MobileNext Broadband Gateway

Exception Handling

Published: 2012-04-16

Juniper Networks, Inc.
1194 North Mathilda Avenue
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

MobileNext Broadband Gateway Exception Handling

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

YEAR 2000 NOTICE

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

END USER LICENSE AGREEMENT

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

Table of Contents

List of Figures

List of Tables

About the Documentation

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 http://www.juniper.net/techpubs/.

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

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

Supported Platforms

For the features described in this document, the following platforms are supported:

- MX240 Routers
- MX960 Routers
- MX480 Routers

Documentation Conventions

Table 1 on page x 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.

Table 2 on page x 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 important new terms. • Identifies book names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS System Basics Configuration Guide* • RFC 1997, *BGP Communities Attribute*
Italic text like this	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# **set system domain-name** *domain-name*
Text like this	Represents names of configuration statements, commands, files, and directories; interface names; 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)	Enclose optional keywords or variables.	**stub** <**default-metric** *metric*>**;**

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

Convention	Description	Examples
| (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)	Enclose a variable for which you can substitute one or more values.	**community name members [** ***community-ids*** **]**

Indention and braces ({ })	Identify 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.	
J-Web GUI Conventions		
Bold text like this	Represents J-Web 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 J-Web selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments to **techpubs-comments@juniper.net**, or fill out the documentation feedback form at https://www.juniper.net/cgi-bin/docbugreport/ . If you are using e-mail, be sure to include the following information with your comments:

- Document or topic name
- URL or page number
- Software release version (if applicable)

Requesting Technical Support

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

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

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

Self-Help Online Tools and Resources

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

- Find CSC offerings: http://www.juniper.net/customers/support/
- Search for known bugs: http://www2.juniper.net/kb/
- Find product documentation: http://www.juniper.net/techpubs/
- Find solutions and answer questions using our Knowledge Base: http://kb.juniper.net/
- Download the latest versions of software and review release notes: http://www.juniper.net/customers/csc/software/
- Search technical bulletins for relevant hardware and software notifications: https://www.juniper.net/alerts/
- Join and participate in the Juniper Networks Community Forum: http://www.juniper.net/company/communities/
- Open a case online in the CSC Case Management tool: http://www.juniper.net/cm/

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

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at http://www.juniper.net/cm/ .
- 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 http://www.juniper.net/support/requesting-support.html .

PART 1

Overview

CHAPTER 1

Exception Handling Overview

IP Packet Fragment Reassembly Overview

You can configure the MobileNext Broadband Gateway so that reassembly of fragmented IP packets is carried out inline (on the Packet Forwarding Engine) instead of performing IP reassembly on the services PIC. By default, IP reassembly is carried out on the services PIC. You can change the default behavior of the gateway, whether the gateway is configured as a Serving Gateway (S-GW), Packet Data Network Gateway (P-GW), or Gateway GPRS Support Node (GGSN). Although Serving Gateway Support Nodes (SGSNs) also reassemble IP packets, the broadband gateway cannot be configured as an SGSN.

Fragmentation of IP packets for transmission and the need to reassemble the IP packets at a destination is a feature of how Layer 2 (the frame layer) and Layer 3 (the packet layer) operate. That is, the maximum size of a frame, set by the Maximum Transmission Unit (MTU) value, and the maximum size of a packet are determined independently. It is usually the case that the packet size can far exceed the MTU size. If the packet size (data plus IP and other headers) exceeds the allowable frame size (usually set by the transport medium limits), the packet must be fragmented at the sender and split across multiple frames for transmission. Frames are always processed immediately, as they arrive (if error-free), but packet fragments cannot be processed until the whole packet has been reassembled. Each packet fragment inside a frame series, except the last, has the more fragments (MF) IP header bit set, indicating that this packet is part of a whole. The last packet fragment inside a frame does not have this MF bit set and therefore ends the fragment sequence. Once all of the fragments of a packet have arrived, the entire packet can be reassembled.

When memory buffers for networking were limited, heavy intervals of arriving fragmented traffic easily resulted in performance degradations or even complete “reassembly deadlock,” with buffers occupied only with fragments and no room for any arriving fragment that might complete a packet. In some cases, a packet fragment was discarded

only to find that the newly arrived frame would have completed the packet just thrown away. It is clear that efficient reassembly is important for network throughput, scalability, and graceful response to congestion.

In some cases, you can avoid the need to fragment packets on a mobile network by adjusting the MTU size to account for added headers such as GTP. However, in cases where multiple vendors are used or organization lines are crossed, this MTU adjustment might not be possible and IP fragmentation is unavoidable.

Figure 1: Fragmented Packet Requiring Reassembly

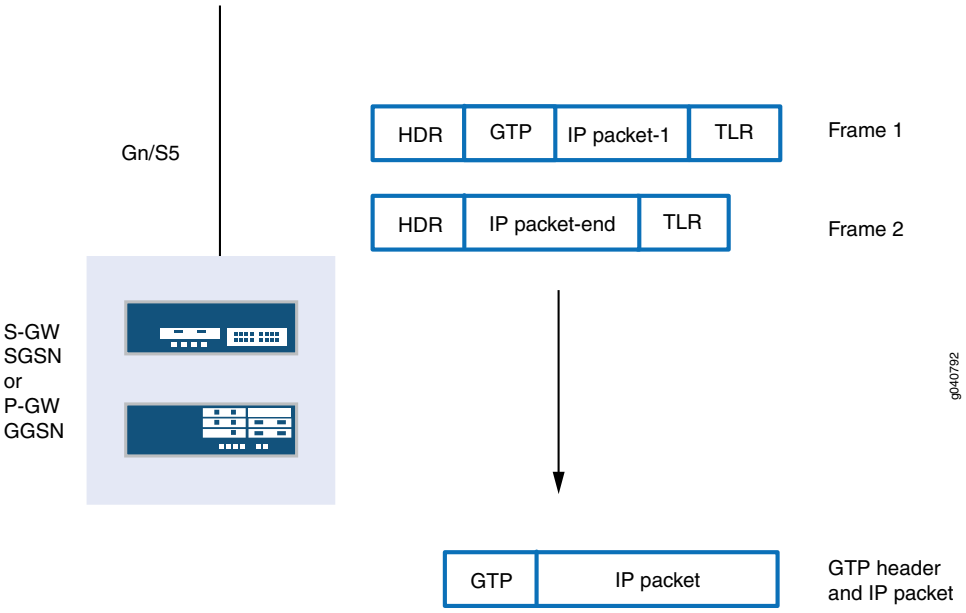
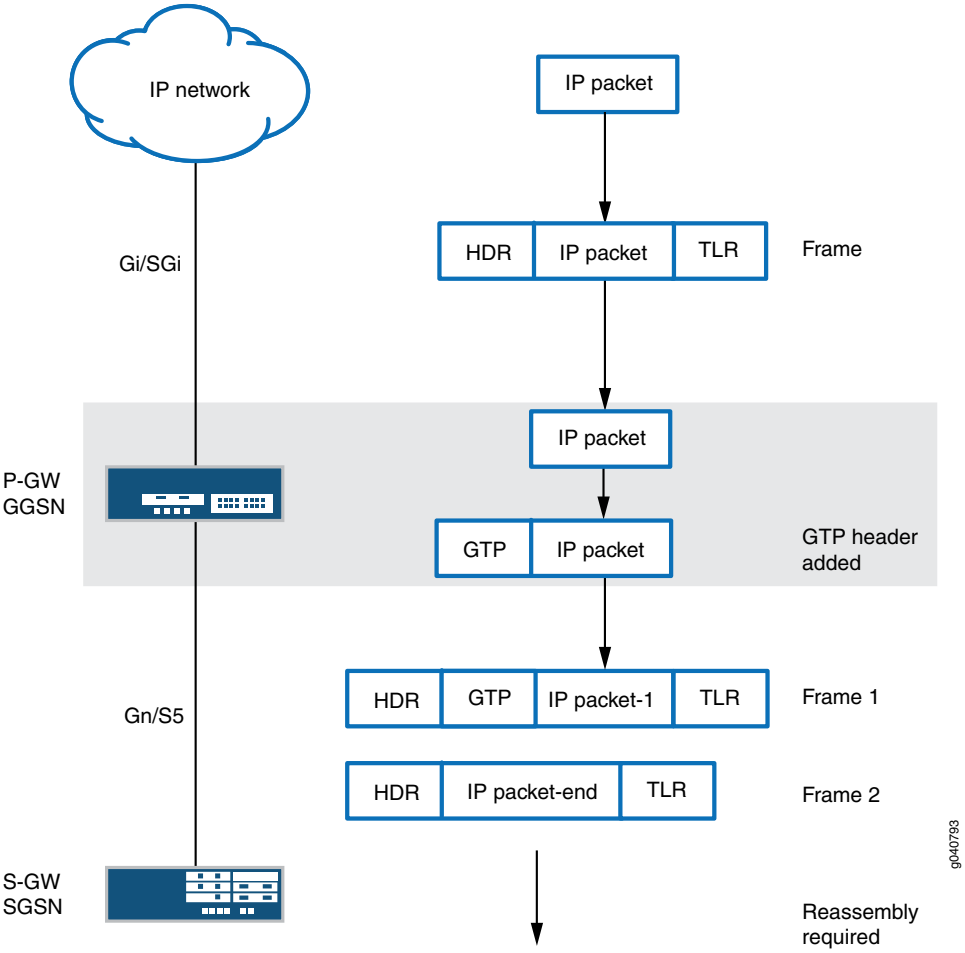


Figure 1 on page 4 shows a fragmented packet containing user data that requires reassembly on arrival on the Gn or S5 interface. On the broadband gateway, IP reassembly is carried out on the services PIC by default. This example configures the broadband gateway to perform IP reassembly of fragmented IP packets inline, on the Packet Forwarding Engine. However, inline reassembly requires the dedication of Packet Forwarding Engine resources for reassembly, which means these resources cannot be used for their usual purposes. You should consider potential trade-offs before changing the default behavior of the gateway.

As shown in Figure 2 on page 5, a framed downstream packet from an IP network to mobile device is sent over a Gi (3G) or SGi (LTE) interface to a GGSN or P-GW. At the GGSN/P-GW, the frame is processed and a 20-byte GTP-U header added to the packet. If the packets use the most common MTU size of 1500 bytes (for network efficiency), the added 20 bytes put the data unit over the allowable 1500 byte limit (1500 + 20 = 1520). To send the 1520-byte packet over the Gn (3G) or S5 (LTE) interface to the SSGN or S-GW, the GGSN or P-GW must fragment the packet and distribute the 1520 bytes into two frames (1500 bytes and 20 bytes). Because frames are processed immediately as they arrive (there is no such thing as “frame 1 of 2”), the first packet fragment must be kept until the second frame is processed and completes the packet. Then the whole packet with GTP-U header can be processed, routed, and sent on downstream. This

requires the SSGN or S-GW to perform the reassembly of the IP packet. Heavy traffic loads create an environment that forces the receiving node to keep track of and process many fragments at the same time.

Figure 2: A GTP-U Header Causing Fragmentation



Inline IP reassembly is enabled at the gateway level (for example, the entire P-GW or S-GW). Fragments for all IP addresses associated with the broadband gateway configured for inline reassembly are stored and reassembled on the interface on which it arrives. Enabling inline IP reassembly affects all fragments for that gateway. The mobility line cards reserve 2 MB of memory for storing fragments (non-mobility line cards reserve 8 MB).

NOTE: Inline IP reassembly of fragments arriving on different Packet Forwarding Engine complexes are not supported. These IP fragments are stored, but cannot be reassembled and eventually timeout and are dropped. The inline reassembly timeout parameter is 20 milliseconds (ms) and cannot be changed. The timeout values from 2 (default) through 60 seconds and is set for an IP reassembly profile at the **[edit services ip-reassembly *ip-reassembly-profile-name* inline-services]** hierarchy level apply to IP reassembly on the services PIC only.

Inline IP reassembly does not preclude the use of the services PIC. The packet forwarding engine could run out of memory to store fragments. In that case, new fragments that arrive are directed to the services PIC (if available) as a kind of "backup." Once the packet forwarding engine memory usage recovers, all fragments are again processed inline in the packet forwarding engine.

It should be noted that other scenarios involve IP fragment reassembly. For instance, IPsec is often used to encapsulate GTP packets on the S1-U interfaces from eNodeB to S-GW. IPsec encapsulation often causes packet fragmentation as well.

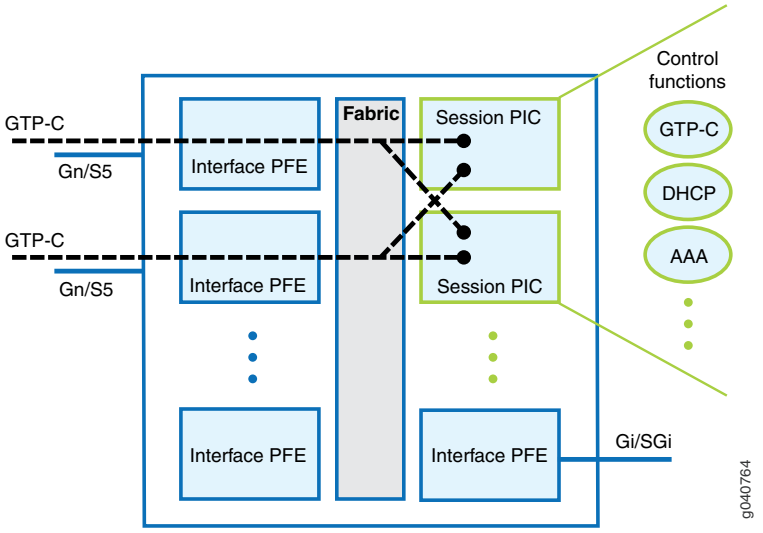
Related Documentation

- Configuring IP Inline Reassembly on page 13
- Example: Configuring Inline IP Packet Fragment Reassembly on page 21
- Understanding the Broadband Gateway Exception Handling on page 7

Understanding the Broadband Gateway Exception Handling

The MobileNext Broadband Gateway processes GPRS tunneling protocol (GTP) and IP packets as they make their way from an input interface to an output interface, upstream from mobile device to IP network or downstream from IP network to mobile device. Usually, the packet processing is handled at the hardware level. However, certain *exception* packets follow a path through software.

Figure 3: GTP-C Handling



As shown in Figure 3 on page 7, control plane packets such as session creation requests arriving on a Gn or S5 (or S8) interface are sent to an anchor session Dense Port Concentrator (DPC) for processing. The session DPC load-balances and selects anchor interface DPCs or Modular Port Concentrators (MPCs) (housing the Packet Forwarding Engines) for the user session, and all subsequent data packets for that session flow through the anchor Packet Forwarding Engine. Mid-session control packets, such as those changing session parameters due to mobility, are still sent to the anchor session DPC and associated PICs. In general, upstream and downstream data flows are handled directly by the anchor Packet Forwarding Engine.

There are four exceptions to the general rule that user packets flow only through Packet Forwarding Engine hardware:

- Anchor Packet Forwarding Engine failovers (N:1)
- Reassembly of GTP-U and mobility control plane (for instance, authentication, authorization, and accounting [AAA]) fragments
- IPv6 router advertisements and router solicitation packet handling
- GTP-U error indication generation

Only IP fragment reassembly and IPv6 router advertisements have parameters you can configure on the broadband gateway. (Anchor Packet Forwarding Engine configuration

is part of the basic chassis configuration and aggregated Packet Forwarding Engines for failover are part of redundancy configuration).

Related Documentation

- Understanding GTP-U Error Exception Handling on page 8
- Understanding Broadband Gateway IP Fragment Handling on page 9
- Configuring Fragment Reassembly Parameters on page 14
- Understanding IPv6 Protocol Parameters on page 9
- Configuring IPv6 Protocol Parameters on page 15
- Configuring Exception Handling Traceoptions on page 17
- Configuring S-GW Data Path Traceoptions on page 69
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- Configuring IP Inline Reassembly on page 13
- IP Packet Fragment Reassembly Overview on page 3

Understanding GTP-U Error Exception Handling

The MobileNext Broadband Gateway processes GPRS tunneling protocol, user plane (GTP-U) packets with errors in a distinctly different way from non-errored packets, and treats two type of errors differently.

The broadband gateway generates error indications based on two major GTP-U Tunnel Endpoint Identifier (TEID) errors:

- Invalid group TEID
- Invalid TEID

The broadband gateway assigns a TEID to all GTP packets and uses the TEID to associate all traffic belonging to the same tunnel and map one section of a tunnel to another. In addition, TEIDs can be grouped so that all sessions (contexts or bearers) can share the same group TEID for charging or other purposes.

The GTP-U error indication can be caused by an invalid individual or group TEID. In both cases, the session DPC sends the error indication back to the source.

The rate of GTP-U error indications is throttled at all steps to prevent storms of invalid TEID messages.

Related Documentation

- Understanding the Broadband Gateway Exception Handling on page 7
- Understanding Broadband Gateway IP Fragment Handling on page 9
- Configuring Fragment Reassembly Parameters on page 14
- Understanding IPv6 Protocol Parameters on page 9
- Configuring IPv6 Protocol Parameters on page 15
- Configuring Exception Handling Traceoptions on page 17

- Configuring S-GW Data Path Traceoptions on page 69
- Configuring IP Inline Reassembly on page 13
- IP Packet Fragment Reassembly Overview on page 3
- Example: Configuring Inline IP Packet Fragment Reassembly on page 21
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27

Understanding Broadband Gateway IP Fragment Handling

The MobileNext Broadband Gateway handles IP packet fragments differently than packets containing a single segment or datagram.

It is most efficient to process GPRS tunneling protocol (GTP) and IP packets immediately, as they arrive at the broadband gateway. Typically, a hardware data path is used to transfer packets to and from the anchor session Dense Port Concentrator (DPC) (for the control plane) or the interface Packet Forwarding Engine (for the data plane). However, fragmented packets require complete reassembly before processing can begin, because upper layer (Layer 4 and above) information will be missing in all but the first fragment. You can control many of the parameters associated with the fragment reassembly process.

You can configure the time interval that the anchor session DPCs wait for fragments to arrive. You can also configure the maximum number of packets that can be waiting for fragments. Both of these methods prevent the session DPCs from waiting for fragments that might never arrive.

Related Documentation

- Understanding the Broadband Gateway Exception Handling on page 7
- Understanding GTP-U Error Exception Handling on page 8
- Configuring Fragment Reassembly Parameters on page 14
- Understanding IPv6 Protocol Parameters on page 9
- Configuring IPv6 Protocol Parameters on page 15
- Configuring Exception Handling Traceoptions on page 17
- Configuring S-GW Data Path Traceoptions on page 69
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27

Understanding IPv6 Protocol Parameters

The MobileNext Broadband Gateway supports a series of parameters relating to IPv6 router advertisement.

Some of the most important pieces of IPv6 are built into the way the IPv6 protocol handles routers (or, in this case, the broadband gateway). Instead of requiring the user to configure a default router address, as typical in IPv4 configuration, IPv6 lets routers

advertise their presence to other devices on the subnet. This allows hosts to choose the router that is most natural for the application.

You can configure several parameters for a gateway that determine how the IPv6 router protocols operate:

- hop limit—The number of hops used in the router advertisements. A value of zero means routers will not readvertise router availability.
- maximum advertisement interval—The maximum interval the router can wait before sending a router advertisement.
- minimum advertisement interval—The minimum interval the router can wait before sending a router advertisement.
- maximum initial advertisement interval—The maximum interval the router can wait between initial router advertisements.
- maximum initial advertisements—The maximum number of initial router advertisements.
- reachable time—The value used in the reachable time field of the router advertisements.
- router lifetime—The value used in the router lifetime field of the router advertisements.
- retransmission timer—The value used in the retransmit timer field of the router advertisements.

Related Documentation

- IP Packet Fragment Reassembly Overview on page 3
- Understanding the Broadband Gateway Exception Handling on page 7
- Understanding GTP-U Error Exception Handling on page 8
- Understanding Broadband Gateway IP Fragment Handling on page 9
- Configuring Fragment Reassembly Parameters on page 14
- Configuring IPv6 Protocol Parameters on page 15
- Configuring Exception Handling Traceoptions on page 17
- Configuring S-GW Data Path Traceoptions on page 69
- Example: Configuring Inline IP Packet Fragment Reassembly on page 21
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27

PART 2

Configuration

CHAPTER 2

Configuration Tasks

Configuring IP Inline Reassembly

This procedure shows how to configure the MobileNext Broadband Gateway so that reassembly of fragmented IP packets is carried out inline (on the Packet Forwarding Engine) instead of performing IP reassembly on the services PIC. By default, IP reassembly is carried out on the services PIC. By default, IP reassembly is carried out on the services PIC. This example changes the default behavior of the gateway, whether the gateway is configured as a Serving Gateway (S-GW), Packet Data Network Gateway (P-GW), or Gateway GPRS Support Node (GGSN). Although Serving Gateway Support Nodes (SGSNs) also reassemble IP packets, the broadband gateway cannot be configured as an SGSN.

Before you configure inline IP reassembly, be sure you have:

- Configured the broadband gateway correctly.
- Configured a valid MTU size and GTP-U parameters.

To configure inline IP reassembly, perform these tasks:

1. [edit unified-edge gateways ggsn-pgw *gateway-name* inline-services]
   [edit unified-edge gateways sgw *gateway-name* inline-services]
   user@host# set ip-reassembly

Related Documentation

- IP Packet Fragment Reassembly Overview on page 3
- Example: Configuring Inline IP Packet Fragment Reassembly on page 21
- Understanding the Broadband Gateway Exception Handling on page 7
- Understanding GTP-U Error Exception Handling on page 8
- Understanding Broadband Gateway IP Fragment Handling on page 9
- Understanding IPv6 Protocol Parameters on page 9

Configuring Fragment Reassembly Parameters

On the MobileNext Broadband Gateway, anchor session Dense Port Concentrators (DPCs) reassemble arriving user plane packet fragment in order to have complete Layer 4 and above information. To prevent reassembly deadlock while waiting for fragments that never arrive, you can configure the time interval that the anchor session DPCs wait for fragments to arrive and the maximum number of packets that can be waiting for fragments.

Before you begin configuring reassembly parameters on the broadband gateway, you should have done the following:

- Configured the chassis of the broadband gateway
- Configured the interfaces of the broadband gateway
- Configured the general redundancy parameters for the broadband gateway

To determine the fragment reassembly behavior, you configure the timeout and maximum packets pending fragment parameters. You can group these parameters into an IP reassembly profile. More than one IP reassembly profile can be configured and applied to a particular gateway.

To configure the reassembly parameters:

1. Configure a value for the **timeout** in the reassembly profile.

   [edit services ip-reassembly profile *reassembly-profile-one*]
   user@host# **set timeout** *4*

   NOTE: You can set the timeout value from 2 through 60 seconds. The default value is 4 seconds.

2. Configure a value for the **max-reassembly-pending-packets** in the reassembly profile.

   [edit services ip-reassembly profle *reassembly-profile-one*]
   user@host# **set max-reassembly-pending-packets** *1000*

   NOTE: You can set the maximum packets pending reassembly value from 100 through 100,000 packets. The default value is 1000 packets.

3. Configure the broadband gateway to use the IP reassembly profile.

   [edit unified-edge gateways ggsn-pgw *MBG1*]

```
user@host# set ip-reassembly-profile reassembly-profile-one
```

NOTE: You can configure multiple IP reassembly profiles, but apply only one to a particular broadband gateway. You can also apply the profile to a S–GW configuration.

Related Documentation

- IP Packet Fragment Reassembly Overview on page 3
- Understanding the Broadband Gateway Exception Handling on page 7
- Understanding GTP-U Error Exception Handling on page 8
- Understanding Broadband Gateway IP Fragment Handling on page 9
- Understanding IPv6 Protocol Parameters on page 9
- Configuring IPv6 Protocol Parameters on page 15
- Configuring Exception Handling Traceoptions on page 17
- Configuring S-GW Data Path Traceoptions on page 69
- Example: Configuring Inline IP Packet Fragment Reassembly on page 21
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27

Configuring IPv6 Protocol Parameters

You can configure several parameters for the MobileNext Broadband Gateway that determine how the IPv6 router protocols operate:

Before you begin configuring IPv6 protocol parameters on the broadband gateway, you should have done the following:

- Configured the chassis of the broadband gateway
- Configured the interfaces of the broadband gateway
- Configured the general parameters for the broadband gateway

To determine the IPv6 router protocol behavior, you configure a series of related timers and parameters used in the IPv6 header fields at the **[edit ggsn-pgw *ggsn-pgw-name* ipv6-router-advertisement]** hierarchy level. The parameters apply to a particular gateway.

To configure the IPv6 router protocol parameters:

1. Configure the **current-hop-limit**.

   ```
   [edit unified-edge gateways ggsn-pgw MBG1 ipv6-router-advertisement]
   user@host# set current-hop-limit 0
   ```

   NOTE: You can configure a value from 0 through 3 hops. The default is 0.

2. Configure the **maximum-advertisement-interval**.

   [edit unified-edge gateways ggsn-pgw *MBG1* ipv6-router-advertisement]
   user@host# **set maximum-advertisement-interval** *21600*

   NOTE: You can configure a value from 5400 through 21,600 seconds. The default is 21,600 seconds.

3. Configure the **maximum-initial-advertisement-interval**.

   [edit unified-edge gateways ggsn-pgw *MBG1* ipv6-router-advertisement]
   user@host# **set maximum-initial-advertisement-interval** *10*

   NOTE: You can configure a value from 10 through 16 seconds. The default is 10 seconds.

4. Configure the **maximum-initial-advertisements**.

   [edit ggsn-pgw *bb-gw-one* ipv6-router-advertisement]
   user@host# **set maximum-initial-advertisements** *10*

   NOTE: You can configure a value from 2 through 5. The default is 3.

5. Configure the **minimum-advertisement-interval**.

   [edit unified-edge gateways ggsn-pgw *MBG1* ipv6-router-advertisement]
   user@host# **set minimum-advertisement-interval** *16200*

   NOTE: You can configure a value from 3600 through 16200 seconds. The default is 16200 seconds.

6. Configure the **reachable-time**.

   [edit unified-edge gateways ggsn-pgw *MBG1* ipv6-router-advertisement]
   user@host# **set reachable-time** *0*

   NOTE: You can configure a value from 0 through 3600000 milliseconds. The default is 0 milliseconds.

7. Configure the **retransmission-timer**.

   [edit unified-edge gateways ggsn-pgw *MBG1* ipv6-router-advertisement]
   user@host# **set retransmission-timer** *0*

   NOTE: You can configure a value in milliseconds. There is no default.

8. Configure the **router-lifetime**.

[edit unified-edge gateways ggsn-pgw *MBG1* ipv6-router-advertisement]
user@host# **set router-lifetime** *21840*

NOTE: You can configure a value from 5400 through 21840 seconds. The default is 21840 seconds.

Related Documentation

- IP Packet Fragment Reassembly Overview on page 3
- Understanding the Broadband Gateway Exception Handling on page 7
- Understanding GTP-U Error Exception Handling on page 8
- Understanding Broadband Gateway IP Fragment Handling on page 9
- Configuring Fragment Reassembly Parameters on page 14
- Understanding IPv6 Protocol Parameters on page 9
- Configuring Exception Handling Traceoptions on page 17
- Configuring S-GW Data Path Traceoptions on page 69
- Example: Configuring Inline IP Packet Fragment Reassembly on page 21
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27

Configuring Exception Handling Traceoptions

Datapath tracing operations record detailed messages about the operation of exception-handling services such as packet reassembly or IPv6 router advertisements on the MobileNext Broadband Gateway. You can trace various types of exception operations such as configuration events, memory usage, the age of a packet flow, configuration information, and other information. You can specify which trace operations are logged by including specific tracing flags and levels.

Table 3 on page 17 describes the flags relating to the exceptions that you can include at the **[edit unified-edge gateways ggsn-pgw** *gateway-name* **software-datapath traceoptions flag]** hierarchy level.

Table 3: Trace Flags

Flag	Description
ager	Trace flow ager.
all	Trace everything.
commands	Trace operational commands.
configuration	Trace configuration events.
flow	Trace flow.

Table 3: Trace Flags *(continued)*

init	Trace events related to data path daemon initialization.
ipv6-router-advertisement	Trace IPv6 router advertisement.
memory	Trace memory.
reassembly	Trace reassembly.
redundancy	Trace redundancy.

Table 4 on page 18 describes the levels you can include.

Table 4: Trace Levels

Level	Description
all	Match all levels.
error	Match error conditions.
info	Match informational messages.
notice	Match conditions that should be specially handled.
verbose	Match verbose messages.
warning	Match warning messages.

To configure tracing options for exception operations:

1. Specify that you want to configure tracing options for exception operations.

   [edit unified-edge gateways ggsn-pgw *MBG1* software-datapath]
   user@host# **edit traceoptions**

2. Configure the filename for the trace file.

   [edit unified-edge mobile gateways ggsn-pgw *MBG1* software-datapath traceoptions]
   user@host# **set file *datapath-log***

3. (Optional) Configure the maximum size of each trace file.

   [edit unified-edge mobile gateways ggsn-pgw *MBG1* software-datapath traceoptions]
   user@host# **set file size 100m**

   NOTE: When a trace file (for example, exception-log) reaches its maximum size, it is renamed exception-log.0, then exception-log.1, and so on, until the maximum number of trace files is reached. The oldest archived file is then overwritten.

4. Configure the tracing flag.

[edit unified-edge mobile gateways ggsn-pgw *MBG1* software-datapath traceoptions]
user@host# **set flag all**

NOTE: You should use care when tracing all operations on a gateway. This can have a performance impact.

5. Configure the tracing level.

   [edit unified-edge mobile gateways ggsn-pgw *MBG1* software-datapath traceoptions]
   user@host# **set level error**

6. View the trace file.

   user@host# **file show /var/log/exception-log**

Related Documentation

- Understanding the Broadband Gateway Exception Handling on page 7
- Understanding GTP-U Error Exception Handling on page 8
- Understanding Broadband Gateway IP Fragment Handling on page 9
- IP Packet Fragment Reassembly Overview on page 3
- Configuring Fragment Reassembly Parameters on page 14
- Understanding IPv6 Protocol Parameters on page 9
- Configuring IPv6 Protocol Parameters on page 15
- Configuring S-GW Data Path Traceoptions on page 69
- Example: Configuring Inline IP Packet Fragment Reassembly on page 21
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27

CHAPTER 3

Configuration Examples

Example: Configuring Inline IP Packet Fragment Reassembly

This example shows how to configure the MobileNext Broadband Gateway so that reassembly of fragmented IP packets is carried out inline (on the Packet Forwarding Engine) instead of performing IP reassembly on the services PIC. By default, IP reassembly is carried out on the services PIC. This example changes the default behavior of the gateway, whether the gateway is configured as a Serving Gateway (S-GW), Packet Data Network Gateway (P-GW), or Gateway GPRS Support Node (GGSN). Although Serving Gateway Support Nodes (SGSNs) also reassemble IP packets, the broadband gateway cannot be configured as an SGSN.

Requirements

This example uses the following hardware and software components:

- A supported MX Series chassis configured with supported line cards and a services PIC.
- A supported and properly installed version of 64-bit Junos OS and the **jmobile** software package.
- Correct configuration as a P-GW, S-GW, or GGSN with corresponding interfaces.

Before you configure inline IP reassembly, be sure you have:

- Configured the broadband gateway correctly.
- Configured a valid MTU size and GTP-U parameters.

Overview

Fragmentation of IP packets for transmission and the need to reassemble the IP packets at a destination is a feature of how Layer 2 (the frame layer) and Layer 3 (the packet layer) operate. That is, the maximum size of a frame, set by the Maximum Transmission Unit (MTU) value, and the maximum size of a packet are determined independently. It is usually the case that the packet size can far exceed the MTU size. If the packet size (data plus IP and other headers) exceeds the allowable frame size (usually set by the transport medium limits), the packet must be fragmented at the sender and split across multiple frames for transmission. Frames are always processed immediately, as they arrive (if error-free), but packet fragments cannot be processed until the whole packet has been reassembled. Each packet fragment inside a frame series, except the last, has the more fragments (MF) IP header bit set, indicating that this packet is part of a whole. The last packet fragment inside a frame does not have this MF bit set and therefore ends the fragment sequence. Once all of the fragments of a packet have arrived, the entire packet can be reassembled.

When memory buffers for networking were limited, heavy intervals of arriving fragmented traffic easily resulted in performance degradations or even complete "reassembly deadlock," with buffers occupied only with fragments and no room for any arriving fragment that might complete a packet. In some cases, a packet fragment was discarded only to find that the newly arrived frame would have completed the packet just thrown away. It is clear that efficient reassembly is important for network throughput, scalability, and graceful response to congestion.

In some cases, you can avoid the need to fragment packets on a mobile network by adjusting the MTU size to account for added headers such as GTP. However, in cases where multiple vendors are used or organization lines are crossed, this MTU adjustment might not be possible and IP fragmentation is unavoidable.

Figure 4: Fragmented Packet Requiring Reassembly

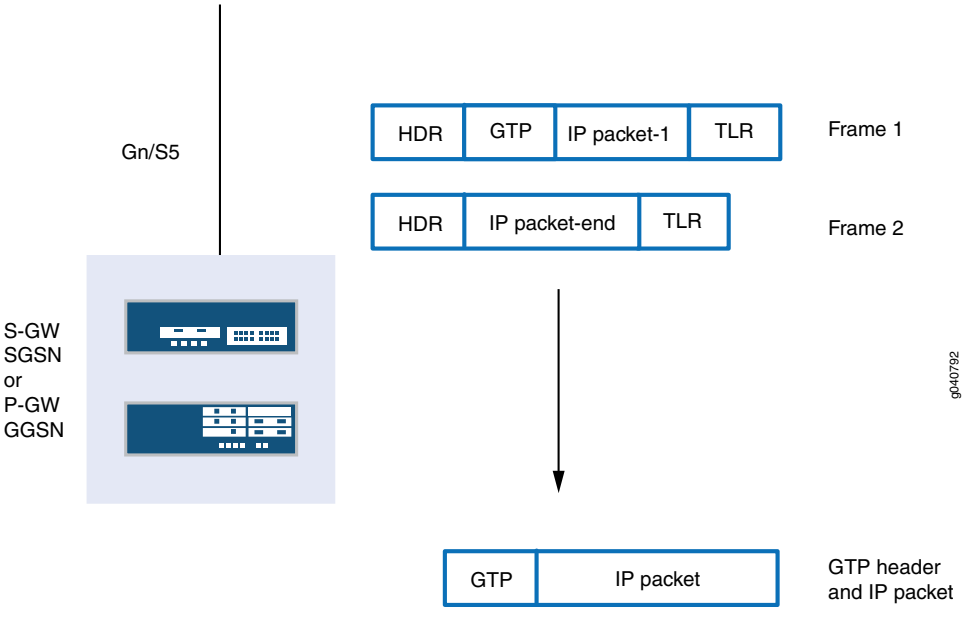
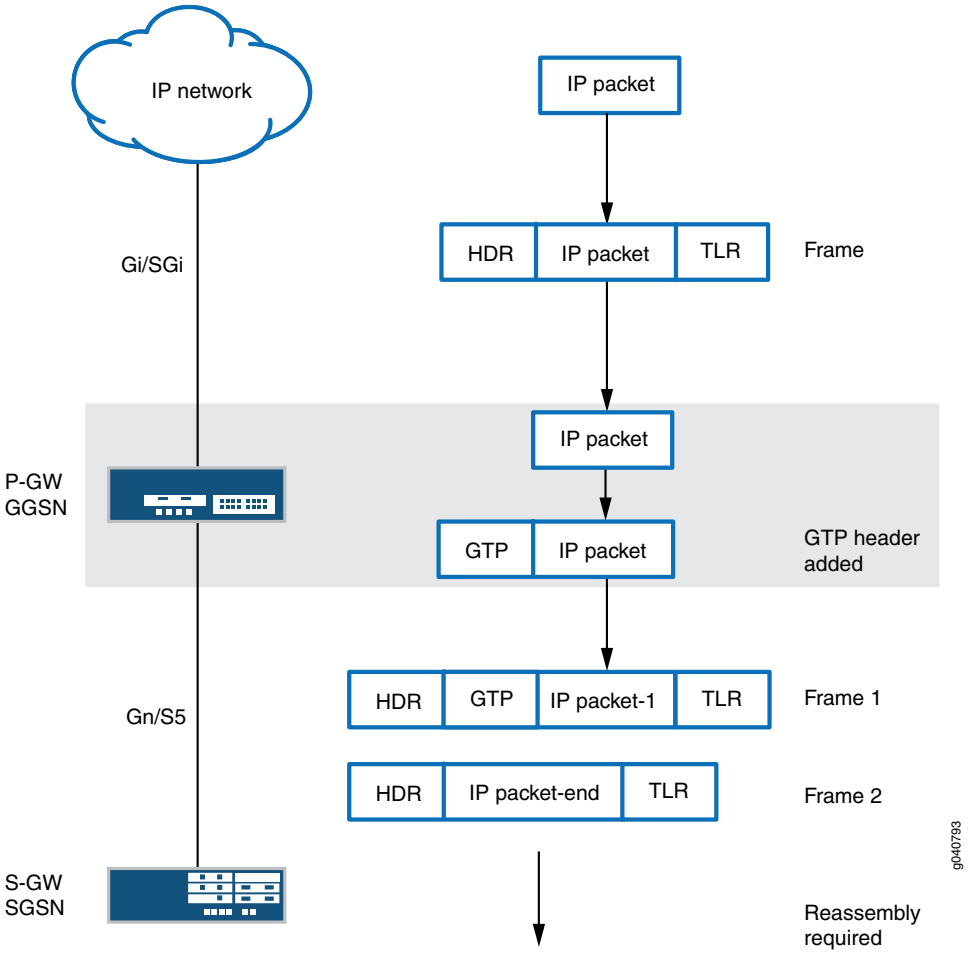


Figure 4 on page 22 shows a fragmented packet containing user data that requires reassembly on arrival on the Gn or S5 interface. On the broadband gateway, IP reassembly is carried out on the services PIC by default. This example configures the broadband gateway to perform IP reassembly of fragmented IP packets inline, on the Packet Forwarding Engine. However, inline reassembly requires the dedication of Packet Forwarding Engine resources for reassembly, which means these resources cannot be used for their usual purposes. You should consider potential trade-offs before changing the default behavior of the gateway.

Topology

The topology for this inline reassembly example consists of two mobile network nodes, the interfaces connecting them to each other, and an IP network such as the Internet. As shown in Figure 5 on page 24, a framed downstream packet from an IP network to mobile device is sent over a Gi (3G) or SGi (LTE) interface to a GGSN or P-GW. At the GGSN/P-GW, the frame is processed and a 20-byte GTP-U header added to the packet. If the packets use the most common MTU size of 1500 bytes (for network efficiency), the added 20 bytes put the data unit over the allowable 1500 byte limit (1500 + 20 = 1520). To send the 1520-byte packet over the Gn (3G) or S5 (LTE) interface to the SSGN or S-GW, the GGSN or P-GW must fragment the packet and distribute the 1520 bytes into two frames (1500 bytes and 20 bytes). Because frames are processed immediately as they arrive (there is no such thing as “frame 1 of 2”), the first packet fragment must be kept until the second frame is processed and completes the packet. Then the whole packet with GTP-U header can be processed, routed, and sent on downstream. This requires the SSGN or S-GW to perform the reassembly of the IP packet. Heavy traffic loads create an environment that forces the receiving node to keep track of and process many fragments at the same time.

Figure 5: A GTP-U Header Causing Fragmentation



Inline IP reassembly is enabled at the gateway level (for example, the entire P-GW or S-GW). Fragments for all IP addresses associated with the broadband gateway configured for inline reassembly are stored and reassembled on the interface on which it arrives. Enabling inline IP reassembly affects all fragments for that gateway. The mobility line cards reserve 2 MB of memory for storing fragments (non-mobility line cards reserve 8 MB).

NOTE: Inline IP reassembly of fragments arriving on different Packet Forwarding Engine complexes are not supported. These IP fragments are stored, but cannot be reassembled and eventually timeout and are dropped. The inline reassembly timeout parameter is 20 milliseconds (ms) and cannot be changed. The timeout values from 2 (default) through 60 seconds and is set for an IP reassembly profile at the **[edit services ip-reassembly *ip-reassembly-profile-name* inline-services]** hierarchy level apply to IP reassembly on the services PIC only.

Inline IP reassembly does not preclude the use of the services PIC. The packet forwarding engine could run out of memory to store fragments. In that case, new fragments that arrive are directed to the services PIC (if available) as a kind of "backup." Once the packet forwarding engine memory usage recovers, all fragments are again processed inline in the packet forwarding engine.

It should be noted that other topologies could have been used for this example. For instance, IPsec is often used to encapsulate GTP packets on the S1-U interfaces from eNodeB to S-GW. IPsec encapsulation often causes packet fragmentation as well.

Configuration

To configure inline IP reassembly, perform these tasks:

- Configuring Inline IP Reassembly on page 25

CLI Quick Configuration

```
[edit unified-edge gateways ggsn-pgw MBG-PGW1 inline-services]
user@host# set ip-reassembly
```

Configuring Inline IP Reassembly

Results

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

For brevity, these **show** command outputs include only the configuration that is relevant to this example.

```
[edit unified-edge]
gateways {
   ggsn-pgw MBG-PGW1 {
      [...}
      inline-services {
         ip-reassembly;
         }
      [...]
   }
}
```

Verification

Verifying Inline IP Reassembly Configuration

Purpose

Verify that the Packet Forwarding Engine of the Gn or S5 or S8 interfaces associated with the broadband gateway where fragments are arriving have non-zero fragment counters and have successfully reassembled packets.

Action

From operational mode, enter the **show services inline ip-reassembly statistics** command.

```
user@MBG-PGW-1# show services inline ip-reassembly statistics
FPC: 0
==============
                                                  Total   Current Rate
Total Fragments Received                     1004681374        6213217
   First Fragments                            502335971        3106615
```

```
   Intermediate Fragments                          0              0
   Last Fragments                          502345403        3106602

Total Packets Successfully Reassembled      71135257         432439

Approximate Packets Pending Reassembly          2408

Fragments Dropped Reasons                    1404714           7700
   Buffers not available                           0              0
   Fragments per packet exceeded                   0              0
   Packet length exceeded                          0              0
   Record insert error                             0              0
   Record in use error                       1404714           7700
   Duplicate first fragments                       0              0
   Duplicate last fragments                        0              0
   Missing first fragment                          0              0

Reassembly Errors Reasons                       0              0
   Fragment not found                           0              0
   Fragment not in sequence                     0              0
   ASIC errors                                  0              0

Aged out packets                          6147008          37279

Total Fragments Successfully Reassembled  142270514         864878

Total Fragments Dropped                     7551722          44979
   Buffers not available                           0              0
   Fragments per packet exceeded                   0              0
   Packet length exceeded                          0              0
   Record insert error                             0              0
   Record in use error                       1404714           7700
   Duplicate first fragments                       0              0
   Duplicate last fragments                        0              0
   Missing first fragment                          0              0
   Fragment not found                              0              0
   Fragment not in sequence                        0              0
   ASIC errors                                     0              0
   Aged out fragments                        6147008          37279

Total fragments punted to UPIC            854858289        5303865
```

Meaning The output associated with FPC 0 (in this case) displays non-zero values for packet fragments and successfully reassembled packets. Errors and dropped fragments are minimal.

Troubleshooting

To troubleshoot inline IP reassembly, perform these tasks:

- Troubleshooting Non-Incrementing Counters on page 26
- Troubleshooting Zero Successfully Reassembled Packets on page 27

Troubleshooting Non-Incrementing Counters

Problem The total fragment received counter and current rate fields are not incrementing.

Solution There are no fragments arriving for the gateway, or the inline reassembly statement is set for the wrong gateway.

Troubleshooting Zero Successfully Reassembled Packets

Problem The counters show zero value for successfully reassembled packets.

Solution Examine the reasons for fragment errors and dropped fragments in **show services inline ip-reassembly statistics** command output. This is usually sufficient to determine the solution to the issue.

Related Documentation

- IP Packet Fragment Reassembly Overview on page 3
- Configuring IP Inline Reassembly on page 13

Example: Configuring Broadband Gateway Exception Handling Parameters

This example shows how to configure exception handing parameters on the MobileNext Broadband Gateway. Both IP reassembly and IPv6 advertisement parameters are configured.

Requirements

This example uses the following hardware and software components:

- An MX chassis equipped with session Dense Port Concentrators (DPCs) and three interface Packet Forwarding Engines (housed in DPCs or Modular Port Concentrators [MPCs]).
- Junos OS Mobility package

Before you begin:

- Install the chassis hardware.
- Configure the chassis, as well as interfaces, anchors, and (optionally) redundancy.

Overview

There are four exceptions to the general rule that user packets flow only through interface Packet Forwarding Engine hardware:

- Anchor Packet Forwarding Engine failovers (N:1)
- Reassembly of GPRS tunneling protocol, user plane (GTP-U) and mobility control plane (for instance, authentication, authorization, and accounting [AAA]) fragments

- IPv6 router advertisements and router solicitation packet handling
- GTP-U error indication generation

The first and last items have no configurable parameters. This example configures parameters for IP fragment reassembly and IPv6 router advertisements. The IP fragment reassembly parameters are configured in **reassembly-profile-one** (you can have multiple reassembly profiles) and applied to the gateway (**MBG1**). All of the statements in this example use the default values.

Configuration

CLI Quick Configuration

The parameters for IP fragment reassembly and IPv6 router advertisements are configured by:

```
[edit services ip-reassembly profile reassembly-profile-one]
set timeout 4 # The default (seconds)
set max-reassembly-pending-packets 1000 # The default

[edit unified-edge gateways ggsn-pgw MBG1]
set ip-reassembly reassembly-profile-one # You can apply only one profile to a gateway

[edit unified-edge gateways ggsn-pgw MBG1 ipv6-router-advertisement]
set current-hop-limit 2 # All statements use defaults
set maximum-advertisement-interval 21600
set maximum-initial-advertisement-interval 10
set maximum-initial-advertisements 10
set minimum-advertisement-interval 16200
set reachable-time 0
set retransmission-timer 100
set router-lifetime 21840
```

Results

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

For brevity, these **show** command outputs include only the configuration that is relevant to this example.

```
show services ip-reassembly reassembly-profile-one
timeout 2;
max-reassembly-pending-packets 100;

show unified-edge gateways ggsn-pgw MBG1
ip-reassembly-profile {
   reassembly-profile-one;
}

show unified-edge gateways ggsn-pgw MBG1 ip-router-advertisement
current-hop-limit 2;
maximum-advertisement-interval 21600;
maximum-initial-advertisement-interval 10;
maximum-initial-advertisements 10;
minimum-advertisement-interval 16200;
```

```
reachable-time 0;
retransmission-timer 100;
router-lifetime 21840;
```

After you configure the device, enter **commit** from configuration mode.

Verification

Verifying the IP Reassembly Configuration

Purpose Verify that IP reassembly exception handling is operating.

Action From operational mode, enter the **show unified-edge gateways ggsn-pgw ip-reassembly statistics** command.

Meaning Non-zero values indicate that reassembly is functioning.

NOTE: You must inspect IPv6 router advertisement packets directly to verify configured header field parameters.

Verifying the Exception Handling Configuration

Purpose Verify that exception handling is operating.

Action From operational mode, enter the **show unified-edge gateways ggsn-pgw exception-handling statistics** command.

NOTE: You can clear these statistics with the **clear unified-edge gateways ggsn-pgw exception-handling statistics** command.

Meaning Non-zero values indicate that exception handling is functioning.

Related Documentation

- IP Packet Fragment Reassembly Overview on page 3
- Configuring IP Inline Reassembly on page 13
- Example: Configuring Inline IP Packet Fragment Reassembly on page 21
- Understanding the Broadband Gateway Exception Handling on page 7
- Understanding GTP-U Error Exception Handling on page 8
- Understanding Broadband Gateway IP Fragment Handling on page 9
- Configuring Fragment Reassembly Parameters on page 14
- Understanding IPv6 Protocol Parameters on page 9

CHAPTER 4

Configuration Statements

[edit services ip-reassembly] Hierarchy Level

```
ip-reassembly {
  profile profile-name {
    max-reassembly-pending-packets number;
    timeout in-seconds;
  }
}
```

Related Documentation

- Notational Conventions Used in Junos OS Configuration Hierarchies

[edit unified-edge gateways] Hierarchy Level

Each of the following topics lists the statements at a sub-hierarchy of the **[edit unified-edge gateways]** hierarchy.

- [edit unified-edge gateways ggsn-pgw <gateway-name>] Hierarchy Level
- [edit unified-edge gateways sgw <gateway-name>] Hierarchy Level

Related Documentation

- [edit unified-edge] Hierarchy Level
- Notational Conventions Used in Junos OS Configuration Hierarchies

error-indication-interval

Syntax error-indication-interval *interval-in-seconds*;

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name* gtp data]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Configure the interval at which the broadband gateway generates an error indication to the peer per bearer. One error indication is generated per bearer for the interval configured, in seconds.

Options ***interval-in-seconds***—Error indication interval.
Range: 1 through 20 seconds
Default: 2 seconds

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

Related Documentation
- Configuring GTP Services on the Data Plane
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- data (GTP)

current-hop-limit (IPv6 Router Advertisement)

Syntax current-hop-limit *current-hop-limit*;

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name* ipv6-router-advertisement]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Configure the value to be placed in the **current-hop-limit** field of the IPv6 router advertisement messages sent from the broadband gateway. This value is used as the hop limit in the outgoing IPv6 packets sent from the user equipment (UE).

Options ***current-hop-limit***—Current hop limit for the IPv6 router advertisement.
Range: 0 through 3
Default: 0. The hop limit is not specified by the broadband gateway.

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

Related Documentation
- Configuring IPv6 Protocol Parameters on page 15
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- **ipv6-router-advertisement (MobileNext Broadband Gateway) on page 37**

disable (IPv6 Router Advertisement)

Syntax disable;

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name* ipv6-router-advertisement]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Disable IPv6 router advertisement for the broadband gateway. By default, IPv6 router advertisement is enabled for the broadband gateway.

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

Related Documentation

- Configuring IPv6 Protocol Parameters on page 15
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- ipv6-router-advertisement (MobileNext Broadband Gateway) on page 37

inline-services (IP Reassembly)

Syntax

```
inline-services {
  ip-reassembly;
}
```

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name*],
[edit unified-edge gateways sgw *gateway-name*]

Release Information Statement introduced in Junos OS Mobility Release 11.4W.

Description Configure inline services for the broadband gateway. Currently, IP reassembly is the only inline service supported.

When fragments arrive at the gateway for reassembly, they can be reassembled inline, in the hardware (inline IP reassembly), or using software on the services PIC (software reassembly). The **ip-reassembly** statement lets you specify that fragments should be reassembled inline.

NOTE: Inline IP reassembly can only be carried out on Trio-based FPCs.

The remaining statement is explained separately.

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

Related Documentation

- [edit unified-edge gateways] Hierarchy Level on page 31
- Example: Configuring Inline IP Packet Fragment Reassembly on page 21

ip-reassembly

Syntax

```
ip-reassembly {
  profile profile-name {
    max-reassembly-pending-packets number;
    timeout in-seconds;
  }
}
```

Hierarchy Level [edit services]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Configure an IP reassembly profile to be applied to the broadband gateway.

The remaining statements are explained separately.

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

Related Documentation

- [edit services ip-reassembly] Hierarchy Level on page 31
- Configuring Fragment Reassembly Parameters on page 14
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27

ip-reassembly (Inline Services)

Syntax ip-reassembly;

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name* inline-services],
[edit unified-edge gateways sgw *gateway-name* inline-services]

Release Information Statement introduced in Junos OS Mobility Release 11.4W.

Description Specify that the reassembly of fragmented IP packets should be carried out inline, on the packet forwarding engine.

When fragments arrive at the gateway for reassembly, they can be reassembled inline, in the hardware (inline IP reassembly), or using software on the services PIC (software reassembly). If you do not include this statement, then, by default, IP reassembly is carried on the services PIC for all gateways.

NOTE: Inline IP reassembly can only be carried out on Trio-based FPCs.

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

Related Documentation

- Example: Configuring Inline IP Packet Fragment Reassembly on page 21
- inline-services (IP Reassembly) on page 33

ip-reassembly-profile

Syntax

```
ip-reassembly-profile {
  profile-name;
}
```

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name*],
[edit unified-edge gateways sgw *gateway-name*]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.
Support at the [edit unified-edge gateways sgw *gateway-name*] hierarchy level introduced in Junos OS Mobility Release 11.4W.

Description Apply a previously configured IP reassembly profile to the broadband gateway.

NOTE: **Currently, only one IP reassembly profile is allowed for the broadband gateway.**

Options ***profile-name***—Name of the IP reassembly profile to be applied.

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

Related Documentation

- [edit unified-edge gateways] Hierarchy Level on page 31
- Configuring Fragment Reassembly Parameters on page 14
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27

ipv6-router-advertisement (MobileNext Broadband Gateway)

Syntax

```
ipv6-router-advertisement {
  current-hop-limit current-hop-limit;
  disable;
  maximum-advertisement-interval maximum-advertisement-interval;
  maximum-initial-advertisement-interval maximum-initial-advertisement-interval;
  maximum-initial-advertisements maximum-initial-advertisements;
  minimum-advertisement-interval minimum-advertisement-interval;
  reachable-time reachable-time;
  retransmission-timer retransmission-timer;
  router-lifetime router-lifetime;
}
```

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name*]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Configure IPv6 router advertisement parameters for the broadband gateway.

The remaining statements are explained separately.

Default By default, IPv6 router advertisement is enabled for the broadband gateway.

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

Related Documentation

- [edit unified-edge gateways ggsn-pgw <gateway-name>] Hierarchy Level
- Configuring IPv6 Protocol Parameters on page 15
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27

max-reassembly-pending-packets (IP Reassembly)

Syntax max-reassembly-pending-packets *number*;

Hierarchy Level [edit services ip-reassembly profile *profile-name*]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Configure the maximum number of IPv4 packets pending reassembly that is allowed in each services PIC that belongs to the broadband gateway.

Options ***number***—Maximum number of packets pending reassembly allowed in each services PIC.

Range: 100 through 10,000

Default: 1000

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

Related Documentation

- Configuring Fragment Reassembly Parameters on page 14
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- **profile (IP Reassembly) on page 43**

maximum-advertisement-interval (IPv6 Router Advertisement)

Syntax maximum-advertisement-interval *maximum-advertisement-interval*;

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name* ipv6-router-advertisement]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Configure the maximum interval between unsolicited router advertisements.

Router advertisements occur in phases. In the initial phase, the interval between the router advertisements is a few seconds. In the later phases, the interval increases to a few minutes. The **maximum-advertisement-interval** parameter controls the interval in the later phases.

Options ***maximum-advertisement-interval***—Maximum interval between unsolicited router advertisements.

Range: 5400 through 21,600 seconds

Default: 21,600 seconds

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

Related Documentation

- Configuring IPv6 Protocol Parameters on page 15
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- ipv6-router-advertisement (MobileNext Broadband Gateway) on page 37

maximum-initial-advertisement-interval (IPv6 Router Advertisement)

Syntax maximum-initial-advertisement-interval *maximum-initial-advertisement-interval*;

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name* ipv6-router-advertisement]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Configure the maximum interval between initial router advertisements.

Router advertisements occur in phases. In the initial phase, the interval between the router advertisements is a few seconds. In the later phases, the interval increases to a few minutes. The **maximum-initial-advertisement-interval** parameter controls the interval in the initial phase.

Options ***maximum-initial-advertisement-interval***—Maximum interval between initial router advertisements.

Range: 10 through 16 seconds

Default: 10 seconds

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

Related Documentation

- Configuring IPv6 Protocol Parameters on page 15
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- ipv6-router-advertisement (MobileNext Broadband Gateway) on page 37

maximum-initial-advertisements (IPv6 Router Advertisement)

Syntax maximum-initial-advertisements *maximum-initial-advertisements*;

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name* ipv6-router-advertisement]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Configure the maximum number of router advertisements sent during the initial phase.

Router advertisements occur in phases. In the initial phase, the router advertisements occur every few seconds. In the later phases, the advertisements occur every few minutes. The **maximum-initial-advertisements** parameter controls the maximum number of advertisements sent during the initial phase.

Options ***maximum-initial-advertisements***—Maximum number of initial router advertisements.

Range: 2 through 5

Default: 3

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

Related Documentation

- Configuring IPv6 Protocol Parameters on page 15
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- ipv6-router-advertisement (MobileNext Broadband Gateway) on page 37

minimum-advertisement-interval (IPv6 Router Advertisement)

Syntax minimum-advertisement-interval *minimum-advertisement-interval*;

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name* ipv6-router-advertisement]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Configure the minimum time allowed between the sending of unsolicited router advertisements.

Router advertisements occur in phases. In the initial phase, the interval between the router advertisements is a few seconds. In the later phases, the interval increases to a few minutes. The **minimum-advertisement-interval** parameter controls the interval in the later phases.

Options ***minimum-advertisement-interval***—Minimum interval between unsolicited router advertisements.

Range: 3600 through 16,200 seconds

Default: 16,200 seconds

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

Related Documentation

- Configuring IPv6 Protocol Parameters on page 15
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- **ipv6-router-advertisement (MobileNext Broadband Gateway) on page 37**

profile (IP Reassembly)

Syntax

```
profile profile-name {
  max-reassembly-pending-packets number;
  timeout in-seconds;
}
```

Hierarchy Level [edit services ip-reassembly]

Release Information Statement introduced in Junos OS Mobility Release 11.4W.

Description Configure an IP reassembly profile to be applied to the broadband gateway.

The remaining statements are explained separately.

Options ***profile-name***—Name of the IP reassembly profile.

NOTE: To create more than one IP reassembly profile, include the profile statement multiple times.

Range: 1 through 32 characters

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

Related Documentation

- Configuring Fragment Reassembly Parameters on page 14
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- ip-reassembly on page 34

reachable-time (IPv6 Router Advertisement)

Syntax reachable-time *reachable-time*;

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name* ipv6-router-advertisement]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Configure the value of the reachable time field of IPv6 router advertisement messages. This is the time (in milliseconds) after which a node (user equipment [UE]) assumes that a neighbor is unreachable after the node had received the initial reachability confirmation. Because the GPRS tunneling protocol (GTP) tunnel behaves like a point-to-point IPv6 link between the user equipment and the gateway, the neighbor for the user equipment is usually the broadband gateway.

Options ***reachable-time***—Value of the reachable time field of the IPv6 router advertisement messages.

Range: 0 through 3,600,000 milliseconds

Default: 0 milliseconds. The reachable time has not been specified by the broadband gateway.

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

Related Documentation

- Configuring IPv6 Protocol Parameters on page 15
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- ipv6-router-advertisement (MobileNext Broadband Gateway) on page 37

retransmission-timer (IPv6 Router Advertisement)

Syntax retransmission-timer *retransmission-timer*;

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name* ipv6-router-advertisement]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Configure the value of the retransmission timer field of the IPv6 router advertisement messages. The retransmission timer is used to control the time (in milliseconds) between retransmissions of neighbor solicitation messages from the user equipment (UE).

Options ***retransmission-timer***—Value of the retransmission timer field of the IPv6 router advertisement messages

Default: 0 milliseconds. The retransmission timer has not been specified by the broadband gateway.

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

Related Documentation

- Configuring IPv6 Protocol Parameters on page 15
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- ipv6-router-advertisement (MobileNext Broadband Gateway) on page 37

router-lifetime (IPv6 Router Advertisement)

Syntax router-lifetime *router-lifetime*;

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name* ipv6-router-advertisement]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Configure the value of the router lifetime field of the IPv6 router advertisement messages. The **router-lifetime** indicates the maximum time up to which the broadband gateway can be considered the default gateway.

Options ***router-lifetime***—Value of the router lifetime field of the IPv6 router advertisement messages.

Range: 5400 through 21,840 seconds

Default: 21,840 seconds

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

Related Documentation

- Configuring IPv6 Protocol Parameters on page 15
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- ipv6-router-advertisement (MobileNext Broadband Gateway) on page 37

software-datapath

Syntax

```
software-datapath {
  traceoptions {
    file filename {
      files files;
      match match;
      size size;
      (no-world-readable | world-readable);
    }
    flag {
      flag;
    }
    level level;
    no-remote-trace;
  }
}
```

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name*],
[edit unified-edge gateways sgw *gateway-name*]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.
Support at the [edit unified-edge gateways sgw *gateway-name*] hierarchy level introduced in Junos OS Mobility Release 11.4W.

Description Specify the configuration for the software datapath.

The remaining statements are explained separately.

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

Related Documentation

- [edit unified-edge gateways] Hierarchy Level on page 31
- Configuring Exception Handling Traceoptions on page 17

timeout (IP Reassembly)

Syntax timeout *in-seconds*;

Hierarchy Level [edit services ip-reassembly profile *profile-name*]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.

Description Configure the maximum time to wait for all IPv4 fragments of a packet to arrive for reassembly.

Options ***in-seconds***—Timeout for the fragments arriving for reassembly.

Range: 2 through 60 seconds

Default: 4 seconds

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

Related Documentation

- Configuring Fragment Reassembly Parameters on page 14
- Example: Configuring Broadband Gateway Exception Handling Parameters on page 27
- **profile (IP Reassembly) on page 43**

traceoptions (Exception Handling)

Syntax

```
traceoptions {
  file filename {
    files files;
    match match;
    size size;
    (no-world-readable | world-readable);
  }
  flag {
    flag;
  }
  level level;
  no-remote-trace;
}
```

Hierarchy Level [edit unified-edge gateways ggsn-pgw *gateway-name* software-datapath],
[edit unified-edge gateways sgw *gateway-name* software datapath]

Release Information Statement introduced in Junos OS Mobility Release 11.2W.
Support at the [edit unified-edge gateways sgw *gateway-name* software-datapath] hierarchy level introduced in Junos OS Mobility Release 11.4W.

Description Define tracing operations for exception handling.

Options

file *filename*—Name of the file that receives the output of the tracing operation. All files are placed in the **/var/log** directory.

files *files*— (Optional) Maximum number of trace files. When a trace file named **trace-file** reaches its maximum size, it is renamed **trace-file.0**, then **trace-file.1**, and so on, until the maximum number of trace files is reached. Then, the oldest trace file is overwritten.

If you specify a maximum number of files, you must also specify a maximum file size with the **size** option and a filename.

Range: 2 through 1000

Default: 3 files

flag

- *flag*—You can use one of the following flags:
  - **ager**—Trace flow ageout-related events.
  - **all**—Trace everything.
  - **buffering**—Trace buffering.
  - **commands**—Trace operational commands.
  - **configuration**—Trace configuration commands.
  - **flow**—Trace flow.

- **init**—Trace events related to the **init** datapath daemon .
- **ipv6-router-advertisement**—Trace IPv6 router advertisements.
- **memory**—Trace memory.
- **reassembly**—Trace reassembly.
- **redundancy**—Trace redundancy.

level *level*—(Optional) Level of tracing to perform. You can specify any of the following levels:

- **all**—Match all levels.
- **error**—Match error conditions.
- **info**—Match informational messages.
- **notice**—Match conditions that should be handled specially.
- **verbose**—Match verbose messages.
- **warning**—Match warning messages.

match *match*—(Optional) Refine the output to include lines that contain the regular expression.

no-remote-trace—(Optional) Disable remote tracing.

no-world-readable—(Optional) Restrict access to the originator of the trace operation only.

size *size*—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). If you specify a maximum file size, you must also specify a maximum number of trace files with the **files** option and filename.

Syntax: **xk** to specify KB, **xm** to specify MB, or **xg** to specify GB

Range: 10 KB through 1 GB

Default: 128 KB

world-readable—(Optional) Enable unrestricted file access.

Required Privilege Level

trace and unified-edge—To view this statement in the configuration.
trace-control and unified-edge-control—To add this statement to the configuration.

Related Documentation

- Configuring Exception Handling Traceoptions on page 17
- software-datapath on page 47

PART 3

Administration

CHAPTER 5

Operational Commands

clear services inline ip-reassembly statistics

Syntax

clear services inline ip-reassembly statistics
<fpc *fpc-slot*>
<pfe *pfe-slot*>

Release Information

Command introduced in Junos OS Mobility Release 11.4W.

Description

Clear the inline IP reassembly statistics for the Packet Forwarding Engines one or more Trio-based FPCs.

If this command is executed when traffic is flowing, then the inline IP reassembly statistics are cleared up to the instant of running the command. If traffic is stopped, then all inline IP reassembly statistics are cleared.

NOTE: Inline IP reassembly can only be carried out on Trio-based FPCs.

Options

none—Clear the inline IP reassembly statistics for one or more FPCs.

fpc *fpc-slot*—(Optional) Clear the inline IP reassembly statistics for all Packet Forwarding Engines on the specified FPC.

pfe *pfe-slot*—(Optional) Clear the inline IP reassembly statistics for the specified Packet Forwarding Engine slot. You must specify an FPC slot number before specifying a Packet Forwarding Engine slot.

Required Privilege Level

clear

Related Documentation

- show services inline ip-reassembly statistics on page 57

List of Sample Output

clear services inline ip-reassembly statistics on page 54

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

clear services inline ip-reassembly statistics

```
user@host> clear services inline ip-reassembly statistics
Cleared inline ip-reassembly statistics
```

clear unified-edge ggsn-pgw ip-reassembly statistics

Syntax **clear unified-edge ggsn-pgw ip-reassembly statistics**
<fpc-slot *fpc-slot*>
<gateway *gateway*>
<*inet*>
<pic-slot *pic-slot*>

Release Information Command introduced in Junos OS Mobility Release 11.2W.
gateway option introduced in Junos OS Mobility Release 11.4W.

Description Clear the IP reassembly statistics for one or more gateway GPRS support nodes (GGSNs) or Packet Data Network Gateways (P-GWs). If a GGSN or P-GW is not specified, then statistics for all GGSNs and P-GWs are cleared.

Options

none—Clear the IP reassembly statistics for all GGSNs and P-GWs.

fpc-slot *fpc-slot* pic-slot *pic-slot*—(Optional) Clear the IP reassembly statistics for the specified Flexible PIC Concentrator (FPC) and PIC slot numbers.

gateway—(Optional) Clear the IP reassembly statistics for all the services PICs in the specified GGSN or P-GW.

inet—(Optional) Clear the IP reassembly for IPv4 packets.

Required Privilege Level clear, unified-edge

Related Documentation
- show unified-edge ggsn-pgw ip-reassembly statistics on page 61

List of Sample Output clear unified-edge ggsn-pgw ip-reassembly statistics on page 55

Output Fields When you enter this command, you are provided feedback on the status of your request.

Sample Output

clear unified-edge ggsn-pgw ip-reassembly statistics

```
user@host>  clear unified-edge ggsn-pgw ip-reassembly statistics
 Cleared IP re-assembly statistics
```

clear unified-edge sgw ip-reassembly statistics

Syntax **clear unified-edge sgw ip-reassembly statistics**
<fpc-slot *fpc-slot*>
<gateway *gateway*>
<inet>
<pic-slot *pic-slot*>

Release Information Command introduced in Junos OS Mobility Release 11.4W.

Description Clear the IP reassembly statistics for one or more Serving Gateways (S-GWs). If a gateway name is not specified, then statistics for all S-GWs are cleared.

Options

none—Clear the IP reassembly statistics for all S-GWs.

fpc-slot *fpc-slot* pic-slot *pic-slot*—(Optional) Clear the IP reassembly statistics for the specified Flexible PIC Concentrator (FPC) and PIC slot numbers.

gateway—(Optional) Clear the IP reassembly statistics for all the services PICs in the specified gateway.

inet—(Optional) Clear the IP reassembly statistics for IPv4 packets.

Required Privilege Level clear, unified-edge

Related Documentation
- show unified-edge sgw ip-reassembly statistics on page 64

List of Sample Output clear unified-edge sgw ip-reassembly statistics on page 56

Output Fields When you enter this command, you are provided feedback on the status of your request.

Sample Output

clear unified-edge sgw ip-reassembly statistics

```
user@host> clear unified-edge sgw ip-reassembly statistics
 Cleared IP re-assembly statistics
```

show services inline ip-reassembly statistics

Syntax

show services inline ip-reassembly statistics
<fpc *fpc-slot*>
<pfe *pfe-slot*>

Release Information

Command introduced in Junos OS Mobility Release 11.4W.

Description

Display the inline IP reassembly statistics for the Packet Forwarding Engines on one or more Trio-based FPCs. Inline IP reassembly statistics are collected at the Packet Forwarding Engine level.

NOTE: **Inline IP reassembly can only be carried out on Trio-based FPCs.**

Options

none—Display the inline IP reassembly statistics for one or more FPCs.

fpc *fpc-slot*—(Optional) Display the inline IP reassembly statistics for the specified FPC.

pfe *pfe-slot*—(Optional) Display the inline IP reassembly statistics for the specified Packet Forwarding Engine slot. You must specify an FPC slot number before specifying a Packet Forwarding Engine slot.

Required Privilege Level

view

Related Documentation

- clear services inline ip-reassembly statistics on page 54

List of Sample Output

show services inline ip-reassembly statistics fpc <fpc-slot> on page 59

Output Fields

Table 5 on page 57 lists the output fields for the **show services inline ip-reassembly statistics** command. Output fields are listed in the approximate order in which they appear.

Table 5: show services inline ip-reassembly statistics Output Fields

Field Name	Field Description
FPC	FPC slot number for which the statistics are displayed.
PFE	Packet Forwarding Engine on the FPC for which the statistics are displayed.

Table 5: show services inline ip-reassembly statistics Output Fields *(continued)*

Field Name	Field Description
Total Fragments Received	Total number of fragments received and the current rate of fragments received for inline IP reassembly. The following information is also displayed: • **First Fragments**—Number of first fragments received and current rate of first fragments processed. • **Intermediate Fragments**—Number of intermediate fragments received and current rate of intermediate fragments processed. • **Last Fragments**—Number and rate of last fragments received. NOTE: Rate refers to the current number of fragments processed per second in the instant preceding the command's execution.
Total Packets Reassembled	Total number of packets reassembled and current rate, in the instant preceding the command's execution, at which the packets are reassembled.
Approximate Packets Pending Reassembly	Approximate number of packets pending reassembly.
Fragments Dropped Reasons	Total number of fragments dropped and the current rate of total fragments dropped for various reasons. The number of fragments dropped and rate corresponding to each of the following reasons are also displayed: • Buffers not available • Fragments per packet exceeded • Packet length exceeded • Record insert error • Record in use error • Duplicate first fragments • Duplicate last fragments • Missing first fragment NOTE: Rate refers to the current number of fragments processed per second in the instant preceding the command's execution.
Reassembly Errors Reasons	Number of errors during reassembly and the current rate of reassembly errors. The number of errors and the rate for each of the following types of errors are also displayed: • Fragment not found • Fragment not in sequence • ASIC errors NOTE: Rate refers to the current number of reassembly errors processed per second in the instant preceding the command's execution.
Aged out packets	Number of aged out packets and the current number of packets aged out per second in the instant preceding the command's execution.
Total Fragments Successfully Reassembled	Number of fragments successfully reassembled and the current number of fragments reassembled per second in the instant preceding the command's execution.

Table 5: show services inline ip-reassembly statistics Output Fields *(continued)*

Field Name	Field Description
Total Fragments Dropped	Total number of fragments dropped and the current rate of total number of fragments dropped. The number of fragments dropped and rate corresponding to each of the following reasons are also displayed: • Buffers not available • Fragments per packet exceeded • Packet length exceeded • Record insert error • Record in use error • Duplicate first fragments • Duplicate last fragments • Missing first fragment • Fragment not found • Fragment not in sequence • ASIC errors • Aged out fragments NOTE: Rate refers to the current total number fragments dropped per second in the instant preceding the command's execution.
Punt to UPIC	Number of fragments sent to the backup user plane PIC (services PIC) and current rate of fragments sent per second in the instant preceding the command's execution

Sample Output

show services inline ip-reassembly statistics fpc <fpc-slot>

```
user@host> show services inline ip-reassembly statistics fpc 2
FPC: 2 PFE: 2
==============
                                                    Total   Current Rate
Total Fragments Received                        432142720        6190683
   First Fragments                              216069011        3095332
   Intermediate Fragments                             0              0
   Last Fragments                               216073709        3095351

Total Packets Reassembled                        19695813         436470

Total Packets Pending Reassembly                     2755

Fragments Dropped Reasons                          145655           9946
   Buffers not available                                0              0
   Fragments per packet exceeded                        0              0
   Packet length exceeded                               0              0
   Record insert error                                  0              0
   Record in use error                             145655           9946
   Duplicate first fragments                            0              0
   Duplicate last fragments                             0              0
   Missing first fragment                               0              0

Reassembly Errors Reasons                               0              0
   Fragment not found                                   0              0
   Fragment not in sequence                             0              0
   ASIC errors                                          0              0
```

Aged out packets	1703485	37739
Total Fragments Successfully Reassembled	39391626	872940
Total Fragments Dropped	1849140	47685
Buffers not available	0	0
Fragments per packet exceeded	0	0
Packet length exceeded	0	0
Record insert error	0	0
Record in use error	145655	9946
Duplicate first fragments	0	0
Duplicate last fragments	0	0
Missing first fragment	0	0
Fragment not found	0	0
Fragment not in sequence	0	0
ASIC errors	0	0
Aged out fragments	1703485	37739
Total fragments punted to UPIC	357272140	5270086

show unified-edge ggsn-pgw ip-reassembly statistics

Syntax

show unified-edge ggsn-pgw ip-reassembly statistics
<brief | detail>
<fpc-slot *fpc-slot*>
<gateway *gateway*>
<inet>
<pic-slot *pic-slot*>

Release Information

Command introduced in Junos OS Mobility Release 11.2W.
gateway option introduced in Junos OS Mobility Release 11.4W.

Description

Display the IP reassembly statistics for one or more gateway GPRS support nodes (GGSNs) or Packet Data Network Gateways (P-GWs). If a GGSN or P-GW is not specified, then statistics for all GGSNs and P-GWs are displayed.

Options

none—(Same as brief) Display the IP reassembly statistics for all GGSNs and P-GWs.

brief | detail—(Optional) Display the specified level of output.

NOTE: The **brief** option displays the aggregated statistics from all the services PICs for each GGSN or P-GW. The **detail** option displays the statistics for each services PIC separately for each GGSN or P-GW.

fpc-slot *fpc-slot* pic-slot *pic-slot*—(Optional) Display the IP reassembly statistics for the specified Flexible PIC Concentrator (FPC) and PIC slot numbers.

gateway—(Optional) Display the IP reassembly statistics for the specified GGSN or P-GW.

inet—(Optional) Display the IP reassembly for IPv4 packets.

Required Privilege Level

view

Related Documentation

- clear unified-edge ggsn-pgw ip-reassembly statistics on page 55

List of Sample Output

show unified-edge ggsn-pgw ip-reassembly statistics brief on page 63
show unified-edge ggsn-pgw ip-reassembly statistics detail on page 63

Output Fields

Table 6 on page 61 lists the output fields for the **show unified-edge ggsn-pgw ip-reassembly statistics** command. Output fields are listed in the approximate order in which they appear.

Table 6: show unified-edge ggsn-pgw ip-reassembly statistics Output Fields

Field Name	Field Description	Level of Output
Gateway	Name of the GGSN or P-GW.	All levels

Table 6: show unified-edge ggsn-pgw ip-reassembly statistics Output Fields *(continued)*

Field Name	Field Description	Level of Output
IP Reassembly Statistics		
FPC Slot	FPC slot number for which the statistics are displayed.	**detail**
PIC slot	PIC slot number for which the statistics are displayed.	**detail**
First fragments	Number of first fragments.	All levels
Non-first fragments	Number of non-first fragments.	All levels
Total fragments	Total number of fragments.	All levels
Reassembled packets	Total number of reassembled packets. In this case, all fragments of the packets have been received.	All levels
Merged packets	Total number of merged packets. In this case, all the fragments of a packet have been merged into a single packet.	All levels
Packets pending reassembly	Total number of packets pending reassembly.	All levels
Timed out packets	Total number of fragmented packets that exceeded the reassembly timeout.	All levels
Timed out fragments	Total number of fragments that exceeded the reassembly timeout.	All levels
Exceeded maximum packet length	Number of packets dropped because the defragmented packets exceeded the maximum packet size.	All levels
Fragments Dropped		
Invalid Length	Number of fragments of invalid length received.	All levels
Overlap	Number of overlapping fragments received.	All levels
Duplicate	Number of duplicate fragments received.	All levels
No buffers	Number of fragments dropped because the system ran out of the packet buffer.	All levels
Packet limit exceeded	Total number of fragments dropped because the maximum allowed number of fragments was exceeded.	All levels
Total fragments dropped	Total number of fragments dropped.	All levels

Sample Output

show unified-edge ggsn-pgw ip-reassembly statistics brief

```
user@host> show unified-edge ggsn-pgw ip-reassembly statistics brief
Gateway: gw1
IP reassembly statistics:
  First fragments:               1
  Non-first fragments:           1
  Total fragments:               2
  Reassembled packets:           1
  Merged packets:                1
  Packets pending reassembly:    0
  Timed out packets:             0
  Timed out fragments:           0
  Exceeded maximum packet length:0
Fragments Dropped:
  Invalid length:                0
  Overlap:                       0
  Duplicate:                     0
  No buffers:                    0
  Packet limit exceeded:         0
  Total fragments dropped:       0
```

show unified-edge ggsn-pgw ip-reassembly statistics detail

```
user@host> show unified-edge ggsn-pgw ip-reassembly statistics detail
Gateway: gw1
IP reassembly statistics (FPC 5 PIC 0):
  First fragments:               1
  Non-first fragments:           1
  Total fragments:               2
  Reassembled packets:           1
  Merged packets:                1
  Packets pending reassembly:    0
  Timed out packets:             0
  Timed out fragments:           0
  Exceeded maximum packet length:0
Fragments Dropped:
  Invalid length :               0
  Overlap :                      0
  Duplicate :                    0
  No buffers:                    0
  Packet limit exceeded:         0
  Total fragments dropped:       0
```

show unified-edge sgw ip-reassembly statistics

Syntax **show unified-edge sgw ip-reassembly statistics**
<brief | detail>
<fpc-slot *fpc-slot*>
<gateway *gateway*>
<inet>
<pic-slot *pic-slot*>

Release Information Command introduced in Junos OS Mobility Release 11.4W.

Description Display the IP reassembly statistics for the one or more Serving Gateways (S-GWs). If a gateway name is not specified, then statistics for all S-GWs are displayed.

Options **none**—(Same as brief) Display the IP reassembly statistics in brief for all S-GWs.

brief | detail—(Optional) Display the specified level of output.

NOTE: The brief option displays the aggregated statistics from all the services PICs for each S-GW. The detail option displays the statistics for each services PIC separately for each S-GW.

fpc-slot *fpc-slot* pic-slot *pic-slot*—(Optional) Display the IP reassembly statistics for the specified Flexible PIC Concentrator (FPC) and PIC slot numbers.

gateway—(Optional) Display the IP reassembly statistics for the specified gateway.

inet—(Optional) Display the IP reassembly statistics for IPv4 packets.

Required Privilege Level view

Related Documentation
- clear unified-edge sgw ip-reassembly statistics on page 56

List of Sample Output
show unified-edge sgw ip-reassembly statistics brief on page 66
show unified-edge sgw ip-reassembly statistics detail on page 66

Output Fields Table 7 on page 64 lists the output fields for the **show unified-edge sgw ip-reassembly statistics** command. Output fields are listed in the approximate order in which they appear.

Table 7: show unified-edge sgw ip-reassembly statistics Output Fields

Field Name	Field Description	Level of Output
Gateway	Name of the S-GW.	All levels
IP Reassembly Statistics		

Table 7: show unified-edge sgw ip-reassembly statistics Output Fields *(continued)*

Field Name	Field Description	Level of Output
Gateway	Name of the S-GW.	All levels
FPC Slot	FPC slot number for which the statistics are displayed.	**detail**
PIC slot	PIC slot number for which the statistics are displayed.	**detail**
First fragments	Number of first fragments.	All levels
Non-first fragments	Number of non-first fragments.	All levels
Total fragments	Total number of fragments.	All levels
Reassembled packets	Total number of reassembled packets. In this case, all fragments of the packets have been received.	All levels
Merged packets	Total number of merged packets. In this case, all the fragments of a packet have been merged into a single packet.	All levels
Packets pending reassembly	Total number of packets pending reassembly.	All levels
Timed out packets	Total number of fragmented packets that exceeded the reassembly timeout.	All levels
Timed out fragments	Total number of fragments that exceeded the reassembly timeout.	All levels
Exceeded maximum packet length	Number of packets dropped because the defragmented packets exceeded the maximum packet size.	All levels
Fragments Dropped		
Invalid Length	Number of fragments of invalid length received.	All levels
Overlap	Number of overlapping fragments received.	All levels
Duplicate	Number of duplicate fragments received.	All levels
No buffers	Number of fragments dropped because the system ran out of the packet buffer.	All levels
Packet limit exceeded	Total number of fragments dropped because the maximum allowed number of fragments was exceeded.	All levels
Total fragments dropped	Total number of fragments dropped.	All levels

Sample Output

show unified-edge sgw ip-reassembly statistics brief

```
user@host> show unified-edge sgw ip-reassembly statistics brief
Gateway: sgw1
IP reassembly statistics:
  First fragments:               1
  Non-first fragments:           2
  Total fragments:               3
  Reassembled packets:           1
  Merged packets:                1
  Packets pending reassembly:    0
  Timed out packets:             0
  Timed out fragments:           0
  Exceeded maximum packet length:0
Fragments Dropped:
  Invalid length:                0
  Overlap:                       0
  Duplicate:                     0
  No buffers:                    0
  Packet limit exceeded:         0
  Total fragments dropped:       0
```

show unified-edge sgw ip-reassembly statistics detail

```
user@host> show unified-edge sgw ip-reassembly statistics detail
Gateway: sgw1
IP reassembly statistics (FPC 5 PIC 1):
  First fragments:               1
  Non-first fragments:           2
  Total fragments:               3
  Reassembled packets:           1
  Merged packets:                1
  Packets pending reassembly:    0
  Timed out packets:             0
  Timed out fragments:           0
  Exceeded maximum packet length:0
Fragments Dropped:
  Invalid length :               0
  Overlap :                      0
  Duplicate :                    0
  No buffers:                    0
  Packet limit exceeded:         0
  Total fragments dropped:       0
```

PART 4

Troubleshooting

CHAPTER 6

Gathering Troubleshooting Information

Configuring S-GW Data Path Traceoptions

Data path tracing operations record detailed messages about the operation of Serving Gateway (S-GW) services on the MobileNext Broadband Gateway. You can trace various types of data path operations such as packet reassembly, IPv6 router advertisements, memory usage, configuration events, and other information. You can specify which trace operations are logged by including specific tracing flags and levels.

Table 8 on page 69 describes the flags relating to the exceptions that you can include at the **[edit unified-edge gateways sgw *gateway-name* software-datapath traceoptions flag]** hierarchy level.

Table 8: S-GW Data Path Trace Flags

Flag	Description
ager	Trace flow ager.
all	Trace everything.
commands	Trace operational commands.
configuration	Trace configuration events.
flow	Trace flow.
init	Trace events related to data path daemon initialization.
ipv6-router-advertisement	Trace IPv6 router advertisement.
memory	Trace memory.
reassembly	Trace reassembly.
redundancy	Trace redundancy.

Table 9 on page 70 describes the levels you can include.

Table 9: S-GW Datapath Trace Levels

Level	Description
all	Match all levels.
error	Match error conditions.
info	Match informational messages.
notice	Match conditions that should be specially handled.
verbose	Match verbose messages.
warning	Match warning messages.

To configure tracing options for datapath operations:

1. Specify that you want to configure tracing options for datapath operations.

   [edit unified-edge gateways sgw *MBG2* software-datapath]
   user@host# **edit traceoptions**

   NOTE: You can use the **no-remote-trace** statement at this level to disable remote tracing capabilities.

2. Configure the filename for the trace file.

   [edit unified-edge mobile gateways sgw *MBG2* software-datapath traceoptions]
   user@host# **set file *datapath-log***

3. (Optional) Configure the maximum size of each trace file.

   [edit unified-edge mobile gateways sgw *MBG2* software-datapath traceoptions]
   user@host# **set file size 100m**

   NOTE: When a trace file (for example, datapath-log) reaches its maximum size, it is renamed datapath-log.0, then datapath-log.1, and so on, until the maximum number of trace files is reached. The oldest archived file is then overwritten.

4. Configure the tracing flag.

   [edit unified-edge mobile gateways sgw *MBG2* software-datapath traceoptions]
   user@host# **set flag all**

   NOTE: You should use care when tracing all operations on a gateway. This can have a performance impact.

5. Configure the tracing level.

```
[edit unified-edge mobile gateways sgw MBG2 software-datapath traceoptions]
user@host# set level error
```

6. View the trace file.

```
user@host# file show /var/log/datapath-log
```

Related Documentation

- IP Packet Fragment Reassembly Overview on page 3
- Understanding the Broadband Gateway Exception Handling on page 7
- Understanding GTP-U Error Exception Handling on page 8
- Understanding Broadband Gateway IP Fragment Handling on page 9
- Configuring Fragment Reassembly Parameters on page 14
- Understanding IPv6 Protocol Parameters on page 9
- Configuring IPv6 Protocol Parameters on page 15
- Configuring Exception Handling Traceoptions on page 17
- Configuring S-GW Traceoptions
- Configuring S-GW GTP Traceoptions
- Configuring S-GW Charging Traceoptions
- Configuring S-GW Local Persistent Storage Traceoptions

PART 5

Index

Index

M

P

R

S

T