel. The TEID based hash distribution is introduced for creating GTP-U sessions to multiple cores on anchor PIC. When both PMI and IPsec session affinity are enabled, the clear-txt traffic acts as a fat GTP tunnel. This helps a fat GTP session to split into multiple slim GTP sessions and handle them on multiple cores simultaneously.

Figure 9: Fat GTP Tunnel Processing



The Figure 9 on page 123 shows how a fat tunnel processed when TEID-based hash distribution for creating GTP-U sessions.

On the encryption path, when one GTP tunnel with the 5-tuple enters, the Input/Output card (IOC) distributes the traffic into different cores according to 6-tuple including TEID hash. If the traffic is destined for the same IPsec tunnel, flow creates multiple GTP sessions on different cores of the anchor SPU.

The flow installs multiple NP caches on the IOC and when subsequent packets hit the NP cache, they are distributed to different cores on the anchor SPU.

Configurations to enable PMI and GTP

The following configuration helps to enable PMI and GTP.

Before you begin determine the following:

Understand how to establish PMI and GTP. Per-flow CoS functions for GTP-U traffic in PMI mode is available. TEID-based hash distribution for creating GTP-U sessions to multiple cores on anchor PIC when both PMI and IPsec session affinity are enabled. TEID-based hash distribution can help split a fat GTP session to multiple slim GTP sessions and process them on multiple cores in parallel. With this enhancement, per-flow CoS for GTP-U traffic is enabled even when the traffic carries multiple streams with different DSCP code within one GTP tunnel.

The following steps explain how to enable PMI and GTP sessions:

1. Set NP cache mode.

```
[edit]
user@host# set chassis fpc 1 np-cache
```

2. Configure power-mode IPsec. When IPsec is enabled, the IPSec tunnel could be a fat tunnel due to the fat flow session.

```
[edit security]
user@host# set flow power-mode-ipsec
```

3. Configure GTP-U session distribution.

```
[edit security]
user@host# set forwarding-process application-services enable-gtpu-distribution
```

4. Enable IPsec session-affinity.

```
[edit security]
user@host# set flow load-distribution session-affinity ipsec
```

5. From the configuration mode, confirm your configuration by entering the **show** command.

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

```
flow {
    load-distribution {
        session-affinity {
            ipsec;
        }
    }
    power-mode-ipsec;
}
forwarding-process {
    application-services {
        enable-gtpu-distribution;
    }
}
```

6. Commit the configuration.

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

7. Reboot the device as NP cache requires reboot to take effect.

GGSN Overview

IN THIS SECTION

The gateway GPRS support node (GGSN) converts the incoming data traffic coming from the mobile users through the Service gateway GPRS support node (SGSN) and forwards it to the relevant network, and vice versa. The GGSN and the SGSN together form the GPRS support nodes (GSN).

Understanding GGSN Redirection

Junos OS supports GPRS tunneling protocol (GTP) traffic and gateway GPRS support node (GGSN) redirection. A GGSN (X) can send create-pdp-context responses in which it can specify different GGSN IP addresses (GGSN Y and GGSN Z) for subsequent GTP-C and GTP-U messages. Consequently, the SGSN sends the subsequent GGSN tunneling protocol, control (GTP-C) and GGSN tunneling protocol, user plane (GTP-U) messages to GGSNs Y and Z, instead of X.

GGSN Pooling Scenarios Overview

IN THIS SECTION

The General Packet Radio Service (GPRS) tunneling protocol (GTP) supports different Gateway GPRS Support Node (GGSN) IP addresses during a tunnel creation procedure. There are two GGSN pooling scenarios that support Serving GPRS Support Node (SGSN) roaming.

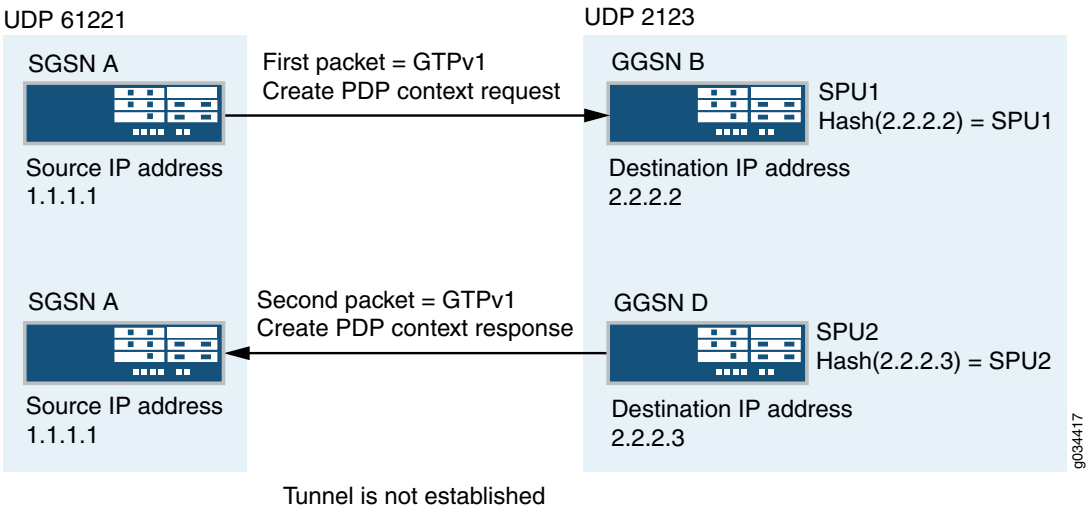
Understanding GGSN Pooling for Scenario 1

In Figure 10 on page 127, a packet data protocol (PDP) context request is sent from SGSN A to GGSN B during a GTP tunnel creation procedure. After sending the PDP context request message, GGSN D records the request information and it uses a different destination IP address from the request packet's destination IP address to send the response message to SGSN A.

In this scenario, two GTP packet messages are sent to Services Processing Unit 1 (SPU1) and SPU2 by the central point, and the messages are processed by SPU1 and SPU2 individually. The session is created on SPU1 and SPU 2 for each GTP packet. SPU1 records the request packet information and SPU2 records the response packet information.

The PDP response message sent from GGSN D to SGSN A is dropped because of a lack of request information. Thus the GTP tunnel is not established.

Figure 10: GGSN Pooling Scenario 1



NOTE: SPU2 cannot retrieve request information from SPU1.

Install Request Information to Remote SPU

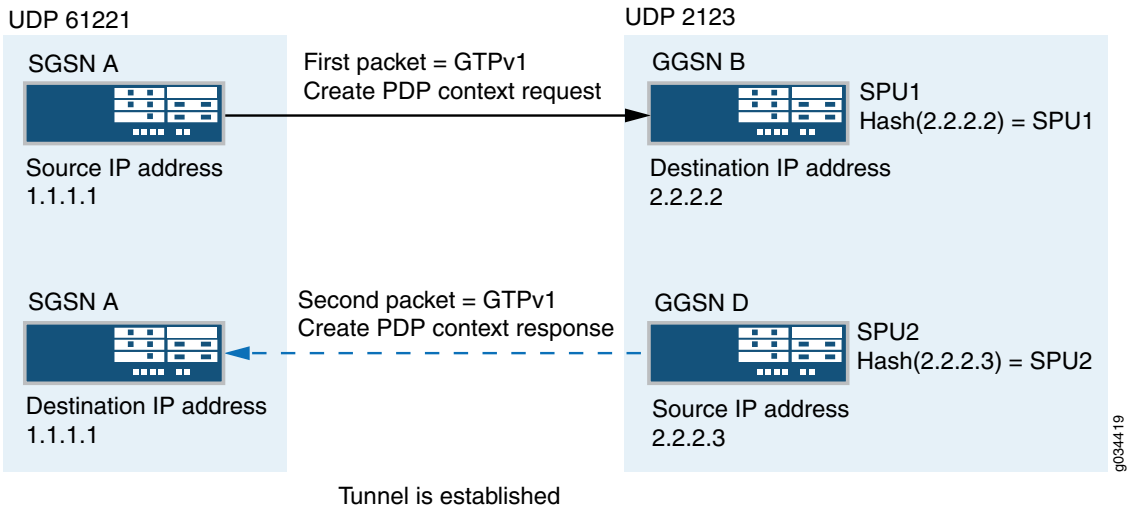
In this scenario, the PDP response packet was dropped because of a lack of request information, and the GTP tunnel was not established. This can be resolved by installing the request information on the correct SPU.

In Figure 11 on page 128, when creating a tunnel, the response packet's GGSN IP address changes, triggering a new session, and the central point distributes the message to another SPU.

The response packet always sends to the request packet's source address to the SPU. This helps to install the request information to the remote SPU for the next response packet.

Install the request information into the predictable SPU, HASH (req-src-ip) function while processing the request packet. After the expected SPU number (Hash (1.1.1.1) = SPU2) is calculated by the source IP address of the PDP request message, the request information is installed in the remote SPU2 through the Juniper Message Passing Interface (JMPI).

Figure 11: Functionality : GGSN Pooling Scenario 1



Now the request information is installed on local SPU1 and remote SPU2, so the PDP response message is allowed.

Workarounds for Scenario 1

In scenario 1, the PDP context request message sent from SGSN A reached the Junos OS default application **junos-gprs-gtp** and the GTP inspection was enabled for PDP context request message. However, the PDP context response message sent from GGSN D cannot reach the Junos OS default application **junos-gprs-gtp**. Thus the packet will not be inspected by the GTP module.

As a workaround, you need to enable GTP inspection for the PDP context response message by configuring the custom policy and applications. See the following examples:

- Example: Configuring a GGSN Custom Policy on page 130
- Example: Configuring Custom GGSN Applications on page 134

Understanding GGSN Pooling for Scenario 2

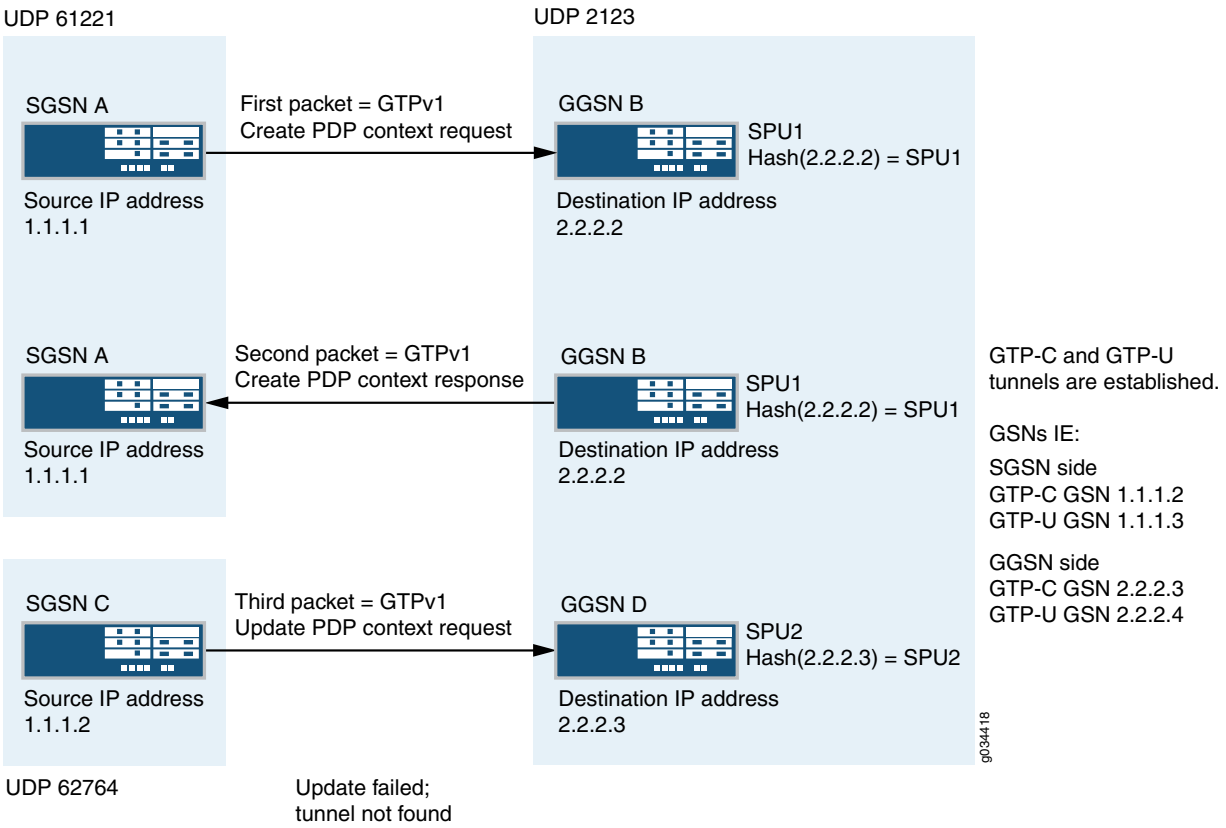
In Figure 12 on page 129, a packet data protocol (PDP) context request is sent from SGSN A to GGSN B during a GTP tunnel creation procedure. After receiving the PDP context request message, GGSN B sends the PDP context response message to SGSN A. After receiving the PDP context response message, the GTP-C tunnel is created between SGSN C and GGSN D. Then SGSN C sends an update PDP context request message to GGSN D using different source and destination IP addresses from the request packet's IP header.

In scenario 2, the SGSN A creates the first GTP context request and sends it to the SPU by the central point. The session is created for the request packet on SPU1. The response packet sent from GGSN B to SGSN A reaches the session correctly.

The request packet sent from SGSN A indicates that GTP-C is established on control IP 1.1.1.2 and the GTP-U is established on data IP 1.1.1.3. Likewise, the response message sent from GGSN indicates that GTP-C is established on control IP 2.2.2.3 and GTP-U is established on data IP 2.2.2.4.

The GTP-C and GTP-U tunnels are created on local SPU1 after all the endpoints are established. However, the tunnel is not established on SPU 2, so the PDP update request message received from SPU2 is dropped.

Figure 12: GGSN Pooling Scenario 2



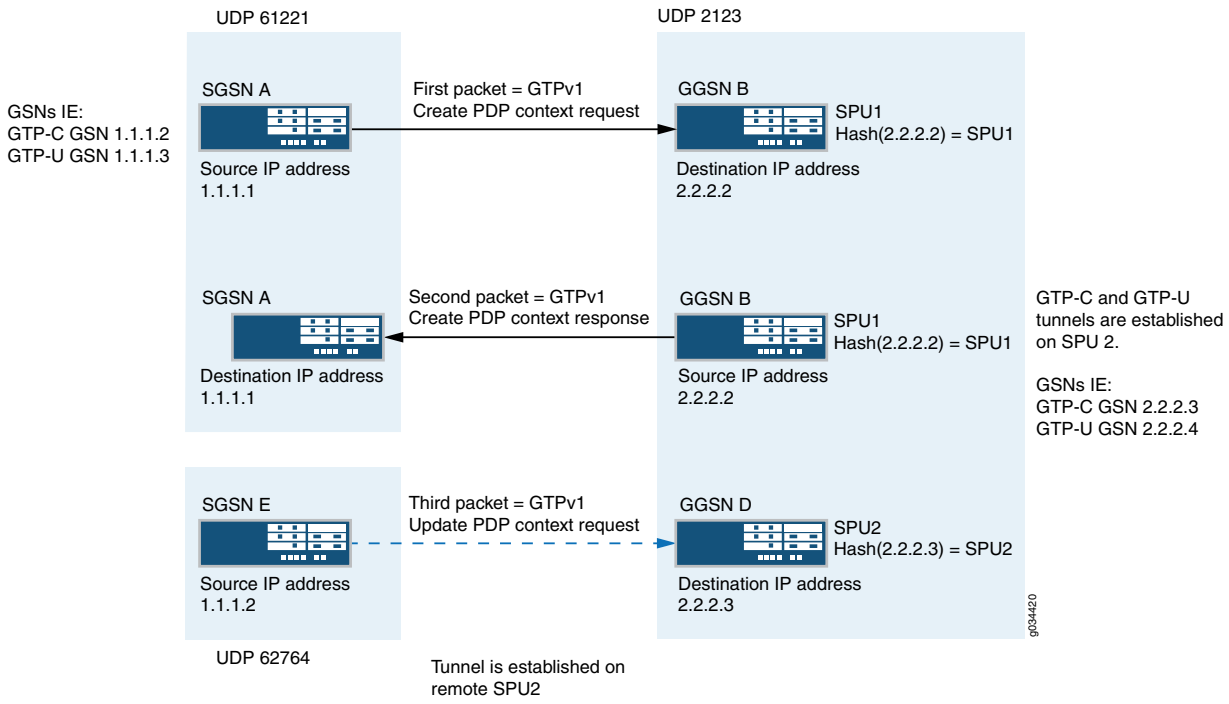
Install Tunnel Information to Remote SPU

In scenario 2, the update request packet is dropped because of a lack of tunnel information. This can be resolved by installing the tunnel information to the correct SPU after the request and response packets are processed. The SPU that receives the response packet installs the tunnel information on the local or remote SPU.

In Figure 13 on page 130, after the tunnel is established, the control messages are sent to the control tunnel endpoint. The destination IP address of all the control messages should be the control tunnel's GGSN endpoint IP address. This helps to calculate the remote SPU number in advance for the subsequent control message.

Install the tunnel information into the predictable SPU. After the SPU number is calculated by the control tunnel GGSN endpoint IP, the tunnel information is installed in the remote SPU through JMPI.

Figure 13: Functionality : GGSN Pooling Scenario 2



Now the tunnel information is installed on remote SPU2, so the PDP update response message is allowed.

Example: Configuring a GGSN Custom Policy

IN THIS SECTION

This example shows how to configure a Gateway GPRS Support Node (GGSN) custom policy to support GGSN pooling scenario 1.

Requirements

This example uses the following hardware and software components:

- SRX5400 device
- A PC
- Junos OS Release 12.1X44-D10

Before you begin, you should be familiar with GGSN pooling scenarios. See "GGSN Pooling Scenarios Overview" on page 126.

Overview

In this example, you set security zones from zone ggsn and to zone sgsn. Next you set the GGSN policy name to ggsn-pool-g2s. You set the name of the match source address to ggsn-1 and the match destination address to sgsn-1.

Then you set the port based application to src_2123 and src_3386. You set the action type to permit. Then you set the application services name to gprs-gtp-profile and the GTP profile name to test. Finally, you set the default policy name to deny-all.

Configuration

Configuring a GGSN Custom Policy

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 ggsn to-zone sgsn policy ggsn-pool-g2s
set security policies from-zone ggsn to-zone sgsn policy ggsn-pool-g2s match source-address ggsn-1
set security policies from-zone ggsn to-zone sgsn policy ggsn-pool-g2s match destination-address sgsn-1
set security policies from-zone ggsn to-zone sgsn policy ggsn-pool-g2s match application src_2123
set security policies from-zone ggsn to-zone sgsn policy ggsn-pool-g2s match application src_3386
set security policies from-zone ggsn to-zone sgsn policy ggsn-pool-g2s then permit application-services
    gprs-gtp-profile test
set security policies default-policy deny-all
```

Step-by-Step Procedure

To configure a GGSN custom policy:

1. Configure the GGSN custom policy.

```
[edit security ]
user@host# set policies from-zone ggsn to-zone sgsn policy ggsn-pool-g2s
```

2. Configure the source address.

```
[edit security]
user@host# set policies from-zone ggsn to-zone sgsn policy ggsn-pool-g2s match source-address ggsn-1
```

3. Configure the destination address.

```
[edit security]
user@host# set policies from-zone ggsn to-zone sgsn policy ggsn-pool-g2s match destination-address sgsn-1
```

4. Configure the policy applications.

```
[edit security]
user@host#set policies from-zone ggsn to-zone sgsn policy ggsn-pool-g2s match application src_2123
user@host# set policies from-zone ggsn to-zone sgsn policy ggsn-pool-g2s match application src_3386
```

5. Configure the activity type and specify the GTP profile name.

```
[edit security]
user@host# set policies from-zone ggsn to-zone sgsn policy ggsn-pool-g2s then permit
user@host# set policies from-zone ggsn to-zone sgsn policy ggsn-pool-g2s then permit application-services
   gprs-gtp-profile test
```

6. Configure the default policy.

```
[edit security]
user@host#  set policies default-policy deny-all
```

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.

```
[edit]
user@host# show security policies
   from-zone zone-name to-zone zone-name {
      from-zone ggsn to-zone sgsn {
         policy ggsn-pool-g2s {
            match {
               source-address ggsn-1;
               destination-address sgsn-1;
               application [ src_2123 src_3386 ];
            }
            then {
               permit {
                  application-services {
                     gprs-gtp-profile test;
                  }
               }
            }
         }
         }
      }
      default-policy {
         deny-all;
      }
```

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

Verification

IN THIS SECTION

- Verifying the Configuration | 133

Confirm that the configuration is working properly.

Verifying the Configuration

Purpose

Verify that the GGSN custom policy configuration is correct.

Action

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

Sample Output

user@host>**show security policies**

```
From zone: sgsn, To zone: ggsn
  Policy: ggsn-pool-g2s, State: enabled, Index: 5, Scope Policy: 0, Sequence number:
 1
    Source addresses: ggsn1
    Destination addresses: sgsn1
    Applications: src_2123 src_3386
    Action: permit, application services: gprs-gtp-profile test
    Default policy: Deny-all
```

This output shows a summary of policy configuration.

Example: Configuring Custom GGSN Applications

IN THIS SECTION

This example shows how to configure custom applications to support GGSN pooling scenario 1.

Requirements

This example uses the following hardware and software components:

- SRX5400 device
- A PC
- Junos OS Release 12.1X44-D10

Before you begin, configure the required GGSN policy. See "Example: Configuring a GGSN Custom Policy" on page 130.

Overview

In this example, you create applications src_2123 and src_3386 to identify source ports 2123 and 3386 for both TCP and UDP.

First you configure a custom application called src_2123.You set the application protocol to gprs-gtp-c. Then you set the networking protocol type to UDP. You set the source port to 2123 and the destination port to 0-0.

Then you configure another custom application called src_3386. You set the application protocol to gprs-gtp-v0. Then you set the networking protocol type to UDP. Finally, you set the source port to 3386 and the destination port to 0-0.

Configuration

Configuring Custom Applications

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 applications application src_2123 application-protocol gprs-gtp-c
set applications application src_2123 protocol udp
set applications application src_2123 source-port 2123
set applications application src_2123 destination-port 0-0
set applications application src_3386 application-protocol gprs-gtp-v0
set applications application src_3386 protocol udp
set applications application src_3386 source-port 3386
set applications application src_3386 destination-port 0-0
```

Step-by-Step Procedure

To configure custom policy applications:

1. Configure the first custom application and application protocol name.

   ```
   [edit applications]
   user@host# set application src_2123 application-protocol gprs-gtp-c
   ```

2. Configure the networking protocol type.

   ```
   [edit applications]
   user@host# set application src_2123 protocol udp
   ```

3. Configure the source port number.

```
[edit applications]
user@host#set application src_2123 source-port 2123
```

4. Configure the TCP or UDP destination port number.

```
[edit applications]
user@host# set application src_2123 destination-port 0-0
```

5. Configure the second custom application and application protocol name.

```
[edit applications]
user@host# set application src_3386 application-protocol gprs-gtp-v0
```

6. Configure the networking protocol type.

```
[edit applications]
user@host# set application src_3386 protocol udp
```

7. Configure the source port number.

```
[edit applications]
user@host#  set application src_3386 source-port 3386
```

8. Configure the destination port number.

```
[edit applications]
user@host# set application src_3386 destination-port 0-0
```

Results

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

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

```
application src_2123 {
    application-protocol gprs-gtp-c;
    protocol udp;
    source-port 2123;
    destination-port 0-0;
}
application src_3386 {
    application-protocol gprs-gtp-v0;
    protocol udp;
    source-port 3386;
    destination-port 0-0;
}
```

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

3

CHAPTER

Securing Stream Control Transmission Protocol (SCTP) Traffic

SCTP Overview

IN THIS SECTION

Stream Control Transmission Protocol (SCTP) is a transport-layer protocol that ensures reliable, in-sequence transport of data. SCTP provides multihoming support where one or both endpoints of a connection can consist of more than one IP address. This enables transparent failover between redundant network paths.

Understanding Stream Control Transmission Protocol

Stream Control Transmission Protocol (SCTP) is an IP Transport Layer protocol. SCTP exists at an equivalent level with User Datagram Protocol (UDP) and Transmission Control Protocol (TCP), which provides transport layer functions to many Internet applications. SCTP is a reliable transport protocol operating on top of a connectionless packet network such as IP and supports data transfer across the network in single IP or multi-IP cases.

SCTP can transport signaling messages to and from Signaling System 7 (SS7) for 3G mobile networks through M3UA, M2UA, or SUA. SCTP is a packet-based transport protocol. SCTP provide reliable and secure transport, minimized end-to-end delay, short failover time in case of network failures and both sequence and no-sequence transport.

SCTP is optimized to:

- Avoid the multithread infrastructure problems, when the traffic is high
- Improve the SCTP association searching rate (association lookup process speed is increased) by SCTP hash table optimization on the SPU
- Improve FSM for retransmission cases

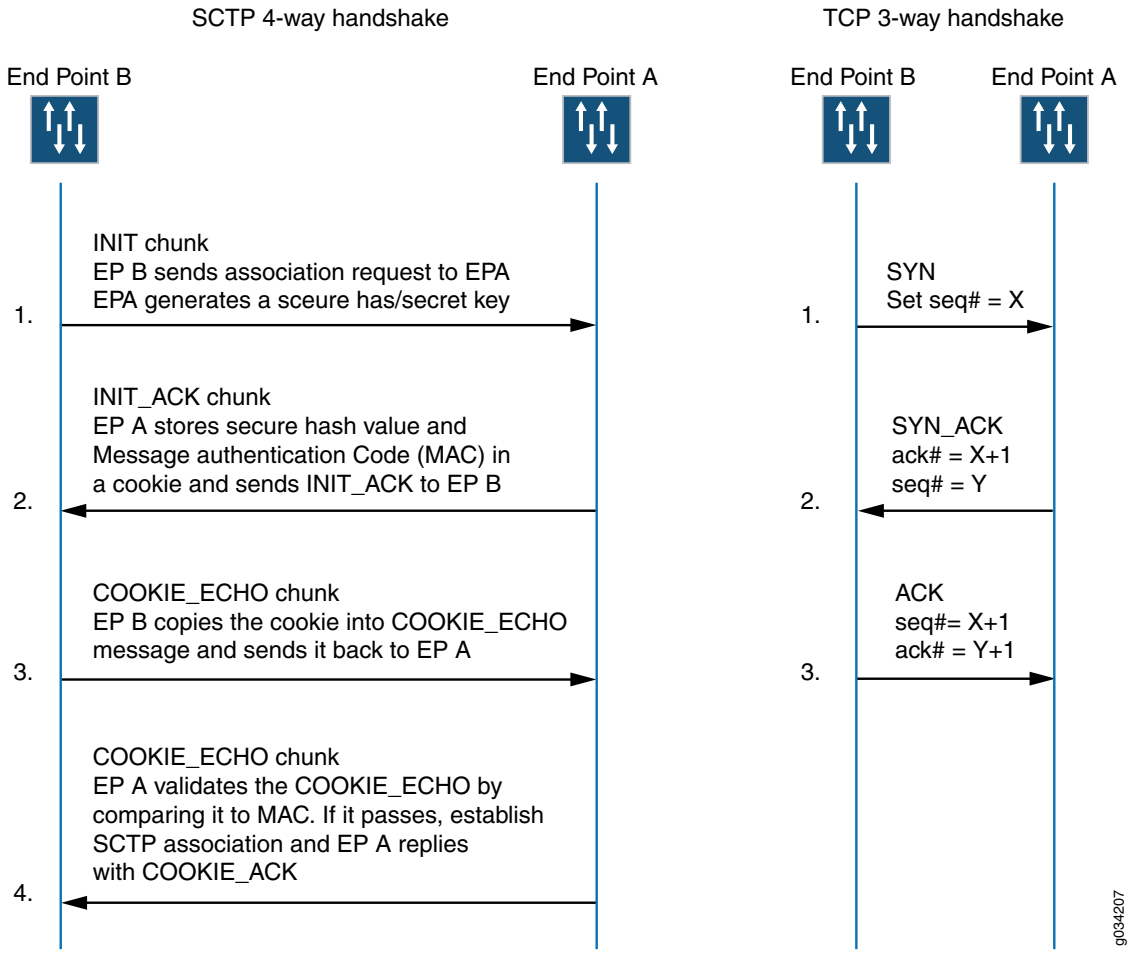
Starting in Junos OS Release 12.3X48-D10 and Junos OS Release 17.3R1, the SCTP module inspects IPv4 and IPv6 traffic and checks all segments of the SCTP packet. (In previous releases the module inspected

only IPv4 traffic and checked only the first segment of the SCTP packet.) The packet is then permitted or dropped based on the policy. For IPv6 traffic, the SCTP module inspects every extension header until it finds the SCTP header, and then only the SCTP header is processed and all the other headers are ignored.

SCTP is used for applications where monitoring and detection of loss of session is required. The SCTP path or session failure detection mechanism, for example, the heartbeat, monitors the connectivity of the session.

Figure 14 on page 140 illustrates the SCTP 4-way handshake and TCP 3-way handshake.

Figure 14: SCTP 4-way Handshake and TCP 3-way Handshake



SCTP Services

SCTP provides the following services:

- Aggregate Server Access Protocol (ASAP)
- Bearer-independent Call Control (BICC)

- Direct Data Placement Segment chunk (DDP-segment)
- Direct Data Placement Stream session control (DDP-stream)
- Diameter in a DTLS/SCTP DATA chunk (Diameter-DTLS)
- Diameter in a SCTP DATA chunk (Diameter-SCTP)
- DPNSS/DASS 2 extensions to IUA Protocol (DUA)
- Endpoint Handlescape Redundancy Protocol (ENRP)
- H.248 Protocol (H248)
- H.323 Protocol (H323)
- ISDN User Adaptation Layer (IUA)
- MTP2 User Peer-to-Peer Adaptation Layer (M2PA)
- MTP2 User Adaptation Layer (M2UA)
- MTP3 User Adaptation Layer (M3UA)
- Other unspecified-configured SCTP payload protocols (Others)
- Q.IPC
- Reserved
- S1 Application Protocol (S1AP)
- Simple Middlebox Configuration (SIMCO)
- SCCP User Adaptation Layer (SUA)
- Transport Adapter Layer Interface (TALI)
- V5.2 User Adaptation Layer (V5UA)
- X2 Application Protocol (X2AP)

SCTP Limitations and Constraints

SCTP has the following limitations and constraints:

- IP Addresses
  - A maximum of eight source IP addresses and eight destination IP addresses are allowed in an SCTP communication.
  - Only static IP NAT is supported; the interface packets (from one side: client or server) coming in must belong to the same zone.
- Policies

- Dynamic policy is not supported. You must configure all policies for SCTP sessions.
- When policies are deleted, the related sessions and associations are cleared.
- You configure one policy to permit SCTP traffic from all client IPs to all server IPs, and another policy to permit SCTP traffic from server IPs to client IPs. If one policy has an SCTP profile, then the same SCTP profile is needed for the reverse policy.
- If you configure different policies for each session belonging to one association, there will be multiple policies related to one association, and the SCTP packet management (drop, rate-limit, and so on) uses the profile attached to the handling SCTP session's policy.
- The applications used in the security policies to permit the SCTP ALG traffic cannot be configured using the **application-protocol ignore** option. This condition is applicable even if the SCTP ALG inspection is not configured.

- SCTP enable/disable is controlled by whether there is a SCTP profile configured.
  - If no profile is attached to a policy, SCTP packets are forwarded without inspection.
  - If a profile with the **nat-only** option is attached to a policy, then only NAT translation is done on the SCTP packets matching the policy. If a profile does not have the **nat-only** option set, then both NAT translation and SCTP inspection are done on each SCTP packet matching the policy.
  - If you disable SCTP, all associations are deleted, and subsequent SCTP packets are passed or dropped according to the policy.
  - If you enable SCTP, all existing SCTP sessions must be cleared or the traffic matching old sessions will be forwarded without any inspection from the SCTP module.

    If you want to enable SCTP again, all the running SCTP communications will be dropped, because no associations exist. New SCTP communications can establish an association and perform the inspections.

    > **NOTE:** Clear old SCTP sessions when SCTP is reenabled; doing this will avoid any impact caused by the old SCTP sessions on the new SCTP communications.

  - If you add an SCTP profile to an existing policy, you must do one of the following: clear related sessions or remove the old policy and create a new policy.
  - If you change the timeout value in the SCTP profile, the configured handshake and the timeout value in existing associations will not change.
- SCTP Rate Limiting
  - Any change in the rate-limiting configuration will not affect the subsequent traffic of existing associations. It will apply to the newly established associations.
  - The supported protocol decimal value is from 0 to 63. This value includes 48 IANA assigned protocols and 16 unassigned protocols.

  - A maximum of 80 addresses are rate limited in one profile.
  - A maximum of 10 protocols are rate limited for one address in one profile.
  - The supported rate limit value is from 1 to 12000.
- SCTP Payload Protocol Blocking
  - Any change in the protocol-blocking configuration immediately impacts the subsequent traffic of existing associations.
  - The supported protocol decimal value is from 0 to 63. This value includes 48 IANA assigned protocols and 16 unassigned protocols.
- An SCTP endpoint can be a multihomed host with either all IPv4 addresses or all IPv6 addresses. An SCTP endpoint also supports NAT-PT in two directions, from an IPv4 address format to an IPv6 address format, and vice versa. SCTP module does not support IPv4 or IPv6 mixed-up multihoming and IPv4 or IPv6 mixed-up NAT-PT.
- For static NAT to work, the interfaces packets (from one side: client or server side) coming in must belong to the same zone.
- For multihome cases, only IPv4 address parameter or IPv6 address parameter in INIT or INI-ACK is supported.
- Only static NAT is supported for SCTP.
- Only established SCTP associations are synchronized to peer sessions.
- SCTP sessions are not deleted with associations; they time out in 30 minutes, which is the default value. The timeout value is configurable and can be changed.
- If the 4-way handshake process is not handled on one node, and is handled instead on two nodes (for example, two sessions on two nodes in active/active mode) or if the cluster is in failover before the 4-way handshake is completed, the association will not be established successfully.
- One SPU supports a maximum of 20,000 associations and a maximum of 1,280,000 SCTP sessions.

  In some cases, the associations might not be distributed to SPUs very evenly because the ports' hash result on the central point is uneven. For example, this event can occur when only two peers of ports are used, and one peer has 100 associations, but another peer has only one association. In this case, the associations cannot be distributed evenly on the firewall with more than one SPU.
- Unified in-service software upgrade (ISSU) to earlier Junos OS releases is not supported.
- The M3UA/SCCP message parsing is checked , but the M3UA/SCCP stateful inspection is not checked.
- Only ITU-T Rec. Q.711-Q.714 (07/96) standard is supported. ANSI, ETSI, China, and other standards are not supported.
- Only RFC 4960 is supported.
- VPN session affinity does not support GPRS tunneling protocol (GTP) and Stream Control Transmission Protocol (SCTP).

SCTP Features Overview

The following are the important features of SCTP:

- Multihoming support where one or both endpoints of a connection can consist of more than one IP address. This enables transparent failover between redundant network paths.
- Delivery of data in chunks within an independent stream eliminates unnecessary head-of-line blocking.
- Path selection and monitoring functionality to select a primary data transmission path and test the connectivity of the transmission path.
- Validation and acknowledgment mechanisms protect against flooding attacks and provide notification of duplicated or missing data chunks.
- Improved error detection suitable for jumbo Ethernet frames.

Understanding Central Point Architecture Support for SCTP

A Stream Control Transmission Protocol (SCTP) association is a connection between two SCTP endpoints. Each SCTP endpoint identifies the association with a tag. During an SCTP association setup, two SCTP endpoints exchange their own tags for receiving packets. During the exchange of packets between two SCTP endpoints, both the source address and the destination address can change in the association life cycle.

Prior to Junos OS Release 15.1X49-D40, all sessions of a given SCTP association are hashed to the same Services Processing Unit (SPU) by the fixed per-association SCTP port pair. However, in some cases, multiple SCTP associations share the same port pair, resulting in a bad load-balancing situation with all traffic being handled by a single SPU. Starting in Junos OS Release 15.1X49-D40 and Junos OS Release 17.3R1, to handle the load-balancing issue, tag-based hash distribution is used to ensure even distribution of SCTP traffic from different associations among all SPUs. A 32-bit connection tag is introduced that uniquely identifies the SCTP sessions. The connection tag for SCTP is the vTag and the connection ID remains 0 if the connection tag is not used by the sessions.

The SCTP flow session utilizes a connection tag to more finely distribute SCTP traffic across SPUs on SRX1500, SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices that support the SCTP ALG. The connection tag is decoded from the SCTP vtag. A separate SCTP session will be created for each of the first three packets—that is, one session for INIT, INIT-ACK, and COOKIE-ECHO, respectively. Because, the reverse-direction traffic has its own session, the session can no longer match the existing forward-direction session and pass through automatically. Therefore, similar to the forward-direction policy, an explicit policy is needed for approving the reverse-direction SCTP traffic. In this scenario, the SCTP flow session requires a bidirectional policy configuration to be established for even a basic connection.

SEE ALSO

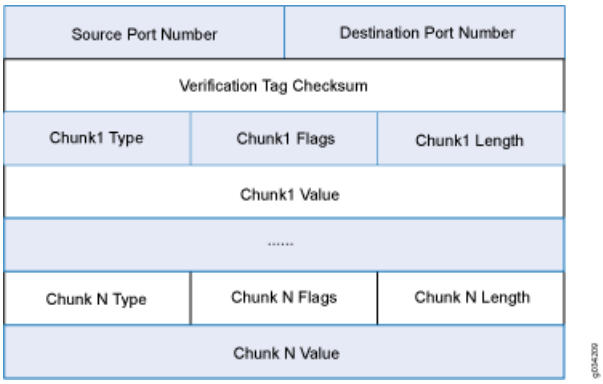
SCTP Packet Structure Overview

An SCTP packet consists of the following sections:

- Common Header Section on page 145
- Data Chunk Section on page 146

Figure 15 on page 145 illustrates the structure of the SCTP packet.

Figure 15: SCTP Packet Structure



Common Header Section

All SCTP packets require a common header section. This section occupies the first 12 bytes of the packet. Table 19 on page 145 describes the fields in the common header section:

Table 19: Common Header Fields

Field	Description
Source port number	Identifies the sending port.
Destination port number	Identifies the receiving port. The hosts use the destination port number to route the packet to the appropriate destination or an application.
Verification tag	Distinguishes stale packets from a previous connection. This is a 32-bit random value created during initialization.
Checksum	Uses the cyclic redundancy check (CRC32) algorithm to detect errors that might have been introduced during data transmission.

Data Chunk Section

Data chunk section—This section occupies the remaining portion of the packet. Table 20 on page 146 describes the fields in the data chunk section:

Table 20: Data Chunk Fields

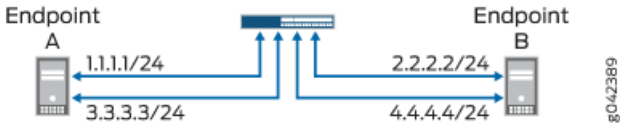
Field	Description
Chunk Type	Identifies the contents of the chunk value field. This is 1- byte long.
Chunk Flags	Consists of 8 flag-bits whose definition varies with the chunk type. The default value is zero. This indicates that no application identifier is specified by the upper layer for the data.
Chunk Length	Specifies the total length of the chunk in bytes. This field is 2 - bytes long. If the chunk does not form a multiple of 4 bytes (that is, the length is not a multiple of 4) it is implicitly padded with zeros which are not included in the chunk length.
Chunk Value	A general purpose data field.

The resource manager (RM) allows 8 source IP addresses and 8 destination IP addresses during an SCTP communication.

Understanding SCTP Multihoming

A Stream Control Transmission Protocol (SCTP) endpoint can be a multihomed host with either all IPv4 addresses or all IPv6 addresses. In Figure 16 on page 146, endpoint A is connected to an SRX Series device with two IPv4 addresses, and endpoint B is connected to an SRX Series device with two IPv4 addresses. Therefore, endpoint A and endpoint B can set up an association using four different pairs of IP addresses, resulting in four valid paths for communication.

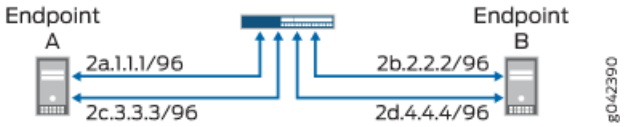
Figure 16: SCTP Multihoming with Two IPv4 Endpoints



In Figure 17 on page 147, endpoint A is connected to an SRX Series device with two IPv6 addresses, and endpoint B is connected to an SRX Series device with two IPv6 addresses. Therefore, endpoint A and

endpoint B can set up an association using four different pairs of IP addresses, resulting in four valid paths for communication.

Figure 17: SCTP Multihoming with Two IPv6 Endpoints



Understanding SCTP Multichunk Inspection

The Stream Control Transmission Protocol (SCTP) firewall checks all chunks in a message and then permits or drops the packet based on the policy. Use the **set security gprs sctp multichunk-inspection enable** command to enable SCTP multichunk inspection to check all chunks in a message. Use the **delete security gprs sctp multichunk-inspection enable** or **set security gprs sctp multichunk-inspection disable** command to disable SCTP multichunk inspection to check only the first chunk.

After enabling SCTP multichunk inspection, the SCTP firewall checks all chunks in a message and permits or drops the packet. The SCTP firewall drops the packet in the following cases:

- The layout of the SCTP chunks do not follow RFC 4960.
- A control chunk cannot pass the inspection of the SCTP finite state machine (FSM) or sanity checks.
- A data chunk is not allowed to pass the SCTP profile because of the SCTP FSM or sanity checks.
- A data chunk is not allowed to pass through the SCTP profile because of protocol blocking or rate limiting. The SCTP firewall resets this chunk to a null protocol data unit (PDU) and continues to check the next chunk. A data chunk is set to a null PDU based on the following rules:
  - When you set the null PDU value to **0xFFFF** using the **set security gprs sctp nullpdu protocol ID-0xFFFF** command, then the payload protocol identifier value is replaced with **0xFFFF** and the user data field is not modified.
  - When you set the null PDU value to **0x0000** using the **set security gprs sctp nullpdu protocol ID-0x0000** command, then the payload protocol identifier value is replaced with **0x0000** and the first four bytes of the user data field is replaced with zeroes.

  If all chunks in a packet are null PDUs, the SCTP firewall drops the packet.

Understanding SCTP Behavior in Chassis Cluster

In a chassis cluster configuration mode, the SCTP configuration and the established SCTP association is synced with the peer device. The SCTP module supports both active-active and active-passive modes.

The established SCTP association sends a creation or deletion message to the peer whenever an association is created or deleted on the active device. The secondary device adds or deletes an association respectively upon receiving the message from the established SCTP association. SCTP module then registers the corresponding callback function to receive and handle this message. There is no continuous timer sync between the two associations.

SCTP module will register a cold start sync function when a secondary device joins the cluster or reboots. The SCTP cold start function is called to sync all SCTP associations with the peer devices at the same time.

After the switchover, the established SCTP associations will remain functioning, but the associations in the progress of establishment will be lost and the establishment procedure needs to be re-initiated. It is also possible that the associations in the progress of teardown miss the ack message and leaves unestablished SCTP associations in the firewall. These associations will be cleaned up when the timer expires (5 hours by default) due to no activity in the association.

- You should configure all policies for your required SCTP sessions.
  For example, suppose you have endpoints A and B. Endpoint A has one SCTP association with x number of IPs (IP_a1, IP_a2, IP_a3...IP_ax). Endpoint B has one SCTP association with y number of IPs (IP_b1, IP_b2, IP_b3...IP_by.) The policy on the security device should permit all possible x*y paths in both directions.
- When an SCTP association is removed, the related SCTP sessions still exist and time out by themselves.

Release History Table

Release	Description
15.1X49-D40	Starting in Junos OS Release 15.1X49-D40 and Junos OS Release 17.3R1, to handle the load-balancing issue, tag-based hash distribution is used to ensure even distribution of SCTP traffic from different associations among all SPUs.
12.3X48-D10	Starting in Junos OS Release 12.3X48-D10 and Junos OS Release 17.3R1, the SCTP module inspects IPv4 and IPv6 traffic and checks all segments of the SCTP packet.

RELATED DOCUMENTATION

Chassis Cluster Overview

SCTP Configuration

IN THIS SECTION

Stream Control Transmission Protocol (SCTP) can be configured to perform stateful inspection on all SCTP traffic.

SCTP Configuration Overview

You must configure at least one SCTP profile to enable the security device to perform stateful inspection on all SCTP traffic. The stateful inspection of SCTP traffic will drop some anomalous SCTP packets.

The SCTP firewall supports deeper inspection of the profiles:

- Packet filtering—The profile configuration of drop packets for special SCTP payload protocol and M3UA service enables packet filtering.
- Limit-rate—Controls the M3UA and SCCP packets rate per association.

The SCTP deeper inspection requires the following settings:

- Creating a SCTP profile
- Configuring the filtering and limit parameters
- Binding the SCTP profile to a policy

Example: Configuring a Security Policy to Permit or Deny SCTP Traffic

IN THIS SECTION

This example shows how to configure a security policy to permit or deny SCTP traffic.

Requirements

Before you begin:

- Create zones. See *Example: Creating Security Zones*.
- Configure an address book and create addresses for use in 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*.
- Configure a GPRS SCTP profile. See "Example: Configuring a GPRS SCTP Profile for Policy-Based Inspection to Reduce Security Risks" on page 154.

Overview

The SCTP firewall implements a policy mechanism that is administratively used to determine the packets that can be passed or dropped. Policies can be configured for multiple addresses, address groups, or the entire zone.

In situations where only a few ports are used for SCTP traffic, the SCTP associations are not evenly distributed to Services Processing Units (SPUs). This occurs in the following cases:

- Uneven hash results on the association ports pairs.
- The number of port pairs is less than, or not much greater than, the number of SPUs.

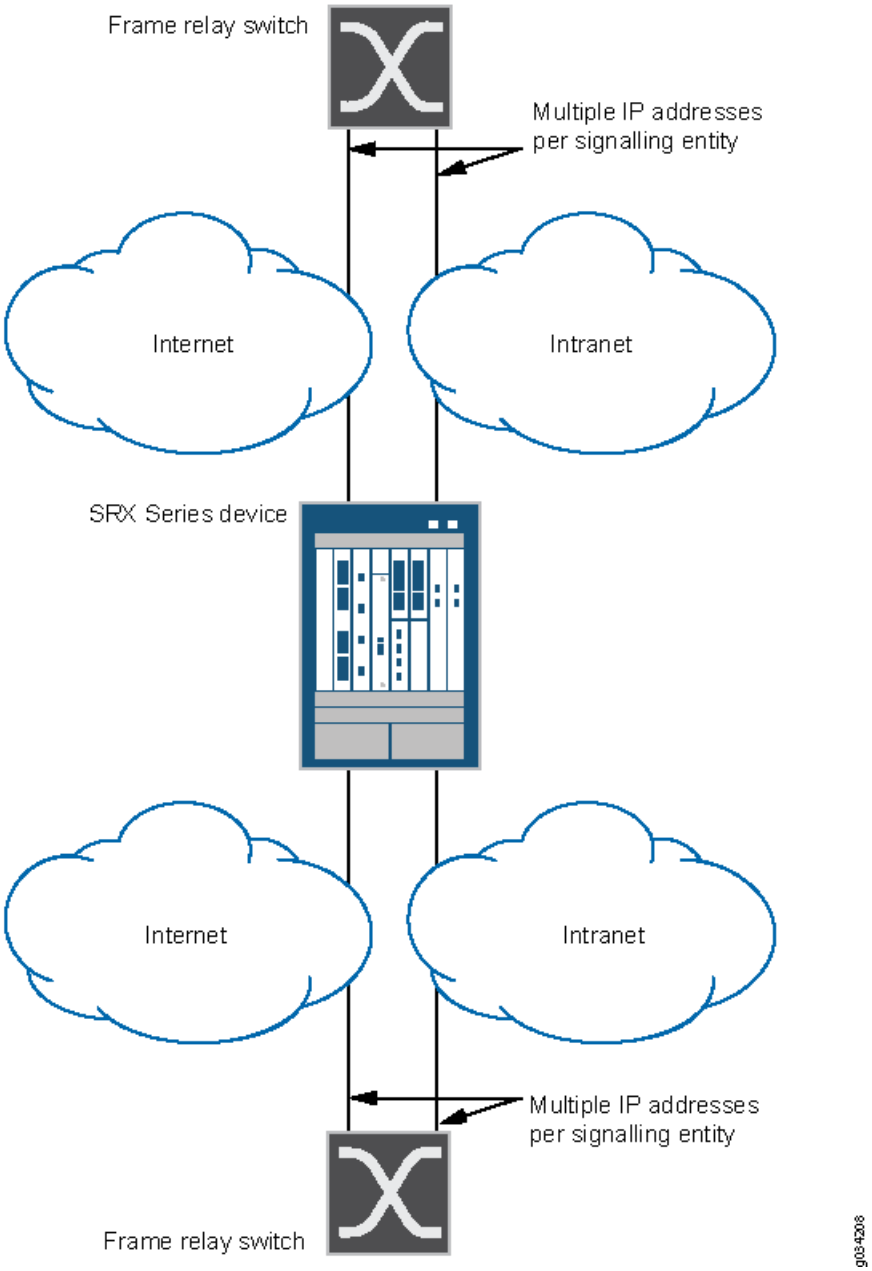
This configuration example shows how to:

- Deny SCTP traffic from the trust zone to the IP address 10.1.1.0/24 in the untrust zone.

- Permit SCTP traffic from an IP address 10.1.2.0/24 in the trust zone to the untrust zone with the SCTP configuration specified in the roam2att profile.

Figure 18 on page 151 shows the SCTP firewall implementation.

Figure 18: SCTP Firewall Implementation



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 trust interfaces ge-0/0/2
set security zones security-zone untrust interfaces ge-0/0/1
set security policies from-zone trust to-zone untrust policy deny-all match source-address any
set security policies policy from-zone trust to-zone untrust policy deny-all match destination-address 10.1.1.0/24
set security policies policy from-zone trust to-zone untrust policy deny-all match application junos-gprs-sctp
set security policies from-zone trust to-zone untrust policy deny-all then deny
set security policies from-zone trust to-zone untrust policy allow-att-roaming match source-address 10.1.2.0/24
set security policies from-zone trust to-zone untrust policy allow-att-roaming match destination-address any
set security policies policy from-zone trust to-zone untrust policy allow-att-roaming match application
   junos-gprs-sctp
set security policies from-zone trust to-zone untrust policy allow-att-roaming then permit application-services
   gprs-sctp-profile roam2att
```

Step-by-Step Procedure

To configure a security policy to permit or deny SCTP traffic:

1. Configure the interfaces and security zones.

```
[edit security zones]
user@host# set security-zone trust interfaces ge-0/0/2
user@host# set security-zone untrust interfaces ge-0/0/1
```

2. Create the security policy to permit traffic from the trust zone to the untrust zone.

```
[edit security policies from-zone trust to-zone untrust]
user@host# set policy allow-att-roaming match source-address 10.1.2.0/24
user@host# set policy allow-att-roaming match destination-address any
user@host# set policy allow-att-roaming match application junos-gprs-sctp
user@host# set policy allow-att-roaming then permit application-services gprs-sctp-profile roam2att
```

3. Create the security policy to deny traffic from the trust zone to the untrust zone.

```
[edit security policies from-zone trust to-zone untrust]
user@host# set policy deny-all match source-address any
user@host# set policy deny-all match destination-address 10.1.1.0/24
user@host# set policy deny-all match application junos-gprs-sctp
user@host# set policy deny-all then deny
```

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 instructions in this example to correct the configuration.

```
[edit]
user@host# show security policies
from-zone trust to-zone untrust {
    policy deny-all {
        match {
            source-address any;
            destination-address 10.1.1.0/24;
            application junos-gprs-sctp;
        }
        then {
            deny;
        }
    }
    policy allow-att-roaming {
        match {
            source-address 10.1.2.0/24;
            destination-address any;
            application junos-gprs-sctp;
        }
        then {
            permit {
                application-services {
                    gprs-sctp-profile roam2att;
                }
            }
        }
    }
}
```

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

Verification

Confirm that the configuration is working properly.

Verifying SCTP Configuration

Purpose

Verify the policy inspection configuration.

Action

From operational mode, enter **show configuration |display set |match profile**

Example: Configuring a GPRS SCTP Profile for Policy-Based Inspection to Reduce Security Risks

IN THIS SECTION

In the GPRS architecture, the fundamental cause of security threats to an operator's network is the inherent lack of security in the GPRS tunneling protocol (GTP). This example shows how to configure a GPRS SCTP profile for policy-based inspection to reduce the GTP's security risks.

Requirements

Before you begin, understand the GPRS SCTP hierarchy and its options.

Overview

In this example, you configure a GPRS SCTP profile by setting the limit rate parameter and the payload protocol parameter for SCTP inspection. If your policy includes the **nat-only** option, the payload IP addresses are translated, but they are not inspected.

The SCTP commands can be applied only to the policy configured with an SCTP profile.

If you remove the SCTP profile from the policy, the packets are forwarded without any inspection, and the IP address list in the packet payload will not be translated, even if the related static NAT is configured.

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 gprs sctp profile roam2att limit rate address 10.1.1.0 sccp 100
set security gprs sctp profile roam2att limit rate address 10.1.1.0 ssp 10
set security gprs sctp profile roam2att limit rate address 10.1.1.0 sst 50
set security gprs sctp profile roam2att drop payload-protocol all
set security gprs sctp profile roam2att permit payload-protocol dua
```

Step-by-Step Procedure

To configure a GPRS SCTP profile:

1. Configure the limit rate parameter.

   The limit rate is per association.

   ```
   [edit security gprs sctp profile roam2att]
   user@host# set limit rate address 10.1.1.0 sccp 100
   user@host# set limit rate address 10.1.1.0 ssp 10
   user@host# set limit rate address 10.1.1.0 sst 50
   ```

2. Configure the payload protocol to drop all SCTP payload messages.

   ```
   [edit security gprs sctp profile roam2att]
   user@host# set drop payload-protocol all
   ```

3. Configure the payload protocol to allow certain SCTP payload messages.

   ```
   [edit security gprs sctp profile roam2att]
   user@host# set permit payload-protocol dua
   ```

Results

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

```
[edit]
user@host# show security gprs
sctp {
```

```
    profile roam2att {
      drop {
        payload-protocol all;
      }
      permit {
        payload-protocol dua;
      }
      limit {
        rate {
          address 10.1.1.0 {
            sccp 100;
            ssp 10;
            sst 50;
          }
        }
      }
    }
  }
```

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

Verification

Confirm that the configuration is working properly.

Verifying SCTP Profile Configuration

Purpose

Verify the SCTP profile configuration.

Action

From configuration mode, enter the **show configuration security gprs sctp profile roam2att** command.

```
user@host> show configuration security gprs sctp profile roam2att
drop {
    payload-protocol all;
}
permit {
    payload-protocol dua;
}
limit {
    rate {
        address 10.1.1.0 {
```

```
            sccp 100;
            ssp 10;
            sst 50;
        }
    }
}
```

Meaning

The output displays information about the SCTP payload messages allowed and SCTP payload messages that are dropped. Verify the following information:

- Dropped SCTP payload messages
- Allowed SCTP payload messages

1

PART

Configuration Statements and Operational Commands

CHAPTER 4

Configuration Statements

IN THIS CHAPTER

action (APN GTP)

Syntax

```
action {
    drop;
    pass;
    selection (ms|net|vrf);
}
```

Hierarchy Level

[edit security gprs gtp profile *profile-name* apn *pattern-string* imsi-prefix*imsi-prefix*]

Release Information

Statement introduced in Junos OS Release 10.0.

Description

Use the GPRS tunneling protocol (GTP) profile access point name (APN) action (pass |drop |selection) to filter packets that helps you to allow or deny access to specific access points.

Options

- **drop**—Use drop to specify to deny GTP packets from all selection modes for the specified access points.
- **pass**—Use pass to specify to permit GTP packets from all selection modes for the access points.
- **selection**—Use selection to specify one of the following selection modes for the access points:
  - **ms**—The access point name is provided by a mobile station, and the user-subscription is not verified.
  - **net**—The access point name is provided by a network, and the user subscription is not verified.
  - **vrf**— The access point name is provided by a network or an MS, and the user-subscription is verified.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding GTP APN Filtering | 80

Understanding GTPv2 IMSI Prefix and APN Filtering | 84

Example: Setting a GTP APN and a Selection Mode | 81

alarm-threshold (Security GPRS)

Syntax

```
alarm-threshold {
    forward number;
    reverse number;
}
```

Hierarchy Level

```
[edit security gprs gtp profile profile-name path-rate-limit message-type (create-req | delete-req | echo-req | other)]
```

Release Information

Statement introduced in Junos OS Release 12.1X45-D10.

Description

Use the alarm-threshold parameter to configure the device to raise an alarm, when the GPRS tunneling protocol (GTP) control messages on a path have reached the configured limit.

Options

number—To limit messages in forward or reverse direction.

Range: For create request, delete request and other GTP control messages, the applicable range is 1 through 10,000 packets per second. For echo request, the applicable range is 1 through 10,000 packets per minute.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Example: Limiting the Message Rate and Path Rate for GTP Control Messages | 53

apn

Syntax

```
apn pattern-string {
   imsi-prefix imsi-prefix-digits {
      action (APN GTP) {
         drop;
         pass;
         selection (ms|net|vrf);
      }
   }
}
```

Hierarchy Level

```
[edit security gprs gtp profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 10.0. Support for GTPv2 added in Junos OS Release 11.4. Option mcc-mnc replaced with imsi-prefix in Junos OS Release 12.1X44-D10.

Description

Use the APN function to allow or deny access to specific access point names (APNs). By default, the device permits all APNs. To enable APN filtering, you must specify one or more APNs. To specify an APN, you need to know the domain name of the network (for example, example.com) and, the operator ID. Because the domain name (network ID) portion of an APN can potentially be very long and contain many characters, you can use the wildcard (*) as the first character of the APN string.

Options

- *pattern-string*—To specify APN pattern string, such as “example.net.mcc123.mnc456.gprs”.
- *imsi-prefix-digits*—To specify an IMSI prefix.

  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 GTP APN Filtering | 80

application-services (Security Forwarding Process)

Syntax

```
application-services {
    enable-gtpu-distribution;
    maximize-alg-sessions;
    maximize-idp-sessions {
        weight (firewall | idp);
    }
    packet-ordering-mode (Application Services) {
        (hardware | software);
    }
}
```

Hierarchy Level

```
[edit security forwarding-process]
```

Release Information

Statement introduced in Junos OS Release 9.6. Statement updated in Junos OS Release 10.4. Statement updated in Junos OS Release 15.1X49-D40 with the **enable-gtpu-distribution** option.

Description

You can configure SRX4100, SRX4200, SRX5400, SRX5600, and SRX5800 devices to switch from an integrated firewall mode to maximize Intrusion Detection and Prevention (IDP) mode to run IDP processing in tap mode and increase the capacity of processing with the **maximize-idp-sessions** option. Inline tap mode can only be configured if the forwarding process mode is set to **maximize-idp-sessions**, which ensures stability and resiliency for firewall services. You also do not need a separate tap or span port to use inline tap mode. When you maximize IDP, you are decoupling IDP processes from firewall processes, allowing the device to support the same number of firewall and IDP sessions, also run the IDP processing in tap mode.

You can configure maximum Application Layer Gateway (ALG) sessions by using the **maximize-alg-sessions** option. The session capacity number for Real-Time Streaming Protocol (RTSP), FTP, and Trivial File Transfer Protocol (TFTP) ALG varies per flow SPU. For SRX5000 series devices the session capacity is 10,240 per flow SPU. You must reboot the device (and its peer in chassis cluster mode) for the configuration to take effect. The **maximize-alg-sessions** option now enables you to increase defaults as follows:

- TCP proxy connection capacity: 40,000 per flow SPU

  Flow session capacity is reduced to half per flow SPU; therefore the aforementioned capacity numbers will not change on central point flow.

Enable GPRS tunneling protocol. GTP-U session distribution is a UE (User equipment) based distribution, generating tunnel based GTP-U session and distributing them across SPUs on a UE basis.

Before 15.1X49-D40, GTP-U sessions are distributed by GGSN IP address always.

15.1X49-D40 onward, the GTP-U distribution is disabled and fat GTP-U sessions are distributed as normal UDP.

Use the **enable-gtpu-distribution** command to enable GTP-U session distribution.

Options

The remaining statements are explained separately. See the CLI Explorer.

Required Privilege Level

security—To view this in the configuration.
security-control—To add this to the configuration.

RELATED DOCUMENTATION

- *Understanding Traffic Processing on Security Devices*

association-timeout

Syntax

```
association-timeout time-in-minutes;
```

Hierarchy Level

```
[edit security gprs sctp profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 10.2. The association timeout range increased in Junos OS Release 12.1X45-D10.

Description

Use the association-timeout parameter to set the association timeout for Stream Control Transmission Protocol (SCTP).

Options

time-in-minutes— Number of minutes of association time that elapse before the session is terminated.

Range: 10 through 6000 (100 hours).

Default: 300 minutes (5 hours).

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Stream Control Transmission Protocol | 139

Understanding SCTP Behavior in Chassis Cluster | 148

create-req

Syntax

```
create-req {
    alarm-threshold (Security GPRS) {
        forward number;
        reverse number;
    }
    drop-threshold (Security GPRS) {
        forward number;
        reverse number;
    }
}
```

Hierarchy Level

[edit security gprs gtp profile *profile-name* path-rate-limit message-type]

Release Information

Statement introduced in Junos OS Release 12.1X45-D10.

Description

Configure the create-req parameter to limit or restrict the number of packets per second for the GPRS tunneling protocol (GTP) create request.

Options

alarm-threshold—To set alarm threshold for path rate limiting.

drop-threshold—To set drop threshold for path rate limiting.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Path Rate Limiting for GTP Control Messages | 53

Example: Limiting the Message Rate and Path Rate for GTP Control Messages | 53

delete-req

Syntax

```
delete-req {
    alarm-threshold (Security GPRS) {
        forward number;
        reverse number;
    }
    drop-threshold (Security GPRS) {
        forward number;
        reverse number;
    }
}
```

Hierarchy Level

[edit security gprs gtp profile *profile-name* path-rate-limit message-type]

Release Information

Statement introduced in Junos OS Release 12.1X45-D10.

Description

Configure the delete-req parameter to limit the number of packets per second for the GPRS tunneling protocol (GTP) delete request.

Options

alarm-threshold—To set alarm threshold for path rate limiting.

drop-threshold—To set drop threshold for path rate limiting.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Path Rate Limiting for GTP Control Messages | 53

Example: Limiting the Message Rate and Path Rate for GTP Control Messages | 53

drop (Security GTP)

Syntax

```
drop {
    aa-create-pdp 0;
    aa-delete-pdp 0;
    bearer-resource 2;
    change-notification 2;
    config-transfer 2;
    context 2;
    create-bearer 2;
    create-data-forwarding 2;
    create-pdp (0 | 1 | all);
    create-session 2;
    create-tnl-forwarding 2;
    cs-paging 2;
    data-record (0 | 1 | all);
    delete-bearer 2;
    delete-command 2;
    delete-data-forwarding 2;
    delete-pdn 2;
    delete-pdp (0 | 1 | all);
    delete-session 2;
    detach 2;
    downlink-notification 2;
    echo (0 | 1 | 2 | all);
    error-indication (0 | 1 | all);
    failure-report (0 | 1 | all);
    fwd-access 2;
    fwd-relocation (1 | 2 | all);
    fwd-srns-context 1;
    g-pdu (0 | 1 | all);
    identification (0 | 1 | 2 | all);
    mbms-session-start (1 | 2 | all);
    mbms-session-stop (1 | 2 | all);
    mbms-session-update (1 | 2 | all);
    modify-bearer 2;
    modify-command 2;
    node-alive (0 | 1 | all);
    note-ms-present (0 | 1 | all);
    pdu-notification (0 | 1 | all);
    ran-info (1 | 2 | all);
    redirection (0 | 1 | all);
    release-access 2;
```

```
    relocation-cancel (1 | 2 | all);
    resume 2;
    send-route (0 | 1 | all);
    sgsn-context (0 | 1 | all);
    stop-paging 2;
    supported-extension 1;
    suspend 2;
    trace-session 2;
    update-bearer 2;
    update-pdn 2;
    update-pdp (0 | 1 | all);
    ver-not-supported (0 | 1 | 2 | all);
}
```

Hierarchy Level

[edit security gprs gtp profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 10.0. New GTP message types added in Junos OS Release 11.4. Support for GTPv2 added in Junos OS Release 11.4

Description

Use the parameters *(0 | 1 | 2 | all)* for the GTP release version number for a specific message type. The possible versions are 0, 1, 2, or all. You can configure the device to drop packets that do not meet your specified minimum or maximum message lengths. A GTP message type includes one or many messages. When you drop a message type, you automatically drop all messages of the specified type.

Options

- **aa-create-pdp** —Represents Create AA PDP Context Request and Create AA PDP Context Response messages.
- **aa-delete-pdp** —Represents Delete AA PDP Context Request and Delete AA PDP Context Response messages.
- **bearer-resource**—Represents Bearer Resource Command and Bearer Resource Failure messages.

- **change-notification**—Represents Change Notification Request and Change Notification Response messages.
- **context**—Represents Context Request and Context Response messages.
- **config-transfer**—Represents Configuration Transfer Tunnel messages.
- **create-bearer**—Represents Create Bearer Request and Create Bearer Response messages.
- **create-data-forwarding**—Represents Create Indirect Data Forwarding Request and Create Indirect Data Forwarding Response messages.
- **create-tnl-forwarding**—Represents Create Forwarding Tunnel Request and Create Forwarding Tunnel Response messages.
- **create-pdp**—Represents Create PDP Context Request and Create PDP Context Response messages.
- **create-session**—Represents Create Session Request and Create Session Response messages.
- **cs-paging**—Represents CS Paging Indication messages.
- **data-record**—Represents Data Record Request and Data Record Response messages.
- **delete-bearer**—Represents Delete Bearer Request and Delete Bearer Response messages.
- **delete-command**—Represents Delete Bearer Command and Delete Bearer Failure messages.
- **delete-data-forwarding**—Represents Delete Indirect Data Forwarding Request and Delete Indirect Data Forwarding Response messages.
- **delete-pdn**—Represents Delete PDN Connection Set Request and Delete PDN Connection Set Response messages.
- **delete-pdp**—Represents Delete PDP Context Request and Delete PDP Context Response messages.
- **delete-session**—Represents Delete Session Request and Delete Session Response messages.
- **detach**—Represents Detach Notification and Detach Acknowledgement messages.
- **downlink-notification**—Represents Downlink Data Notification, Downlink Data Acknowledgement, and Downlink Data Notification Failure Indication messages.
- **echo**—Represents Echo Request and Echo Response messages.
- **error-indication**—Represents Error Indication messages.
- **failure-report**—Represents Failure Report Request and Failure Report Response messages.
- **fwd-access**—Represents Forward Access Context Notification and Forward Access Context Acknowledgment messages.
- **fwd-relocation**—Represents Forward Relocation Request, Forward Relocation Response, Forward Relocation Complete, and Forward Relocation Complete Acknowledge messages.
- **fwd-srns-context**—Represents Forward SRNS Context Request and Forward SRNS Context Response messages.

- **g-pdu**—Represents G-PDU and T-PDU messages.
- **identification**—Represents Identification Request and Identification Response messages.
- **mbms-sess-start**—Represents MBMS Session Start Request and MBMS Session Start Response messages.
- **mbms-sess-stop**—Represents MBMS Session Stop Request and MBMS Session Stop Response messages.
- **mbms-sess-update**—Represents MBMS Session Update Request and MBMS Session Update Response messages.
- **modify-bearer**—Represents Modify Bearer Request and Modify Bearer Response messages.
- **modify-command**—Represents Modify Bearer Command and Modify Bearer Failure messages.
- **node-alive**—Represents Node Alive Request and Node Alive Response messages.
- **note-ms-present**—Represents Note MS GPRS Present Request and Note MS GPRS Present Response messages.
- **pdu-notification**—Represents PDU Notification request and PDU Notification response messages.
- **ran-info**—Represents Ran Info Relay messages.
- **redirection**—Represents Redirection Request and Redirection Response messages.
- **relocation-cancel**—Represents Relocations Cancel Request and Relocation Cancel Response messages.
- **resume**—Represents Resume Notification and Resume Acknowledgement messages.
- **send-route**—Represents Send Route Info Request and Send Route Info Response messages.
- **sgsn-context**—Represents SGSN Context Request and SGSN Context Response messages.
- **stop-paging**—Represents Stop Paging Indication messages.
- **supported-extension**—Represents Supported Extension Headers Notification messages.
- **suspend**—Represents Suspend Notification and Suspend Acknowledgement messages.
- **trace-session**—Represents Trace Session Activation and Trace Session Deactivation messages.
- **update-bearer**—Represents Update Bearer Request and Update Bearer Response messages.
- **update-pdn**—Represents Update PDN Set Connection Request and PDN Set Connection Response messages.
- **update-pdp**—Represents Update PDP Request and Update PDP Response messages.
- **ver-not-supported**—Represents Version Not Supported messages.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding GTP Message Filtering | 46

Example: Filtering GTP Message Types | 51

Understanding GTP APN Filtering | 80

drop (Security SCTP)

Syntax

```
drop {
    m3ua-service {
        isup;
        sccp;
        tup;
    }
    payload-protocol {
        id;
        all;
        asap;
        bicc;
        ddp-segment;
        ddp-stream;
        diameter-dtls;
        diameter-sctp;
        dua;
        enrp;
        h248;
        h323;
        iua;
        m2pa;
        m2ua;
        m3ua;
        qipc;
        reserved;
        s1ap;
        simco;
        sua;
        tali;
        v5ua;
        x2ap;
    }
}
```

Hierarchy Level

[edit security gprs sctp profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 10.2. Support for the **payload-protocol** statement was modified n Junos OS Release 12.1X46-D10.

Description

Configure the drop SCTP message types to display information about the configuration of the current Stream Control Transmission Protocol (SCTP) inspection.

Options

- **m3ua-services**—M3UA data service indicator. The following values are supported:
  - **isup**—ISDN Upper Part.
  - **sccp**—Signaling Connection Control Part.
  - **tup**—Telephone User Part.
- **payload-protocol**—SCTP payload protocol identifier. The following values are supported:
  - **id**—Specify payload protocol ID.
  - **all**—All SCTP payload protocol identifiers (id:0~63).
  - **asap**—Aggregate Server Access Protocol.
  - **bicc**—Bearer Independent Call Control.
  - **ddp-segement**—Direct Data Placement Segment chunk.
  - **ddp-stream**—Direct Data Placement Stream session control.
  - **diameter-dtls**—Diameter in a DTLS/SCTP DATA chunk.
  - **diameter-sctp**—Diameter in a SCTP DATA chunk.
  - **dua**—DPNSS/DASS 2 extensions to IUA Protocol.
  - **enrp**—Endpoint Handlespace Redundancy Protocol.
  - **h248**—H.248 Protocol.
  - **h323**—H.323 Protocol.
  - **iua**—ISDN User Adaptation Layer.
  - **m2pa**—MTP2 User Peer-to-Peer Adaption Layer.
  - **m2ua**—MTP2 User Adaption Layer.
  - **m3ua**—MTP3 User Adaption Layer.
  - **qipc**—Q.IPC.
  - **reserved**—Reserved by SCTP.
  - **s1ap**—S1 Application Protocol (S1AP).
  - **simco**—Simple Middlebox Configuration.
  - **sua**—SCCP User Adaption Layer.
  - **tali**—Transport Adapter Layer Interface.
  - **v5ua**—v5.2 User Adaption Layer.
  - **x2ap**—X2 Application Protocol (X2AP).

Required Privilege Level

security—To view this statement in the configuration.

security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Stream Control Transmission Protocol | 139

Understanding SCTP Multichunk Inspection | 147

drop-threshold (Security GPRS)

Syntax

```
drop-threshold {
    forward number;
    reverse number;
}
```

Hierarchy Level

```
[edit security gprs gtp profile profile-name path-rate-limit message-type (create-req | delete-req | echo-req | other)]
```

Release Information

Statement introduced in Junos OS Release 12.1X45-D10.

Description

Configure the drop-threshold parameter to drop traffic when the number of packets per second or per minute exceeds the configured limit.

Options

number—Limit messages in forward or reverse direction.

Range: 1 through 10,000.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Example: Limiting the Message Rate and Path Rate for GTP Control Messages | 53

echo-req

Syntax

```
echo-req {
    alarm-threshold (Security GPRS) {
        forward number;
        reverse number;
    }
    drop-threshold (Security GPRS) {
        forward number;
        reverse number;
    }
}
```

Hierarchy Level

[edit security gprs gtp profile *profile-name* path-rate-limit message-type]

Release Information

Statement introduced in Junos OS Release 12.1X45-D10.

Description

Configure the echo-req parameter to limit the number of packets per minute for the GPRS tunneling protocol (GTP) echo request.

Options

alarm-threshold—To set alarm threshold for path rate limiting.

drop-threshold—To set drop threshold for path rate limiting.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Path Rate Limiting for GTP Control Messages | 53

Example: Limiting the Message Rate and Path Rate for GTP Control Messages | 53

enable-gtpu-distribution

Syntax

```
enable-gtpu-distribution;
```

Hierarchy Level

```
[edit security forwarding-process application-services]
```

Release Information
Statement introduced in Junos OS Release 15.1X49-D40.

Description
Enable GTP-C and GTP-U session distribution to distribute the GTP-C and GTP-U traffic handled by a gateway GPRS support node (GGSN) and a Serving GPRS Support Node (SGSN) pair on all Services Processing Units (SPUs) by using tunnel-based session distribution where the GTP-C or the GTP-U traffic of different tunnels is spread across different SPUs.

This option is not enabled by default and you need to enable the option to distribute GTP-U and GTP-C traffic on all SPUs.

Required Privilege Level
security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding GTP Support for Central Point Architecture | 21

gprs

Syntax

```
gprs {
  gtp {
    handover-default {
      deny;
    }
    ip-group name {
      address-book name {
        address-set set-name;
      }
    }
    profile (Security GTP) profile-name {
      apn pattern-string {
        imsi-prefix imsi-prefix-digits {
          action (APN GTP) {
            drop;
            pass;
            selection (ms|net|vrf);
          }
        }
      }
      drop (Security GTP) {
        aa-create-pdp 0;
        aa-delete-pdp 0;
        bearer-resource 2;
        change-notification 2;
        config-transfer 2;
        context 2;
        create-bearer 2;
        create-data-forwarding 2;
        create-pdp (0 | 1 | all);
        create-session 2;
        create-tnl-forwarding 2;
        cs-paging 2;
        data-record (0 | 1 | all);
        delete-bearer 2;
        delete-command 2;
        delete-data-forwarding 2;
        delete-pdn 2;
        delete-pdp (0 | 1 | all);
        delete-session 2;
        detach 2;
```

```
    downlink-notification 2;
    echo (0 | 1 | 2 | all);
    error-indication (0 | 1 | all);
    failure-report (0 | 1 | all);
    fwd-access 2;
    fwd-relocation (1 | 2 | all);
    fwd-srns-context 1;
    g-pdu (0 | 1 | all);
    identification (0 | 1 | 2 | all);
    mbms-session-start (1 | 2 | all);
    mbms-session-stop (1 | 2 | all);
    mbms-session-update (1 | 2 | all);
    modify-bearer 2;
    modify-command 2;
    node-alive (0 | 1 | all);
    note-ms-present (0 | 1 | all);
    pdu-notification (0 | 1 | all);
    ran-info (1 | 2 | all);
    redirection (0 | 1 | all);
    release-access 2;
    relocation-cancel (1 | 2 | all);
    resume 2;
    send-route (0 | 1 | all);
    sgsn-context (0 | 1 | all);
    stop-paging 2;
    supported-extension 1;
    suspend 2;
    trace-session 2;
    update-bearer 2;
    update-pdn 2;
    update-pdp (0 | 1 | all);
    ver-not-supported (0 | 1 | 2 | all);
}
end-user-address-validated;
gtp-in-gtp-denied;
handover-group group-name;
handover-on-roaming-intf;
log (Security GTP) {
    forwarded (basic | detail);
    gtp-u name;
    prohibited (basic | detail);
    rate-limited (basic | detail);
state-invalid (basic | detail);
max-message-length max-message-length;
```

```
        min-message-length min-message-length;
        ne-group group-name;
        path-rate-limit {
            message-type (create-req | delete-req | echo-req | other) {
                alarm-threshold (Security GPRS) {
                    forward forward;
                    reverse reverse;
                }
                drop-threshold (Security GPRS) {
                    forward forward;
                    reverse reverse;
                }
            }
        }
        rate-limit (Security GTP) limit;
        remove-ie {
            version v1 {
            number ie-number;
            release (R6 | R7 | R8 | R9);
            }
        }
        req-timeout second;
        restart-path (all | create | echo);
        timeout (Security GTP) hour;
        u-tunnel-validated;
        ue-group group-name;
    }
    traceoptions (Security GTP) {
        file <filename> <files files> <match match> <size size> <(world-readable | no-world-readable)>;
        flag name;
        no-remote-trace;
        trace-level {
            (error | info | notice | verbose | warning);
        }
    }
}
```

```
sctp {
    log (Security SCTP) name;
    multichunk-inspection disable;
    nullpdu {
        protocol (ID-0x0000 | ID-0xFFFF);
    }
    profile (Security SCTP) name {
        association-timeout association-timeout;
        drop (Security SCTP) {
            m3ua-service name;
            payload-protocol name;
        }
        handshake-timeout handshake-timeout;
        limit (Security SCTP) {
            address name {
                payload-protocol (asap | bicc | ddp-segment | ddp-stream | diameter-dtls | diameter-sctp | dua | enrp |
                    h248 | h323 | id | iua | m2pa | m2ua | m3ua | others | qipc | reserved | s1ap | simco | sua | tali | v5ua |
                    x2ap) {
                    rate rate;
                }
            }
            payload-protocol (asap | bicc | ddp-segment | ddp-stream | diameter-dtls | diameter-sctp | dua | enrp | h248
                | h323 | id | iua | m2pa | m2ua | m3ua | others | qipc | reserved | s1ap | simco | sua | tali | v5ua | x2ap) {
                rate rate;
            }
            rate {
                address name {
                    sccp sccp;
                    ssp ssp;
                    sst sst;
                }
                sccp sccp;
                ssp ssp;
                sst sst;
            }
        }
        nat-only;
        permit (Security SCTP) {
            payload-protocol name;
        }
    }
    traceoptions (Security SCTP) {
        file <filename> <files files> <match match> <size size> <(world-readable | no-world-readable)>;
        flag name;
```

```
        no-remote-trace;
      }
    }
  }
```

Hierarchy Level

```
[edit security]
```

Release Information

Statement introduced in Junos OS Release 10.0. Statement modified in Junos OS Release 15.1X49-D40.

Description

Use the gprs function to configure all the General Packet Radio Service (GPRS) features.

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

- GPRS Overview | 17
- GTPv1 Message Filtering | 45
- SCTP Overview | 139

gprs-gtp-profile

Syntax

```
gprs-gtp-profile 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 11.1.

Description
Specify the name of the GPRS tunneling protocol profile.

Required Privilege Level
security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

gprs-sctp-profile

Syntax

```
gprs-sctp-profile 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 11.1.

Description
Specify the name of the GPRS stream control protocol profile.

Required Privilege Level
security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

gtp

Syntax

```
gtp {
    handover-default {
        deny;
    }
    ip-group name {
        address-book name {
            address-set set-name;
        }
    }
    profile (Security GTP) profile-name {
        apn pattern-string {
            imsi-prefix imsi-prefix-digits {
                action (APN GTP) {
                    drop;
                    pass;
                    selection (ms|net|vrf);
                }
            }
        }
        drop (Security GTP) {
            aa-create-pdp 0;
            aa-delete-pdp 0;
            bearer-resource 2;
            change-notification 2;
            config-transfer 2;
            context 2;
            create-bearer 2;
            create-data-forwarding 2;
            create-pdp (0 | 1 | all);
            create-session 2;
            create-tnl-forwarding 2;
            cs-paging 2;
            data-record (0 | 1 | all);
            delete-bearer 2;
            delete-command 2;
            delete-data-forwarding 2;
            delete-pdn 2;
            delete-pdp (0 | 1 | all);
            delete-session 2;
            detach 2;
            downlink-notification 2;
```

```
    echo (0 | 1 | 2 | all);
    error-indication (0 | 1 | all);
    failure-report (0 | 1 | all);
    fwd-access 2;
    fwd-relocation (1 | 2 | all);
    fwd-srns-context 1;
    g-pdu (0 | 1 | all);
    identification (0 | 1 | 2 | all);
    mbms-session-start (1 | 2 | all);
    mbms-session-stop (1 | 2 | all);
    mbms-session-update (1 | 2 | all);
    modify-bearer 2;
    modify-command 2;
    node-alive (0 | 1 | all);
    note-ms-present (0 | 1 | all);
    pdu-notification (0 | 1 | all);
    ran-info (1 | 2 | all);
    redirection (0 | 1 | all);
    release-access 2;
    relocation-cancel (1 | 2 | all);
    resume 2;
    send-route (0 | 1 | all);
    sgsn-context (0 | 1 | all);
    stop-paging 2;
    supported-extension 1;
    suspend 2;
    trace-session 2;
    update-bearer 2;
    update-pdn 2;
    update-pdp (0 | 1 | all);
    ver-not-supported (0 | 1 | 2 | all);
}
end-user-address-validated;
gtp-in-gtp-denied;
handover-group group-name;
handover-on-roaming-intf;
log (Security GTP) {
    forwarded (basic | detail);
    gtp-u name;
    prohibited (basic | detail);
    rate-limited (basic | detail);
state-invalid (basic | detail);
max-message-length max-message-length;
min-message-length min-message-length;
```

```
        ne-group group-name;
        path-rate-limit {
            message-type (create-req | delete-req | echo-req | other) {
                alarm-threshold (Security GPRS) {
                    forward forward;
                    reverse reverse;
                }
                drop-threshold (Security GPRS) {
                    forward forward;
                    reverse reverse;
                }
            }
        }
        rate-limit (Security GTP) limit;
        remove-ie {
            version v1 {
            number ie-number;
            release (R6 | R7 | R8 | R9);
            }
        }
        req-timeout second;
        restart-path (all | create | echo);
        timeout (Security GTP) hour;
        u-tunnel-validated;
        ue-group group-name;
    }
    traceoptions (Security GTP) {
        file <filename> <files files> <match match> <size size> <(world-readable | no-world-readable)>;
        flag name;
        no-remote-trace;
        trace-level {
            (error | info | notice | verbose | warning);
        }
    }
}
```

Hierarchy Level

```
[edit security gprs]
```

Release Information

Statement introduced in Junos OS Release 10.0. The **restart-path** option added in Junos OS Release 11.4. New GPRS tunneling protocol (GTP) message types added in Junos OS Release 11.4. Support for GTPv2 added in Junos OS Release 11.4. Statement modified in Junos OS Release 15.1X49-D40. Support for **handover-default** and **handover-group** options added in Junos OS Release 17.4R1.

Description

Use the GTP commands to enable the GTP service, configure GTP objects, set traceoptions, remove GTP inspection object configurations, and obtain configuration information.

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

GPRS Overview | **17**

Understanding GTP Support for Central Point Architecture | **21**

Enabling GTP Interoperability between 2G and 3G Networks | **69**

handover-default

Syntax

```
handover-default {
    deny;
}
```

Hierarchy Level

```
[edit security gprs gtp]
```

Release Information

Statement introduced in Junos OS Release 17.4R1.

Description

A GPRS tunneling protocol (GTP) handover group is a set of SGSNs or serving gateway (SGW) with a common address-book library. You can configure the handover group using the “handover-group” command. If there is no handover group defined in the GTP profile, and if the traffic reaches the policy configured with this profile, handover between all GTPs matching this policy is permitted by default. Therefore, if you configure handover-default deny command, then handover is denied.

Options

deny—To deny default handover.

Required Privilege Level

security—To view this statement in the configuration.

RELATED DOCUMENTATION

GTP Handover Group Overview | 60

Understanding GTP Handover Messages | 61

handover-group

Syntax

```
handover-group group-name;
```

Hierarchy Level

```
[edit security gprs gtp profile name
```

Release Information
Statement introduced in Junos OS Release 17.4R1.

Description
A GPRS tunneling protocol (GTP) handover group is a set of SGSNs or serving gateway (SGW) with a common address-book library. You can configure a GTP profile and associate an GTP handover group to the GTP profile. When a GTP handover group name is referenced by a GTP profile, the device checks to see if the current SGSN/SGW address and the proposed SGSN/SGW address are both contained within the same GTP handover group. If both SGSN/SGW addresses are contained within the same GTP handover group, then the handover is allowed. If both the current and proposed SGSN/SGW addresses are not within the same GTP handover group, then the profile for the default handover group is used.

Options
name—To specify the handover group on the GTP profile.

address-book—To specify the common address-book name.

address-set—To specify the address set for the handover group.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level
security—To view this statement in the configuration.

RELATED DOCUMENTATION

Configuring GTP Handover Group | 60

handshake-timeout

Syntax

```
handshake-timeout time-in-seconds;
```

Hierarchy Level

```
[edit security gprs sctp profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 10.2.

Description

Use the handshake-timeout function to set the handshake time for Stream Control Transmission Protocol (SCTP).

Options

time-in-seconds—Number of seconds of handshake time that elapse before the session is terminated.

Range: 10 to 30 seconds.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Stream Control Transmission Protocol | 139

SCTP Packet Structure Overview | 145

imsi-prefix

Syntax

```
imsi-prefix imsi-prefix-digits {
    action (APN GTP) {
        drop;
        pass;
        selection (ms|net|vrf);
    }
}
```

Hierarchy Level

```
[edit security gprs gtp profile profile-name apn pattern-string]
```

Release Information

Statement introduced in Junos OS Release 10.0. Support for GTPv2 added in Junos OS Release 11.4. Option mcc-mnc replaced with imsi-prefix in Junos OS Release 12.1X44-D10.

Description

Use the imsi-prefix option to specify an International Mobile Station Identity (IMSI) prefix for filtering GTP packets. You can also filter GTP packets based on the combination of an IMSI prefix and an access point name (APN).

Options

imsi-prefix-digits—To specify an IMSI prefix.

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 GTP APN Filtering | 80
- Understanding GTPv2 IMSI Prefix and APN Filtering | 84
- Example: Setting a GTP APN and a Selection Mode | 81

limit (Security SCTP)

Syntax

```
limit {
    address name {
        payload-protocol (asap | bicc | ddp-segment | ddp-stream | diameter-dtls | diameter-sctp | dua | enrp | h248 |
            h323 | id | iua | m2pa | m2ua | m3ua | others | qipc | reserved | s1ap | simco | sua | tali | v5ua | x2ap) {
            rate rate;
        }
    }
    payload-protocol (asap | bicc | ddp-segment | ddp-stream | diameter-dtls | diameter-sctp | dua | enrp | h248 | h323
        | id | iua | m2pa | m2ua | m3ua | others | qipc | reserved | s1ap | simco | sua | tali | v5ua | x2ap) {
        rate rate;
    }
    rate {
        address name {
            sccp sccp;
            ssp ssp;
            sst sst;
        }
        sccp sccp;
        ssp ssp;
        sst sst;
    }
}
```

Hierarchy Level

```
[edit security gprs sctp profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 10.2. Statement is modified in Junos OS Release 12.1X46-D10. Support for **address** option accepting both IPv4 and IPv6 formats added in Junos OS Release 12.1X47-D10.

Description

Use the limit option to set the rate limit per association for local Services Processing Unit (SPU) packets. You can configure a GPRS SCTP profile by setting the limit rate parameter and the payload protocol parameter for SCTP inspection.

Options

address *ip-address*—To set Signalling Connection Control Part (SCCP), Subsystem-Prohibited (SSP), and Subsystem Status Test (SST) messages rate limit to an IP address. The IP address can accept either an IPv4 address or an IPv6 address.

sccp *rate-limit*—To set the SCCP messages rate limit.

ssp *rate-limit*—To set the SSP messages rate limit.

sst *rate-limit*—To set the SSP messages rate limit.

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 Stream Control Transmission Protocol | 139
SCTP Packet Structure Overview | 145

log (Security GTP)

Syntax

```
log {
    forwarded (basic | detail);
    gtp-u name;
    prohibited (basic | detail);
    rate-limited (basic | detail);
    state-invalid (basic | detail);
}
```

Hierarchy Level

[edit security gprs gtp profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 10.0. Support for GTPv2 added in Junos OS Release 11.4.

Description

Use the console or syslog to view GPRS tunneling protocol version 2 (GTPv2) traffic logs. You can configure the device to log GTPv2 packets based on their status. You can use the log configuration statement to enable GTPv2 logging on the device. By default, all logs are disabled on the device.

Options

- **forwarded**—A packet that the security device transmitted because it was valid.
- **GTP-U**—A packet that the security devices have for gtp-u.
- **prohibited**—A packet that the security device dropped because it was invalid.
- **rate-limited**—A packet that the security device dropped because it exceeded the maximum rate limit of the destination GSN.
- **state-invalid**—A packet that the security device dropped because it failed stateful inspection.

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 GTPv2 Traffic Logging | 43

log (Security SCTP)

Syntax

```
log name;
```

Hierarchy Level

```
[edit security gprs sctp]
```

Release Information

Statement introduced in Junos OS Release 10.2. The options **association**, **control-message-all**, **control-message-drop**, and **data-message-drop** added in Junos OS Release 12.1X45-D10.

Description

Use the console or syslog to view Stream Control Transmission Protocol (SCTP) logs.

Options

association—To log association events.

configuration—To log the CLI configuration.

control-message-all—To log both dropped and passed control messages.

control-message-drop—To log the dropped control messages.

data-message-drop—To log the dropped data messages.

decoding-error—To log the decoding errors.

dropped-packet—To log dropped packets and out of resource errors.

rate-limit—To log the rate limit.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Stream Control Transmission Protocol | 139

SCTP Packet Structure Overview | 145

max-message-length

Syntax

```
max-message-length number;
```

Hierarchy Level

```
[edit security gprs gtp profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 10.0. Support for GTPv2 added in Junos OS Release 11.4.

Description

In the GPRS tunneling protocol (GTP) header, the message length field indicates the length, in octets, of the GTP payload. Use the max-message-length option to set the maximum message payload length (in bytes). The maximum GTP message length is 65,535 bytes. The message length range is from 1 through 65,535 bytes.

Options

number—To set the maximum message payload length in bytes.

Range: 1 through 65,535 bytes.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding GTP Message Filtering | 46

Example: Setting the GTP Message-Length Filtering | 47

message-type

Syntax

```
message-type {
    create-req {
        alarm-threshold (Security GPRS) {
            forward number;
            reverse number;
        }
        drop-threshold (Security GPRS) {
            forward number;
            reverse number;
        }
    }
    delete-req {
        drop-threshold (Security GPRS) {
            forward number;
            reverse number;
        }
        drop-threshold (Security GPRS) {
            forward number;
            reverse number;
        }
    }
    echo-req {
        drop-threshold (Security GPRS) {
            forward number;
            reverse number;
        }
        drop-threshold (Security GPRS) {
            forward number;
            reverse number;
        }
    }
    other {
        drop-threshold (Security GPRS) {
            forward number;
            reverse number;
        }
        drop-threshold (Security GPRS) {
            forward number;
            reverse number;
        }
    }
```

```
}
```

Hierarchy Level

```
[edit security gprs gtp profile profile-name path-rate-limit]
```

Release Information
Statement introduced in Junos OS Release 12.1X45-D10.

Description
Use the message-type function to specify the group of control messages.

Options
create-req—To limit packet-per-second of GTP create request.

delete-req—To limit packet-per-second of GTP delete request.

echo-req—To limit packet-per-minute of GTP echo request.

other—To limit packet-per-second of all other GTP control messages.

Required Privilege Level
security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

GTPv1 Message Filtering | 45

min-message-length

Syntax

```
min-message-length number;
```

Hierarchy Level

```
[edit security gprs gtp profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 10.0. Support for GTPv2 added in Junos OS Release 11.4.

Description

In the GPRS tunneling protocol (GTP) header, the message length field indicates the length, in octets, of the GTP payload. Use the min-message-length option to set the minimum message payload length (in bytes). The minimum GTP message length is 0 bytes. The message length range is from 1 through 65,535 bytes.

Options

number—To set the minimum message payload length in bytes.

Range: 0 through 65,535 bytes.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding GTP Message Filtering | 46
Example: Setting the GTP Message-Length Filtering | 47

multichunk-inspection

Syntax

```
multichunk-inspection (enable | disable);
```

Hierarchy Level

```
[edit security gprs sctp]
```

Release Information

Statement introduced in Junos OS Release 12.1X47-D10.

Description

The Stream Control Transmission Protocol (SCTP) firewall checks all chunks in a message and then permits or drops the packet based on the policy. Use the multichunk-inspection enable command to enable SCTP multichunk inspection. It checks all the chunks in a message. Use the multichunk-inspection disable command to disable SCTP multichunk inspection. It checks only the first chunk.

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 SCTP Multichunk Inspection | 147

nullpdu

Syntax

```
nullpdu {
   protocol (ID-0x0000 | ID-0xFFFF);
}
```

Hierarchy Level

```
[edit security gprs sctp]
```

Release Information
Statement introduced in Junos OS Release 12.1X47-D10.

Description
Use the nullpdu function to configure the Stream Control Transmission Protocol (SCTP) null protocol data unit (PDU) value. If you set the null PDU value to 0xFFFF, then the payload protocol identifier value is replaced with 0xFFFF and the user data field is not modified. If you set the null PDU value to 0x0000, then the payload protocol identifier value is replaced with 0x0000 and the first four bytes of the user data field is replaced with zeroes. If all chunks in a packet are null PDUs, the SCTP firewall drops the packet.

Options
protocol—To specify the SCTP null PDU payload protocol identifier.

Required Privilege Level
security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding SCTP Multichunk Inspection | 147

other

Syntax

```
other {
   alarm-threshold (Security GPRS) {
      forward number;
      reverse number;
   }
   drop-threshold (Security GPRS) {
      forward number;
      reverse number;
   }
}
```

Hierarchy Level

[edit security gprs gtp profile *profile-name* path-rate-limit message-type]

Release Information

Statement introduced in Junos OS Release 12.1X45-D10.

Description

Use other parameter to limit the number of packets per second for all the other GTPv0/GTPv1-C/GTPv2-C messages. The message types not included in the other GTPv0 messages are listed in Table 21 on page 207.

Table 21: GTPv0 Messages

Message Type	Message
1	Echo Request
16	Create PDP Context Request
20	Delete PDP Context Request
22	Create AA PDP Context Request
255	T-PDU

The message types not included in the other GTPv1 messages are listed in Table 22 on page 208

Table 22: GTPv1 Messages

Message Type	Message
1	Echo Request
16	Create PDP Context Request
20	Delete PDP Context Request
255	G-PDU

The message types not included in the other GTPv2 messages are listed in Table 23 on page 208.

Table 23: GTPv2 Messages

Message Type	Message
1	Echo Request
32	Create Session Request
36	Delete Session Request
95	Create Bearer Request
99	Delete Bearer Request

Options

alarm-threshold—To set alarm threshold for path rate limiting.

drop-threshold—To set drop threshold for path rate limiting.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Path Rate Limiting for GTP Control Messages | 53
Example: Limiting the Message Rate and Path Rate for GTP Control Messages | 53

path-rate-limit

Syntax

```
path-rate-limit {
    message-type {
        create-req {
            alarm-threshold (Security GPRS) {
                forward number;
                reverse number;
            }
            drop-threshold (Security GPRS) {
                forward number;
                reverse number;
            }
        }
        delete-req {
            alarm-threshold (Security GPRS) {
                forward number;
                reverse number;
            }
            drop-threshold (Security GPRS) {
                forward number;
                reverse number;
            }
        }
        echo-req {
            alarm-threshold (Security GPRS) {
                forward number;
                reverse number;
            }
            drop-threshold (Security GPRS) {
                forward number;
                reverse number;
            }
        }
        other {
            alarm-threshold (Security GPRS) {
                forward number;
                reverse number;
            }
            drop-threshold (Security GPRS) {
                forward number;
                reverse number;
            }
```

```
    }
  }
}
```

Hierarchy Level

[edit security gprs gtp profile *profile-name*]

Release Information

Statement introduced in Junos OS Release 12.1X45-D10.

Description

Use the path-rate-limit function to control specific GPRS tunneling protocol (GTP) messages in both the forward and reverse directions. A drop threshold and an alarm threshold parameter can be configured for each control message in the forward and reverse direction for one path.

Options

message-type—To specific group of control messages

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Path Rate Limiting for GTP Control Messages | 53

Example: Limiting the Message Rate and Path Rate for GTP Control Messages | 53

permit (Security SCTP)

Syntax

```
permit {
    payload-protocol name;
}
```

Hierarchy Level

```
[edit security gprs sctp profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 12.1X46-D10.

Description

Use the permit option to display information about the configuration of the current Stream Control Transmission Protocol (SCTP) inspection.

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 Stream Control Transmission Protocol | 139

Example: Configuring a GPRS SCTP Profile for Policy-Based Inspection to Reduce Security Risks | 154

profile (Security GTP)

Syntax

```
profile profile name {
    apn pattern-string {
        imsi-prefix imsi-prefix-digits {
            action (APN GTP) {
                drop;
                pass;
                selection (ms|net|vrf);
            }
        }
    }
    drop (Security GTP) {
        aa-create-pdp 0;
        aa-delete-pdp 0;
        bearer-resource 2;
        change-notification 2;
        config-transfer 2;
        context 2;
        create-bearer 2;
        create-data-forwarding 2;
        create-pdp (0 | 1 | all);
        create-session 2;
        create-tnl-forwarding 2;
        cs-paging 2;
        data-record (0 | 1 | all);
        delete-bearer 2;
        delete-command 2;
        delete-data-forwarding 2;
        delete-pdn 2;
        delete-pdp (0 | 1 | all);
        delete-session 2;
        detach 2;
        downlink-notification 2;
        echo (0 | 1 | 2 | all);
        error-indication (0 | 1 | all);
        failure-report (0 | 1 | all);
        fwd-access 2;
        fwd-relocation (1 | 2 | all);
        fwd-srns-context 1;
        g-pdu (0 | 1 | all);
        identification (0 | 1 | 2 | all);
        mbms-session-start (1 | 2 | all);
```

```
    mbms-session-stop (1 | 2 | all);
    mbms-session-update (1 | 2 | all);
    modify-bearer 2;
    modify-command 2;
    node-alive (0 | 1 | all);
    note-ms-present (0 | 1 | all);
    pdu-notification (0 | 1 | all);
    ran-info (1 | 2 | all);
    redirection (0 | 1 | all);
    release-access 2;
    relocation-cancel (1 | 2 | all);
    resume 2;
    send-route (0 | 1 | all);
    sgsn-context (0 | 1 | all);
    stop-paging 2;
    supported-extension 1;
    suspend 2;
    trace-session 2;
    update-bearer 2;
    update-pdn 2;
    update-pdp (0 | 1 | all);
    ver-not-supported (0 | 1 | 2 | all);
}
end-user-address-validated;
gtp-in-gtp-denied;
handover-group group-name;
handover-on-roaming-intf;
log (Security GTP) {
    forwarded (basic | detail);
    gtp-u name;
    prohibited (basic | detail);
    rate-limited (basic | detail);
state-invalid (basic | detail);
max-message-length max-message-length;
min-message-length min-message-length;
ne-group group-name;
```

```
    path-rate-limit {
        message-type (create-req | delete-req | echo-req | other) {
            alarm-threshold (Security GPRS) {
                forward forward;
                reverse reverse;
            }
            drop-threshold (Security GPRS) {
                forward forward;
                reverse reverse;
            }
        }
    }
    rate-limit (Security GTP) limit;
    remove-ie {
        version v1 {
        number ie-number;
        release (R6 | R7 | R8 | R9);
        }
    }
    req-timeout second;
    restart-path (all | create | echo);
    timeout (Security GTP) hour;
    u-tunnel-validated;
    ue-group group-name;
}
```

Hierarchy Level

```
[edit security gprs gtp]
```

Release Information

Statement introduced in Junos OS Release 10.0. The **restart-path** option added in Junos OS Release 11.4. New GPRS tunneling protocol (GTP) message types added in Junos OS Release 11.4. Support for GTPv2 added in Junos OS Release 11.4. Statement modified in Junos OS Release 15.1X49-D40.

Description

Use the profile option to create a profile for the GPRS tunneling protocol (GTP) feature. This profile includes all subsequent configuration options.

Options

- **end-user-address-validated**—During the GTP-U security check procedure, IPv4 and IPv6 addresses for user equipment is checked against the end-user address stored in the user tunnel. Once the GTP-U packet is determined to match the user equipment address, the packet data unit (PDU) is parsed to obtain the user equipment address. Use the end-user-address-validated function to validate the IP address. By default, the UE address check is disabled, it will not check the IP address of GTP-U payload.
- **gtp-in-gtp-denied**—To enable the security device to detect and drop a GTP packet that contains another GTP packet in its message body.
- **handover-on-roaming-intf**—To enable the security device to receive context and forward relocation messages, inspect the packets, and to set up PDP contexts on the device.
- **u-tunnel-validated**—To specify GTP-U tunnel validation. When u-tunnel-validated is enabled, the GTP ALG checks whether the tunnel endpoint identifier (TEID) in the GTP-U packet matches the user tunnel in the tunnel table. If the user tunnel is not found, then the GTP-U packet is dropped. By default, the check is disabled.

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 GTP Path Restart | 40
Understanding GTPv2 Tunnel Cleanup | 42
GTPv1 Message Filtering | 45

profile (Security SCTP)

Syntax

```
profile profile-name {
    association-timeout association-timeout;
    drop (Security SCTP) {
        m3ua-service name;
        payload-protocol name;
    }
    handshake-timeout handshake-timeout;
    limit (Security SCTP) {
        address name {
            payload-protocol (asap | bicc | ddp-segment | ddp-stream | diameter-dtls | diameter-sctp | dua | enrp | h248
                | h323 | id | iua | m2pa | m2ua | m3ua | others | qipc | reserved | s1ap | simco | sua | tali | v5ua | x2ap) {
                rate rate;
            }
        }
        payload-protocol (asap | bicc | ddp-segment | ddp-stream | diameter-dtls | diameter-sctp | dua | enrp | h248 |
            h323 | id | iua | m2pa | m2ua | m3ua | others | qipc | reserved | s1ap | simco | sua | tali | v5ua | x2ap) {
            rate rate;
        }
        rate {
            address name {
                sccp sccp;
                ssp ssp;
                sst sst;
            }
            sccp sccp;
            ssp ssp;
            sst sst;
        }
    }
    nat-only;
    permit (Security SCTP) {
        payload-protocol name;
    }
}
```

Hierarchy Level

```
[edit security gprs sctp]
```

Release Information

Statement introduced in Junos OS Release 10.2. Support for the **nat-only** option added in Junos OS Release 12.1X45-D10. Support for the **permit** option is added in Junos OS Release 12.1X46-D10.

Description

Use the profile option to create a profile of the Stream Control Transmission Protocol (SCTP) feature. This profile includes all subsequent configuration options.

Options

name—Specify SCTP configuration name.

nat-only—Specify only do payload IPs translation for SCTP packet.

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 Stream Control Transmission Protocol | **139**

Understanding SCTP Multichunk Inspection | **147**

rate-limit (Security GTP)

Syntax

```
rate-limit value;
```

Hierarchy Level

```
[edit security gprs gtp profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 10.0. Support for GTPv2 added in Junos OS Release 11.4.

Description

Use the rate-limit option to limit the GTP messages per second. The default value of rate limit is 0, which means there is no limit.

Options

Range: 1 through 80,000 messages per second.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Path Rate Limiting for GTP Control Messages | 53
Example: Limiting the Message Rate and Path Rate for GTP Control Messages | 53

remove-ie

Syntax

```
remove-ie {
    version v1 {
        number ie-number;
        release name;
    }
}
```

Hierarchy Level

```
[edit security gprs gtp profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 11.4.

Description

Use the remove-ie option to enable the security device to detect and remove 3G-specific attributes from the GPRS tunneling protocol (GTP) packet header when the packet passes into a 2G network. It allows you to retain interoperability when roaming between 2G and 3G networks.

Options

- **version v1**—To specify GTP version 1.
- **number** —To specify the user-configured IE number. IE removal by IE number supports all IEs, ranging from 1 to 255.
- **release** —To Specify release number. Available options are:
  - Release R6—To specify R6 IE removal.
  - Release R7—To specify R7 IE removal.
  - Release R8—To specify R8 IE removal.
  - Release R9—To specify R9 IE removal.

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: Removing R6, R7, R8, and R9 Information Elements from GTP Messages | 76

Understanding GTPv1 Information Element Removal | 77

Example: Removing GTPv1 Information Elements Using IE Number | 78

req-timeout

Syntax

```
req-timeout second;
```

Hierarchy Level

```
[edit security gprs gtp profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 12.1X46-D35.

Description

Use the req-timeout option to specify a GTP request message timeout. The default timeout value is 5 seconds.

Options

Range: 1 to 30 seconds.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Example: Configure the Validity of IP Address in GTP Messages | 94

restart-path

Syntax

```
restart-path (all | create | echo);
```

Hierarchy Level

```
[edit security gprs gtp profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 11.4. Support for GTPv2 added in Junos OS Release 11.4.

Description

Use the restart-path function to restart a GTP path. By default, the restart path is disabled and then related function does not work. Tunnels are not deleted when restart counter changes.

Options

- **all**—Restart GTP paths by detecting the changed restart number obtained from the Recovery information element (IE) in all GTP messages.
- **create**—Restart GTP paths by detecting the changed restart number obtained from the Recovery IE in create-session messages.
- **echo**—Restart GTP paths by detecting the changed restart number obtained from the Recovery IE in echo messages.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding GTP Path Restart | 40

Example: Restarting a GTPv2 Path | 40

sctp

Syntax

```
sctp {
    log (Security SCTP) name;
    multichunk-inspection disable;
    nullpdu {
        protocol (ID-0x0000 | ID-0xFFFF);
    }
    profile (Security SCTP) name {
        association-timeout association-timeout;
        drop (Security SCTP) {
            m3ua-service name;
            payload-protocol name;
        }
        handshake-timeout handshake-timeout;
        limit (Security SCTP) {
            address name {
                payload-protocol (asap | bicc | ddp-segment | ddp-stream | diameter-dtls | diameter-sctp | dua | enrp | h248
                    | h323 | id | iua | m2pa | m2ua | m3ua | others | qipc | reserved | s1ap | simco | sua | tali | v5ua | x2ap) {
                    rate rate;
                }
            }
            payload-protocol (asap | bicc | ddp-segment | ddp-stream | diameter-dtls | diameter-sctp | dua | enrp | h248
                | h323 | id | iua | m2pa | m2ua | m3ua | others | qipc | reserved | s1ap | simco | sua | tali | v5ua | x2ap) {
                rate rate;
            }
            rate {
                address name {
                    sccp sccp;
                    ssp ssp;
                    sst sst;
                }
                sccp sccp;
                ssp ssp;
                sst sst;
            }
        }
        nat-only;
        permit (Security SCTP) {
            payload-protocol name;
        }
    }
    traceoptions (Security SCTP) {
```

```
        file <filename> <files files> <match match> <size size> <(world-readable | no-world-readable)>;
        flag name;
        no-remote-trace;
    }
}
```

Hierarchy Level

```
[edit security gprs]
```

Release Information

Statement introduced in Junos OS Release 10.2. Support for the **nat-only** option added in Junos OS Release 12.1X45-D10. Support for the **profile** statement added in Junos OS Release 12.1X46-D10.

Description

Use the Stream Control Transmission Protocol (SCTP) commands to configure SCTP objects, configure SCTP logs, set trace options, and set address rate limit.

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 Stream Control Transmission Protocol | 139

SCTP Configuration | 149

seq-number-validated (GTP)

Syntax

```
seq-number-validated;
```

Hierarchy Level

```
[edit security gprs gtp profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 12.1X45-D10.

Description

When the command seq-number-validated is configured, GTP ALG check the sequence number in the GTP-U packet. If it is not configured, the sequence check is disabled by default.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

timeout (Security GTP)

Syntax

```
timeout value;
```

Hierarchy Level

```
[edit security gprs gtp profile profile-name]
```

Release Information

Statement introduced in Junos OS Release 10.0. Support for GTPv2 added in Junos OS Release 11.4.

Description

Use the timeout option to set the tunnel timeout value in hours. The default is 36 hours. If a device detects no activity in a tunnel for a specified period, it removes the tunnel from the state table.

Options

Range: 1 through 1,000 hours.

Required Privilege Level

security—To view this statement in the configuration.
security-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding GTPv2 Tunnel Cleanup | 42

Example: Setting the Timeout Value for GTPv2 Tunnels | 42

traceoptions (Security GTP)

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 gprs gtp]
```

Release Information

Statement introduced in Junos OS Release 10.0. Support for GTPv2 added in Junos OS Release 11.4.

Description

Use the traceoptions function to enable the device to identify and log the contents of GTP-U or GTP-C messages based on IMSI prefixes or Mobile Station-Integrated Services Data Network (MS-ISDN) identification.

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 everything.
  - **chassis-cluster**—Trace chassis cluster events.
  - **configuration**—Trace configuration events.
  - **flow**—Trace flow events.
  - **parser**—Trace parser 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.

traceoptions (Security SCTP)

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 gprs sctp]
```

Release Information

Statement introduced in Junos OS Release 10.2. The flag statement **detail** introduced in Junos OS Release 12.1X45-D10.

Description

Use the traceoptions function to set the trace options for Stream Control Transmission Protocol (SCTP).

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 everything.
- chassis-cluster—Trace chassis cluster events.
- configuration—Trace configuration events.
- detail—Trace information used for debugging.
- flow—Trace flow events.
- parser—Trace parser 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.

CHAPTER 5

Operational Commands

IN THIS CHAPTER

clear gtp tunnels

Syntax

```
clear security gprs gtp tunnel <all | identifier>
```

Release Information

Command introduced in Junos OS Release 10.0. Support for GTPv2 added in Junos OS Release 11.4.

Description

Clear all or specified GTP tunnels on the device.

Options

- *identifier*—Clear a single tunnel by entering the tunnel ID. To view current tunnel IDs, type **show security gprs gtp tunnels**.
- all—Clear all existing tunnels.

Required Privilege Level

clear

clear security gprs gtp counters

Syntax

```
clear security gprs gtp counters <all | error | ha | message <message-name> | packet | request | tunnel | path-rate-limit>
```

Release Information

Command introduced in Junos OS Release 12.1X44-D10.

Description

Clear all GTP counters on the device.

Options

- **all**—Clear all GTP counters.
- **data-packet**—Clear GTP-U data packet counters.
- **error**—Clear GTP error counters.
- **ha**—Clear GTP HA counters.
- **message *message-name***—Clear GTP message counters.
- **packet**—Clear GTP packet counters.
- **request**—Clear GTP request counters.
- **tunnel**—Clear GTP tunnel counters.
- **path-rate-limit**—Clear path-rate-limit counters.

Required Privilege Level

clear

RELATED DOCUMENTATION

show security gprs gtp counters | 250

List of Sample Output

clear security gprs gtp counters tunnel on page 234
clear security gprs gtp counters path-rate-limit on page 234

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

clear security gprs gtp counters all

```
user@host> clear security gprs gtp counters all
```

```
All GTP counters have been cleared
```

clear security gprs gtp counters data-packet

```
user@host> clear security gprs gtp counters data-packet
```

```
All GTP-U data packet counters have been cleared
```

clear security gprs gtp counters error

```
user@host> clear security gprs gtp counters error
```

```
GTP error counter has been cleared
```

clear security gprs gtp counters ha

```
user@host> clear security gprs gtp counters ha
```

```
GTP HA counter has been cleared
```

clear security gprs gtp counters message v0-create-aa-pdp-req

```
user@host> clear security gprs gtp counters message v0-create-aa-pdp-req
```

```
GTPv0 create AA PDP request message counter has been cleared
```

clear security gprs gtp counters packet

```
user@host> clear security gprs gtp counters packet
```

```
GTP packet counter has been cleared
```

clear security gprs gtp counters request

```
user@host> clear security gprs gtp counters request
```

```
GTP request counter has been cleared
```

clear security gprs gtp counters tunnel

```
user@host> clear security gprs gtp counters tunnel
```

```
GTP tunnel counter has been cleared
```

clear security gprs gtp counters path-rate-limit

```
user@host> clear security gprs gtp counters path-rate-limit
```

```
GTP path-rate-limit counter has been cleared
```

clear security gprs sctp association

Syntax

```
clear security gprs sctp association
<all>
<destination-ip>
<desitnation-port>
<guid>
<init>
<source-ip>
<source-port>
```

Release Information

Command introduced in Junos OS Release 12.1X45-D10.

Description

Clear the Stream Control Transmission Protocol (SCTP) association.

Options

none—Clear the live SCTP associations.

all—Clear all the SCTP associations, both initiated and live. All SCTP traffic is blocked while the associations are being cleared, which can take up to one minute.

destination-ip—Clear the destination IP SCTP association.

destination-port—Clear the destination port SCTP association.

guid—Clear the globally unique identifier SCTP association.

init—Clear the initiated SCTP associations.

source-ip—Clear the source IP address SCTP association.

source-port—Clear the source port SCTP association.

Required Privilege Level

clear

RELATED DOCUMENTATION

show security gprs sctp association | 268

List of Sample Output

clear security gprs sctp association on page 236

Sample Output

clear security gprs sctp association

`user@host>` **clear security gprs sctp association**

```
Clear Association Information for FPC: 2    PIC: 0
Cleared matched SCTP association information:
Has cleared matched association: 0


Clear Association Information for FPC: 2    PIC: 1
Cleared matched SCTP association information:
Has cleared matched association: 9


Clear Association Information for FPC: 2    PIC: 2
Cleared matched SCTP association information:
Has cleared matched association: 8


Clear Association Information for FPC: 2    PIC: 3
Cleared matched SCTP association information:
Has cleared matched association: 10


Clear Association Information for FPC: 5    PIC: 0
Cleared matched SCTP association information:
Has cleared matched association: 7


Clear Association Information for FPC: 5    PIC: 1
Cleared matched SCTP association information:
Has cleared matched association: 6
```

clear security gprs sctp counters

Syntax

```
clear security gprs sctp counters
```

Release Information
Command introduced in Junos OS Release 10.2.

Description
Clear the statistics of the dropped Stream Control Transmission Protocol (SCTP) counters.

Options
none—Clear all dropped SCTP counters.

Required Privilege Level
clear

RELATED DOCUMENTATION

show security gprs sctp counters | 271

List of Sample Output
clear security gprs sctp counters on page 237

Output Fields
When you enter this command, you are provided feedback on the status of your request.

Sample Output

clear security gprs sctp counters

```
user@host> clear security gprs sctp counters
```

show gtp tunnels

Syntax

```
show security gprs gtp tunnels (brief | summary | detail)
```

Release Information

Command introduced in Junos OS Release 10.0. Support for GPRS tunneling protocol version 2 (GTPv2) added in Junos OS Release 11.4. Command output updated in Junos OS Release 15.1X49-D40. Starting in Junos OS Release 18.4R1, GPRS tunneling protocol (GTP) traffic is supported on both IPv4 and IPv6 through tunnel-based session distribution for security inspection.

Description

Displays all existing GTP tunnels.

Options

- brief—Displays a short listing of all GTP tunnels.
- summary—Displays a summary of all GTP tunnels.
- detail–Displays detailed information about all the GTP tunnels.

Required Privilege Level

view

List of Sample Output

Sample Output

show security gprs gtp tunnels

```
user@host> show security gprs gtp tunnels
```

Refer the GTP tunnel output for IPv4.

```
FPC 7 PIC 0:
```

```
 Index: 72000002, EBI/LBI: 5/5(V2)to sgw, Timeout: 1440m
 User: 61.0.0.102, 12345678 --> 62.0.0.102, 00000021
 Control: 61.0.0.101, 00325ac1 --> 62.0.0.101, 00000001

FPC 8 PIC 0:

 Index: 0x02000040 Tunnel ID: 0x50502410121507f5(V0), Timeout: 59m
 User: 20.1.0.1, 00000001 -> 20.0.2.1, 00000001
 Ctrl: 20.1.0.1, 00000001 -> 20.0.2.1, 00000001

 3 tunnels active in total
```

show security gprs gtp tunnels summary

`user@host>` **show security gprs gtp tunnels summary**

Refer the GTP tunnel summary output for IPv4 address.

```
FPC 1 PIC 0:

FPC 1 PIC 1:

FPC 2 PIC 0:

FPC 2 PIC 1:

2 tunnels active in total
```

show security gprs gtp tunnels detail

`user@host>` **show security gprs gtp tunnels detail**

Refer the GTP tunnel detail output for IPv4 address.

```
node0:
--------------------------------------------------------------------------
 FPC 0 PIC 0:

 FPC 0 PIC 1:

 FPC 0 PIC 2:
```

```
 FPC 0 PIC 3:

Index: 0x02000040 Tunnel ID: 0x505024101215O7f5(V0), Timeout: 59m
User: 20.1.0.1, 00000001 -> 20.0.2.1, 00000001
Ctrl: 20.1.0.1, 00000001 -> 20.0.2.1, 00000001

 1 tunnels active in total
```

Sample Output

Starting with Junos OS 18.4R1, the GTP tunnel is supported on both IPv4 and IPv6 address.

show security gprs gtp tunnels

`user@host>` **show security gprs gtp tunnels**

Refer the GTP tunnel output for IPv4 and IPv6 address.

```
node0:
--------------------------------------------------------------------------
FPC 0 PIC 0:

Index: 0x00000002, V2, Control tunnel, IMSI: 110469790910178, MSISDN:
123456780912345
   IPv6: 2001:10::108, 0000042a -> 2001:13::104, 0000042a
   IPv4: 201.10.0.101, 0000042a -> 201.13.0.103, 0000042a
    User tunnel, EBI/LBI:5/5, to pgw, Timeout:50
      IPv6: 2001:10::102, 00000822 -> 2001:13::109, 00000832
      IPv4: 201.10.0.104, 00000822 -> 201.13.0.107, 00000832
    User tunnel, EBI/LBI:6/5, to pgw, Timeout:51
      IPv6: ::, 00000823 -> ::, 00000833
      IPv4: 201.10.0.105, 00000823 -> 201.13.0.108, 00000833
2 tunnels active in total
```

```
node1:
--------------------------------------------------------------------------
FPC 0 PIC 0:

Index: 0x00000002, V2, Control tunnel, IMSI: 110469790910178, MSISDN:
```

```
123456780912345
   IPv6: 2001:10::108, 0000042a -> 2001:13::104, 0000042a
   IPv4: 201.10.0.101, 0000042a -> 201.13.0.103, 0000042a
    User tunnel, EBI/LBI:5/5, to pgw, Timeout:50
      IPv6: 2001:10::102, 00000822 -> 2001:13::109, 00000832
      IPv4: 201.10.0.104, 00000822 -> 201.13.0.107, 00000832
    User tunnel, EBI/LBI:6/5, to pgw, Timeout:50
      IPv6: ::, 00000823 -> ::, 00000833
      IPv4: 201.10.0.105, 00000823 -> 201.13.0.108, 00000833
2 tunnels active in total
```

show security gprs gtp tunnels summary

`user@host>` **show security gprs gtp tunnels summary**

Refer the GTP tunnel summary output for IPv4 and IPv6 address.

```
node0:
--------------------------------------------------------------------------
FPC 0 PIC 0: 2 tunnels active

2 tunnels active in total


node1:
--------------------------------------------------------------------------
FPC 0 PIC 0: 2 tunnels active

2 tunnels active in total
```

show security gprs gtp tunnels detail

`user@host>` **show security gprs gtp tunnels detail**

Refer the GTP tunnel detail output for IPv4 and IPv6 address.

```
node0:
--------------------------------------------------------------------------
FPC 0 PIC 0:

Index: 0x00000002, V2, Control tunnel, IMSI: 110469790910178, MSISDN:
123456780912345
```

```
   IPv6: 2001:10::108, 0000042a -> 2001:13::104, 0000042a
   IPv4: 201.10.0.101, 0000042a -> 201.13.0.103, 0000042a
    User tunnel, EBI/LBI:5/5, to pgw, Timeout:51, alive time: 8
    Uplink: Packets 0, Bytes 0, Downlink: Packets 0, Bytes 0
      IPv6: 2001:10::102, 00000822 -> 2001:13::109, 00000832
      IPv4: 201.10.0.104, 00000822 -> 201.13.0.107, 00000832
    User tunnel, EBI/LBI:6/5, to pgw, Timeout:51, alive time: 8
    Uplink: Packets 0, Bytes 0, Downlink: Packets 0, Bytes 0
      IPv6: ::, 00000823 -> ::, 00000833
      IPv4: 201.10.0.105, 00000823 -> 201.13.0.108, 00000833
2 tunnels active in total
```

```
node1:
--------------------------------------------------------------------------
FPC 0 PIC 0:

Index: 0x00000002, V2, Control tunnel, IMSI: 110469790910178, MSISDN:
123456780912345
   IPv6: 2001:10::108, 0000042a -> 2001:13::104, 0000042a
   IPv4: 201.10.0.101, 0000042a -> 201.13.0.103, 0000042a
    User tunnel, EBI/LBI:5/5, to pgw, Timeout:51, alive time: 8
    Uplink: Packets 0, Bytes 0, Downlink: Packets 0, Bytes 0
      IPv6: 2001:10::102, 00000822 -> 2001:13::109, 00000832
      IPv4: 201.10.0.104, 00000822 -> 201.13.0.107, 00000832
    User tunnel, EBI/LBI:6/5, to pgw, Timeout:51, alive time: 8
    Uplink: Packets 0, Bytes 0, Downlink: Packets 0, Bytes 0
      IPv6: ::, 00000823 -> ::, 00000833
      IPv4: 201.10.0.105, 00000823 -> 201.13.0.108, 00000833
2 tunnels active in total
```

show security gprs gtp configuration

Syntax

```
show security gprs gtp configuration (identifier <identifier number 1 to 512 | all)
```

Release Information

Command introduced in Junos OS Release 19.3R1.

Description

IP addresses in GPRS tunneling protocol (GTP) message on Gp or the S8 interface are validated with the configured IP group list to prevent attacks. The GTP firewall determines if the IP addresses in GTP messages and matches with the configured IP group list. Based on the match criteria valid GTP messages are forwarded to Packet and Forwarding Engine, invalid GTP messages are dropped.

Options

- identifier number 1 to 512 —Displays the GTP configuration based on the identifier selected. For each GTP profile configuration, system gives a identifier number. It is in sequence order starting from 1.
- all —Displays all the GTP configuration profile list along with the identifier and name.

Required Privilege Level

view

List of Sample Output

show security gprs gtp configuration all on page 247
show security gprs gtp configuration 1 on page 248

Output Fields

Table 24 on page 243 lists the output fields for the **show security gprs gtp configuration 1** command. Output fields are listed in the approximate order in which they appear.

Table 24: show security gprs gtp configuration 1

Field Name	Field Description
Index	An internal number associated with the GTP message.
Min Message Length	Displays minimum message payload length (in bytes).
Max Message Length	Displays maximum message payload length (in bytes).
Timeout	Elapsed time without activity after which the profile is terminated.
Rate Limit	Displays limit rate of control traffic to any GSN defined in a GTP profile.

Table 24: show security gprs gtp configuration 1 *(continued)*

Field Name	Field Description
Remove R6 Remove R7 Remove R8 Remove R9	Displays count of IEs that are removed from GTP messages.
Deny Nested GTP	Represents the deny of nested GTP profiles.
Validated	Represents validated address of the end user.
Passive learning enable	Represents passive learning enabled in GTP profile.
Restart Path	Represents the restart status of the GTP path.
Log Forwarded	Represents packets that the security device transmitted because it was valid.
Log State Invalid	A packet that the security device dropped because it failed stateful inspection.
Log Prohibited	packet that the security device dropped because it was invalid.
Log Ratelimited	A packet that the security device dropped because it exceeded the maximum rate limit of the destination GSN.
Frequency Number	Logging frequency over threshold set by rate-limit.
Drop AA Create PDU	Represents Create AA PDU Context Request and Create AA PDU Context Response messages.
Drop AA Delete PDU	Represents Delete AA PDP Context Request and Delete AA PDP Context Response messages.
Drop Bearer Resource	Represents Bearer Resource Command and Bearer Resource Failure messages.
Drop Change Notification	Represents Change Notification Request and Change Notification Response messages.
Drop Config Transfer	Represents Configuration Transfer Tunnel messages.
Drop Context	Represents Context Request and Context Response messages.
Drop Create Bear	Represents Create Bearer Request and Create Bearer Response messages.

Table 24: show security gprs gtp configuration 1 *(continued)*

Field Name	Field Description
Drop Create Data Forwarding	Represents Create Indirect Data Forwarding Request and Create Indirect Data Forwarding Response messages.
Drop Create PDU	Represents Create PDU Context Request and Create PDU Context Response messages.
Drop Create Session	Represents Create Session Request and Create Session Response messages.
Drop Create Forwarding Tnl	Represents Create Forwarding Tunnel Request and Create Forwarding Tunnel Response messages.
Drop CS Paging	Represents CS Paging Indication messages.
Drop Data Record	Represents Data Record Request and Data Record Response messages.
Drop Delete Bearer	Represents Delete Bearer Request and Delete Bearer Response messages.
Drop Delete Command	Represents Delete Bearer Command and Delete Bearer Failure messages.
Drop Delete Data Forwarding	Represents Delete Indirect Data Forwarding Request and Delete Indirect Data Forwarding Response messages.
Drop Delete PDN	Represents Delete PDN Connection Set Request and Delete PDN Connection Set Response messages
Drop Delete PDP	Represents Delete PDP Context Request and Delete PDP Context Response messages.
Drop Delete Session	Represents Delete Session Request and Delete Session Response messages.
Drop Detach	Represents Detach Notification and Detach Acknowledgement messages.
Drop Downlink Notification	Represents Downlink Data Notification, Downlink Data Acknowledgement, and Downlink Data Notification Failure Indication messages.
Drop Echo	Represents Echo Request and Echo Response messages.
Drop Error Indication	Represents Error Indication messages.
Drop Failure Report	Represents Failure Report Request and Failure Report Response messages.

Table 24: show security gprs gtp configuration 1 *(continued)*

Field Name	Field Description
Drop FWD Access	Represents Forward Access Context Notification and Forward Access Context Acknowledgment messages.
Drop FWD Relocation	Represents Forward Relocation Request, Forward Relocation Response, Forward Relocation Complete, and Forward Relocation Complete Acknowledge messages.
Drop FWD SRNS Context	Represents Forward SRNS Context Request and Forward SRNS Context Response messages.
Drop G-PDU	Represents G-PDU and T-PDU messages.
Drop Identification	Represents Identification Request and Identification Response messages.
Drop MBMS Sess Start	Represents MBMS Session Start Request and MBMS Session Start Response messages.
Drop MBMS Sess Stop	Represents MBMS Session Stop Request and MBMS Session Stop Response messages.
Drop MBMS Sess Update	Represents MBMS Session Update Request and MBMS Session Update Response messages.
Drop Modify Bearer	Represents Modify Bearer Request and Modify Bearer Response messages.
Drop Modify Command	Represents Modify Bearer Command and Modify Bearer Failure messages.
Drop Node Alive	Represents Node Alive Request and Node Alive Response messages.
Drop Note MS Present	Represents Note MS GPRS Present Request and Note MS GPRS Present Response messages.
Drop PDU Notification	Represents PDU Notification request and PDU Notification response messages.
Drop Ran Info	Represents Ran Info Relay messages.
Drop Redirection	Represents Redirection Request and Redirection Response messages.
Drop Release Access	

Table 24: show security gprs gtp configuration 1 *(continued)*

Field Name	Field Description
Drop Relocation Cancel	Represents Relocations Cancel Request and Relocation Cancel Response messages.
Drop Resume	Represents Resume Notification and Resume Acknowledgement messages.
Drop Send Route	Represents Send Route Info Request and Send Route Info Response messages.
Drop SGSN Context	Represents SGSN Context Request and SGSN Context Response messages.
Drop Stop Paging	Represents Stop Paging Indication messages.
Drop Supported Extension	Represents Supported Extension Headers Notification messages.
Drop Suspend	Represents Suspend Notification and Suspend Acknowledgement messages.
Drop Trace Session	Represents Trace Session Activation in GTP.
Drop Update Bearer	Represents Update Bearer Request and Update Bearer Response messages.
Drop Update PDN	Represents Update PDN Set Connection Request and PDN Set Connection Response messages.
Drop Update PDP	Represents Update PDP Request and Update PDP Response messages.
Drop Ver Not Supported	Represents Version Not Supported messages.
Handover group name	Name of the handover IP address group.
NE group name	Name of the network equipment group.
UE group name	Name of the user equipment group.

Sample Output

show security gprs gtp configuration all

```
user@host> show security gprs gtp configuration all
```

```
        1 gtp1
```

show security gprs gtp configuration 1

```
user@host>  show security gprs gtp configuration 1
```

```
   Profile Details:

         Index                       : 2
         Min Message Length          : 0
         Max Message Length          : 65535
         Timeout                     : 24
         Rate Limit                  : 0
         Request Timeout             : 5
         Remove R6                   : 0
         Remove R7                   : 0
         Remove R8                   : 0
         Remove R9                   : 0
         Deny Nested GTP             : 0
         Validated                   : 0
         Passive learning enable     : 0
         Restart Path                : 0
         Log Forwarded               : 0
         Log State Invalid           : 0
         Log Prohibited              : 0
         Log Ratelimited             : 0
         Frequency Number            : 0
         Drop AA Create PDU          : 0
         Drop AA Delete PDU          : 0
         Drop Bearer Resource        : 0
         Drop Change Notification    : 0
         Drop Config Transfer        : 0
         Drop Context                : 0
         Drop Create Bear            : 0
         Drop Create Data Forwarding : 0
         Drop Create PDU             : 0
         Drop Create Session         : 0
         Drop Create Forwarding Tnl  : 0
         Drop CS Paging              : 0
         Drop Data Record            : 0
         Drop Delete Bearer          : 0
         Drop Delete Command         : 0
```

```
Drop Delete Data Forwarding : 0
Drop Delete PDN             : 0
Drop Delete PDP             : 0
Drop Delete Session         : 0
Drop Detach                 : 0
Drop Downlink Notification  : 0
Drop Echo                   : 0
Drop Error Indication       : 0
Drop Failure Report         : 0
Drop FWD Access             : 0
Drop FWD Relocation         : 0
Drop FWD SRNS Context       : 0
Drop G-PDU                  : 0
Drop Identification         : 0
Drop MBMS Sess Start        : 0
Drop MBMS Sess Stop         : 0
Drop MBMS Sess Update       : 0
Drop Modify Bearer          : 0
Drop Modify Command         : 0
Drop Node Alive             : 0
Drop Note MS Present        : 0
Drop PDU Notification       : 0
Drop Ran Info               : 0
Drop Redirection            : 0
Drop Release Access         : 0
Drop Relocation Cancel      : 0
Drop Resume                 : 0
Drop Send Route             : 0
Drop SGSN Context           : 0
Drop Stop Paging            : 0
Drop Supported Extension    : 0
Drop Suspend                : 0
Drop Trace Session          : 0
Drop Update Bearer          : 0
Drop Update PDN             : 0
Drop Update PDP             : 0
Drop Ver Not Supported      : 0
Handover group name         : N/A
NE group name               : ng1
UE group name               : ug1
```

show security gprs gtp counters

Syntax

```
show security gprs gtp counters <all | data-packet | error | ha | message <message-name> | packet | request | tunnel |
    path-rate-limit>
```

Release Information

Command introduced in Junos OS Release 12.1X44-D10.

Description

Display counters that can be used to indicate the number of GPRS tunneling protocol (GTP) tunnel counters (allocated and freed), GTP packet counters (received, passed, and dropped), brief message counters (receive, forward, and drop), error counters, request counters, HA counters, and path-rate-limit counters (drop and alarm).

Options

- **all**—Show all GTP counters.
- **data-packet**— Show GTP-U data packet counters.
- **error**—Show GTP error counters.
- **ha**—Show GTP HA counters.
- **message *message-name***—Show GTP message counters.
- **packet**—Show GTP packet counters.
- **request**—Show GTP request counters.
- **tunnel**—Show GTP tunnel counters.
- **path-rate-limit**—Show path-rate-limit counters.

Required Privilege Level

view

RELATED DOCUMENTATION

clear security gprs gtp counters | 232

List of Sample Output

show security gprs gtp counters message v0-create-aa-pdp-req on page 260
show security gprs gtp counters packet on page 260
show security gprs gtp counters request on page 260
show security gprs gtp counters tunnel on page 260
show security gprs gtp counters path-rate-limit on page 261

Output Fields

Table 25 on page 251 lists the output fields for the **show security gprs gtp counters** command.

Table 25: show security gprs gtp counters all Output Fields

Field Name	Field Description
Tunnel counters	Tunnel counters are used to track the number of tunnels that are created on the device. There are two entries: • Allocated • Freed Active tunnel number = number of allocated counters - number of freed counters
Packet counters	Packet counters indicate the number of GTP packets that are received and processed on the device. There are three entries: • Received–Number of GTP packet messages received. • Passed–Number of GTP packet messages passed. • Dropped–Number of GTP packet messages dropped because of an error. Number of received counters = number of dropped counters + number of passed counters
Data-packet counters	GTP-U data packet counters are used to track the number of data packets that are received, passed, dropped, no-tunnel dropped, sequence error dropped, end-user dropped, or dropped otherwise.

Table 25: show security gprs gtp counters all Output Fields *(continued)*

Field Name	Field Description
Brief message counters	GTP messages counters indicate the number of GTP messages that are received and processed on the device. There are three entries: • Received–Number of GTP messages received. • Forwarded–Number of GTP messages forwarded. • Dropped–Number of GTP messages dropped because of an error. Number of received counters = number of dropped counters + number of forward counters
Error counters	Drop reason and drop counters indicate the number of GTP packets that are dropped as a result of an error. Total error = Sum of all the following errors
Request counters	Request counters indicate the number of GTP request messages that are received and processed on the device. This information can be used for debugging purpose.
HA counters	HA counters indicate the number of messages that are received or sent by the device.
Path-rate-limit counters	Path-rate-limit counters indicate the number of packet data protocol (PDP) create, delete, echo, and other messages that are received and processed on the device after drop-threshold and alarm-threshold are reached. • Create Request–Number of create PDP messages. • Delete Request–Number of delete PDP messages. • Echo Request–Number of PDP echo messages. • Others–Control messages other than the above messages. Drop–Indicate the number of packets dropped. Alarm–Indicate the number of packets transferred after the alarm threshold is reached.

Sample Output

show security gprs gtp counters all

```
user@host> show security gprs gtp counters all
```

```
Tunnel counters:
                  Total      GTPv0    GTPv1-c    GTPv1-u    GTPv2-c    GTPv2-u
Allocated         0          0        0          0          0          0
Freed             0          0        0          0          0          0


Packet counters:
                  Total      GTPv0      GTPv1      GTPv2       GTP'
Received          0          0          0          0          0
Passed            0          0          0          0          0
Dropped           0          0          0          0          0

Data-packet counters:
        gtpv1 data pkt received               : 0
        gtpv1 data pkt passed                 : 0
        gtpv1 data pkt dropped                : 0
        gtpv1 data pkt no-tunnel dropped      : 0
        gtpv1 data pkt sequence error dropped : 0
        gtpv1 data pkt end-user dropped       : 0
        gtpv1 data pkt other dropped          : 0
        gtpv0 data pkt received               : 0
        gtpv0 data pkt passed                 : 0
        gtpv0 data pkt dropped                : 0
        gtpv0 data pkt no-tunnel dropped      : 0
        gtpv0 data pkt sequence error dropped : 0
        gtpv0 data pkt end-user dropped       : 0
        gtpv0 data pkt other dropped          : 0


Brief message counters:
                                    Received    Forwarded       Dropped
GTPv0
  Create PDP Request                0           0           0
  Create PDP Response               0           0           0
  Update PDP Request                0           0           0
  Update PDP Response               0           0           0
  Delete PDP Request                0           0           0
  Delete PDP Response               0           0           0
  Create AA PDP Request             0           0           0
  Create AA PDP Response            0           0           0
  Delete AA PDP Request             0           0           0
  Delete AA PDP Response            0           0           0
  SGSN Context Request              0           0           0
  SGSN Context Response             0           0           0
```

```
  SGSN Context Acknowledge          0          0          0
  Others                            0          0          0
GTPv1
  Create PDP Request                0          0          0
  Create PDP Response               0          0          0
  Update PDP Request                0          0          0
  Update PDP Response               0          0          0
  Delete PDP Request                0          0          0
  Delete PDP Response               0          0          0
  SGSN Context Request              0          0          0
  SGSN Context Response             0          0          0
  SGSN Context Acknowledge          0          0          0
  Forward Relocation Request        0          0          0
  Forward Relocation Response       0          0          0
  Others                            0          0          0
GTPv2
  Create Session Request            0          0          0
  Create Session Response           0          0          0
  Delete Session Request            0          0          0
  Delete Session Response           0          0          0
  Create Bearer Request             0          0          0
  Create Bearer Response            0          0          0
  Modify Bearer Request             0          0          0
  Modify Bearer Response            0          0          0
  Delete Bearer Request             0          0          0
  Delete Bearer Response            0          0          0
  Context Request                   0          0          0
  Context Response                  0          0          0
  Context Acknowledge               0          0          0
  Forward Relocation Request        0          0          0
  Forward Relocation Response       0          0          0
  Create Indirect Tunnel Request    0          0          0
  Create Indirect Tunnel Response   0          0          0
  Others                            0          0          0

Error counters:
        Total error                 : 0
        Exception                   : 0
        Invalid header              : 0
        Message length              : 0
        Zero IMSI                   : 0
        Zero charge ID              : 0
        Sequence                    : 0
        APN filter                  : 0
```

```
Port not match               : 0
GTP-in-GTP                   : 0
Message too short            : 0
Message too long             : 0
GSN not exist                : 0
Over GSN rate limit          : 0
Request not found            : 0
Retransmit response          : 0
Missing IE                   : 0
Unexpected IE                : 0
Unknown IE type              : 0
IE order                     : 0
IE length                    : 0
Duplicate IE                 : 0
Non-digit TID/TEID           : 0
Non-zero TID/TEID            : 0
Zero TID/TEID                : 0
Control TID/TEID             : 0
Data TID/TEID                : 0
Control GSN IE               : 0
Data GSN IE                  : 0
End user IE                  : 0
GGSN IP for handover         : 0
Disallowed v0 message        : 0
Disallowed v1 message        : 0
Disallowed v2 message        : 0
Invalid message type         : 0
No tunnel0                   : 0
No control tunnel            : 0
No user tunnel               : 0
Invalid tunnel0              : 0
Invalid control tunnel       : 0
Invalid user tunnel          : 0
Create tunnel0               : 0
Create control tunnel        : 0
Create user tunnel           : 0
No request                   : 0
Out of request               : 0
No action                    : 0
Out of action                : 0
GTPv2 TEID not exist         : 0
GTPv2 Missing TEID           : 0
GTPv2 Non-zero EBI           : 0
GTPv2 EBI not found          : 0
```

```
        GTPv2 IE context              : 0
        Duplicate new jbuf            : 0
        Out of jmpi cookie            : 0
        Send jmpi message             : 0
        JMPI target                   : 0
        Out of callback cookie        : 0
        Reinject packet               : 0
        Distribute wrong spu          : 0
        System under reset            : 0
        Source IP                     : 0
        Destination IP                : 0
        Invalid EBI                   : 0
        SPU not all up                : 0
        Interface not support         : 0
        Out of path                   : 0
        Over path rate limit          : 0
        New utnl key                  : 0
        No utnl key                   : 0
        End user                      : 0
        New sync action               : 0
        NSAPI                         : 0
        New conflict sync action      : 0
        Primary u-tunnel id not exist : 0
        Too many same type ie         : 0
        Invalid v2 lbi                : 0
        Remove conflict utnl          : 0
        Conflict primary u-tunnel     : 0
        Ctnl recovery error           : 0
        Link ctnl conflict            : 0
        Link utnl conflict            : 0
        Link tnl0 conflict            : 0
        Error ggsn ip for v0 packet   : 0
        Invalid payload(NAT)          : 0
        Wrong SPU since NULL sinfor   : 0
        Wrong SPU since no match wings: 0
        Wrong SPU since no anchor GSN : 0
        Bad reqeust retransmit        : 0
        Cross group handover deny     : 0
        Handover default deny         : 0

HA counters:
        Total message received              : 0
        Message received success            : 0
        Bad message received                : 0
```

```
        Unknown message type received       : 0
        Unknown message version received    : 0
        Total message send                  : 0
        Message send success                : 0
        Message send failed                 : 0
        Memory allocate failed              : 0
        Message received during tunnel reset: 0

Request counters:
        Request allocated               : 0
        Request freed                   : 0
        Request allocated fail          : 0
        Request hit by wrong SPU        : 0
        Request pending for JMPI ACK    : 0


Path-rate-limit counters:
                            Drop              Alarm
Create Request           0                  0
Delete Request           0                  0
Echo Request             0                  0
Others                   0                  0
```

show security gprs gtp counters error

`user@host>` **show security gprs gtp counters error**

```
Error counters:
        Total error            : 0
        Exception              : 0
        Gate failed            : 0
        Invalid header         : 0
        Message length         : 0
        Zero IMSI              : 0
        Zero charge ID         : 0
        Sequence               : 0
        APN filter             : 0
        Port not match         : 0
        GTP-in-GTP             : 0
        Message too short      : 0
        Message too long       : 0
        GSN not exist          : 0
        Over GSN rate limit    : 0
        Request not found      : 0
```

```
Retransmit response    : 0
Missing IE             : 0
Unexpected IE          : 0
Unknown IE type        : 0
IE order               : 0
IE length              : 0
Duplicate IE           : 0
Non-digit TID/TEID     : 0
Non-zero TID/TEID      : 0
Zero TID/TEID          : 0
Control TID/TEID       : 0
Data TID/TEID          : 0
Control GSN IE         : 0
Data GSN IE            : 0
End user IE            : 0
GGSN IP for handover   : 0
Disallowed v0 message  : 0
Disallowed v1 message  : 0
Disallowed v2 message  : 0
Invalid message type   : 0
No tunnel0             : 0
No control tunnel      : 0
No user tunnel         : 0
Invalid tunnel0        : 0
Invalid control tunnel : 0
Invalid user tunnel    : 0
Create tunnel0         : 0
Create control tunnel  : 0
Create user tunnel     : 0
No request             : 0
Out of request         : 0
No action              : 0
Out of action          : 0
GTPv2 TEID not exist   : 0
GTPv2 Missing TEID     : 0
GTPv2 Non-zero EBI     : 0
GTPv2 EBI not found    : 0
GTPv2 IE context       : 0
Duplicate new jbuf     : 0
Out of jmpi cookie     : 0
Send jmpi message      : 0
JMPI target            : 0
Out of callback cookie : 0
Reinject packet        : 0
```

```
        Distribute wrong spu   : 0
        System under reset     : 0
        Source IP              : 0
        Destination IP         : 0
        Invalid EBI            : 0
        SPU not all up         : 0
        Interface not support  : 0
        Out of path            : 0
        Over path rate limit   : 0
        New utnl key           : 0
        No utnl key            : 0
        End user               : 0
        New sync action        : 0
        NSAPI                  : 0
        New conflict sync action      : 0
        Primary u-tunnel id not exist : 0
        Too many same type ie         : 0
        Invalid v2 lbi                : 0
        Remove conflict utnl          : 0
        Conflict primary u-tunnel     : 0
        Ctnl recovery error           : 0
        Link ctnl conflict            : 0
        Link utnl conflict            : 0
        Link tnl0 conflict            : 0
        Error ggsn ip for v0 packet   : 0
        Invalid payload(NAT)          : 0
        Wrong SPU since NULL sinfor   : 0
        Wrong SPU since no match wings: 0
        Wrong SPU since no anchor GSN : 0
        Bad reqeust retransmit        : 0
        Cross group handover deny     : 0
        Handover default deny         : 0
```

show security gprs gtp counters ha

user@host> **show security gprs gtp counters ha**

```
HA counters:
        Total message received              : 0
        Message received success            : 0
        Bad message received                : 0
        Unknown message type received       : 0
        Unknown message version received    : 0
        Total message send                  : 0
```

```
        Message send success                : 0
        Message send failed                 : 0
        Memory allocate failed              : 0
```

show security gprs gtp counters message v0-create-aa-pdp-req

```
user@host> show security gprs gtp counters message v0-create-aa-pdp-req
```

```
Message counters:
  Received              0
  Forwarded             0
  Dropped               0
```

show security gprs gtp counters packet

```
user@host> show security gprs gtp counters packet
```

```
Packet counters:
                Total      GTPv0      GTPv1      GTPv2       GTP'
  Received          0          0          0          0          0
  Passed            0          0          0          0          0
  Dropped           0          0          0          0          0
```

show security gprs gtp counters request

```
user@host> show security gprs gtp counters request
```

```
Request counters:
        Request allocated           : 0
        Request freed               : 0
        Request activated           : 0
        Request died                : 0
        Request action allocated    : 0
        Request action freed        : 0
```

show security gprs gtp counters tunnel

```
user@host> show security gprs gtp counters tunnel
```

```
Tunnel counters:
                 Total      GTPv0    GTPv1-c    GTPv1-u    GTPv2-c    GTPv2-u
  Allocated          0          0          0          0          0          0
  Freed              0          0          0          0          0          0
```

show security gprs gtp counters path-rate-limit

user@host> **show security gprs gtp counters path-rate-limit**

```
Path-rate-limit counters:
                            Drop           Alarm
  Create Request             0              0
  Delete Request             0              0
  Echo Request               0              0
  Others                     0              0
```

show security gprs gtp counters path-rate-limit

Syntax

```
show security gprs gtp counters path-rate-limit
```

Release Information

Statement introduced in Junos OS Release 12.1X45-D10.

Description

Display information about path-rate-limit counters.

Required Privilege Level

view

List of Sample Output

show security gprs gtp counters path-rate-limit on page 263

Output Fields

Table 26 on page 262 lists the output fields for the **show security gprs gtp counters path-rate-limit** command.

Table 26: show security gprs gtp counters path-rate-limit Output Fields

Field Name	Field Description
Create Request	Specify the number of create request messages received in a second after the alarm-threshold or drop-threshold is reached.
Delete Request	Specify the number of delete request messages received in a second after the alarm-threshold or drop-threshold is reached.
Echo Request	Specify the number of echo request messages received in a minute after the alarm-threshold or drop-threshold is reached.
Other messages	Specify the number of other GTP control messages received in a second after the alarm-threshold or drop-threshold is reached.
Drop	Display the number of packets dropped after the drop-threshold is reached.
Alarm	Display the number of packets received after the alarm-threshold is reached.

Sample Output

show security gprs gtp counters path-rate-limit

```
user@host> show security gprs gtp counters path-rate-limit
```

```
Path-rate-limit counters:
                                    Drop                          Alarm
Create Request                      200                            100
Delete Request                      300                            200
Echo Request                        600                            400
Others                              900                            800
```

show security gprs gtp gsn statistics

Syntax

```
show security gprs gtp gsn statistics
```

Release Information
Command introduced in Junos OS Release 12.1X46-D25.

Description
Display a brief summary of GPRS support node (GSN) statistics, including active GSNs, obsolete GSNs, and the usage rate of each SPU.

Required Privilege Level
view

RELATED DOCUMENTATION

show security gprs gtp counters path-rate-limit | 262

List of Sample Output
show security gprs gtp gsn statistics on page 264

Sample Output

show security gprs gtp gsn statistics

`user@host>` **show security gprs gtp gsn statistics**

```
FPC 1 PIC 0:

Active GSNs: 0 Obsolete GSNs: 0 Use rate: 0%

FPC 2 PIC 0:

Active GSNs: 0 Obsolete GSNs: 0 Use rate: 0%
```

show security gprs gtp handover-group

Syntax

```
show security gprs gtp handover-group
```

Release Information
Command introduced in Junos OS Release 17.4R1.

Description
A GPRS tunneling protocol (GTP) handover group is a set of SGSNs or serving gateway (SGW) with a common address-book library. An administrator can configure a GTP profile and associate an GTP handover group to the GTP profile. When a GTP handover group name is referenced by a GTP profile, the device checks to see if the current SGSN/SGW address and the proposed SGSN/SGW address are both contained within the same GTP handover group. If both SGSN/SGW addresses are contained within the same GTP handover group, then the handover is allowed. If both the current and proposed SGSN/SGW addresses are not within the same GTP handover group, then the profile for the default handover group is used.

Required Privilege Level
view

RELATED DOCUMENTATION

show security gprs gtp counters | 250

List of Sample Output
show security gprs gtp handover-group on page 265

Sample Output

show security gprs gtp handover-group

`user@host>` **show security gprs gtp handover-group**

```
All configured handover group:
    Group name                  Address book name          Address set name
handover_group_v1v2                addr_book_h              roam_group_v1v2

    hg_v1_h                        addr_book_h                 roam_v1_h
```

show security gprs gtp ip-group

Syntax

```
show security gprs gtp ip-group
```

Release Information

Command introduced in Junos OS Release 19.3R1.

Description

IP group is a list of IP addresses that belongs to all kinds of network equipment. IP group name(s) are referenced in GTP profiles. The GTP firewall applies configured policies in incoming and outgoing IP addresses in GPRS tunneling protocol (GTP) messages.

Required Privilege Level

view

List of Sample Output

show security gprs gtp ip-group on page 266

Output Fields

Table 27 on page 266 lists the output fields for the **show security gprs gtp ip-group** command. Output fields are listed in the approximate order in which they appear.

Table 27: show security gprs gtp ip-group

Field Name	Field Description
Group name	The name of the handover group on the GTP profile.
Address book name	The name of the common address-book name.
Address set name	The name of the address set for the handover group.

Sample Output

show security gprs gtp ip-group

```
user@host> show security gprs gtp ip-group
```

```
All configured IP group:
    Group name             Address book name       Address set name
```

```
ng1                     global                  ne-group-as
ug1                     global                  ue-group-as
```

show security gprs sctp association

Syntax

```
show security gprs sctp association
<all>
<destination-ip>
<destination-port>
<guid>
<init-state>
<source-ip>
<source-port>
<summary>
```

Release Information
Command introduced in Junos OS Release 12.1X44-D10. The **all**, **destination-ip**, **destination-port**, **guid**, **init**, **source-ip**, **source-port**, and **summary** options introduced in Junos OS Release 12.1X45-D10.

Description
Display the Stream Control Transmission Protocol (SCTP) association information.

Options
none—Display the live security SCTP association.

all—Display information about all the SCTP associations, both initiated and live.

destination-ip—Display information about the destination IP address associations.

destination-port—Display information about the destination port associations.

guid—Display information about the globally unique identifier associations.

init—Display information about initiated associations.

source-ip—Display information about the source IP address associations.

source-port—Display information about the source port associations.

summary—Display the output summary.

Required Privilege Level
view

RELATED DOCUMENTATION

clear security gprs sctp counters | 237

clear security gprs sctp association | 235

List of Sample Output

show security gprs sctp association on page 269

Output Fields

Table 28 on page 269 lists the output fields for the **show security gprs sctp association** command. Output fields are listed in the approximate order in which they appear.

Table 28: show security gprs sctp association

Field Name	Field Description
Association Information	Association Information of FPC and PIC.
SCTP association numbers • **Total association**	Number of established SCTP associations. The SCTP association numbers field contains the total number of associations.
Association GUID	Globally unique association identifier information.

Sample Output

show security gprs sctp association

`user@host>` **show security gprs sctp association**

```
SCTP association numbers:
Total association 0

Association Information for FPC: 0      PIC: 1
SCTP association numbers:

Association GUID: 502a161a-a063bc44-0108000000001402
  source:
    10.3.202.118 (10.57.68.118)
    10.3.202.218 (10.57.68.218)
    port: 4215, state: SCTP_ESTABLISHED, tag: 0xe5d562d2;
  destination:
    172.28.34.206 (172.28.34.206)
    192.168.24.2 (192.168.24.2)
```

```
    port: 4215, state: SCTP_ESTABLISHED, tag: 0x631b82e4;
time left: 1786 s, access time: 45370 s;
policy id: sctp_policy/1, cfg live timeout: 30 min, handshake timeout: 20 s;

SCTP association numbers:
Total association 1

Association Information for FPC: 1      PIC: 0
SCTP association numbers:
Total association 0

Association Information for FPC: 1      PIC: 1
SCTP association numbers:
Total association 0
```

show security gprs sctp counters

Syntax

```
show security gprs sctp counters <detail>
```

Release Information

Command introduced in Junos OS Release 10.2. Support for the **detail** option added in Junos OS Release 12.1X45-D10. Support for SCTP payload protocols chunk counters added in Junos OS Release 12.1X47-D10.

Description

Display the statistics of the received and dropped Stream Control Transmission Protocol (SCTP) chunks.

Options

none—Display the statistics of all received and dropped SCTP chunks.

detail—Display detailed debugging counters for SCTP chunks.

Required Privilege Level

view

RELATED DOCUMENTATION

clear security gprs sctp counters | 237

List of Sample Output

show security gprs sctp counters on page 272
show security gprs sctp counters detail on page 275

Output Fields

Table 29 on page 271 lists the output fields for the **show security gprs sctp counters** command. Output fields are listed in the approximate order in which they appear.

Table 29: show security gprs sctp counters

Field Name	Field Description
Name	Name of the SCTP payload protocol identifier.
Received Counter	Number of SCTP chunk counters received.
Drop Counter	Number of SCTP chunk counters dropped due to error.

Table 29: show security gprs sctp counters *(continued)*

Field Name	Field Description
Counter Information	Association information of FPC and PIC.
Association detail counters	(detail output only) Number of total and dying associations.
Dbg records	(detail output only) Number and type of debugging records.
Packet error	(detail output only) Number and type of packet errors.
Association matching error	(detail output only) Number of association matching errors.
Association state error	(detail output only) Number of state errors.
Over rate drop	(detail output only) Number of messages over the rate limit.
Memory counters	(detail output only) Number and type of memory counters.
Other error	(detail output only) Number and type of other errors.

Sample Output

show security gprs sctp counters

`user@host>` **show security gprs sctp counters**

```
Counter Information for FPC: 1 PIC: 0
Association detail counters:
Total association: 0
Dying association: 0
Ready wrap: 0

Dbg records:
pak-without-profile : 0
pak-nat-only : 0
pak-inspection : 0
drop-at-clearing-all : 0
src-pnat : 0
dst-pnat : 0
hostname : 0
dup-init : 0
```

```
dup-initack : 0
tag-null-abort : 0
error-chunk : 0
bad-interest : 0
wing-attach : 0
wing-detach : 0
wrap-with-assoc : 0
unwrap-from-assoc : 0
conflict-assoc : 0
conflict-redr : 0
wrong-distribution : 0

Packet error:
chunk-unsupport : 0
cookie-invalid : 0
pkt-len : 0
chunk-len : 0
tag-error : 0
bad-len : 0
bad-chk-hdr : 0

Association matching error:
ha-assoc : 0
data-assoc : 0
initack-assoc : 0
sack-assoc : 0
hb-assoc : 0
hb-ack-assoc : 0
abort-assoc : 0
shutdown-assoc : 0
shutdown-ack-assoc : 0
err-assoc : 0
cookie-echo-assoc : 0
cookie-ack-assoc : 0
shutdown-complete-assoc : 0
lookup-no-assoc : 0
dup-init-diff-ip-list : 0
dup-init-diff-dst-ip : 0
dup-initack-src-ip-invalid : 0
dup-initack-diff-ip-lis : 0

Associaiton state error:
data-state : 0
init-state : 0
```

```
initack-state : 0
sack-state : 0
shutdown-state : 0
shutdown-ack-state : 0
cookie-echo-state : 0
cookie-ack-state : 0
shutdown-complete-state : 0
cookie-echo-retrans-timeout : 0
cookie-ack-retrans-timeout : 0

Association LoadBalance counter:
redirect-assoc-request-send : 0
redirect-assoc-request-ack-recv : 0
redirect-assoc-request-nack-recv : 0
redirect-assoc-request-ack-timeoute : 0
redirect-assoc-request-recv : 0
redirect-assoc-request-ack-send : 0
redirect-assoc-request-nack-send : 0

Over rate drop:
sccp : 0
ssp : 0
sst : 0

Memory counters:
alloc-assoc : 0
free-assoc : 0
alloc-redr : 0
free-redr : 0
alloc-assoc-wrap : 0
free-assoc-wrap : 0
alloc-cookie : 0
free-cookie : 0
alloc-addr : 0
free-addr : 0

HA counters:
invalid-type : 0
bad-msg : 0
no-assoc-info : 0
send-fail : 0
dup-create : 0
no-policy : 0
no-profile : 0
```

```
alloc-fail : 0
non-established-issu: 0

Other error:
over-max : 0
over-min : 0
del-error : 0
sess-cookie-set-fail : 0
sess-cookie-get-fail : 0
no-assoc-install-redr-cb : 0
wrap-alloced-failure : 0
wrap-null-assocp : 0
assoc-alloced-failure : 0
redr-assoc-alloced-failure : 0
invalid-pkt-pointer : 0
nat-jbuf-alloc-fail : 0
evt-cookie-alloc-fail : 0
```

Sample Output

show security gprs sctp counters detail

user@host> **show security gprs sctp counters detail**

```
Counter Information for FPC: 1 PIC: 0
Association detail counters:
Total association: 0
Dying association: 0
Ready wrap: 0

Dbg records:
pak-without-profile : 0
pak-nat-only : 0
pak-inspection : 0
drop-at-clearing-all : 0
src-pnat : 0
dst-pnat : 0
hostname : 0
dup-init : 0
dup-initack : 0
tag-null-abort : 0
error-chunk : 0
```

```
bad-interest : 0
wing-attach : 0
wing-detach : 0
wrap-with-assoc : 0
unwrap-from-assoc : 0
conflict-assoc : 0
conflict-redr : 0
wrong-distribution : 0

Packet error:
chunk-unsupport : 0
cookie-invalid : 0
pkt-len : 0
chunk-len : 0
tag-error : 0
bad-len : 0
bad-chk-hdr : 0

Association matching error:
ha-assoc : 0
data-assoc : 0
initack-assoc : 0
sack-assoc : 0
hb-assoc : 0
hb-ack-assoc : 0
abort-assoc : 0
shutdown-assoc : 0
shutdown-ack-assoc : 0
err-assoc : 0
cookie-echo-assoc : 0
cookie-ack-assoc : 0
shutdown-complete-assoc : 0
lookup-no-assoc : 0
dup-init-diff-ip-list : 0
dup-init-diff-dst-ip : 0
dup-initack-src-ip-invalid : 0
dup-initack-diff-ip-lis : 0

Associaiton state error:
data-state : 0
init-state : 0
initack-state : 0
sack-state : 0
shutdown-state : 0
```

```
shutdown-ack-state : 0
cookie-echo-state : 0
cookie-ack-state : 0
shutdown-complete-state : 0
cookie-echo-retrans-timeout : 0
cookie-ack-retrans-timeout : 0

Association LoadBalance counter:
redirect-assoc-request-send : 0
redirect-assoc-request-ack-recv : 0
redirect-assoc-request-nack-recv : 0
redirect-assoc-request-ack-timeoute : 0
redirect-assoc-request-recv : 0
redirect-assoc-request-ack-send : 0
redirect-assoc-request-nack-send : 0

Over rate drop:
sccp : 0
ssp : 0
sst : 0

Memory counters:
alloc-assoc : 0
free-assoc : 0
alloc-redr : 0
free-redr : 0
alloc-assoc-wrap : 0
free-assoc-wrap : 0
alloc-cookie : 0
free-cookie : 0
alloc-addr : 0
free-addr : 0

HA counters:
invalid-type : 0
bad-msg : 0
no-assoc-info : 0
send-fail : 0
dup-create : 0
no-policy : 0
no-profile : 0
alloc-fail : 0
non-established-issu: 0
```

```
Other error:
over-max : 0
over-min : 0
del-error : 0
sess-cookie-set-fail : 0
sess-cookie-get-fail : 0
no-assoc-install-redr-cb : 0
wrap-alloced-failure : 0
wrap-null-assocp : 0
assoc-alloced-failure : 0
redr-assoc-alloced-failure : 0
invalid-pkt-pointer : 0
nat-jbuf-alloc-fail : 0
evt-cookie-alloc-fail : 0
```