Chapter 3

# Commissioning

## In This Chapter:

# 3.1 Initial NPU Configuration

## 3.1.1 Introduction

After completing the installation process, as described in the preceding chapter, some basic NPU parameters must be configured locally using the CLI via the MON port of the NPU.

Refer to “Using the Command Line Interface for 4Motion System Management” on page 114 for information on how to access the CLI either via the MON port or via Telnet and how to use it.

The following sections describe the minimum mandatory configuration actions required to allow remote configuration of the site and to enable discovery by the EMS system:

1. ”NPU Local Connectivity”
2. ”Site Connectivity”
3. ”ACL Definition”
4. ”Static Route Definition”
5. ”SNMP Manager Definition”
6. ”Site ID Definition”

For a configuration example, refer to Appendix C.

## 3.1.2 NPU Local Connectivity

Refer to “Accessing the CLI from a Local Terminal” on page 115 for details on connecting locally to the NPU.

Clear existing site configuration (must be executed for "used” NPUs). Restore to factory default and reboot using the following command:

*npu# restore-factory-default*

The system will reset automatically.

## 3.1.3 Site Connectivity

### 3.1.3.1 Connectivity Mode

The connectivity mode determines how traffic is to be routed between the NPU and the BSs, AAA server and external Management System servers.

The default connectivity mode is In-Band (IB) via the Data port. Alternatively, the NPU can be managed Out-Of-Band (OOB) via the dedicated Management port.

To view the current and configured connectivity mode, use the command:
*npu# show connectivity mode*

To change the connectivity mode to Out-Of-Band, use the command:
*npu(config)# connectivity mode outband* (for details refer to "Configuring the IP Connectivity Mode" on page 138).

### 3.1.3.2 VLANs Translation (Outband Connectivity Mode)

When using In-Band connectivity via the Data port, the default VLAN ID for management packets is 12. The default VLAN ID for data packets is 11. If different VLAN IDs are used in the backbone, the VLANs should be translated accordingly. To enable VLAN translation and configure the required VLANs translation, run the following commands (the examples are for backhaul Data VLAN ID 30 and Management VLAN ID 31):

1. Enable the Data port configuration mode (for details refer to "Enabling the Interface configuration mode" on page 142):
   *npu(config)# interface gigabitethernet 0/10*

2. Enable VLAN translation (for details refer to "Enabling/Disabling VLAN Translation" on page 150): *npu(config-if)# vlan mapping enable*

3. Translate data VLAN 11 to the backhaul data VLAN 30 (for details refer to "Creating a VLAN Translation Entry" on page 150):
   *npu(config-if)# vlan mapping 11 30*

4. Translate management VLAN 12 to the backhaul management VLAN 31:
   *npu(config-if)# vlan mapping 12 31*

5. Exit the interface configuration mode: *npu(config-if)# exit*

6. To view the VLAN mapping parameters, run the command:
   *npu# show interface gigabitethernet 0/10 vlan mapping*

### 3.1.3.3 External Management Interface

To configure the necessary parameters of the External Management interface used for connectivity with the EMS system, run the following commands:

1. Enable the External Management interface configuration mode (for details refer to "Enabling the Interface configuration mode" on page 142):
   *npu(config)# interface external-mgmt*

2 Disable the interface to allow configuring its parameters:
*npu(config-if)# shutdown*

3 Configure the IP address (x.x.x.x) and subnet mask (y.y.y.y). For details refer to "Assigning an IP address to an interface" on page 161:
*npu(config-if)# ip address x.x.x.x y.y.y.y*

4 Configure the MTU of the interface to 1500 bytes: *npu(config-if)# mtu 1500*

5 Enable the interface: *npu(config-if)# no shutdown*

6 Exit the interface configuration mode: *npu(config-if)# exit*

7 Exit the configuration mode: *npu(config)# exit*

#### 3.1.3.4 Save and Apply Changes in Site Connectivity Configuration

1 Save the configuration: *npu# write* (otherwise, after the next time reset you will lose the configuration changes).

2 Reset the system to apply the changes: *npu# reset*

### 3.1.4 ACL Definition

For details on ACLs refer to "Configuring ACLs" on page 215.

1 Create a standard ACL (number 1) and enable the ACL configuration mode:
*npu(config)# "ip access-list standard 1*

2 For initial configuration, permit traffic from any source address to any destination address: *npu(config-std-nacl)# "permit any any*.

3 Terminate the ACL configuration mode: *npu(config-std-nacl)# exit*

4 Enable the AUs virtual interface configuration mode:
*npu(config)# "interface all-au*

5 Attach the ACL to the AUs virtual interface:
*npu(config-acl)# "ip access-group 1*

6 Terminate the AUs virtual interface configuration mode: *npu(config-acl)# exit*

### 3.1.5 Static Route Definition

Static Route must be configured whenever the EMS server and the NPU are on different subnets. For more details refer to "Adding a Static Route" on page 212.

Run the following command: *npu(config)# "ip route 0.0.0.0 0.0.0.0 x.x.x.x*"
(x.x.x.x is the next hop IP address, 0.0.0.0 0.0.0.0 define the IP address and mask

as “any destination”. Depending on your backhaul network, you may define different IP address and mask to allow only specific destinations).

## 3.1.6 SNMP Manager Definition

To define the communities to be used by the SNMP manager, run the command: *npu(config)# snmp-mgr ReadCommunity public ReadWriteCommunity private*. For more details refer to “Adding an SNMP Manager” on page 422.

For proper operation of the manager you should configure also the Trap Manager parameters and enable sending traps to the defined Trap Manager (this can also be done later via the management system):

1. *npu(config)# trap-mgr ip-source x.x.x.x port 162 TrapCommunity public* ( x.x.x.x is the IP address of the EMS server). For more details refer to “Adding/Modifying a Trap Manager entry” on page 425
2. *npu(config)# trap-mgr enable ip-source x.x.x.x*

Note that if the management system is behind a NAT router, the NAT Outside IP address (the IP of the router’s interface connected to the managed device LAN) must also be defined in the device as a Trap Manager, with traps sending enabled. In the NAT router, Port Forwarding (NAT Traversal) must be configured for UDP and TCP ports 161 and 162 from Outside IP (connected to the managed device’s LAN) to Inside IP (connected to the management system’s LAN).

## 3.1.7 Mapping the AU Software Version

To define the software version to be used by all AUs run the command: *npu(config)# map au default <image name>*, where image name is the required AU software version (to view the AU software versions available in the NPU run the command *npu# show au image repository*).

## 3.1.8 Site ID Definition

To define the site ID (Site Number): *npu(config)# site identifier x*
(x is the unique site identifier, a number in the range from 1 to 999999)

For more details refer to “Configuring the Unique Identifier for the 4Motion Shelf” on page 462.

## 3.1.9 Saving the Configuration

To save the configuration run the command: *npu# write* (otherwise, after the next time reset you will lose the configuration changes).

# 3.2 Completing the Site Configuration Using AlvariSTAR

## 3.2.1 Introduction

After completion of the initial configuration you should be able to manage the new Site using AlvariSTAR and continue configuring (at least) all mandatory parameters to enable the necessary services.

For details on how to use AlvariSTAR for managing 4Motion sites refer to the AlvariSTAR and 4Motion Device Manager User Manuals.

Verify that the Site is included in the list of devices that can be managed by AlvariSTAR. It can be added to the list of managed devices either through the Equipment Manager (by creating a New managed device) or through the Managed Network window (by inclusion in a range to be discovered and activation of the Network Scan Task from the Task Manager).

To complete the minimal configuration, open the Site’s Device Manager from the Equipment Manager and perform the following configuration steps:

1. “Site Configuration” on page 104
2. “Connectivity Configuration (optional)” on page 104
3. “Equipment Configuration” on page 104
4. “ASNGW Configuration” on page 106 (only for Distributed ASNGW topology)
5. “BS Configuration” on page 108
6. “Site Sector Configuration” on page 110
7. “Apply All Changes” on page 111

**NOTE**

The following sections list the minimum actions that must be performed for completing basic configuration of the Site. Additional parameters may also be configured in order to complete the entire configuration of the Site.

After configuring the mandatory parameters in each screen, click on the Apply button. Click Apply even if you did not change any of the screen’s default parameters.

In some of the screens in the following sections there are no mandatory parameters but still you must click on the Apply button to activate the default values.

## 3.2.2 Site Configuration

### 3.2.2.1 General Tab

ASN Topology - the default is Distributed ASNGW.

If you change it to Centralized ASNGW click Apply for the device to accept the change.

## 3.2.3 Connectivity Configuration (optional)

### 3.2.3.1 IP Interface Screen

Configure the IP address of the Bearer interface:

1 Change the Administrative State to Down.

2 Click Apply.

3 Change the IP and/or any other parameter value, except VLAN ID.

4 Click Apply.

5 Change the Administrative State to Up.

6 Click on Apply to accept the changes.

### 3.2.3.2 IP Routing Screen

The IP Routing screen is used to define the static routes for traffic originating from the NPU.

The static route for management traffic was already configured (see “Static Route Definition” on page 101).

If necessary (depending on your specific backhaul network) you may configure additional static route(s) for Bearer Traffic and/or Control Traffic. If additional static routes were defined (or if you made any changes in the already configured static route), click on the Apply button.

## 3.2.4 Equipment Configuration

### 3.2.4.1 AU

AU entities must be created for all installed AUs (you may create an AU entity also for AUs that are not installed yet).

**To create a new AU entity:**

1 Right click on the AU lnode in the Navigation Pane and select Create. The New AU definition window will open. You can also double-click on an empty slot in the Site Equipment View Page to open the New AU window for the selected slot.

2 In the New AU definition window, define the following:

   » AU number (AU Slot)

   » Type

   » Ports (in current release only 4 Ports AUs are applicable)

   » Bandwidth

3 Click Apply.

4 Repeat the process for all required AU entities.

### 3.2.4.2 ODU

ODU entities must be created for all installed ODUs (you may create an ODU entity also for ODUs that are not installed yet).

**To create a new ODU entity:**

1 Right click on the ODU node in the Navigation Pane and select Create. The New ODU definition window will open.

2 In the New ODU definition window, define the following:

   » ODU number

   » ODU Type

3 Click Apply.

4 In the ODU General screen of the applicable ODU, in the Ports Configuration section, configure the Tx Power for the relevant Tx/Rx port(s) . Click on the Apply button for the device the accept the configuration.

5 Repeat the process for all required ODU entities.

### 3.2.4.3 Antenna

Antenna entities must be created for all installed and connected antennas (you may create an Antenna entity also for antennas that are not installed/connected yet).

**To create a new Antenna entity:**

1. In the Anteena screen, click on the Add New Antenna button.
2. In the Antenna Parameters section, define the following:
   - Number of Ports
   - Heading
3. Click Apply.
4. Repeat the process for all required Antenna entities.

### 3.2.4.4 GPS

The default GPS Type is Trimble. If there is no GPS, the value should be changed to None.

Click Apply for the device to accept the change.

## 3.2.5 ASNGW Configuration

**NOTE**

ASNGW screens are available only for Distributed ASNGW topology (see also "Site Configuration" on page 104.

### 3.2.5.1 AAA Screen

1. Configure the following mandatory parameters:
   - Primary AAA Server (IP address)
   - RADIUS Shared Secret
   - ASNGW NAS ID
2. Click Apply for the device to accept the configuration.

## 3.2.5.2 Service Screen

### 3.2.5.2.1 Service Interface Tab

At least one Service Interface for data must be defined. If a dedicated management station for CPEs is being used, a suitable Service Interface for management must also be defined.

1 Click on the Add Service Interface button and configure the following mandatory parameters:

   - » Service Interface Name
   - » Type
   - » Tunnel Destination IP (IP-in-IP Service Interface)
   - » Service VLAN ID (VLAN and QinQ Service Interface)
   - » Default Gateway IP Address (VLAN Service Interface)

2 Click Apply for the device to accept the configuration.

### 3.2.5.2.2 Service Groups Tab

At least one Service Group associated with a defined Service Interface for data must be defined. If a dedicated management station for CPEs is being used, a suitable Service Group associated with the defined Service Interface for management must also be defined.

1 Click on the Add Service Group button and configure at least the following mandatory parameters:

   - » Name
   - » Type
   - » Service Interface Name
   - » DHCP Function Mode
   - » DHCP Own IP Address
   - » External DHCP Server IP Address (Relay mode)
   - » IP Address Pool From (Server mode)

- IP Address Pool To (Server mode)
- Subnet Mask (Server mode)
- DNS Server IP Address (Proxy mode)

2 Click Apply for the device to accept the configuration.

### 3.2.5.3 SFA Screen -Classification Rules Tab

Create the necessary Classification Rule(s) according to the relevant type of traffic, and click Apply.

### 3.2.5.4 Service Profiles

At least one Service Profile must be defined and associated with an already defined Service Group.

1 Right-click on the Service Profile node and select **Create**. The New Service Profile window is displayed.

2 Define the Name of the New Service Profile and click Apply.

3 The new Service Profile added to the list of available Service Profiles in the navigation tree. Select it to continue the configuration process.

4 Click Add in the Service Flow area.

5 Configure the applicable general parameters of the Service Flow.

6 Configure the applicable QoS parameters of Service Flow for UL and DL (for Data deleivery type=BE it will be Maximum Sustained Traffic Rate and Traffic Priority)

7 Associate this Service Flow with previously created Classification Rule(s).

8 Change the Profile Status to Enable

9 Click Apply for the device to accept the configuration.

## 3.2.6 BS Configuration

### 3.2.6.1 Creating a New BS Entity

**To create a new BS entity:**

1 Right click on the BS level entry in the Navigation Pane. The New BS definition window will open.

2 In the New BS definition window, define the following:

- » BS ID LSB
- » Operator ID

3 Click Apply.

4 Complete the BS configuration as described in the following sections.

## 3.2.6.2 Radio

### 3.2.6.2.1 Basic Screen

#### 3.2.6.2.1.1 General Tab

1 Configure the following mandatory parameters:

- » Name
- » Bandwidth
- » Center Frequency

2 Click Apply for the device to accept the configuration.

3 You will be prompted to properly configure some or all of the following parameters:

a Total Uplink Duration (Air Frame Structure General Tab)

b Major Map Groups (Air Frame Structure Zones Tab)

c Downlink Data Zone Number of Sub-Channels (Air Frame Structure Zones Tab)

d Uplink Feedback Zone Number of Sub-Channels (Air Frame Structure Zones Tab):

- ◊ For a Bandwidth of 7 or 10 MHz, configure this parameter to the default value of 35.
- ◊ For a Bandwidth of 5 MHz, configure this parameter to the default value of 17.

e Uplink Data Zone Number of Sub-Channels (Air Frame Structure Zones Tab):

◊ For a Bandwidth of 7 or 10 MHz, configure this parameter to the default value of 35.

◊ For a Bandwidth of 5 MHz, configure this parameter to the default value of 17.

4 Click Apply for the device to accept the configuration.

#### 3.2.6.2.2 Advanced Screen

All the parameters in the Advanced screen should be left with their default values. However, the Apply button must be clicked once (in any tab) for the device to accept the default configuration.

### 3.2.6.3 Connectivity

#### 3.2.6.3.1 Basic Screen - Bearer Tab

1 Configure the following mandatory parameters:

» IP Address

» IP Subnet Musk

» Default Gateway

2 Click Apply for the device to accept the configuration.

#### 3.2.6.3.2 Basic Screen - Authentication Tab

1 Configure the mandatory Default Authenticator IP Address parameter.

2 Click Apply for the device to accept the configuration.

#### 3.2.6.3.3 Advanced Screen

All the parameters in the Advanced page should be left with their default values. However, the Apply button must be clicked for the device to accept the default configuration.

## 3.2.7 Site Sector Configuration

**To create a new Site Sector entity:**

1 Right click on the Site Sector level entry in the Navigation Pane. The New Site Sector definition window will open.

2 In the New Site Sector definition window, define the Site Sector Number

3 Click Apply.

4 At least one Site Sector Association must be defined for each Site Sector. Click on the Add Sector Association button and configure all the parameters in the applicable line of the Sector site Association table:

- BS ID LSB
- AU Slot Number
- AU Port Number
- ODU Number
- ODU Port Number
- Antenna Number
- Antenna Port Number

5 Click Apply for the device to accept the configuration.

### 3.2.8 Apply All Changes

If you changed any of the parameters that are applied only after reset of the NPU such as ASN Topology or Configured GPS Type (indicated by a pop-up message after applying the change), you must reset the NPU (in the NPU screen select the Reset option in the Shutdown Operation parameter). This will cause also automatic reset of all AUs

To fully apply all the Site Sector configuration changes, reset all the relevant AUs (in the Control tab of each applicable AU screen select the Reset option in the Shutdown Operation parameter). It is not necessary to reset each of the AUs if you reset the NPU.

Chapter 4

# Operation and Administration Using the CLI

## In This Chapter:

# 4.1 Using the Command Line Interface for 4Motion System Management

All 4Motion system components are managed via the NPU module. The AU is not accessed directly: any configuration change or status enquiry is sent to the NPU that communicates with other system components.

The following system management options are available:

- Accessing the Command Line Interface (CLI) locally via the MON port
- Using Telnet/Secure Shell (SSH) to access the CLI

The CLI is a configuration and management tool that you can use to configure and operate the 4Motion system, either locally or remotely, via Telnet/SSH. The following are some administrative procedures to be executed using the CLI:

- Specifying the boot mode to be used at the next system reset
- Selecting the connectivity mode
- Shutting down/resetting 4Motion
- Configuring and operating 4Motion
- Monitoring hardware and software components
- Executing debug procedures
- Executing software upgrade procedures

This section provides information about:

- "Accessing the CLI" on page 115
- "Command Modes" on page 117
- "Interpreting the Command Syntax" on page 118
- "Using the CLI" on page 120

- “Managing Users and Privileges” on page 122

### 4.1.1 Accessing the CLI

You can access the CLI, locally, via an ANSI ASCII terminal or PC that is connected via the DATA port of the NPU. You can also use Telnet/SSH to remotely access the CLI.

This section describes the procedures for:

- “Accessing the CLI from a Local Terminal” on page 115
- “Accessing the CLI From a Remote Terminal” on page 116

#### 4.1.1.1 Accessing the CLI from a Local Terminal

➤ **To access the CLI via the MON connector:**

1 Use the MON cable to connect the MON connector of the NPU to the COM port of your ASCII ANSI terminal or PC. The COM port connector of the Monitor cable is a 3-pin to 9-pin D-type plug.

2 Run a terminal emulation program, such as HyperTerminal™.

3 Set the communication parameters listed in the following table:

**Table 4-1: COM Port Configuration**

| Parameter | Value |
|---|---|
| Baud rate | 115200 |
| Data bits | 8 |
| Stop bits | 1 |
| Parity | None |
| Flow control | Xon/Xoff |
| Port | Connected COM port |

4 The login prompt is displayed. (Press Enter if the login prompt is not displayed.) Enter your login ID and password to log in to the CLI.

**NOTE**

The default login ID and password are:
Login ID: root
Password: admin123

After you provide your login information, the following command prompt is displayed:

**npu#**

This is the global command mode. For more information about different command modes, refer to Section 4.1.2.

### 4.1.1.2 Accessing the CLI From a Remote Terminal

The procedure for accessing the CLI from a remote terminal differs with respect to the IP connectivity mode. The Ethernet port and IP interface you are required to configure for enabling remote connectivity is different for each connectivity mode. For more information about connectivity modes, and Ethernet ports and IP interface used for operating the 4Motion system, refer "Managing the IP Connectivity Mode" on page 136.

**To access the CLI from a remote terminal, execute the following procedure:**

**IMPORTANT**

The in-band connectivity mode is the default connectivity mode; the DATA port and external-management VLAN are the default Etherent port and IP interface that are configured for the in-band connectivity mode. The following procedure can be used for accessing the CLI when the in-band connectivity mode is selected. This procedure is identical for all other connectivity modes. However, the Ethernet port, VLAN, and IP interface to be configured will differ for the out-of-band and unified connectivity modes, as listed in Table 4-8.

1 Assign an IP address to the external-management interface. For this, execute the following procedure. (Refer Table 4-8 for more information about the IP interface to be configured for the connectivity mode you have selected).

   a Run the following command to enable the interface connectivity mode for the external-management interface:

   ```
   npu(config)# interface external-mgmt
   ```

   b Run the following command to disable the interface:

```
npu(config-if)# shutdown
```

c Run the following command to assign an IP address to this interface:

```
npu(config-if)# ip address <ip-address> <subnet-mask>
```

d Run the following command to enable this interface:

```
npu(config-if)# no shutdown
```

2 Connect the Ethernet cable to the DATA connector on the front panel of the NPU. (Refer Table 4-8 for more information about the Ethernet port to be used for the connectivity mode you have selected).

3 To enable exchange of packets, create IP-level connectivity between the remote machine and the external-management interface.

4 From the remote terminal, execute the following command to use Telnet/SSH to access the IP address of the external-management interface:

```
telnet <ip address of external-management interface>

ssh <ip address of external-management interface>
```

5 At the prompt, enter your login ID and password.

**NOTE**

The default login ID and password are:
Login ID: root
Password: admin123

After you provide your login information, the following command prompt is displayed:

**npu#**

This is the global command mode. For more information about different command modes, refer to Section 4.1.2.

## 4.1.2 Command Modes

The CLI provides a number of command modes, some of which are listed in the following table for executing different types of commands:

**Table 4-2: CLI Command Modes**

| Mode | Used for... | Command Prompt |
|---|---|---|
| Global configuration mode | Executing all configuration commands | **npu(config)#** |
| Global command mode | Executing all other commands such as show and delete commands | **npu#** |
| Interface configuration mode | Executing all commands for configuring physical and IP interfaces. | **npu(config-if)#** |
| Standard/extended ACL mode | Executing commands for configuring standard and extended ACLs | **npu(config-std-nacl)#**<br>**npu(config-ext-nacl)#** |

The following table lists the commands to be executed for entering/exiting a particular command mode:

**Table 4-3: Commands to Enter/Exit a Command Mode**

| To... | Run the Command... | The Command Mode is Now... |
|---|---|---|
| Enter the global configuration mode | **npu# config terminal** | **npu(config)#** |
| Enter the interface configuration mode | **npu(config)# interface** {<interface-type> <interface-id> \|**internal-mgmt** \|**external-mgmt** \| **bearer** \| **local-mgmt** \| **npu-host** \| **all-au**} | **npu(config-if)#** |
| Exit the configuration mode and enter the global command mode. | **npu(config)# end**<br>**npu (config-if)# end** | **npu#**<br>**npu#** |
| Exit the current configuration mode by one level | **npu (config-if)# exit** | **npu(config)#** |

## 4.1.3 Interpreting the Command Syntax

The following table lists the conventions used in the command syntax for all 4Motion commands:

**Table 4-4: Conventions Used in the 4Motion Command Syntax**

| Convention | Description | Example |
|---|---|---|
| { } | Indicates that the parameters enclosed in these brackets are mandatory, and only one of these parameters should be specified. | **npu(config)# limit** {**cpu** \| **memory**} ([**softlimit** <limit>] [**hardlimit** <limit>])<br>This command is used for specifying the soft and hard limits for memory and CPU utilization. The cpu/memory parameters are enclosed within {} brackets, indicating that their presence is mandatory, and that only one of these parameters is required. |
| ( ) | Indicates that one or all parameters enclosed within these brackets are optional. However, the presence of at least one parameter is required to successfully execute this command. | **npu(config)# limit** {**cpu** \| **memory**} ([**softlimit** <limit>] [**hardlimit** <limit>])<br>This command is used for specifying the soft and hard limits for memory and CPU utilization. The softlimit and hardlimit parameters are enclosed within () brackets, indicating that you are required to specify the value of at least one of these parameters to successfully execute this command. |
| [ ] | Indicates that the parameter enclosed within these brackets is optional. | **npu(config)# reboot from shadow** [<shadow image name>]<br>This command is used to reboot the system with the shadow image. The shadow image name parameter is enclosed with the [ ] brackets, indicating that it is optional. If you do not specify the value of this parameter, the system automatically boots up with the last downloaded shadow image. |
| < > | Indicates that the parameter is mandatory and requires a user-defined value (and not a discrete value). | **npu(config)# load to shadow** <shadow image name><br>This command is used to load the system with a particular shadow image. It is mandatory to specify a value for the shadow image name parameter; otherwise an error is raised by the system. The value of this parameter is not a discrete value; you are required to specify a value for this parameter. |

**Table 4-4: Conventions Used in the 4Motion Command Syntax**

| | | |
|---|---|---|
| \| | Indicates the OR conditional operator that is used between two or more parameters. The presence of this parameter indicates that only one of the parameters separated by the \| conditional parameter should be specified in the command. | **npu(config)# group enable** {**pmNpuBckhlPort** \| **pmNpuMgmtPort** \| **pmNpuCascPort** \| **pmAuPort** \| **pmNpuIntMgmtIf** \| **pmNpuExtMgmtIf** \| **pmNpuLclMgmtIf** \| **pmNpuBearerIf** \| **pmSfa** \| **pmDatapathFn** \| **pmAaaClient** \| **pmAuthenticator** \| **pmContextFn** \| **pmDhcpProxy** \| **pmDhcpRelay** \| **pmDhcpServer** \| **pmMsStateChangeFn**}<br>This command is used to specify the group for which performance data collection and storage is to be enabled. The \| conditional operator indicates that only one parameter should be specified. |

**NOTE**

In this document, all discrete values are specified in boldface, and all user-defined values are not bold.

## 4.1.4 Using the CLI

To help you use the CLI, this section provides information about:

- "Using Control Characters" on page 120
- "Using the CLI Help" on page 121
- "Using the History Feature" on page 121
- "Using Miscellaneous Commands" on page 122
- "Privilege Levels" on page 122

### 4.1.4.1 Using Control Characters

Control characters refer to special characters that you can use to recall or modify previously-executed commands. The following table lists the control characters to be used for executing commands on the CLI:

**Table 4-5: Control Characters for Using the CLI**

| Press | To... |
|---|---|
| Up/Down arrow keys | Scroll the previously executed CLI commands. Press Enter if you want to select and execute a particular command. |
| Right/Left arrow keys | Navigate to the right/left of the selected character in a command. |
| Home key | Navigate to the first character of a command. |
| End key | Navigate to the last character of a command. |
| Backspace key | Delete the characters of a command. |
| TAB key | Prompt the CLI to complete the command for which you have specified a token command. Remember that the CLI that is the nearest match to the token command that you have specified is displayed. |
| ? key | View the list of commands available in the current mode. If you press ? after a command, a list of parameters available for that command is displayed. |

## 4.1.4.2 Using the CLI Help

The CLI provides help that you can access while using the CLI. Execute the following command to obtain help for a specific command:

```
help [“<text>”]
```

Specify the command name as the parameter to view help for this command. For example, to obtain help for the **show resource limits** command, run the following command:

```
npu# help “show resource limits”
```

The help for the **show resource limits** command is displayed.

If you do not provide the command name as the parameter, all commands that can be executed in the current command mode are displayed.

## 4.1.4.3 Using the History Feature

The history feature of the CLI maintains a sequential list of all previously executed commands. The following table lists the commands that you can run to access, edit or execute a command from the command history list:

Table 4-6: Commands for Using the History Feature

| Run the command... | To... |
|---|---|
| show history | Obtain a list of previously executed commands. |
| !! | Execute the last command displayed in the list of previously executed commands. |
| !<n> | Execute the nth command in the list of previously-executed commands. |
| !<string> | Execute the most recent command in the CLI history that starts with the string entered as the value for the `string` parameter. |

### 4.1.4.4 Using Miscellaneous Commands

The following table lists other miscellaneous commands that you can execute while using the CLI:

Table 4-7: Miscellaneous Commands

| Enter the command... | To... |
|---|---|
| **`exit`** | Exit the CLI. After you run this command, provide your login ID and password to access the CLI. |
| **`clear screen`** | Clear the screen. |

### 4.1.4.5 Privilege Levels

All commands that can be executed using the CLI are assigned privilege levels between 0 and 15, where 0 is the lowest, and 15 is the highest. In addition, each user is assigned a privilege level; the user can access only those commands for which the privilege level is the same or lower than the user's privilege level.

The default user, root, is assigned privilege level 15. However, if you are logging in as root, you can execute certain additional commands for managing users and enabling passwords for privilege levels. For more information about managing users and privileges, refer to Section 4.1.5.

## 4.1.5 Managing Users and Privileges

To enable multi-level access to the CLI, you can create and manage multiple users, and assign privilege levels for each user. The privilege level determines whether a user is authorized to execute a particular command. The privilege level is pre-configured for each command, and can be between 0 and 15, where 0 is the lowest and 15 is the highest. The user can execute all commands for which the privilege level is equal to or lower than the default privilege level assigned to the user.

**IMPORTANT**

By default, the privilege level of users logging in with root privileges is 15. However, the root user can execute some additional commands for adding users and enabling passwords for different privilege levels.

You can also configure passwords for each privilege level. Users with lower privilege levels can enter this password to enable higher privilege levels.

This section describes the commands for:

- "Managing Users" on page 123
- "Managing Privileges" on page 126
- "Enabling/Disabling Higher Privilege Levels" on page 128
- "Displaying Active Users" on page 130
- "Displaying All Users" on page 130
- "Displaying the Privilege Level" on page 131

## 4.1.5.1 Managing Users

You can add/modify/delete one or more users for accessing the CLI either through a local or remote terminal.

**IMPORTANT**

Only users who have logged in as root can add/modify/delete users.

This section describes the commands for:

- "Adding/Modifying Users" on page 124
- "Deleting a User" on page 125

#### 4.1.5.1.1 Adding/Modifying Users

**IMPORTANT**

Only users who have logged in as root can execute this task.

To add/modify a user, and assign a username, password, and privilege level, run the following command:

```
npu(config)# username <name> password <password> privilege <0-15>
```

**IMPORTANT**

An error may occur if:

- You are not logged in as the root.
- The username or password that you have specified is more than 20 characters.
- The privilege level that you have specified is not within the range, 0-15.

**Command Syntax**

```
npu(config)# username <name> password <password> privilege <0-15>
```

**Privilege Level**

root

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| **username** <name> | Indicates the user name of the user to be added. | Mandatory | N/A | String (up to 20 characters and case-sensitive) |
| **password** <password> | Indicates the password to be assigned to the user to be added. | Optional | password | String (up to 20 characters and case-sensitive) |
| **privilege** <0-15> | Indicates the privilege level to be assigned to a user. The user will be permitted to execute all commands for which the privilege level is equal to or lower than the value of this parameter. | Mandatory | N/A | 0-15 |

**Command Modes**

Global command mode

### 4.1.5.1.2 Deleting a User

**IMPORTANT**

Only users who have logged in as root can execute this task.

To delete a user, run the following command:

```
npu(config)# no user <username>
```

**IMPORTANT**

An error may occur if:

- You are not logged in as root user.
- The username that you have specified does not exist. Remember that user names are case-sensitive.
- You are trying to delete an active user or the root user.

**Command Syntax**

```
npu(config)# no user <username>
```

**Privilege Level**

root

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| **username** <name> | Indicates the username of the user to be deleted. | Mandatory | N/A | String (upto 20 characters and case-sensitive) |

**Command Modes**

Global command mode

### 4.1.5.2 Managing Privileges

To enable users to execute commands that require a higher privilege level (than their currently configured default level), you can configure a password for each privilege level. Other users can then use the password you have specified to enable a higher privilege level.

**IMPORTANT**

Only users who have logged in as root can assign or delete passwords for any privilege level.

This section describes the commands for:

- "Assigning a Password for a Privilege Level" on page 126
- "Deleting a Password for a Privilege Level" on page 127

#### 4.1.5.2.1 Assigning a Password for a Privilege Level

**IMPORTANT**

Only users who have logged in as root can execute this command.

To assign a password for a privilege level, run the following command:

```
npu(config)# enable password  [Level <0-15>] <password>
```

**IMPORTANT**

After you execute this command, any user can use this password to enable the (higher) privilege level for which you have configured the password. For more information about using passwords for enabling higher privilege levels, refer Section 4.1.5.3.

**IMPORTANT**

An error may occur if:

- You are trying to configure a password for a privilege level that is higher than your default privilege level.
- The password that you have specified is more than 20 characters.
- The privilege level that you have specified is not within the range, 0-15.

**Command Syntax**

```
npu(config)# enable password  [Level <0-15>] <password>
```

**Privilege Level**

15

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[Level <0-15>]` | Indicates the privilege level for which a password is to be enabled. | Optional | 15 | 0-15 |
| `<password>` | Denotes the password to be assigned for the current privilege level. | Mandatory | N/A | String (up to 20 characters and case-sensitive) |

**Command Modes**

Global configuration mode

### 4.1.5.2.2 Deleting a Password for a Privilege Level

**IMPORTANT**

Only users who have logged in as root can execute this command.

To delete a password for a privilege level, run the following command:

```
npu(config)# no enable password [Level <0-15>]
```

**IMPORTANT**

An error may occur if:

- The privilege level that you have specified is not within the range, 0-15.
- You are trying to delete a password for a privilege level that is higher than your default privilege level.

**Command Syntax**

```
npu(config)# no enable password [Level <0-15>]
```

**Privilege Level**

root

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[Level <0-15>]` | Indicates the privilege level for which a password is to be disabled. | Optional | 10 | 015 |

**Command Syntax**

Global configuration mode

## 4.1.5.3 Enabling/Disabling Higher Privilege Levels

You can execute commands that require higher privilege levels. If the root user has configured a password for that level, you can use that password to enable higher privilege levels.

For example, if your privilege level is 1, you can provide the password configured for privilege level 10 to execute all commands that require privilege level 10.

This section describes the commands for:

- "Enabling a Higher Privilege Level" on page 128
- "Returning to the Default Privilege Level" on page 129

### 4.1.5.3.1 Enabling a Higher Privilege Level

**To enable a higher privilege level:**

1 Log in to the CLI.

2 Run the following command to specify the privilege level and password:

```
npu(config)# enable [Level <0-15>]
```

3 At the password prompt, specify the password configured for the privilege level that you have specified.

If you specify the correct password, you are logged in to the CLI with the privilege level that you had specified. You can now execute all commands that require the current privilege level.

**NOTE**

You can display your current privilege level, using the following command:

```
npu# show privilege
```

You can, at any time, return to your default privilege level. For details, refer Section 4.1.5.3.2.

**NOTE**

An error may occur if:

- You have specified an incorrect password. Remember that all passwords are case-sensitive.
- No password is not configured for the privilege level you are trying to access.

**Command Syntax**

```
npu(config)# enable [Level <0-15>]
```

**Privilege Level**

0

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [Level <0-15>] | Indicates the privilege level you want to enable. | Mandatory | N/A | 0-15 |

**Command Modes**

Global configuration mode

### 4.1.5.3.2 Returning to the Default Privilege Level

Run the following command to disable the current privilege level, and return to your default privilege level:

```
npu(config)# disable [Level <0-15>]
```

After you run this command, you automatically return to your default privilege level. You can display your current privilege level, using the following command:

```
npu# show privilege
```

**Command Syntax**

```
npu(config)# disable [Level <0-15>]
```

**Privilege Level**

0

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[Level <0-15>]` | Indicates the privilege level you want to disable. | Mandatory | N/A | 0-15 |

**Command Modes**

Global configuration mode

### 4.1.5.4 Displaying Active Users

To display all active users, run the following command:

```
npu# show users
```

**Command Syntax**

```
npu# show users
```

**Privilege Level**

1

**Display Format**

```
Line      User                 Peer Address
0 con      <user name>         <value>
```

**Command Syntax**

Global command mode

### 4.1.5.5 Displaying All Users

To display all users, run the following command:

```
npu# listuser
```

**Command Syntax**

```
npu# listuser
```

**Privilege Level**

1

**Display Format**

```
User        Mode
User 1      <value>
User 2      <value>
User 3      <value>
```

**Command Syntax**

Global command mode

### 4.1.5.6 Displaying the Privilege Level

To display your current privilege level, run the following command:

```
npu# show privilege
```

**Command Syntax**

```
npu# show privilege
```

**Privilege Level**

1

**Display Format**

```
Current privilege level is <value>
```

**Command Syntax**

Global command mode

# 4.2 Shutting Down/Resetting the System

This section describes the commands for:

- "Shutting Down the System" on page 132
- "Managing System Reset" on page 133

## 4.2.1 Shutting Down the System

You can, at any time, use the CLI to shut down the 4Motion system. When you execute the `shutdown` command, the system and all its processes are gracefully shut down. It is also possible that the system may initiate self shutdown if an internal error has occurred.

**IMPORTANT**

Before shutting down the system, it is recommended that you:

- Save the configuration file. The last saved configuration is used for rebooting the system. For more information about saving the current configuration, refer to Section 4.3.4.1.
- Periodically make a backup of log and trace files on the NPU flash if you have configured logs and traces to be written to file. This file does not store log and trace messages after the system is reset or shut down. For details, refer to Section 4.3.11.1.5.

To shut down the 4Motion system, run the following command:

```
npu# npu shutdown
```

A few seconds after you run this command, the system is shut down.

**NOTECAUTION**

The system does not display any warning or request for verification; it immediately shuts down after you execute this command. To start up the NPU (after shut down), either switch off and then switch on the -48V power supply, or disconnect and then reconnect the PIU power cable.

| | |
|---|---|
| **Command Syntax** | `npu# npu shutdown` |
| **Privilege Level** | `10` |

**Command Modes**

Global command mode

## 4.2.2 Managing System Reset

System reset refers to a complete shutdown and reboot of the 4Motion system. You can use the CLI to manually reset the system. It is also possible that the system may be reset because of an internal or external error, or after the NPU is upgraded.

After the system is reset and boots up, you can use the CLI to retrieve the reason for the last system reset. For more information about using the CLI to display the reason for system reset, refer to "Displaying the Reason for the Last System Reset" on page 134.

### 4.2.2.1 Resetting the system

**IMPORTANT**

Before resetting the system, it is recommended that you:

- Save the configuration file. For more information about saving the current configuration, refer to Section 4.3.4.1.
- Periodically make a backup of log and trace files on the NPU flash if you have configured logs and traces to be written to file. This file does not store log and trace messages after the system is reset or shut down. For details, refer to Section 4.3.11.1.5.

To reset the system, run the following command:

```
npu(config)# reset
```

A few seconds after you run this command, the 4Motion system is shut down, and then boots up with the last saved configuration.

**Command Syntax**

```
npu(config)# reset
```

**Privilege Level**

**10**

**Command Modes**

Global configuration mode

### 4.2.2.2 Displaying the Reason for the Last System Reset

The 4Motion system may be reset because of any of the following reasons.

- NPU upgrade
- Health failure (an internal module does not respond to the periodic health messages sent by the system)
- Internal error:
  - » A system module did not initialize correctly
  - » The software image to be used for rebooting the system is invalid or inaccessible.
- System initialization failure after last reboot
- User-initiated system reset
- Generic (unknown error)

To display the reason for the last system reset, run the following command:

**`npu# show reset reason`**

After you run this command, the reason for the last system reset is displayed.

| | |
|---|---|
| **Command Syntax** | **`npu# show reset reason`** |
| **Privilege Level** | **1** |
| **Display Format** | `Reset reason : <Reason For Last Reset>` |
| **Command Modes** | Global command mode |

# 4.3 NPU Configuration

After installing, commissioning, and powering up 4Motion, you can use the CLI to configure 4Motion and make it completely operational in the network.

Configuration information is stored in a configuration file that resides in the NPU flash. When you power up 4Motion for the first time after installation, the system boots up using the factory default configuration. You can then use the CLI to modify these configuration parameters.

**NOTE**

For more information about accessing the CLI from a local terminal or remotely via Telnet/SSH, refer to, Section 4.1.1.

This section provides information about the following configuration-specific tasks:

- "Managing the IP Connectivity Mode" on page 136
- "Configuring Physical and IP Interfaces" on page 139
- "Managing the NPU Boot Mode" on page 169
- "Managing the 4Motion Configuration File" on page 172
- "Batch-processing of CLI Commands" on page 180
- "Configuring the CPU" on page 181
- "Configuring QoS Marking Rules" on page 196
- "Configuring Static Routes" on page 211
- "Configuring ACLs" on page 215
- "Configuring the ASN-GW Functionality" on page 246
- "Configuring Logging" on page 395
- "Configuring Performance Data Collection" on page 411
- "Configuring the SNMP/Trap Manager" on page 421

- "Configuring the 4Motion Shelf" on page 429

## 4.3.1 Managing the IP Connectivity Mode

The following are the various types of traffic originating or terminating from/to the NPU:

- Subscriber data flows
- ASN/CSN control messages
- Network Management System (NMS) traffic (external management traffic)
- Local management traffic
- Internal management traffic

4Motion has defined separate IP domains for each traffic type:

- Bearer IP domain: Enables connectivity between ASN-GW (NPU), Base Station (BS), AAA server and the Home Agent (HA) for managing transport for subscriber data and the ASN/CSN control traffic.
- NMS IP domain (external management IP domain): Defines the connectivity between NMS agent of the NPU and external NMS server.
- Local management IP domain: Defines the connectivity between the NMS agent of NPU and IP-based local craft terminal.
- Internal management IP domain: Enables connectivity between the NPU NMS agent and management agents for the AU cards.
- Subscriber IP domain: NPU supports subscriber IP domain through multiple VLAN service interfaces.

To enable separation of the bearer IP and NMS IP domains, the following (user-configurable) connectivity modes are defined:

- Out-of-band connectivity mode: In this connectivity mode, the bearer and external NMS IP domains are separated at the Ethernet interface. The DATA port and bearer VLAN is used for the bearer IP domain, and the MGMT port and external-management VLAN is used for external NMS connectivity.

- In-band connectivity mode: In this connectivity mode, the VLAN is used to differentiate between the bearer and external NMS IP domains on the DATA port. The bearer VLAN is used for the bearer IP domain and the external-management VLAN is used for the external NMS IP domain. The MGMT port is assigned to the local-management VLAN in this connectivity mode.

- Unified connectivity mode: In this connectivity mode, the bearer IP domain and external NMS IP domain are unified. That is, the same IP address and VLAN are used to connect to the NMS server, AAA server, HA, and BS. (The MGMT port is assigned to the local-management VLAN in this connectivity mode.

**IMPORTANT**

For all connectivity modes, the CSCD port enabled in VLAN-transparent bridging mode, and is assigned to local-management VLAN.

For more information about the VLANs that are configured for 4Motion, refer the section, “Configuring Physical and IP Interfaces” on page 139.

**IMPORTANT**

In addition to the bearer IP domain, local-mangement IP domain, and external-management IP domain, each NPU has an internal NMS IP domain. The internal NMS IP domain is used for separating the IP domain for management traffic between the BS and NPU card.

The following table lists the physical interface and VLAN configuration with respect to the connectivity mode:

**Table 4-8: Ethernet and VLAN-to-Connectivity Mode Configuration**

| Connectivity Mode | Bearer IP Domain | External-Management IP Domain | Local-management IP Domain |
|---|---|---|---|
| Out-of-band | ■ DATA port<br>■ Bearer VLAN | ■ MGMT port<br>■ External-management VLAN | ■ CSCD port<br>■ Local-management VLAN |
| In-band | ■ DATA port<br>■ Bearer VLAN | ■ DATA port<br>■ External-management VLAN | ■ CSCD and MGMT ports<br>■ Local-management VLAN |

**Table 4-8: Ethernet and VLAN-to-Connectivity Mode Configuration**

| Connectivity Mode | Bearer IP Domain | External-Management IP Domain | Local-management IP Domain |
|---|---|---|---|
| Unified | ■ DATA port<br>■ Bearer VLAN | ■ DATA port<br>■ Bearer VLAN | ■ CSCD and MGMT ports<br>■ Local-management VLAN |

This section describes the commands for:

- “Configuring the IP Connectivity Mode” on page 138
- “Displaying the IP connectivity Mode” on page 139

## 4.3.1.1 Configuring the IP Connectivity Mode

To configure the IP connectivity mode, run the following command:

**npu(config)# connectivity mode {inband | outband | unified}**

In-band is the default connectivity mode. You can display the currently configured connectivity mode. For details, refer Section 4.3.1.2.

**IMPORTANT**

Reset the system for the change in connectivity mode to take effect.

**Command Syntax**

```
npu(config)# connectivity mode {inband | outband | unified}
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{inband | outband | unified}` | Indicates the connectivity mode to be configured. | Mandatory | inband | ■ inband<br>■ outband<br>■ unified |

**Command Modes**

Global configuration mode

### 4.3.1.2 Displaying the IP connectivity Mode

To display the IP connectivity mode, run the following command:

```
npu# show connectivity mode
```

**Command Syntax**

```
npu# show connectivity mode
```

**Privilege Level**

1

**Display Format**

```
connectivity mode is <value>
```

**Command Modes**

Global command mode

## 4.3.2 Configuring Physical and IP Interfaces

The following Ethernet interfaces are provided on the front panel of the NPU for enabling connectivity with external entities:

- DATA port: A Gigabit Ethernet interface that connects the NPU with the operator network.

- CSCD port: A Gigabit Ethernet interface that provides a dedicated Ethernet connectivity to the local management NMS Server, or supports concatenation of two or more 4Motion chassis. (Concatenation is not supported in the current release.)

- MGMT port: A Fast Ethernet interface that provides a dedicated Ethernet interface for external EMS server connectivity. In some configurations the MGMT port is used for connecting the local NMS server (IP-based craft terminal).

You can configure the speed, duplex, and MTU for these interfaces.

The following table lists the default (non-configurable) VLAN ID for each physical interface:

Table 4-9: Default VLAN IDs For Ethernet interfaces

| Physical Port | Default VLAN ID |
|---|---|
| MGMT | 9 |
| CSCD | 9 |
| DATA | 11 |
| 7 AU Fast Ethernet interfaces | 11 |

In addition to these Ethernet interfaces, you can also configure seven Fast Ethernet interfaces from the NPU towards the AUs. These interfaces are internal NPU interfaces, and are not accessible to user.

Based on the connectivity mode, 4Motion initializes the following pre-configured IP interfaces:

- Local-management: Used for enabling connectivity with the local NMS server that is connected via the MGMT port when 4Motion is operating in the in-band connectivity mode; or via CSCD port when 4Motion is operating in the out-of-band connectivity mode. The IP address used for the local-management interface is intended for "back-to-back" connection between NPU and Local NMS Server.

- Internal-management: Used for enabling the NMS connectivity between the AU and NPU. This interface is used internally by 4Motion and is not reachable from user-visible ports. The IP address and VLAN identifier used for the internal-management interface are not user-configurable.

- External-management: Used for enabling connectivity with the NMS server that is connected via the DATA port when 4Motion is operating in the in-band connectivity mode, or via MGMT port when 4Motion is operating in the out-of-band connectivity mode.

- Bearer: Used for enabling bearer IP domain connectivity. When the Unified connectivity mode is selected, the NMS server is also connected using bearer interface.

You can configure the IP address for bearer, external-management and local-management interfaces. You can also modify the VLAN ID for bearer and external-management interfaces. The following table lists the default VLAN IDs assigned to pre-configured IP interfaces.

**Table 4-10: Default VLAN IDs**

| Interface | Default VLAN ID |
|---|---|
| Local-management | 9 |
| Internal-management | 10 (non-configurable) |
| Bearer | 11 |
| External-management | 12 |

In addition to the physical and IP interfaces, 4Motion defines the following virtual interfaces. These interfaces are used only for applying Access Control Lists (ACLs) for filtering traffic destined towards the NPU or AUs.

- NPU
- All AUs

This section describes the commands for:

- “Configuring Physical Interfaces” on page 141
- “Managing the External Ether Type” on page 157
- “Configuring IP interfaces” on page 158
- “Configuring Virtual Interfaces” on page 166
- “Displaying Status and Configuration Information for Physical, IP, and Virtual Interfaces” on page 166

## 4.3.2.1 Configuring Physical Interfaces

The NPU contains seven AU-facing Fast Ethernet interfaces, and three Ethernet interfaces on the front panel: one Fast Ethernet interface (MGMT port) and two Gigabit Ethernet interfaces (DATA and CSCD ports). Each of these interfaces is a member of one or more VLANs. The following table lists the physical interfaces, and their type, port numbers and member VLANs:

**Table 4-11: Ethernet Interfaces - Types, Port Numbers, and Member VLANs**

| Interface Type | Physical Interfaces | Port Number | Member VLANs |
|---|---|---|---|
| Fast Ethernet | Seven Fast Ethernet interfaces towards the AU (internal to the NPU) | 0/1-0/7 | ■ Bearer<br>■ Internal-management |
| | MGMT | 0/8 | ■ Local-management (in the in-band or out-of-band connectivity modes)<br>■ External-management (only in the out-of-band connectivity mode) |
| Gigabit Ethernet | CSCD | 0/9 | ■ Local-management |
| | DATA | 0/10 | ■ Bearer·<br>■ External-management (only in-band connectivity mode)<br>■ Multiple Service VLAN |

**To configure a physical interface:**

1 Enable the interface configuration mode (refer Section 4.3.2.3.1).

2 You can now enable any of the following tasks:

» Modify the physical properties of an interface (refer Section 4.3.2.1.2).

» Manage VLAN translation (refer Section 4.3.2.1.3).

3 Terminate the interface configuration mode (refer Section 4.3.2.3.7).

You can, at any time, display VLAN membership information (refer Section 4.3.2.1.5), and VLAN translation entries for the DATA port (refer Section 4.3.2.1.7).

#### 4.3.2.1.1 Enabling the Interface configuration mode

To configure a physical interface, run the following command to enable the interface configuration mode.

```
npu(config)# interface {<interface-type> <interface-id>
|internal-mgmt |external-mgmt | bearer | local-mgmt | npu-host |
all-au}
```

**Table 4-12: Parameters for Configuring the Interface Configuration Mode (Ethernet Interfaces)**

| Interface | Parameter | Example |
|---|---|---|
| Fast Ethernet | `<interface-type>`<br>`<interface-id>` | `npu(config)# interface au fastethernet 0/1`<br>`npu(config)# interface au fastethernet 0/2`<br>`npu(config)# interface au fastethernet 0/3`<br>`npu(config)# interface au fastethernet 0/4`<br>`npu(config)# interface au fastethernet 0/5`<br>`npu(config)# interface au fastethernet 0/6`<br>`npu(config)# interface au fastethernet 0/7`<br>`npu(config)# interface fastethernet 0/8` |
| Gigabit Ethernet | `<interface-type>`<br>`<interface-id>` | `npu(config)# interface gigabitethernet 0/9`<br>`npu(config)# interface gigabitethernet 0/10` |

**IMPORTANT**

To enable the interface configuration mode for physical interfaces, specify values for the `interface-type` and `interface-id` parameters only. The `internal-mgmt`, `external-mgmt`, `bearer`, `local-mgmt` parameters are used for enabling the interface configuration mode for IP interfaces; the `npu-host` and `all-au` parameters are used for enabling the interface configuration mode for virtual interfaces. For more information about configuring IP interfaces, refer to Section 4.3.2.3; refer to Section 4.3.2.4 for configuring virtual interfaces.

**IMPORTANT**

An error may occur if the interface type and ID that you have specified is in an invalid format or does not exist. Refer to the syntax description for more information about the correct format for specifying the interface type and name.

After enabling the interface configuration mode, you can:

- Modify the physical properties of an interface (refer to Section 4.3.2.1.2)
- Manage VLAN translation (refer to Section 4.3.2.1.3)

**Command Syntax**

```
npu(config)# interface {<interface-type> <interface-id> |internal-mgmt
|external-mgmt | bearer | local-mgmt | npu-host | all-au}
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<interface-type>` | Indicates the type of physical interface (Gigabit Ethernet or Fast Ethernet) for which the configuration mode is to be enabled. | Mandatory | N/A | - au fastethernet<br>- fastethernet<br>- gigabitethernet |
| `<interface-id>` | Indicates the port number of the physical interface for which the configuration mode is to be enabled. | Mandatory | N/A | AU Fast Ethernet:<br>- 0/1<br>- 0/2<br>- 0/3<br>- 0/4<br>- 0/5<br>- 0/6<br>- 0/7<br>Fast Ethernet<br>- 0/8<br>Gigabit Ethernet:<br>- 0/9<br>- 0/10 |

**Command Modes** Global configuration mode

### 4.3.2.1.2 Configuring the Properties of the Physical Interface

After you enable the interface configuration mode, you can configure the following properties for this interface:

- Auto-negotiation mode
- Duplex (full/half) mode
- Port speed
- MTU

Before you modify the properties of a physical interface, first shut down the interface. This section describes the commands to be used for:

- "Shutting down the interface" on page 145
- "Defining the auto-negotiation mode" on page 146
- "Specifying the Duplex Status" on page 147
- "Specifying the port speed" on page 147
- "Configuring the MTU for physical interfaces" on page 148

#### 4.3.2.1.2.1 Shutting down the interface

Run the following command to shut down this physical interface:

```
npu(config-if)# shutdown
```

**IMPORTANT**

Beware from shutting down the interface you use for accessing the device.

Run the following command to enable this physical interface:

```
npu(config-if)# no shutdown
```

**Command Syntax**

```
npu(config-if)# shutdown
npu(config-if)# no shutdown
```

**Privilege Level**

10

**Command Modes**

Interface configuration mode

#### 4.3.2.1.2.2 Defining the auto-negotiation mode

The auto-negotiation feature enables the system to automatically negotiate the port speed and the duplex (half or full) status with the link partner. If you disable auto-negotiation, you are required to manually configure the port speed and duplex status.

**IMPORTANT**

By default, auto-negotiation is enabled.

Run the following command to enable the auto-negotiation mode:

```
npu(config-if)# auto-negotiate
```

Enter the following command if you want to disable the auto-negotiation mode:

```
npu(config-if)# no auto-negotiate
```

After you disable auto-negotiation, you can manually configure the port speed and duplex status. For details, refer to Section 4.3.2.1.2.3 and Section 4.3.2.1.2.4

**IMPORTANT**

An error may occur if you run this command when the physical interface is enabled.

**Command Syntax**

```
npu(config-if)# auto-negotiate
npu(config-if)# no auto-negotiate
```

**Privilege Level**

10

**Command Modes**

Interface configuration mode

### 4.3.2.1.2.3 Specifying the Duplex Status

The duplex status for an interface can be either full-duplex or half duplex. If you have disabled the auto-negotiation feature, specify whether data transmission should be half or full duplex.

**IMPORTANT**

By default, full-duplex is enabled if auto-negotiation is disabled.

Run the following command to configure the full duplex mode for this interface:

```
npu(config-if)# full-duplex
```

Run the following command to configure the half duplex mode for this interface:

```
npu(config-if)# half-duplex
```

**IMPORTANT**

An error may occur if you run this command when:

- The physical interface is enabled.
- Auto-negotiation is enabled.

**Command Syntax**

```
npu(config-if)# full-duplex
npu(config-if)# half-duplex
```

**Privilege Level**

10

**Command Modes**

Interface configuration mode

### 4.3.2.1.2.4 Specifying the port speed

If you have disabled the auto-negotiation feature, you can run the following command configure the port speed to be used for this physical interface.

```
npu(config-if)# speed {10 | 100 | 1000}
```

By default, the port speed for the Fast Ethernet interfaces is 100 Mbps, and for the Gigabit Ethernet interfaces is 1000 Mbps.

**IMPORTANT**

An error may occur if you run this command when:

- The physical interface is enabled.
- Auto-negotiation is enabled.
- The interface does not support the specified speed.

**Command Syntax**

```
npu(config-if)# speed {10 | 100 | 1000}
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| {10 \| 100 \| 1000} | Indicates the speed, in Mbps, to be configured for this physical interface.<br>A value of 1000 is not applicable for Fast Ethernet interfaces. | Mandatory | N/A | ■ 10<br>■ 100<br>■ 1000 |

**Command Modes**

Interface configuration mode

### 4.3.2.1.2.5 Configuring the MTU for physical interfaces

You can configure the MTU for the physical interface. If the port receives packets that are larger than the configured MTU, packets are dropped.

Run the following command to configure the MTU of the physical interface:

```
npu(config-if)# mtu <frame-size(1518-9000)>
```

**IMPORTANT**

An error may occur if you run this command when the physical interface is enabled.

**Command Syntax**

```
npu(config-if)# mtu <frame-size(1518-9000)>
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<frame-size(1518-9000)>` | Indicates the MTU (in bytes) to be configured for the physical interface.<br>For the Backhaul interface the range is from 1518 to 9000.<br>For all other interfaces the following values are supported by the hardware: 1518, 1522, 1526, 1536, 1552, 1664, 2048, 9022. | mandatory | For the Backhaul and AU interfaces the default is 1664.<br>For all other physical interfaces the default is 1522. | 1518-9000 for the Backhaul interface.<br>1518, 1522, 1526, 1536, 1552, 1664, 2048, 9022 for all other interfaces. |

**Command Modes**

Interface configuration mode

## 4.3.2.1.3 Managing VLAN Translation

4Motion supports translation of the VLAN ID for packets received and transmitted on the DATA port to a configured VLAN ID. Before starting VLAN translation, first enable VLAN translation, and then create one or more VLAN translation entries.

This section describes the commands for:

- "Enabling/Disabling VLAN Translation" on page 150
- "Creating a VLAN Translation Entry" on page 150
- "Deleting a VLAN Translation Entry" on page 152

#### 4.3.2.1.3.1 Enabling/Disabling VLAN Translation

By default, VLAN translation is disabled. Run the following command to enable/disable VLAN translation on the DATA (gigabitethernet 0/10) interface:

```
npu(config-if)# vlan mapping {enable|disable}
```

**IMPORTANT**

An error may occur when you run this command:

- For an interface other than the DATA port (0/10).

**Command Syntax**

```
npu(config-if)# vlan mapping {enable|disable}
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| {enable\|disable} | Indicates whether VLAN translation should be enabled or disabled for this interface. | Mandatory | disable | ■ enable<br>■ disable |

**Command Modes**

Interface configuration mode

#### 4.3.2.1.3.2 Creating a VLAN Translation Entry

A VLAN translation entry contains a mapping between the original and translated VLANs. To create a VLAN translation entry, run the following command:

```
npu(config-if)# vlan mapping <integer(11-4094)> <integer(11-4094)>
```

Specify the original VLAN ID and the translated VLAN ID.

**IMPORTANT**

An error may occur if:

- The original and translated VLAN ID that you have specified is not within the range, 11-4094.
- The translated VLAN ID that you have specified is already a member VLAN for this port.
- You are trying to create a VLAN translation entry for a VLAN that is not a member of DATA port.
- A VLAN translation mapping already exists for the original VLAN IDs that you have specified.
- VLAN translation is disabled.

**Command Syntax**

```
npu(config-if)# vlan mapping <integer(11-4094)> <integer(11-4094)>
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<integer(11-4094)>` | The first VLAN ID Indicates the VLAN ID of the VLAN for which VLAN translation is required.<br>Legitimate values include:<br>- The Bearer VLAN ID (default 11).<br>- The External Management VLAN ID (default 12) - only in In-Band Connectivity Mode. | Mandatory | N/A | 11-4094 |
| `<integer(11-4094)>` | Indicates the translated VLAN ID that is being mapped to the original VLAN ID. | Mandatory | N/A | 11-4094 |

**Command Modes**

Interface configuration mode

### 4.3.2.1.3.3 Deleting a VLAN Translation Entry

To delete an existing VLAN translation entry, run the following command:

```
npu(config-if)# no vlan mapping {all | <integer(11-4094)>
<integer(11-4094)>}
```

Specify `all` if you want to delete all the VLAN translation mapping entries. Specify the VLAN identifiers of the translation entry if you want to delete a specific VLAN entry.

**IMPORTANT**

An error may occur if:

- The VLAN ID or mapping that you have specified is not within the range, 11-4094 or it does not exist.
- You are trying to delete a VLAN translation entry for a VLAN that is not a member of this physical interface.

**Command Syntax**

```
npu(config-if)# no vlan mapping {all | <integer(11-4094)>
<integer(11-4094)>}
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{all \| <integer(11-4094)> <integer(11-4094)>}` | Indicates the VLAN translation entry to be deleted. | Mandatory | N/A | ■ all: Indicates that all VLAN translation entries are to be deleted.<br>■ <integer(11-4094)> <integer(1-4094)>: Indicates the original and translated VLAN IDs for the translation entry to be deleted. |

**Command Modes**

Global command mode

### 4.3.2.1.4 Terminating the Interface Configuration Mode

To terminate the interface configuration mode, run the following command:

```
npu(config-if)# exit
```

**Command Syntax**

```
npu(config-if)# exit
```

**Privilege Level**

10

**Command Modes**

Interface configuration mode

### 4.3.2.1.5 Displaying VLAN Membership Information

Run the following command to display Ethernet interfaces that are members of a particular or all VLAN:

```
npu# show vlan [id <vlan-id(11-4094)>]
```

Do not specify the VLAN ID if you want to view membership information for all VLANs.

**Command Syntax**

```
npu# show vlan [id <vlan-id(11-4094)>]
```

**Privilege Level**

**1**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [id <vlan-id(11-4094)>] | Indicates the VLAN ID for which membership information is to be displayed. Do not specify any value for this parameter if you want to view VLAN membership information for all VLANs. | Mandatory | N/A | 11-4096 |

**Display Format**

```
Vlan            Name            Ports
 ----            ----            -----
<VLAN ID    <>VLAN Name>      <member ports>
<VLAN ID    <>VLAN Name>      <member ports>
```

**Command Modes**

Global command mode

### 4.3.2.1.6 Displaying VLAN Configuration Information for Physical Interfaces

To display the configuration information for a VLAN that is bound to a particular physical interface, run the following command:

```
npu# show vlan port config [port <interface-type> <interface-id>]
```

Do not specify the port number and type if you want to display configuration information for all physical interfaces.

**IMPORTANT**

An error may occur if you specify an interface type or ID that does not exist.

**Command Syntax**

```
npu# show vlan port config [port <interface-type> <interface-id>]
```

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<interface-type>` | Indicates the type of physical interface for which VLAN membership information is to be displayed. | Optional | N/A | - fastethernet<br>- gigabitethernet |
| `<interface-id>` | Indicates the ID of the physical interface for which VLAN membership information is to be displayed. | Optional | N/A | Fast Ethernet:<br>- 0/1<br>- 0/2<br>- 0/3<br>- 0/4<br>- 0/5<br>- 0/6<br>- 0/7<br>- 0/8<br>Gigabit Ethernet:<br>- 0/9<br>- 0/10 |

**Display Format**

```
Vlan Port configuration table
----------------------------------------
Port                                    <port number>
 Port Vlan ID                           : <value>
 Port Acceptable Frame Type             : <value>
 Port Ingress Filtering                 : <Enabled/Disabled>
```

**Command Modes**

Global command mode

### 4.3.2.1.7 Displaying the VLAN Translation Entries

Run the following command to display VLAN translation entries for a Gigabit Ethernet interface:

```
npu# show interface gigabitethernet <interface-id> vlan mapping
```

**IMPORTANT**

An error may occur if you specify an interface ID that does not exist.

**Command Syntax**

```
npu# show interface gigabitethernet <interface-id> vlan mapping
```

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<interface-id>` | Indicates the identifier of the Gigabit Ethernet interface for which VLAN translation entries are to be displayed.<br>In current release VLAN Mapping is supported only on the DATA port (interface-id 0/10). | Mandatory | N/A | ■ 0/10 |

**Command Modes**

Global command mode

## 4.3.2.2 Managing the External Ether Type

The External Ether Type parameter defines the EtherType in outer VLAN header of uplink Q-in-Q traffic. The External Ether Type parameter is not applicable the device operates in Transparent (Centralized ASN Topology) mode.

This section includes:

- "Configuring the External Ether type"
- "Displaying the Ether Type"

### 4.3.2.2.1 Configuring the External Ether type

To configure the Ether Type run the following command:

**npu(config)# config npuEtherType** {8100 | 88A8 | 9100 | 9200}

**Command Syntax**

**npu(config)# config npuEtherType** {8100 | 88A8 | 9100 | 9200}

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| {8100 \| 88A8 \| 9100 \| 9200} | Indicates the type of Ether Type. | Mandatoryl | 88A8 | ■ 8100<br>■ 88A8<br>■ 9100<br>■ 9200 |

**Command Modes**

Global configuration mode

#### 4.3.2.2.2 Displaying the Ether Type

Run the following command to display the current Ether Type value:

```
npu# show npuetherType
```

| | |
|---|---|
| **Command Syntax** | `npu# show npuetherType` |
| **Privilege Level** | 1 |
| **Display Format** | `Ethertype: <value>` |
| **Command Modes** | Global command mode |

### 4.3.2.3 Configuring IP interfaces

The following IP interfaces are pre-configured in the system:

- Local-management
- Internal-management
- External-management
- Bearer

**IMPORTANT**

You cannot modify the IP address and VLAN identifier for the internal-management interface. You also cannot modify the VLAN identifier for the local-management.

**To configure an IP interface:**

1. Enable the interface configuration mode (refer Section 4.3.2.3.1).
2. Shut down the IP interface (if you are modifying configuration information for this interface) (refer to Section 4.3.2.3.2).

3 You can now:

   » Assign an IP address to an interface (refer to Section 4.3.2.3.3).

   » Remove an IP address associated with an interface (refer to Section 4.3.2.3.4).

   » Modify the VLAN ID (refer to Section 4.3.2.3.5).

   » Modify the MTU (refer to Section 4.3.2.3.6).

4 Enable the IP interface (refer to Section 4.3.2.3.2).

5 Terminate the interface configuration mode (refer to Section 4.3.2.3.7).

You can, at any time, display configuration information for an IP interface (refer to Section 4.3.2.3.8).

#### 4.3.2.3.1 Enabling the Interface Configuration Mode

To configure an IP interface, run the following command to enable the interface configuration mode:

```
npu(config)# interface {<interface-type> <interface-id>
|internal-mgmt |external-mgmt | bearer | local-mgmt | npu-host |
all-au}
```

The following table lists the IP interfaces that each parameter represents:

**Table 4-13: Parameters for Configuring the Interface Configuration Mode (IP Interfaces**

| IP Interface | Parameter | Example |
|---|---|---|
| Internal-management | `internal-mgmt` | **`npu(config)# interface internal-mgmt`** |
| External-management | `external-mgmt` | **`npu(config)# interface external-mgmt`** |
| Bearer | `bearer` | **`npu(config)# interface bearer`** |
| Local-management | `local-mgmt` | **`npu(config)# interface local-mgmt`** |

**IMPORTANT**

To enable the interface configuration mode for IP interfaces, specify values for the for `internal-mgmt`, `external-mgmt`, `bearer`, `local-mgmt` only. The `interface-type` and `interface-id` parameters are used for enabling the interface configuration mode for physical interfaces; the `npu-host` and `all-au` parameters are used for enabling the interface configuration mode for virtual interfaces. For more information about configuring physical interfaces, refer Section 4.3.2.1; refer Section 4.3.2.4 for configuring virtual interfaces.

After enabling the interface configuration mode for this interface, you can:

- Assign an IP address to an interface (refer Section 4.3.2.3.3).
- Remove an IP address associated with an interface (refer Section 4.3.2.3.4).
- Modify the VLAN ID (refer Section 4.3.2.3.5).
- Modify the MTU (refer to Section 4.3.2.3.6).

**Command Syntax**

```
npu(config)# interface {<interface-type> <interface-id>
|internal-mgmt |external-mgmt | bearer | local-mgmt | npu-host |
all-au}
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `internal-mgmt |external-mgmt | bearer | local-mgmt` | Indicates the IP interface for which the configuration mode is to be enabled. | Mandatory | N/A | internal-mgmt<br>external-mgmt<br>bearer<br>local-mgmt |

**Command Modes**

Global configuration mode

### 4.3.2.3.2 Shutting down/Enabling an IP Interface

To modify configuration for an IP interface, first shut down the IP interface, using the following command:

```
npu(config-if)# shutdown
```

After you have modified configuration for this interface, run the following command to enable the interface:

```
npu(config-if)# no shutdown
```

**Command Syntax**

```
npu(config-if)# shutdown
npu(config-if)# no shutdown
```

**Privilege Level**

10

**Command Modes**

Interface configuration mode

### 4.3.2.3.3 Assigning an IP address to an interface

Run the following command to assign an IP address and subnet mask for an IP interface. Shut down this interface before executing this command:

```
npu(config-if)# ip address <ip-address> <subnet-mask>
```

**IMPORTANT**

You can configure the IP address and subnet mask for only the external-management, local-management, and bearer interfaces.

For example, run the following command to assign the IP address, 172.10.1.0, and subnet mask, 255.255.255.0 to the external-management interface:

```
npu (config-if)# ip address 172.10.1.0 255.255.255.0
```

**IMPORTANT**

An error may occur if:

- The IP address you have specified is already configured for another interface.
- You are trying to assign an IP address for an interface for which IP address configuration is not permitted. This error is caused only for the internal-management interface (the pre-configured IP address for this interface is 10.0.0.254).
- The IP interface is enabled. Shut down the IP interface before executing this command.

**Command Syntax**

```
npu(config-if)# ip address <ip-address> <subnet-mask>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<ip-address>` | Indicates the IP address to be assigned to this IP interface.<br>The defaults are:<br>External Management: 192.168.1.1<br>Beare: 172.16.0.1<br>Local Management: 172.31.0.1 | Mandatory | Depends on interface type. | Valid IP address |
| `<subnet-mask>` | Indicates the subnet mask to be assigned to this IP interface. | Mandatory | 255.255.255.0 | Valid subnet mask |

**Command Modes**

Interface configuration mode

### 4.3.2.3.4 Removing an IP Address from an Interface

To remove an IP address from an interface, run the following command. Shut down this interface before executing this command:

```
npu(config-if)# no ip address
```

**IMPORTANT**

An error may occur if you run this command when this IP interface is enabled. Shut down the IP interface before executing this command

**Command Syntax**

```
npu(config-if)# no ip address
```

**Privilege Level**

**10**

**Command Modes**

Interface configuration mode

### 4.3.2.3.5 Configuring/Modifying the VLAN ID for an IP Interface

**IMPORTANT**

You can modify the VLAN ID for only the bearer, local-management and external-management interfaces.

Run the following command to modify the VLAN ID for this interface:

```
npu(config-if)# if_vlan <vlanid(9 | 11-100 | 110-4094)>
```

**NOTE**

Refer Table 4-10 for the default VLAN IDs assigned to the bearer, local-management and external-management interfaces.

**IMPORTANT**

An error may occur if:

- The VLAN ID you have specified is not within the specified, or is in use by another VLAN. Refer the syntax description for the VLAN ID range.
- The VLAN ID is already used as a translated VLAN or a VLAN translation entry already exists for this VLAN.
- You are trying to run this command for the internal-management interface. You can modify the VLAN ID for only the external-management, local-management or bearer interfaces.

**Command Syntax**

```
npu(config-if)# if_vlan <vlanid(9 | 11-100 | 110-4094)>
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<vlanid(9 \| 11-100 \| 110-4094)` | Indicates the VLAN ID to be assigned to this interface.<br>**Note**: The VLAN IDs, 1-8, 10, 101-109 are reserved. | Mandatory | N/A | 9<br>11-100<br>110-4094 |

**Command Modes**

Global command mode

### 4.3.2.3.6 Configuring the MTU for IP Interfaces

You can configure the MTU for the IP interface. Received packets that are larger than the configured MTU will be dropped.

Run the following command to configure the MTU of the IP interface:

```
npu(config-if)# mtu <frame-size(68-1500)>
```

**IMPORTANT**

An error may occur if you run this command when the interface is enabled.

**Command Syntax**

```
npu(config-if)# mtu <frame-size(68-1500)>
```

**Privilege Level**

10

**Syntax Description**

| **Parameter** | **Description** | **Presence** | **Default Value** | **Possible Values** |
|---|---|---|---|---|
| `<frame-size(68-1500)>` | Indicates the MTU (in bytes) to be configured for the IP interface. | mandatory | 1500 | 68-1500 |

**Command Modes**

Interface configuration mode

### 4.3.2.3.7 Terminating the Interface Configuration Mode

To terminate the interface configuration mode, run the following command:

```
npu(config-if)# exit
```

**Command Syntax**

```
npu(config-if)# exit
```

**Privilege Level**

10

**Command Modes**

Interface configuration mode

### 4.3.2.3.8 Displaying IP Interface Status and Configuration Information

To display the status and configuration information for an IP interface, run the following command:

```
npu# show ip interface [{internal-mgmt | external-mgmt | bearer | local-mgmt}]
```

Do not specify the interface if you want to view configuration information for all IP interfaces.

**IMPORTANT**

An error may occur if the IP interface does not exist for the configured connectivity and boot mode.

**Command Syntax**

```
npu# show ip interface [{internal-mgmt | external-mgmt | bearer | local-mgmt}]
```

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{internal-mgmt | external-mgmt | bearer | local-mgmt}` | Indicates the interface for which configuration information is to be displayed.<br>Do not specify any value for this parameter if you want to view configuration information for all IP interfaces. | Optional | N/A | ■ internal-mgmt<br>■ external-mgmt<br>■ bearer<br>■ local-mgmt |

**Display Format**

```
<Interface Name> is <up/down>

Internet Address is <value>

Broadcast Address  <value>
```

**Command Modes**

Global command mode

### 4.3.2.4 Configuring Virtual Interfaces

In addition to physical and IP interfaces, 4Motion defines the following virtual interfaces. All ACLs configured for filtering traffic destined towards the NPU or AUs, are attached to either of these interfaces.

- NPU-host: Used for configuring ACLs to filter traffic destined towards the NPU.
- All-AU: Used for configuring ACLs to filter traffic destined towards the AUs in the 4Motion shelf.

For more information about attaching ACLs to the NPU or all-AUs, refer the section, “Attaching/De-attaching ACLs to/from an Interface” on page 241.

### 4.3.2.5 Displaying Status and Configuration Information for Physical, IP, and Virtual Interfaces

To display the status and configuration information for physical, IP and/or virtual interfaces, run the following command:

```
npu# show interfaces [{[<interface-type> <interface-id>] | internal-mgmt | external-mgmt | bearer | local-mgmt | npu-host | all-au}]
```

To display the configuration information for all interfaces, do not specify a value for any parameter.

The following table lists parameters to be specified with respect to the type of interface for which configuration information is to be displayed:

**Table 4-14: Parameters for Displaying Configuration Information for Physical, IP, and Virtual Interfaces**

| Interface | Parameters | Example |
|---|---|---|
| All Interfaces | None | `npu# show interfaces` |

### Table 4-14: Parameters for Displaying Configuration Information for Physical, IP, and Virtual Interfaces

| Interface | Parameters | Example |
|---|---|---|
| Physical Interfaces | **Fast Ethernet:**<br>`<interface-type> <interface-id>` | **npu# show interfaces fastethernet 0/1**<br>**npu# show interfaces fastethernet 0/2**<br>**npu# show interfaces fastethernet 0/3**<br>**npu# show interfaces fastethernet 0/4**<br>**npu# show interfaces fastethernet 0/5**<br>**npu# show interfaces fastethernet 0/6**<br>**npu# show interfaces fastethernet 0/7**<br>**npu# show interfaces fastethernet 0/8** |
| | **Gigabit Ethernet**<br>`<interface-type> <interface-id>` | **npu# show interfaces gigabitethernet 0/9**<br>**npu# show interfaces gigabitethernet 0/10** |
| IP Interfaces | internal-mgmt | **npu# show interfaces internal-mgmt** |
| | external-mgmt | **npu# show interfaces external-mgmt** |
| | bearer | **npu# show interfaces bearer** |
| | local-mgmt | **npu# show interfaces local-mgmt** |
| Virtual Interfaces | npu-host | **npu# show interfaces npu-host** |
| | all-au | **npu# show interfaces all-au** |

**IMPORTANT**

An error may occur if:

- The interface type or ID that you have specified does not exist.
- The IP interface does not exist for the configured connectivity and boot mode.

**Command Syntax**

```
npu# show interfaces [{[<interface-type> <interface-id>] | internal-mgmt
| external-mgmt | bearer | local-mgmt | npu-host | all-au}]
```

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [{[<interface-type> <interface-id> ] \| **internal-mgmt** \| **external-mgmt** \| **bearer** \| **local-mgmt** \| **npu-host** \| **all-au**}] | Indicates the type of interface (physical, IP, or virtual) for which configuration information is to be displayed.<br>Do not specify any value for this parameter if you want to display configuration information for all physical, IP, and virtual interfaces. | Optional | N/A | Refer Table 4-14 |

**Display Format (Physical Interfaces)**

```
<Port Number> <up/down>, line protocol is <up/down> (connected) MTU
<value >bytes,

<Full/half> duplex,

<value> Mbps,  Auto-Negotiation

Octets                     : <value>

Unicast Packets            : <value>

Broadcast Packets          : <value>

Multicast Packets          : <value>

Discarded Packets          : <value>

Error Packets              : <value>

Unknown Packets            : <value>

Octets                     : <value>

Unicast Packets            : <value>

Broadcast Packets          : <value>

Multicast Packets          : <value>

Discarded Packets          : <value>

Error Packets              : <value>
```

**Display Format (IP Interfaces)**

```
<IP Interface Name> <up/down>, MTU <value> bytes,

<value> InBytes,

<value> InUnicast Packets

<value> InDiscarded Packets

<value> InError Packets

<value> OutBytes,

<value> OutUnicast Packets
```

**Display Format (Virtual Interfaces)**

```
<Virtual Interface Name> interface

Acls attached <No. of attached ACLs>
```

**Command Modes**

Global command mode

## 4.3.3 Managing the NPU Boot Mode

The NPU boot mode refers to the mode of operation to be used for operating the NPU. You can configure the NPU to be operated in any of the following boot modes:

- ASN-GW mode: In this mode, the NPU implements ASN-GW functionalities, that is, it implements R3 Reference Point (RP) towards the CSN, R4 reference point toward other ASN-GWs, and R6 reference point toward AU/BSs. The R8 reference point traffic is transparently relayed between AU/BSs (intra- or inter-shelf). The ASN-GW mode operates:
  - With HA support, that is, the NPU implements Mobile IP services (MIP) Not supported in the current release.
  - Without HA support, that is, the NPU does not implement MIP services

**IMPORTANT**

The ASN-GW mode without HA support is the default boot mode that is used when the NPU boots up for the first time.

- Transparent mode: In this mode, the NPU transparently relays R6 and R8 reference-point traffic between AU/BSs (intra- or inter-shelf).

This section describes the commands to be used for:

- "Configuring the Next Boot Mode" on page 170
- "Displaying the Current and Next Boot Mode Information" on page 171

### 4.3.3.1 Configuring the Next Boot Mode

The next boot mode refers to the boot mode that should be used for booting up the NPU the next time it is shut down or reset. The default boot mode is the ASN-GW mode without HA support.

The following are the possible boot modes for operating the NPU:

- ASN-GW mode without HA support (does not implement MIP services)
- Transparent mode

**NOTE**

To view the NPU current and next boot mode, refer to "Displaying the Current and Next Boot Mode Information" on page 171.

To configure the next boot mode, run the following command:

```
npu(config)# nextbootmode {asngwStatic | transparent}
```

**IMPORTANT**

It is recommended that you run this command to specify the boot mode to be used after the next NPU reset. If you do not specify the next boot mode, the NPU boots up using the last configured boot mode.

| | |
|---|---|
| **Command Syntax** | `npu(config)# nextbootmode {asngwStatic | transparent}` |
| **Privilege Level** | **10** |

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{asngwStatic \| transparent}` | Indicates the mode that is to be used for rebooting the NPU. | Mandatory | asngwStatic | ■ asngwStatic: Indicates that the ASN-GW boot mode without HA support. That is, the system will not implement MIP services. This is the default mode of operation.<br>■ transparent: Indicates transparent boot mode. |

**Command Modes** Global configuration mode

### 4.3.3.2 Displaying the Current and Next Boot Mode Information

To display the current and next boot modes, run the following command:

```
npu# show bootmode
```

**Command Syntax**

```
npu# show bootmode
```

**Privilege Level** 1

**Display Format**

```
current bootmode : <Current Boot Mode>
next bootmode    :   <Configured Next Boot Mode>
```

**Command Modes** Global command mode

## 4.3.4 Managing the 4Motion Configuration File

4Motion configuration parameters are stored in a default configuration file that resides in the NPU flash. When you start 4Motion for the first time after installation and commissioning, the system boots up with the factory default configuration. After the system boots up, you can use the CLI to modify the values of parameters (for which default values exist), and specify values for the remaining parameters.

**IMPORTANT**

You can, at any time, restore factory default configuration parameters. If you have not saved configuration since the first time the system was started (after installation and commissioning), the system boots up with the factory default parameters at the next system reset.

You can also download the configuration file from an external TFTP server, and use the configuration parameters in this file to boot up the 4Motion system. In addition, you can batch-process commands.

**IMPORTANT**

It is recommended that you periodically save changes to configuration. (The saved configuration is written to a file that resides in the NPU flash.) If you have modified any configuration parameters at runtime, it is recommended that you save configuration before resetting/shutting down 4Motion. Unsaved configuration is lost after system reset or shut down.

It is recommended that you make periodic backups of the configuration file. You can either manually make a backup of this file or configure the system to automatically make a daily backup. You can, at any time, restore the configuration specified in the backup file or the factory default configuration.

This section describes the commands for:

- "Saving the Current Configuration" on page 173
- "Downloading the Configuration File from an External Server" on page 173
- "Making a Backup/Restoring the Configuration File" on page 175

### 4.3.4.1 Saving the Current Configuration

When you reset the 4Motion system, it always boots up using the last saved configuration. If you are starting 4Motion for the first time after installation and commissioning, it boots up using the factory default configuration. Thereafter, any changes to configuration (made at runtime using the CLI) should be saved; all unsaved changes are lost after system reset.

**IMPORTANT**

You can, at any time, revert to the factory default configuration. For more information about restoring factory default configuration, refer to Section 4.3.4.3.5. If you do not save configuration after first time start up of 4Motion, it boots up with the factory default configuration the next time the system is reset.

Run the following command to save the current configuration:

```
npu# write
```

The next time you reset the system, it boots up with the last saved configuration.

**IMPORTANT**

It is recommended that you save the current configuration before shutting down or resetting the system. The last saved configuration is used during system startup. Unsaved configuration is lost after system reset/shutdown. For more information about shutting down/resetting the system, refer to Section 4.2.

| | |
|---|---|
| **Command Syntax** | `npu# write` |
| **Privilege Level** | **10** |
| **Command Mode** | Global command mode |

### 4.3.4.2 Downloading the Configuration File from an External Server

**IMPORTANT**

Before downloading the configuration file from an external server, you are required to configure the IP interfaces, internal-management, external-management, bearer, and local-management. For more information about configuring IP interfaces, refer the section, “Configuring Static Routes” on page 211.

You can download the configuration file from an external server, and use this file for booting up 4Motion. After downloading this file, reset the system. The system boots up with the downloaded configuration.

**IMPORTANT**

As soon as the system boots up with the downloaded configuration, the downloaded configuration file is deleted from the NPU flash. The system continues to operate using the downloaded configuration until the next system reset. After the system is reset, it boots up using the last saved configuration. To ensure that the downloaded configuration is used to boot up the system after reset, save the downloaded configuration using the following command:

```
npu# write
```

For more information about saving configuration, refer to Section 4.3.4.1.

Run the following command to download the configuration file from an external server:

```
npu# configfile download tftp://<ip-address>/<filename>
```

Reset 4Motion after you run this command. The system boots up with the downloaded configuration. To reset the system, run the following command:

```
npu(config)# reset
```

For more information about resetting 4Motion, refer to Section 4.2.2.1.

**NOTE**

An error may occur if:

- The file to be downloaded is not present in the appropriate path on the TFTP server.
- The file name that you have provided is in an invalid format. (The file to be downloaded should be a compressed zip file with the .gz extension.)

**Command Syntax**

```
npu# configfile download tftp://<ip-address>/<filename>
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<ip-address>` | Indicates the IP address of the TFTP server. | Mandatory | N/A | Valid IP address |
| `<filename>` | Indicates the name of the configuration file to be downloaded using the TFTP server. The file to be downloaded should be a compressed zip file. Always suffix the file name with **.gz**. | Mandatory | N/A | <filename>.gz |

**Command Modes**

Global command mode

### 4.3.4.3 Making a Backup/Restoring the Configuration File

You can make a backup of the current system configuration. You can either manually make a backup or configure the system to automatically make a daily backup of the current configuration. You can, at any time, restore configuration from the backup configuration file or revert to the factory default configuration.

**NOTE**

The system makes a backup (automatic daily backups or manual backup) of the current configuration. The backup files are stored in the path, tftpboot\management\configuration. The naming convention used for the backup configuration files is, **YYYYMMDDHHMM.cfg.gz**.

You can display the three most recent backup configuration files residing in the NPU flash. For details, refer to Section 4.3.4.3.6.

This section describes the commands for:

- "Making a Manual Backup of the Current Configuration" on page 176
- "Displaying the Status of the Manual Backup Procedure" on page 176
- "Making Automatic Backups of the Current Configuration" on page 177
- "Restoring the Configuration Defined in the Backup Configuration File" on page 178
- "Restoring the Factory Default Configuration" on page 179

- "Displaying the Currently Stored Backup Configuration Files" on page 179

### 4.3.4.3.1 Making a Manual Backup of the Current Configuration

To manually make a backup of the current configuration, run the following command:

```
npu# manual-backup
```

You can, at any time, view the status of the manual backup procedure. For details, refer to Section 4.3.4.3.2.

**IMPORTANT**

To enable the system to automatically make a backup of the current configuration, everyday, refer to Section 4.3.4.3.3.

**Command Syntax**

```
npu# manual-backup
```

**Command Modes**

Global command mode

### 4.3.4.3.2 Displaying the Status of the Manual Backup Procedure

To display the current status of the manual backup procedure, run the following command:

```
npu# show manual-backup-status
```

**Command Syntax**

```
npu# show manual-backup-status
```

**Privilege Level**

1

**Display Format**

`The Status of the File Backup operation is: <status-value>`

Where `<status value>` may be any of the following:

- Generating (1)
- Copying (2)
- Compressing (3)
- Compression Failure (4)
- Copying Failed (5)
- Completed (6)

**Command Modes**

Global command mode

### 4.3.4.3.3 Making Automatic Backups of the Current Configuration

You can enable the system to automatically make daily backups of the current configuration at a specific time. (You can also manually make a backup of the configuration. For details, refer to Section 4.3.4.3.1.)

**NOTE**

By default, the system makes a daily backup of the current configuration, at 00:00 hours.

To enable the system to make automatic backups of the current configuration, run the following command:

```
npu(config)# auto-backup-time <hh:mm>
```

Specify the time in the 24-hour format. The system will automatically make a backup of the current configuration, everyday, at the time that you have specified.

**IMPORTANT**

You can restore the configuration from any of the backup configuration files residing in the NPU flash. For details refer to Section 4.3.4.3.4.

**Command Syntax**

```
npu(config)# auto-backup-time <hh:mm>
```

**Privilege Level** **10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<hh:mm>` | Indicates the time at which the system should automatically create a backup of the current configuration, everyday. | Mandatory | 00:00 | HH:MM<br>(Enter the time in the 24-hour format) |

**Command Modes** Global configuration mode

### 4.3.4.3.4 Restoring the Configuration Defined in the Backup Configuration File

You can, at any time, restore configuration from the backup configuration file. (To display a list of currently stored backup files, refer to Section 4.3.4.3.6.) Run the following command to specify the backup file to be restored:

```
npu# restore-from-local-backup <local-restore-filename>
```

**IMPORTANT**

After executing this command, reset the system to restore configuration from the backup configuration file. For more information about resetting the system, refer to Section 4.2.2.1.

**IMPORTANT**

If you have stored the backup file on an external server, you can download the backup file from the external server, and reset the system to apply the configuration defined in the downloaded file. For details about downloading the configuration file from an external server, refer Section 4.3.4.2.

**Command Syntax**

```
npu# restore-from-local-backup <filename>
```

**Privilege Level** **10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<filename>` | Indicates the name of the backup configuration file to be used for restoring configuration. | Mandatory | N/A | Valid file name |

**Command Modes**

Global command mode

### 4.3.4.3.5 Restoring the Factory Default Configuration

You can, at any time, run the following command to restore factory default configuration:

```
npu# restore-factory-default
```

**Command Syntax**

```
npu# restore-factory-default
```

**Privilege Level**

**10**

**Command Modes**

Global command mode

### 4.3.4.3.6 Displaying the Currently Stored Backup Configuration Files

To display a list of backup configuration files that are currently residing on the NPU flash, run the following command:

```
npu# show backup-configuration-files
```

The three most recent backup configuration files are displayed.

**Command Syntax**

```
npu# show backup-configuration-files
```

**Privilege Level**

**1**

**Display Format**

```
1.<file name>.gz
2. <file name>.gz
3. <file name>.gz
```

**Command Modes**

Global command mode

## 4.3.5 Batch-processing of CLI Commands

You can use the CLI to batch-process commands to be executed for configuring and monitoring 4Motion.

**IMPORTANT**

Before initiating batch-processing of commands, remember that:

- If an error occurs while executing any command, the batch-processing operation is aborted; all subsequent commands are not executed.
- If you want to execute a command that requires system reset, specify the save configuration and system reset commands at the end of the batch file. (For more details about saving configuration and resetting the system, refer to "Saving the Current Configuration" on page 173 and "Resetting the system" on page 133.

**To batch-process CLI commands:**

1. Ensure that the text file comprising the commands to be batch processed is present on the TFTP server to be used for downloading the batch file.
2. Run the following command to download the text file and initiate batch-processing of commands specified in this file:

```
npu# batch-run tftp://<ip-address>/<file name>
```

After you execute this command, the file is downloaded from the TFTP server, and the commands in the file are executed sequentially. After batch-processing of all commands in this file is complete, the downloaded file is deleted from the 4Motion system.

The following is a sample text file that contains a list of commands to be batch-processed:

```
config terminal
nextbootmode asngwStatic
limit cpu softlimit 80 hardlimit 85
bearerqos rule_1 0 3 5 data 1
config outer-dscp 3 vlan-priority 4 qos enable
exit
write
reset
```

**Command Syntax**

`npu# batch-run tftp://<ip-address>/<file name>`

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<ip-address>` | Indicates the IP address of the TFTP server to be used for batch-processing commands to be used for configuring and monitoring 4Motion. | Mandatory | N/A | Valid IP address |
| `<file name>` | Indicates the configuration file to be used for batch-processing the CLI commands. Always suffix the file name with .txt. | Mandatory | N/A | <filename>.txt |

**Command Modes**

Global configuration mode

## 4.3.6 Configuring the CPU

To ensure optimal utilization of the NPU resources, you are required to configure the thresholds for the CPU and memory utilization for the NPU. In addition, to protect the from hostile applications, you can limit the type and rate of traffic destined towards the NPU.

This section describes the commands to be executed for:

- "Configuring CPU and Memory Utilization Thresholds for the NPU" on page 182
- "Configuring the Rate Limiting for the NPU" on page 184

## 4.3.6.1 Configuring CPU and Memory Utilization Thresholds for the NPU

This section describes the commands for:

- "Specifying Thresholds for CPU and Memory Utilization for the NPU" on page 182
- "Displaying CPU and Memory Utilization Limits for the NPU" on page 183

### 4.3.6.1.1 Specifying Thresholds for CPU and Memory Utilization for the NPU

You can use the CLI to configure the thresholds (soft and hard limits) for CPU and memory utilization for the NPU. When the soft or hard limit for either CPU or memory utilization is reached, an alarm is raised.

**NOTE**

To display the current thresholds that are configured for CPU and memory utilization for the NPU, refer to Section 4.3.6.1.2.

To configure the thresholds (soft and hard limits) for CPU and memory utilization for the NPU, run the following command:

```
npu(config)# limit {cpu | memory} ([softlimit <limit>] [hardlimit
<limit>])
```

For example, run the following command if you want to configure the soft and hard limits for CPU utilization to be 78 and 85 percent, respectively.

```
npu(config)# limit cpu softlimit 80 hardlimit 85
```

**NOTE**

An error may occur if the value of the `softlimit` parameter is higher than the `hardlimit` parameter.

**Command Syntax**

```
npu(config)# limit {cpu | memory} ([softlimit <integer (1-99>] [hardlimit <integer (1-99>])
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{cpu \| memory}` | Indicates whether the threshold is to be specified for CPU or memory utilization. | Mandatory | N/A | cpu/ memory |
| `[softlimit <integer (1-99>]` | Indicates the soft limit, as a percentage, for CPU/memory utilization. When this limit is reached, the system raises a Minor or Major alarm. | Optional | 70 (for CPU and memory utilization) | 1-99 |
| `[hardlimit <integer (1-99>])` | Indicates the hard limit, as a percentage, for CPU/memory utilization. When this limit is reached, the system raises a Critical alarm.<br>The value of this parameter should always be greater than the `softlimit` parameter. | Optional | 90 (for CPU and memory utilization) | 1-99 |

**Command Modes**

Global configuration mode

### 4.3.6.1.2 Displaying CPU and Memory Utilization Limits for the NPU

To display the configured CPU and memory utilization limits for the NPU, run the following command:

```
npu# show resource limits
```

**NOTE**

To configure the CPU and memory utilization limits for the NPU, refer to Section 4.3.6.1.2.

**Command Syntax**

```
npu# show resource limits
```

**Privilege Level**

1

**Display Format**

```
Resource   softlimit    hardlimit
CPU       <limit>     <limit>
Memory    <limit>     <limit>
```

**Command Modes**

Global configuration mode

### 4.3.6.2 Configuring the Rate Limiting for the NPU

The rate limiting feature enables you to limit the type of traffic destined towards the NPU. This feature is used to protect the NPU from hostile applications or Denial of Service (DoS) attacks because packets that exceed an allowed rate are dropped and not queued to the NPU.

The following are pre-defined applications for which rate limiting is already configured:

- File Transfer protocol (FTP)
- Telnet
- Trivial File Transfer Protocol (TFTP)
- SSH
- Internet Control Protocol Message (ICMP)
- Simple Network Management Protocol (SNMP)
- R6, R4
- Internet Group Management Protocol (IGMP)
- Extensible Authentication Protocol (EAP)

- Address Resolution Protocol (ARP)

**NOTE**

Rate limiting for pre-defined applications is only configured for control traffic from FTP, Telnet, and TFTP applications. You need to configure rate limiting separately for data traffic from FTP, Telnet, and TFTP. For details, refer to "Configuring Rate Limiting for User-defined Applications" on page 189.

You can, at any time, modify the rate limit parameters for pre-defined applications. Besides the pre-defined applications, you can also configure rate limiting for other applications.

**IMPORTANT**

100 Kbps is the default rate limit that is configured for pre-defined and user-defined applications. In addition, 100 Kbps is the default rate limit that is specified for all other applications that may send packets to the NPU (but are not in the list of pre-defined or user-defined applications).

If you disable rate limiting for a specific pre-defined or user-defined application, the rate limit that you have configured for all other applications will be applicable for the application (for which rate-limiting is disabled.

You can, at any time, view configuration information for the rate limiting feature.

**To configure rate limiting for the NPU:**

1 Enable the rate limiting configuration mode (refer to Section 4.3.6.2.1)

2 You can now execute any of the following tasks:

» Modify default rate limiting configuration for pre-defined applications (refer to Section 4.3.6.2.2)

» Configure rate limiting for user-defined applications (refer to Section 4.3.6.2.3)

» Disable rate limiting for specific applications (refer to Section 4.3.6.2.4)

You can, at any time, enable or disable rate limiting (refer to Section 4.3.6.2.5). In addition, you can also display configuration information for the rate limiting feature (refer to Section 4.3.6.2.6).

**NOTE**

In addition, you can also display the number of non-conforming packets dropped by the rate limiting feature. For details, refer to Section 4.10.1.3.

### 4.3.6.2.1 Enabling the Rate Limiting Configuration Mode

To enable the rate limiting configuration mode, run the following command:

```
npu(config)# rate-limit config
```

After you run this command, you can:

- Modify default rate limiting configuration parameters for pre-defined applications (refer to Section 4.3.6.2.2)
- Configure rate limiting for user-defined applications (refer to Section 4.3.6.2.3)
- Disable rate limiting for specific applications (refer to Section 4.3.6.2.4)

**Command Syntax**

```
npu(config)# rate-limit config
```

**Privilege Level**

**10**

**Command Modes**

Global configuration mode

### 4.3.6.2.2 Modifying Configuration Parameters for Pre-defined Applications

Rate limiting is configured and enabled for the following pre-defined applications:

- FTP
- Telnet
- TFTP
- SSH
- ICMP
- SNMP

- R6, R4
- IGMP
- EAP
- ARP

**NOTE**

To configure user-defined applications, refer to Section 4.3.6.2.3.

Run the following command to modify the rate limiting configuration parameters for a pre-defined application. You can also use this command to configure rate limiting for all other applications that may send packets to the NPU.

```
npu(config-ratelmt)# set rate-limit {ftp | telnet | tftp | ssh |
icmp | snmp | R4-R6 | igmp | eap | arp | all-others} [dstport
<port_num>] <rate-Kbps>
```

**IMPORTANT**

Rate limiting for pre-defined applications is only configured for control traffic from FTP, Telnet, and TFTP applications. You need to configure rate limiting seaparately for data traffic from FTP, Telnet, and TFTP applications. For details, refer to "Configuring Rate Limiting for User-defined Applications" on page 189.

**NOTE**

By default, the NPU listens for packets from pre-defined applications on standard ports.

For example, run the following command to specify that NPU should listen for FTP packets on port 1024 a packet rate of 300 Kbps.

```
npu(config-ratelmt)# set rate-limit ftp dstport 1024 300
```

**Command Syntax**

```
npu(config-ratelmt)# set rate-limit {ftp | telnet | tftp | ssh | icmp |
snmp | R4-R6 | igmp | eap | arp | all-others} [dstport <port_num>]
<rate-Kbps>
```

**Privilege Level**

**10**

### Syntax Description

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{ftp \| telnet \| tftp \| ssh \| icmp \| snmp \| R4-R6 \| igmp \| eap \| arp \| all-others}` | Indicates the application for which the rate limiting is to be configured. | Mandatory | N/A | ■ ftp<br>■ telnet<br>■ tftp<br>■ ssh<br>■ icmp<br>■ snmp<br>■ R4-R6<br>■ igmp<br>■ eap<br>■ arp<br>■ all-others: Refers to all other applications that may send packets to the NPU, and are not in the list of pre-defined or user-defined applications. |
| `[dstport <port_num>]` | Indicates the TCP/UDP port on which the NPU listens for packets from a pre-defined application. | Optional | Standard ports | 1-65535 |
| `[rate-Kbps]` | Indicates the rate, in Kbps, at which a pre-defined application can send packets to the NPU. | Mandatory | 100 for all specific applications.<br>1000 for all-others | 1-1000000 |

**Command Modes**

Rate limiting configuration mode

### 4.3.6.2.3 Configuring Rate Limiting for User-defined Applications

Besides the pre-defined applications (refer to Section 4.3.6.2.2), you can also configure other applications that can send packets to the NPU.

Run the following command to configure rate limiting for a user-defined application.

```
npu(config-ratelmt)# set rate-limit <user-defined-app> {[srcport
<port_num>] [dstport <port_num>] [protocol <protocol_num>] [srcaddr
<ip_addr>] [dstaddr <ip_addr>] [ethertype <protocol_num>]}
<rate-Kbps>
```

In the above command, it is recommended that you configure at least one of the following parameters. The more parameters you configure, the higher the granularity of the rate limiting definition for that application.

**NOTE**

To display the rate limiting parameters defined for user-defined and other applications, refer to Section 4.3.6.2.6

- L4 source port
- L4 destination port
- L3 protocol field
- Source IP address
- Destination IP address
- L2 protocol type field

**IMPORTANT**

While configuring rate limiting for user-defined applications, remember that:

- Configuration for user-defined applications is applied with respect to the sequence in which you configure these values. It is recommended that you specify the more granular definitions before the less granular ones. For example, if you are creating a definition that configures the source port 200 and destination port 500, create this definition before creating a generic configuration for applications with source port 200. Otherwise, packets with source port 200 and destination port 500 will be limited according to the rate configured for source port 200.

- Packets are classified and identified by the hardware with respect to the depth of the fields that are configured. Specify the values of the rate limiting parameters for user-defined applications exactly as these appear in the packet header.

- You cannot modify rate limiting definitions for a user-defined application. To modify rate limiting configuration for a user-defined application, disable and delete that definition, and then create a new one using the command described in this section. To disable an application definition, refer to Section 4.3.6.2.4.

- L2 protocols cannot be defined with any of the other L4 or L3 fields mentioned above.

- The destination IP address that you specify should be the IP address that you have configured for the external-management, internal-management, bearer, and local-management interface.

**IMPORTANT**

An error may occur when you run this command and:

- The destination port, protocol fields, or Ethernet type that you have configured for the user-defined application is identical to the destination port of the pre-defined application.

- Rate limiting is completely disabled for the NPU.

**Command Syntax**

```
npu(config-ratelmt)# set rate-limit <user-defined-app> {[srcport
<port_num>] [dstport <port_num>] [protocol <protocol_num>] [srcaddr
<ip_addr>] [dstaddr <ip_addr>] [ethertype <protocol_num>]} <rate-Kbps>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<user-defined-app>` | Indicates the name of the application. | Mandatory | N/A | String (up to 20 characters) |

| | | | | |
|---|---|---|---|---|
| [srcport <port_num>] | Indicates the L4 source port of the user-defined application. specify the value of this parameter exactly as this field appears in the TCP/UDP header. | Optional | N/A | 1-65535 |
| [dstport <port_num>] | Indicates the L4 destination port of the user-defined application. This parameter should be specified exactly as it appears in the TCP/UDP header. | Optional | N/A | 1-65535 |
| [protocol <protocol_num> ] | Indicates the L3 protocol field of the user-defined application. This parameter should be specified exactly as it appears in the IP header | Optional | N/A | 0-255 |
| [srcaddr <ip_addr>] | Indicates the source IP address of the user-defined application. | Optional | N/A | Valid unicast IP address |
| [dstaddr <ip_addr>] | Indicates the pre-configured destination IP address for the NPU for which rate limiting for this user-defined application is to be configured. Specify the IP address that is assigned to the external-management, internal-management, local-management or bearer interface. | Optional | N/A | Valid unicast IP address |
| [ethertype <protocol_num> ] | Indicates the Ethernet type field of the user-defined L2 protocol. | Optional | N/A | 1536-65535 |
| [rate-Kbps] | Indicates the rate, in Kbps, at which an application can send packets to the NPU. | Mandatory | 100 | 1-1000000 |

**Command Modes**

Rate limiting configuration mode

### 4.3.6.2.4 Disabling and Deleting Rate Limiting Configuration for an Application

To disable and delete rate limiting configuration for an application, run the following command:

```
npu(config-ratelmt)# no rate-limit {ftp | telnet | tftp | ssh |
icmp | snmp | R4-R6 | igmp | <user-defined-app>}
```

**IMPORTANT**

While disabling rate limiting for user-defined applications, remember that:

- Rate limiting configuration specified for applications categorized as ‘all-others’ is applicable for all pre-defined/user-defined applications for which you have disabled rate limiting. (However, if you disable rate-limiting for the entire system, it is disabled completely across pre-defined, user-defined, and all other applications. For details, refer to Section 4.3.6.2.5.)

- After rate limiting is disabled for an application, the application traffic is identical to that of other applications (applications other than pre-defined and user defined applications.)

- You cannot disable rate limiting for EAP and ARP.

- An error may occur if you try disabling rate limiting for an application when this feature is already disabled for the entire system. For details, refer to Section 4.3.6.2.5.

**Command Syntax**

```
npu(config-ratelmt)# no rate-limit {ftp | telnet | tftp | ssh | icmp |
snmp | R4-R6 | igmp | <user-defined-app>}
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{ftp \| telnet \| tftp \| ssh \| icmp \| snmp \| R4-R6 \| igmp \| eap \| arp \| <user-defined-app>}` | Indicates the application for which rate limiting is to be disabled. | Mandatory | N/A | ■ ftp<br>■ telnet<br>■ tftp<br>■ ssh<br>■ icmp<br>■ snmp<br>■ R4-R6<br>■ igmp<br>■ eap<br>■ arp<br>■ user-defined-app: Refers to user-defined applications for which rate limiting is to be disabled. |

**Command Modes** Rate limiting configuration mode

### 4.3.6.2.5 Enabling/Disabling the Rate Limiting for the NPU

You can disable or enable the rate limiting feature for the NPU. When this feature is disabled, rate-limiting for all applications is in the "not-in-service" state. When you enable this feature, the last saved configuration parameters for all applications (pre-defined, user-defined, and all others) is used.

By default, this feature is enabled for the NPU.

**NOTECAUTION**

When you disable rate limiting for the entire system, it is disabled for all applications, pre-defined, user-defined, and all others, and any application can use 100% of the NPU’s capacity, thereby making it vulnerable to attack from hostile applications. To disable rate limiting for a specific user-defined and pre-defined application, refer Section 4.3.6.2.2 and Section 4.3.6.2.3.

To enable/disable the rate limiting feature, run the following command:

```
npu(config)# set cpu rate-limit {enable | disable}
```

**Command Syntax**

```
npu(config)# set cpu rate-limit {enable | disable}
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| {enable \| disable} | Indicates whether this feature should be enabled or disabled for the NPU. | Mandatory | N/A | ■ enable<br>■ disable |

**Command Modes**

Global configuration mode

### 4.3.6.2.6 Displaying the Rate Limiting Configuration Information for an Application

To display rate limiting parameters that are configured for specific or all user-defined and pre-defined applications, run the following command:

```
npu# show rate-limit config {ftp | telnet | tftp | ssh | icmp | snmp
| R4-R6 | igmp | eap | arp | all-others | <user-defined-app> | all}
```

**IMPORTANT**

An error may occur if you want to run this command to display configuration information for an application for which rate limiting is disabled.

**Command Syntax**

```
npu# show rate-limit config {ftp | telnet | tftp | ssh | icmp | snmp |
R4-R6 | igmp | eap | arp | all-others | <user-defined-app> | all}
```

**Privilege Level**

**1**

### Syntax Description

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{ftp \| telnet \| tftp \| ssh \| icmp \| snmp \| R4-R6 \| igmp \| eap \| arp \| <user-defined-app> \| all}` | Indicates the application for which rate limiting is to be displayed. | Optional | N/A | ■ ftp<br>■ telnet<br>■ tftp<br>■ ssh<br>■ icmp<br>■ snmp<br>■ R4-R6<br>■ igmp<br>■ eap<br>■ arp<br>■ user-defined-app: Refers to user-defined applications for which rate limiting is to be displayed.<br>■ all |

**Display Format**

```
CPU Rate Limiting Status : Enabled

PRE-DEFINED RATELIMIT CONFIGURATION:

-----------------------------------

Application   DestPort      Rate(Kbps)    Status

<Application>  <Port Number>  <Configured Rate> <Current Status>

<Application>  <Port Number>  <Configured Rate> <Current Status>

<Application>  <Port Number>  <Configured Rate> <Current Status>


USER-DEFINED RATELIMIT CONFIGURATION:

Application  Srcport    Dstport     Proto       SrcIPAddr   DstIPAddr
L2type    Rate

<Application> <Port Number> <Port Number>  <Protocol>    IP address> <IP
Address>   <value>    <Configured Rate>
```

**Command Modes**

Global command mode

## 4.3.7 Configuring QoS Marking Rules

QoS marking rules refer to the classification of traffic originating from the NPU into different flows. You can then apply DiffServ Code Points (DSCP) and/or 802.1p priority bits for appropriate QoS handling of each flow.

The NPU generates the following types of traffic:

- R4/R6 control traffic
- R3 control traffic such as RADIUS or MIP
- Management traffic

To define QoS marking for traffic generated by NPU, you are required to configure:

- Class-maps: Define the DSCP and/or VLAN priority bits to be applied for signaling and management traffic originating from the NPU.
- QoS classification rules: Classify packets into flows, based on the IP address of the host interface, transport protocol, and the source port number of the application traffic. A class-map can be associated with each flow to define

separate DSCP and/or VLAN priority bits for QoS handling of each flow. Extended ACL 199 is used for configuring QoS classification rules and associating each rule with a class-map.

**IMPORTANT**

By default, QoS marking rules are disabled. You are required to enable a QoS marking rule before it is applied on host originating traffic matching the QoS classification rules.

**To configure QoS marking rules:**

1 Create one or more class-maps (refer to Section 4.3.7.1)

2 Use extended ACL 199 to configure QoS classification rules, and apply the appropriate class-map for each classifcation rule (refer to Section 4.3.7.2).

3 Enable the QoS marking rule to classify packets based on the QoS classifcation criteria, and apply the apprpriate class-map (refer to Section 4.3.7.3)

You can, at any time, display configuration information for a particular class-map (refer to Section 4.3.7.1.6).

### 4.3.7.1 Managing Class-maps

A class-map refers to the DSCP and/or 802.1p VLAN priority bits to be applied on host-originating traffic that match the criteria defined by the applicable QoS classification rules. Each class-map is assigned a class-identifier, which you can use to reference a class-map (while associating it with the QoS classification rule).

**To configure a class-map:**

1 Enable the QoS class-map configuration mode (refer to Section 4.3.7.1.1)

2 You can now:

» Configure the 802.1p VLAN priority and/or DSCP for this class-map (refer to Section 4.3.7.1.2).

» Delete the 802.1p VLAN priority and/or DSCP for this QoS class-map (refer to Section 4.3.7.1.3).

» Terminate the QoS class-map configuration mode (refer to Section 4.3.7.1.4).

You can, at any time, delete an existing class-map (refer to Section 4.3.7.1.5) or view the configuration information for an existing class-map (refer to Section 4.3.7.1.6).

### 4.3.7.1.1 Enabling the QoS Class-map Configuration Mode/ Creating a New Class Map

To specify the 802.1p VLAN priority and/or DSCP values for a class-map, first enable the QoS class-map configuration mode. Run the following command to enable the QoS class-map configuration mode. You can use this command to create a new QoS class-map

```
npu(config)# class-map <class-map-number(1-65535)>
```

If you run the above command to create a new QoS class-map, the configuration mode for this QoS class-map is automatically enabled.

By default, class-maps 1-8 are pre-configured. Refer to Table 4-15 for details on these class-maps and the QoS classification rules to which they are associated.

**IMPORTANT**

If you want to modify the 802.1p VLAN priority and/or DSCP values for a class-map that is already associated with a QoS classification rule, first disable the QoS classification rule. For more information about disabling QoS classification rules, refer to Section 4.3.7.3.

**NOTE**

The QoS class-map number is used to reference the QoS class-map that you want to associate with a QoS classification rule, which defines the classification rule to be applied for host-originating traffic. For more information about creating QoS classification rules, refer Section 4.3.7.2.

After you enable the QoS class-map configuration mode, you can:

- Configure the 802.1p VLAN priority and/or DSCP for this class-map (refer to Section 4.3.7.1.2).

- Delete the 802.1p VLAN priority and/or DSCP for this QoS class-map (refer to Section 4.3.7.1.3).

- Terminate the QoS class-map configuration mode (refer to Section 4.3.7.1.4).

**IMPORTANT**

An error may occur if:

- You specify a class-map number that is not within the range, 1- 65535.
- The class-map configuration mode for the class-map you have specified is already enabled.
-

**Command Syntax**

```
npu(config)# class-map <class-map-number(1-65535)>
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<class-map-number(1-65535)>` | Indicates the identifier of the QoS class-map for which the QoS class-map configuration mode is to be enabled. | Mandatory | N/A | 1-65535 |

**Command Modes**

Global configuration mode

#### 4.3.7.1.2 Specifying 802.1p VLAN priority and/or DSCP for a Class-map

**IMPORTANT**

If you are modifying the 802.1p VLAN priority and/or DSCP for a class-map that is associated with a QoS classification rule, first disable the QoS classification rules for that ACL. For details, refer to Section 4.3.7.3.

After enabling the QoS class-map configuration mode, you can configure one or both of the following values for this QoS class-map:

- DSCP value in the IPv4 packet header to indicate a desired service.
- 802.1p VLAN priority in the VLAN header of the packet.

Run the following command to configure the 802.1p VLAN priority and/or DSCP:

```
npu(config-cmap)# set {[cos <new-cos(0-7)>] [ip dscp
<new-dscp(0-63)>]}
```

**Command Syntax**

```
npu(config-cmap)# set {[cos <new-cos(0-7)>] [ip dscp <new-dscp(0-63)>]}
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [cos <new-cos(0-7)> ] | Indicates the 802.1p VLAN priority value to be applied for this class-map. | Optional | N/A | 0-7 where 0 is the lowest and 7 is the highest |
| [ip dscp <new-dscp(0-63 )>] | Indicates the DSCP value to be applied for this class-map. | Optional | N/A | 0-63 |

**Command Modes**

Class-map configuration mode

### 4.3.7.1.3 Deleting 802.1p and/or DSCP Values from a Class-map

**IMPORTANT**

If you are deleting the 802.1p VLAN priority and/or DSCP for a class-map that is associated with a QoS classification rule, first disable the QoS classification rules for that ACL. For details, refer to Section 4.3.7.3.

Run the following command to delete the 802.1p VLAN priority and/or DSCP for this class-map.

```
npu(config-cmap)# no {[cos <new-cos(0-7)>] [ip dscp
<new-dscp(0-63)>]}
```

**IMPORTANT**

An error may occur if the 802.1p or DSCP that you have specified do not exist for this class-map.

**Command Syntax**

```
npu(config-cmap)# no {[cos <new-cos(0-7)>] [ip dscp <new-dscp(0-63)>]}
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[cos <new-cos(0-7)> ]` | Indicates the 802.1p VLAN priority to be deleted for this class-map. | Optional | N/A | 0-7 |
| `[ip dscp <new-dscp(0-63 )>]` | Indicates the DSCP to be deleted for this class-map. | Optional | N/A | 0-63 |

**Command Modes**

QoS class-map configuration mode

### 4.3.7.1.4 Terminating the QoS Class-map Configuration Mode

To terminate the QoS class-map configuration mode, run the following command:

```
npu(config-cmap)# exit
```

**Command Syntax**

```
npu(config-cmap)# exit
```

**Privilege Level**

10

**Command Modes**

QoS class-map configuration mode

### 4.3.7.1.5 Deleting a QoS Class-map

Run the following command to delete an existing QoS class-map:

```
npu(config)# no class-map <class-map-number(1-65535)>
```

**IMPORTANT**

An error may occur if you specify a class-map number that does not exist or is not within the range, 1-65535.

**Command Syntax**

```
npu(config)# no class-map <class-map-number(1-65535)>
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<class-map-number(1-65535)>` | Indicates the identifier of the QoS class-map number to be deleted. | Mandatory | N/A | 1-65535 |

**Command Modes**

Global configuration mode

### 4.3.7.1.6 Displaying Configuration Information for a Class-map

Run the following command to view the configuration information for a class-map:

```
npu# show class-map [<class-map-num(1-65535)>]
```

Specify the class-map number if you want to view configuration information for a specific class-map. If you do not specify the class-map number, configuration information for all class-maps is displayed.

**IMPORTANT**

An error may occur if you specify a class-map number that does not exist or is not within the range, 1-65535.

**Command Syntax**

```
npu# show class-map [<class-map-num(1-65535)>]
```

**Privilege Level**

**1**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<class-map-num(1-65535)>]` | Indicates the identifier of the class-map for which configuration information is to be displayed. Do not specify a value for this parameter if you want to view the configuration information for all class-maps. | Optional | N/A | 1-65535 |

**Display Format** (for each class-map if requested for all class-maps)

```
Class map <class map number>

---------------------------------------------

CoS Value                    : <value>

DSCP Value                   : <value>
```

**Command Modes**

Global command mode

### 4.3.7.2 Managing QoS Classification Rules

QoS classification rules classify packets into flows, based on the following parameters:

- IP address of the host originating the traffic (the IP address assigned to the bearer, internal-management or external-management interface)
- Layer 3 protocol indicating either TCP or UDP
- Layer 4-source port for the application that needs to be marked (for example, FTP, Telnet, SNMP, MIP, or RADIUS)

A class-map can be associated with each flow to define separate DSCP and/or VLAN priority bits for QoS handling of each flow.

**To configure a QoS classification rule:**

1 Enable the ACL configuration mode for ACL 199 (refer to Section 4.3.7.2.1).

**IMPORTANT**

QoS classification rules can be associated only with ACL 199.

2 You can now:

- » Configure one or more QoS classification rules (refer to Section 4.3.7.2.2)
- » Delete one or more QoS classification rules (refer to Section 4.3.7.2.3)
- » Terminate the ACL configuration mode (refer to Section 4.3.7.2.4)

You can, at any time, enable/disable QoS marking (refer to Section 4.3.7.3) or view the configuration information for ACL 199 (refer to Section 4.3.7.4).

### 4.3.7.2.1 Enabling the ACL Configuration Mode for ACL 199

To configure QoS classification rules for host-originating traffic, first enable the extended ACL 199 configuration mode.

**IMPORTANT**

QoS classification rules can be added only to extended ACL 199

Run the following command to enable the extended ACL configuration mode for ACL 199.

```
npu(config)# ip access-list {standard <access-list-number (1-99)> |
extended <access-list-number (100-199)>} [name<string>]
```

After you enable the ACL 199 configuration mode, you can one or several QoS classification rules, and associate them with the appropriate class-maps.

**Command Syntax**

```
npu(config)# ip access-list {standard <access-list-number (1-99)> |
extended <access-list-number (100-199)>} [name <string>]
```

**Privilege Level**

```
10
```

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| **extended** `<access-list-number (100-199)>` | Indicates the identifier of the extended ACL for which the ACL configuration mode is to be enabled. You must specify 199 to enable configuration of QoS classification rules. | Mandatory | N/A | 199 |
| `[`**name** `<string>]` | Indicates the name of the ACL for which the ACL configuration mode is to be enabled.<br>**Note**: If you do not specify the ACL name, the ACL number is used as the default ACL name. | Optional | N/A | String (upto 20 characters) |

**Command Modes**

Global configuration mode

### 4.3.7.2.2 Configuring a QoS Classification Rule

You can configure the QoS classification rules for the ACL with respect the following parameters:

- Source IP address for the host-originating application traffic
- Application protocol (TCP or UDP)
- L4 source port of the application traffic
- QoS class-map identifier

By default, there are 8 pre-configured QoS classification rules associated with the 8 pre-configured QoS class-maps:

**Table 4-15: Pre-Configured QoS Classification Rules and Class-Maps**

| IP Interface | Type of Traffic | Protocol | Source Port | Class Map | DSCP | 802.1p |
|---|---|---|---|---|---|---|
| Bearer | RADIUS | UDP | 1812 | 1 | 7 | 7 |

**Table 4-15: Pre-Configured QoS Classification Rules and Class-Maps**

| IP Interface | Type of Traffic | Protocol | Source Port | Class Map | DSCP | 802.1p |
|---|---|---|---|---|---|---|
| Bearer | MobileIP-Agent | UDP | 434 | 2 | 7 | 7 |
| Bearer | WiMAX ASN Control Plane Protocol | UDP | 2231 | 3 | 7 | 7 |
| Internal-Management | OBSAI message exchange between NPU and AU | UDP | 10009 | 4 | 0 | 0 |
| Internal-Management | Trivial File Transfer Protocol | UDP | 69 | 5 | 0 | 0 |
| External-Management | Telnet | TCP | 23 | 6 | 0 | 0 |
| External-Management | SSH Remote Login Protocol | TCP | 22 | 7 | 0 | 0 |
| External-Management | SNMP | UDP | 161 | 8 | 0 | 0 |

After configuring QoS classification rules for this ACL, enable QoS marking for this ACL. By default, QoS marking is disabled. For details, refer to Section 4.3.7.3.

Run the following command to configure a QoS classification rule for this ACL:

```
npu(config-ext-nacl)# qos-mark {{host <src-ip-address>} {{tcp |
udp} srcport <short (1-65535)>} qosclassifier <short (1-65535)>}
```

When you execute this command, a new QoS classification rule is added to the ACL for which the configuration mode is enabled.

**IMPORTANT**

An error may occur if:

- You have specified a source port that is not within the range, 1-65535.
- The host IP address or class-map identifier that you have specified do not exist.

**Command Syntax**

```
npu(config-ext-nacl)# qos-mark {{host <src-ip-address>} {{tcp | udp}
srcport <short (1-65535)>} qosclassifier <short (1-65535)>}
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{host <src-ip-address>}` | Indicates the IP address of the host interface that generates the traffic for which this classification rule is to be configured. Specify the IP address that you have assigned to the internal-management, external-management or bearer IP interface. | Mandatory | N/A | Valid IP address (assigned to the internal-management, external-management or bearer IP interface) |
| `{tcp \| udp}` | Indicates the transport protocol. | Mandatory | N/A | ■ tcp<br>■ udp |
| `srcport <short (1-65535)>` | Indicates the source port number of the application traffic for which this QoS classification rule is to be applied. | Mandatory | N/A | 1-65535 |
| `qosclassifier <class-map-number (1-65535)>` | Indicates the identifier of the QoS class-map to be associated with this classification rule. For more information about configuring class-maps, refer Section 4.3.7.1. | Mandatory | N/A | 1-65535 |

**Command Modes**

Extended ACL configuration mode

### 4.3.7.2.3 Deleting a QoS Classification Rule

**IMPORTANT**

You can delete a QoS classification rule only if the associated ACL is INACTIVE. For more information, refer Section 4.3.9.3.

To delete a QoS classification rule for an ACL, run the following command:

```
npu(config-ext-nacl)# no qos-mark {{host <src-ip-address>} {{tcp |
udp} srcport <short (1-65535)>} qosclassifier <short (1-65535)>}
```

When you execute this command, the QoS classification rule is deleted from the ACL.

**IMPORTANT**

An error may occur if you specify a combination of parameters that do not match any of the existing QoS classification rules.:

■

**Command Syntax**

```
npu(config-ext-nacl)# no qos-mark {{host <src-ip-address>} {{tcp | udp}
srcport <short (1-65535)>} qosclassifier <short (1-65535)>}
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[host <src-ip-address>]` | Indicates the IP address of the host interface that generates the traffic for which this classification rule is to be deleted. | Mandatory | N/A | Valid IP address (assigned to the internal-management, external-management or bearer IP interface) |
| `{tcp \| udp}` | Indicates the transport protocol. | Mandatory | N/A | ■ tcp<br>■ udp |
| `srcport <short (1-65535)>` | Indicates the source port number of the application traffic for which this QoS classification rule is to be deleted. | Mandatory | N/A | 1-65535 |
| `qosclassifier <class-map-number (1-65535)>` | Indicates the identifier of the QoS class-map associated with the classification rule to be deleted. For more information about class-maps, refer Section 4.3.7.1. | Mandatory | N/A | 1-65535 |

**Command Modes** Extended ACL configuration mode

### 4.3.7.2.4 Terminating the ACL Configuration Mode

To terminate the ACL configuration mode, run the following command:

```
npu(config-ext-nacl) # exit
```

**Command Syntax** `npu(config-ext-nacl) # exit`

**Privilege Level** 10

**Command Modes** Extended ACL configuration mode

## 4.3.7.3 Enabling/Disabling QoS Marking for ACL 199

You can enable/disable the QoS marking for the ACL. The class-map is applied on traffic matching a QoS classification rule only after you enable the QoS marking for the ACL).

**NOTE**

If you want to modify a QoS class-map, first disable the QoS marking rules for the associated ACL. By default, QoS marking is disabled for the ACL.

Run the following command to enable/disable the QoS marking for the specified ACL:

```
npu(config)# set qos {enable | disable} 199
```

**Command Syntax** `npu(config)# set qos {enable | disable} 199`

**Privilege Level** `10`

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{enable \| disable}` | Indicates whether QoS marking should be enabled or disabled for a specific ACL. | Mandatory | disable | ■ enable<br>■ disable |
| `199` | Indicates the identifier of the ACL for which the QoS marking is to be activated. You musr specify 199. | Mandatory | N/A | 199 |

**Command Modes**

Global configuration mode

### 4.3.7.4 Displaying ACL 199 Configuration Information

Run the following command to display the configuration information for ACL 199:

```
npu# show access-lists [{199 | <access-list-199-name}]
```

**IMPORTANT**

An error may occur if the ACL name you have specified does not exist.

**Command Syntax**

```
npu# show access-lists [199| <access-list-199-name}]
```

**Privilege Level**

**1**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[199 \| <access-list-199-name}]` | To view configuration information for ACL 199, specify 199 or the name configured for this ACL. | Mandatory for viewing information for ACL 199. | N/A | ■ 199<br>■ String; the name configured for ACL 199. |

**Display Format (Standard)**

```
Extended IP Access List 199
Access List Name(Alias)            : 199

 Interface List                    : NIL
 Status                            : <Active|Inactive>
 Admin-Status                      : <Up|Down>

 Filter Protocol Type              : <UDP|TCP>
 Source IP address                 : <IP address>
 Filter Source Port                : <value>
 Rule Action                       : QoS Marking
 QoS Classifier ID                 : <value>
 Marking rule status               : <ACTIVE|INACTIVE>
...............
```

## 4.3.8 Configuring Static Routes

**Command Modes**

Global command mode

Using the CLI, you can configure the static routes for traffic originating from the NPU. For each static route, you can configure the destination IP address, address mask, and the next hop IP address. The following are the types of traffic originating from the NPU:

- R4/R6 control traffic
- R3 control traffic such as RADIUS or MIP
- NMS traffic

This section describes the commands for:

- "Adding a Static Route" on page 212
- "Deleting a Static Route" on page 213

- "Displaying the IP Routing Table" on page 214

There are four automatically created static route with the IP addresses of the directly connected Bearer, External Management, Local Management and Internal Management interfaces (the IP address of the Internal Management interface is set to 10.0.0.254. Note that availability of certain interfaces depend on the connectivity mode). These routes cannot be modified or deleted.

In addition, the "Any Destination" entry with Destination 0.0.0.0 and Mask 0.0.0.0 must be created during initial setup and should not be deleted. The Next Hop IP address of this route must be in the same subnet with the interface used for remote management.

### 4.3.8.1 Adding a Static Route

To add a static route, run the following command:

```
npu(config)# ip route <ip_address> <ip_mask> <ip_nexthop>
```

**NOTE**

Refer to Section 4.3.8.3 to display the IP routing table.

For example, run the following command to add an entry for a static route with the destination IP address, 11.0.0.2, and the address mask, 255.255.255.255, and next-hop IP address, 192.168.10.1.

```
npu(config)# ip route 11.0.0.2 255.255.255.255 192.168.10.1
```

**IMPORTANT**

An error may occur if:

- The IP address, address mask or the next-hop IP address are invalid.
- A route with the parameters that you have specified already exists.
- The IP address that you have specified is being used for another interface.
- The next-hop IP address that you have specified is either unreachable or is down.

**Command Syntax**

```
npu(config)# ip route <ip_address> <ip_mask> <ip_nexthop>
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<ip_address>` | Indicates the destination host or network IP address, for which the route is to be added. | Mandatory | N/A | Valid IP address |
| `<ip_mask>` | Indicates the address mask for the static route to be added. | Mandatory | N/A | Valid address mask |
| `<ip_nexthop>` | Indicates the next hop IP address, for the route to be added. | Mandatory | N/A | Valid IP address |

**Command Modes**

Global configuration mode

### 4.3.8.2 Deleting a Static Route

To delete a static route, run the following command:

```
npu(config)# no ip route <ip_address> <ip_mask> <ip_nexthop>
```

For example, run the following command to delete an entry for a static route with the destination IP address, 11.0.0.2, and the address mask, 255.255.255.255, and next-hop IP address, 192.168.10.1.

```
npu(config)# no ip route 11.0.0.2 255.255.255.255 192.168.10.1
```

**IMPORTANT**

An error may occur if a route matching the specified parameters does not exist.

**Command Syntax**

```
npu(config)# no ip route <ip_address> <ip_mask> <ip_nexthop>
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<ip_address>` | Indicates the destination host or network IP address, for which the route is to be deleted. | Mandatory | N/A | Valid IP address |
| `<ip_mask>` | Indicates the address mask for the static route to be deleted. | Mandatory | N/A | Valid address mask |
| `<ip_nexthop>` | Indicates the next hop IP address, for the route to be deleted. | Mandatory | N/A | Valid IP address |

**Command Modes**

Global configuration mode

### 4.3.8.3 Displaying the IP Routing Table

To display the IP routing table, run the following command:

```
npu# show ip route
```

**Command Syntax**

```
npu(config)# show ip route
```

**Privilege Level**

1

**Display Format**

```
<IP address/mask>         is directly connected
<IP address/mask>         is directly connected
<IP address/mask>         is directly connected
<IP address/mask>         via <Next-hop IP address>
<IP address/mask>         via <Next-hop IP address>
                          via <Next-hop IP address>
<IP address/mask>         via <Next-hop IP address>
<IP address/mask>         via <Next-hop IP address>
```

| | |
|---|---|
| **Command Modes** | Global command mode |

## 4.3.9 Configuring ACLs

ACLs are applied on traffic received from the DATA, MGMT or CSCD ports, and destined towards the following virtual interfaces:

- AUs
- NPU

By default, all traffic destined towards the AUs or NPU is denied. To enable initial access to the device, the factory default configuration includes a standard ACL (ACL 1) with a pre-configured rule permitting unrestricted access to the Local-Management interface. You can use the CLI to configure ACLs for permitting or denying traffic destined towards the NPU or AUs.

You can create the following types of ACLs:

- Standard: Allows you to filter traffic based on the source and destination IP addresses.
- Extended: Allows you to filter traffic based on the source and destination IP addresses, source and destination ports, and protocol.

**IMPORTANT**

You can use extended ACL 199 to configure QoS classification rules for classifying traffic originating from the NPU into different flows. For details, refer "Configuring QoS Marking Rules" on page 196).

You can create the following types of rules for an ACL:

- Permit: Indicates that traffic matching the filter criteria is allowed to reach the NPU or AUs.
- Deny: Indicates that traffic matching the filter criteria is dropped, and not allowed to reach the NPU or AUs.

You can configure multiple rules for each ACL; the priority for these rules is applied with respect to the sequence in which these rules are configured. After you configure an ACL, you can attach the ACL to either the NPU or the AUs or both NPU and AUs.

All ACLs are either in the ACTIVE or INACTIVE state. The ACTIVE state indicates that the ACL is attached to one or more interfaces; the INACTIVE state indicates that the ACL is not attached to any interface.

**IMPORTANT**

By default, all ACLs are INACTIVE, and are ACTIVE only after you attach the ACL  to an interface to make ACTIVE.That is, all traffic destined to the NPU or AUs is denied until you configure ACLs for permitting specific connections.

This section describes the commands for:

- "Configuring an ACL in the Standard/Extended Mode" on page 216
- "Deleting an ACL" on page 240
- "Attaching/De-attaching ACLs to/from an Interface" on page 241
- "Displaying ACL Configuration Information" on page 244

## 4.3.9.1 Configuring an ACL in the Standard/Extended Mode

You can configure an ACL in either of the following modes:

- Standard mode: Use this mode if you want to create Permit or Deny rules for traffic based on source and destination IP addresses. Extended mode: Use this mode if you want to create Permit or Deny rules with based on source and destination IP addresses, source and destination ports, protocol.

**To configure an ACL:**

1 Enable the standard or extended ACL configuration mode (refer Section 4.3.9.1.1).

2 After you enter the ACL configuration mode, you can:

   » Configure ACLs in the standard mode (refer Section 4.3.9.1.2).

   » Configure ACLs in the extended mode (refer Section 4.3.9.1.3).

3 Terminate the ACL configuration mode (refer Section 4.3.9.1.4).

4 After you have configured the ACL, you can attach the ACL with the AUs or NPU refer Section 4.3.9.3.

#### 4.3.9.1.1 Enable the ACL Configuration Mode/Creating an ACL

To configure an ACL, first enable either of the following ACL configuration modes:

- Standard
- Extended

**IMPORTANT**

ACL 199 is the default extended ACL that is pre-configured in the system, and is not attached to any interface, that is, it is INACTIVE. However, ACL 199 is reserved for QoS classification rules. You cannot configure Permit/Deny rules for ACL 199.

To view the default configuration information for ACL 199, you can run the following command:

```
npu# show access-lists 199
```

For details on using ACL 199 refer to Section 4.3.7.

To apply this ACL to traffic destined towards the AUs or the NPU, you are required to activate this ACL. (for details refer Section 4.3.9.3).

Run the following command to enable the ACL configuration mode. You can also use this command to create a new ACL.

```
npu(config)# ip access-list {standard <access-list-number (1-99)> |
extended <access-list-number (100-199)>}[name<string>]
```

When you run this command, the ACL configuration mode for the newly-created ACL is automatically enabled. If the name is not specified when creating a new ACL, the default name will be the specified ACL number.

For example, run the following command to create ACL 22 in the standard mode:

```
npu(config)# ip access-list standard 22
```

```
Standard ACL 22 will be created with the default name 22.
```

For example, run the following command to create ACL 111 in the extended mode, with the name ACL-111:

```
npu(config)# ip access-list extended 111 ACL-111
```

After you create an ACL or enable the ACL configuration mode, you can

- Configure the ACL in the standard mode (refer Section 4.3.9.1.2)

- Configuring the ACL in the extended mode (refer Section 4.3.9.1.3)

**IMPORTANT**

An error may occur if:·

- You specify an invalid ACL number. The ACL number should be between 1 and 99 in the standard mode, and between 100 and 199 in the extended mode.
- The ACL name you have specified is already used for another ACL or is more than 20 characters.

**Command Syntax**

```
npu(config)# ip access-list {standard <access-list-number (1-99)> |
extended <access-list-number (100-199)>}[name<string>]
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `standard <access-list-number (1-99)> \| extended <access-list-number (100-199)>` | Denotes the number of the standard or extended ACL that is to be created or for which the ACL configuration mode is to be enabled. If you are creating a new ACL, the ACL configuration mode is automatically enabled when you execute this command.<br>**Note**: ACL 199 is reserved for QoS classification rules and cannot be used for creating Permit/Deny rules. | Mandatory | N/A | standard 1-99<br>extended (100-198) |
| `[name<string>]` | Indicates the name of the ACL to be created or for which the ACL configuration mode is to be enabled. | Optional | ACL name | String (upto 20 characters) |

**Command Modes**

Global configuration mode

### 4.3.9.1.2 Configuring ACLs in the Standard Mode

After you have enabled the standard ACL configuration mode, you can create or delete the Permit/Deny rules for forwarding traffic from/to a particular source/destination IP address.

To enable initial access to the NPU, the Standard ACL 1 is available by default, with a Permit rule allowing unrestricted access to the Local Management interface (Destination IP Address = 172.31.0.1, Source IP Address = Any).

**IMPORTANT**

You cannot create Permit or Deny rules for an ACL that is associated with a Qos marking rule. You can either associate QoS marking rules or permit/deny rules with an ACL.

This section describes the commands for:

- "Creating a Permit/Deny Rule (Standard Mode)" on page 219
- "Deleting a Permit/Deny Rule (Standard Mode)" on page 221

**IMPORTANT**

After you have configured the rules to be applied on an ACL, you can attach the ACL to the NPU or AUs. The ACL enables filtering of traffic destined to these interfaces. For more information, refer to Section 4.3.9.3.

#### 4.3.9.1.2.1 Creating a Permit/Deny Rule (Standard Mode)

Run the following commands to create the Permit/Deny rules for forwarding traffic from/to a particular source/destination IP address:

```
npu(config-std-nacl)# permit {any | host <src-ip-address> |
<network-src-ip> <mask>} [{any | host <dest-ip-address> |
<network-dest-ip> <mask>}]
```

```
npu(config-std-nacl)# deny {any | host <src-ip-address> |
<network-src-ip> <mask>} [{any | host <dest-ip-address> |
<network-dest-ip> <mask>}]
```

**IMPORTANT**

In the above commands, it is mandatory to specify the source IP address for which the Permit/Deny rule is to be created. If you do not specify the destination IP address/subnet mask, by default, traffic to all destination IP addresses configured for the NPU is permitted/denied.

The following table lists the parameters and their descriptions in these commands.

**Table 4-16: Parameters for Configuring Permit/Deny Rules in the Standard ACL Mode**

| | Parameter | Description | Example |
|---|---|---|---|
| Source IP | any | Indicates that incoming traffic from any source IP address is permitted or denied. | **npu(config-std-nacl)# permit any**<br>**npu(config-std-nacl)# deny any** |
| | host <src-ip-address> | Indicates that incoming traffic from a specific source IP address is permitted or denied. | **npu(config-std-nacl)# permit host 1.1.1.1**<br>**npu(config-std-nacl)# deny host 1.1.1.1** |
| | <network-src-ip> <mask> | Indicates that incoming traffic is to be permitted or denied for a particular subnet. | **npu(config-std-nacl)# permit 1.1.1.0 255.255.255.0**<br>**npu(config-std-nacl)# deny 1.1.1.0 255.255.255.0** |
| Destination IP address | any | Indicates that traffic destined to all NPU IP addresses is permitted or denied. | **npu(config-std-nacl)# permit host 1.1.1.1 any**<br>**npu(config-std-nacl)# deny host 1.1.1.1 any** |
| | host <src-ip-address> | Indicates that traffic destined to a specific destination IP address is permitted or denied. | **npu(config-std-nacl)# permit any host 1.1.1.1**<br>**npu(config-std-nacl)# deny any host 1.1.1.1** |
| | <network-src-ip> <mask> | Indicates that traffic destined to a particular subnet is to be permitted or denied. | **npu(config-std-nacl)# permit any 1.1.1.0 255.255.255.0**<br>**npu(config-std-nacl)# deny any 1.1.1.0 255.255.255.0** |

**Command Syntax**

```
npu(config-std-nacl)# permit { any | host <src-ip-address> |
<network-src-ip> <mask> }  [ { any | host <dest-ip-address> |
<network-dest-ip> <mask> } ]

npu(config-std-nacl)# deny { any | host <src-ip-address> |
<network-src-ip> <mask> }  [ { any | host <dest-ip-address> |
<network-dest-ip> <mask> } ]
```

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{ any \| host <src-ip-address> \| <network-src-ip> <mask> }` | Indicates the source IP address/subnet for which incoming traffic is permitted/denied. | Mandatory | N/A | For details, refer Table 4-16 |
| `[ { any \| host <dest-ip-address> \| <network-dest-ip> <mask> } ]` | Indicates the destination IP address/subnet for which traffic is permitted/denied | Optional | any | For details, refer Table 4-16 |

**Command Modes**

Standard ACL configuration mode

### 4.3.9.1.2.2 Deleting a Permit/Deny Rule (Standard Mode)

Run the following commands to delete the Permit/Deny rule for incoming traffic from/to a specific IP address/subnet.

```
npu(config-std-nacl)# no permit {any | host <src-ip-address> |
<network-src-ip> <mask>} [{any | host <dest-ip-address> |
<network-dest-ip> <mask>}]
```

```
npu(config-std-nacl)# no deny {any | host <src-ip-address> |
<network-src-ip> <mask>} [{any | host <dest-ip-address> |
<network-dest-ip> <mask>}]
```

**Command Syntax**

```
npu(config-std-nacl)# no permit { any | host <src-ip-address> |
<network-src-ip> <mask> }  [ { any | host <dest-ip-address> |
<network-dest-ip> <mask> } ]
```

```
npu(config-std-nacl)# no deny { any | host <src-ip-address> |
<network-src-ip> <mask> }  [ { any | host <dest-ip-address> |
<network-dest-ip> <mask> } ]
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{ any \| host <src-ip-address> \| <network-src-ip> <mask> }` | Indicates the source IP address/subnet for which the Permit/Deny rule is to be deleted. | Mandatory | N/A | For details, refer Table 4-16 |
| `[ { any \| host <dest-ip-address> \| <network-dest-ip> <mask> } ]` | Indicates the destination IP address/subnet for which the Permit/Deny rule is to be deleted. | Optional | any | For details, refer Table 4-16 |

**Command Modes**

Standard ACL configuration mode

### 4.3.9.1.3 Configuring ACLs in the Extended Mode

After you have enabled the extended ACL configuration mode, you can create Permit/Deny rules based on source/destination IP address, protocol and source/destination port numbers.

**IMPORTANT**

You cannot create Permit or Deny rules for an ACL that is associated with a Qos marking rule. You can either associate QoS marking rules or permit/deny rules with an ACL.

This section describes the commands to be used for:

- "Configuring Permit/Deny Rules from/to a Specific Protocol and Source/Destination IP Addresses" on page 223
- "Configuring Permit/Deny Rules for TCP/UDP Traffic" on page 227
- "Configuring Permit/Deny Rules for ICMP Traffic" on page 236

**IMPORTANT**

After you have configured the rules to be applied on an ACL, you can attach the ACL to the NPU or AUs. The ACL enables filtering of traffic destined to these interfaces. For more information, refer to Section 4.3.9.3.

#### 4.3.9.1.3.1 Configuring Permit/Deny Rules from/to a Specific Protocol and Source/Destination IP Addresses

After you have created an ACL, you can configure Permit/Deny rules to be applied for traffic from/to a particular source/destination IP address/subnet, with respect to a specific protocol.

**IMPORTANT**

You cannot configure Permit or Deny rules for an ACL that is associated with a Qos marking rule. You can either associate QoS marking rules or permit/deny rules with an ACL.

This section describes the commands to be used for:

- "Creating a Permit/Deny Rule for Specific Protocols/IP Addresses (Extended Mode)" on page 223
- "Deleting a Permit/Deny Rule for Specific Protocols/IP Addresses (Extended Mode)" on page 226

##### *4.3.9.1.3.1.1 Creating a Permit/Deny Rule for Specific Protocols/IP Addresses (Extended Mode)*

You can create the Permit or Deny rule for traffic from/to a source/ destination IP address/subnet with respect to the following protocols:

- IP
- OSPF
- Protocol Independent Multicast (PIM)
- Any other protocol

Run the following commands to create the Permit/Deny rule for traffic from and to a specific IP address/subnet for a particular protocol:

```
npu(config-ext-nacl)# permit {ip | ospf | pim | <protocol-type
(1-255)>} {any | host <src-ip-address> | <src-ip-address> <mask>}
{any | host <dest-ip-address> | <dest-ip-address> <mask>}
```

```
npu(config-ext-nacl)# deny {ip | ospf | pim | <protocol-type
(1-255)>} {any | host <src-ip-address> | <src-ip-address> <mask>}
{any | host <dest-ip-address> | <dest-ip-address> <mask>}
```

In the above commands, it is mandatory to specify the protocol and source IP address for which the Permit/Deny rule is to be created. If you do not specify the destination IP address/subnet mask, by default, traffic to all destination IP addresses is permitted/denied.

The following table lists the parameters and their descriptions in these commands:

**Table 4-17: Parameters for Configuring Permit/Deny Rules for Traffic from/to Specific IP Addresses**

| | Parameter | Description | Example |
|---|---|---|---|
| Protocol | `ip` | Indicates that the Permit/Deny rule to be created is to be applied for the IP-in-IP packets. | **`npu(config-ext-nacl)# permit ip any`** |
| | `ospf` | Indicates that the Permit/Deny rule to be created is to be applied to OSPF packets. | **`npu(config-ext-nacl)# permit ospf any`** |
| | `pim` | Indicates that the Permit/Deny rule to be created is to be applied to the PIM packets. | **`npu(config-ext-nacl)# permit pim any`** |
| | `<protocol-type (1-255)>` | Indicates that the Permit/Deny rule to be created is to be applied to traffic from/to any protocol (other than IP, OSPF, PIM). Use standard IANA values to specify the values of these protocols | **`npu(config-ext-nacl)# permit 11 any`** |
| Source IP address | `any` | Indicates that incoming traffic from any source IP address is permitted or denied. | **`npu(config-std-nacl)# permit ip any`**<br>**`npu(config-std-nacl)# deny ip any`** |
| | `host <src-ip-address>` | Indicates that incoming traffic from a specific source IP address is permitted or denied. | **`npu(config-std-nacl)# permit ip host 1.1.1.1`**<br>**`npu(config-std-nacl)# deny ip host 1.1.1.1`** |
| | `<network-src-ip> <mask>` | Indicates that incoming traffic is to be permitted or denied for a particular source IP address and subnet mask. | **`npu(config-std-nacl)# permit ip  1.1.1.0 255.255.255.0`**<br>**`npu(config-std-nacl)# deny ip  1.1.1.0 255.255.255.0`** |

**Table 4-17: Parameters for Configuring Permit/Deny Rules for Traffic from/to Specific IP Addresses**

| | Parameter | Description | Example |
|---|---|---|---|
| Destination IP address | any | Indicates that traffic to any destination IP address is permitted or denied. any is the default destination IP address. | `npu(config-std-nacl)# permit ip host 1.1.1.1  any`<br>`npu(config-std-nacl)# deny ip host 1.1.1.1  any` |
| | host <dst-ip-address> | Indicates that traffic destined to a specific destination IP address is permitted or denied. | `npu(config-std-nacl)# permit ip  any host 1.1.1.1`<br>`npu(config-std-nacl)# deny ip any host 1.1.1.1` |
| | <network-dst-ip> <mask> | Indicates that traffic destined to a particular subnet is to be permitted or denied. | `npu(config-std-nacl)# permit ip  any  1.1.1.0 255.255.255.0`<br>`npu(config-std-nacl)# deny ip  any  1.1.1.0 255.255.255.0` |

**Command Syntax**

```
npu(config-ext-nacl)# permit { ip | ospf | pim | <protocol-type (1-255)>}
{ any | host <src-ip-address> | <src-ip-address> <mask> } { any | host
<dest-ip-addresq> | <dest-ip-address> <mask> }

npu(config-ext-nacl)# deny { ip | ospf | pim | <protocol-type (1-255)>} {
any | host <src-ip-address> | <src-ip-address> <mask> } { any | host
<dest-ip-addresq> | <dest-ip-address> <mask> }
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| { ip \| ospf \| pim \| <protocol-type (1-255)>} | Indicates the type of protocol for which incoming traffic is permitted. | Mandatory | N/A | For details, refer Table 4-17 |
| { any \| host <src-ip-address> \| <src-ip-address> <mask> } | Indicates the source IP address/subnet for which incoming traffic is permitted/denied. | Mandatory | N/A | For details, refer Table 4-17 |

| | | | | |
|---|---|---|---|---|
| `{ any \| host <dest-ip-addresq> \| <dest-ip-address> <mask> }` | Indicates the destination IP address/subnet for which traffic is permitted/denied | Optional | any | For details, refer Table 4-17 |

**Command Modes** Extended ACL configuration mode

### 4.3.9.1.3.1.2 Deleting a Permit/Deny Rule for Specific Protocols/IP Addresses (Extended Mode)

Run the following commands to delete the Permit/Deny rule for traffic from to a specific IP address/subnet for a particular protocol:

```
npu(config-ext-nacl)# no permit {ip | ospf | pim | <protocol-type
(1-255)>} {any | host <src-ip-address> | <src-ip-address> <mask>}
{any | host <dest-ip-address> | <dest-ip-address> <mask>}
```

```
npu(config-ext-nacl)# no deny {ip | ospf | pim | <protocol-type
(1-255)>} {any | host <src-ip-address> | <src-ip-address> <mask>}
{any | host <dest-ip-address> | <dest-ip-address> <mask>}
```

**Command Syntax**

```
npu(config-ext-nacl)# no permit { ip | ospf | pim | <protocol-type
(1-255)>} { any | host <src-ip-address> | <src-ip-address> <mask> } { any
| host <dest-ip-addresq> | <dest-ip-address> <mask> }
```

```
npu(config-ext-nacl)# no deny { ip | ospf | pim | <protocol-type (1-255)>}
{ any | host <src-ip-address> | <src-ip-address> <mask> } { any | host
<dest-ip-addresq> | <dest-ip-address> <mask> }
```

**Privilege Level** **10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{ ip \| ospf \| pim \| <protocol-type (1-255)>}` | Indicates the type of protocol for which the Permit/Deny rule is to be deleted. | Mandatory | N/A | For details, refer Table 4-17 |

| | | | | |
|---|---|---|---|---|
| `{ any | host <src-ip-address> | <src-ip-address> <mask> }` | Indicates the source IP address/subnet for which the Permit/Deny rule is to be deleted. | Mandatory | N/A | For details, refer Table 4-17 |
| `{ any | host <dest-ip-addresq> | <dest-ip-address> <mask> }` | Indicates the destination IP address/subnet for which the Permit/Deny rule is to be deleted. | Optional | any | For details, refer Table 4-17 |

**Command Modes** Extended ACL configuration mode

### 4.3.9.1.3.2 Configuring Permit/Deny Rules for TCP/UDP Traffic

After you have created an ACL, you can configure Permit/Deny rules for TCP and UDP traffic from/to specific source and destination IP address and port.

**IMPORTANT**

You cannot configure Permit or Deny rules for an ACL that is associated with a Qos marking rule. You can either associate QoS marking rules or permit/deny rules with an ACL.

This section describes the commands to be used for:

- "Creating a Permit/Deny Rule for TCP/UDP Traffic (Extended Mode)" on page 227
- "Deleting a Permit/Deny Rule for TCP/UDP Traffic (Extended Mode)" on page 233

#### *4.3.9.1.3.2.1 Creating a Permit/Deny Rule for TCP/UDP Traffic (Extended Mode)*

Run the following commands to specify the Permit rule for TCP/UDP traffic from/to a specific source/destination IP address/port:

```
npu(config-ext-nacl)# permit tcp {any | host <src-ip-address> |
<src-ip-address> <src-mask>} [{gt <port-number (1-65535)> | lt
<port-number (1-65535)> |eq <port-number (1-65535)> | range
<port-number (1-65535)> <port-number (1-65535)>}] {any | host
<dest-ip-address> | <dest-ip-address> <dest-mask>} {gt <port-number
(1-65535)>   | lt <port-number (1-65535)> | eq <port-number
(1-65535)> | range <port-number (1-65535)> <port-number
(1-65535)>}]
```

```
npu(config-ext-nacl)# permit udp {any | host <src-ip-address> |
<src-ip-address> <src-mask>} [{gt <port-number (1-65535)> | lt
<port-number (1-65535)> |eq <port-number (1-65535)> | range
<port-number (1-65535)> <port-number (1-65535)>}] {any | host
<dest-ip-address> | <dest-ip-address> <dest-mask>} {gt <port-number
(1-65535)>   | lt <port-number (1-65535)> | eq <port-number
(1-65535)> | range <port-number (1-65535)> <port-number
(1-65535)>}]
```

Run the following commands to specify the Deny rule for TCP/UDP traffic from/to a specific source/destination IP address/port:

```
npu(config-ext-nacl)# deny tcp {any | host <src-ip-address> |
<src-ip-address> <src-mask>} [{gt <port-number (1-65535)> | lt
<port-number (1-65535)> |eq <port-number (1-65535)> | range
<port-number (1-65535)> <port-number (1-65535)>}] {any | host
<dest-ip-address> | <dest-ip-address> <dest-mask>} {gt <port-number
(1-65535)>   | lt <port-number (1-65535)> | eq <port-number
(1-65535)> | range <port-number (1-65535)> <port-number
(1-65535)>}]
```

```
npu(config-ext-nacl)# deny udp {any | host <src-ip-address> |
<src-ip-address> <src-mask>} [{gt <port-number (1-65535)> | lt
<port-number (1-65535)> |eq <port-number (1-65535)> | range
<port-number (1-65535)> <port-number (1-65535)>}] {any | host
<dest-ip-address> | <dest-ip-address> <dest-mask>} {gt <port-number
(1-65535)>   | lt <port-number (1-65535)> | eq <port-number
(1-65535)> | range <port-number (1-65535)> <port-number
(1-65535)>}]
```

In the above commands, it is mandatory to specify the source and destination IP address for which the Permit/Deny rule is to be created.

**IMPORTANT**

To increase the granularity of the Permit/Deny rule you are creating, specify the source and destination port numbers for the source and destination IP addresses.

The following table lists the parameters and their descriptions in these commands:

**Table 4-18: Parameters for Configuring Permit/Deny Rules for TCP/UDP Traffic**

| | Parameter | Description | Example |
|---|---|---|---|
| Source IP address | `any` | Indicates that incoming TCP/UDP traffic from any source IP address is permitted or denied. | **`npu(config-ext-nacl)# permit tcp any any`**<br>**`npu(config-ext-nacl)# deny udp any`** |
| | `host <src-ip-address>` | Indicates that incoming TCP/UDP traffic from a specific source IP address is permitted or denied. | **`npu(config-ext-nacl)# permit tcp host 1.1.1.1 any`**<br>**`npu(config-ext-nacl)# deny udp host 1.1.1.1`** |
| | `<network-src-ip> <mask>` | Indicates that incoming TCP/UDP traffic is to be permitted or denied for a particular subnet. | **`npu(config-ext-nacl)# permit tcp 1.1.1.0 255.255.255.0 any`**<br>**`npu(config-ext-nacl)# deny udp 1.1.1.0 255.255.255.0`** |
| Source port | `[{gt <port-number (1-65535)>` | Indicates that incoming TCP/UDP traffic is to be permitted or denied from the source port for which the port number is greater than the value of this parameter. | **`npu(config-ext-nacl)# permit tcp 1.1.1.0 255.255.255.0 gt 1111`**<br>**`npu(config-ext-nacl)# deny udp host 1.1.1.1 gt 1010`** |
| | `[{lt <port-number (1-65535)>` | Indicates that incoming TCP/UDP traffic is to be permitted or denied from the source port for which the port number is less than the value of this parameter. | **`npu(config-ext-nacl)# permit tcp 1.1.1.0 255.255.255.0 lt 1111`**<br>**`npu(config-ext-nacl)# deny udp host 1.1.1.1 lt 1010`** |
| | `[{eq <port-number (1-65535)>` | Indicates that incoming TCP/UDP traffic is to be permitted or denied from the source port for which the port number is equal to the value of this parameter. | **`npu(config-ext-nacl)# permit tcp 1.1.1.0 255.255.255.0 eq 8080`**<br>**`npu(config-ext-nacl)# deny udp host 1.1.1.1 eq 4040`** |
| | `range <port-number (1-65535)> <port-number (1-65535)> }]` | Indicates that incoming TCP/UDP traffic is to be permitted or denied from the source port for which the port number is within the range specified by this parameter. | **`npu(config-ext-nacl)# permit tcp 1.1.1.0 255.255.255.0 range 1010 8080`**<br>**`npu(config-ext-nacl)# deny udp host 1.1.1.1 range 1010 4040`** |

**Table 4-18: Parameters for Configuring Permit/Deny Rules for TCP/UDP Traffic**

| | Parameter | Description | Example |
|---|---|---|---|
| Destination IP address | `any` | Indicates that TCP/UDP traffic to all NPU interface IP addresses is permitted or denied. | **`npu(config-ext-nacl)# permit tcp 1.1.1.1 host any`**<br>**`npu(config-ext-nacl)# deny udp any any`** |
| | `host <src-ip-address>` | Indicates that TCP/UDP traffic to a specific NPU interface IP address is permitted or denied. | **`npu(config-ext-nacl)# permit tcp any host 1.1.1.1 host host 1.1.1.1`**<br>**`npu(config-ext-nacl)# deny udp any host 1.1.1.1`** |
| | `<network-src-ip> <mask>` | Indicates that TCP/UDP traffic is to be permitted or denied for a particular NPU interface subnet. | **`npu(config-ext-nacl)# permit tcp any host 1.1.1.0 255.255.255.0`**<br>**`npu(config-ext-nacl)# deny udp any host 1.1.1.0 255.255.255.0`** |

**Table 4-18: Parameters for Configuring Permit/Deny Rules for TCP/UDP Traffic**

| | Parameter | Description | Example |
|---|---|---|---|
| Destination port | `[{gt <port-number (1-65535)>` | Indicates that TCP/ UDPtraffic is to be permitted or denied to the NPU interface source port for which the port number is greater than the value of this parameter. | **npu(config-ext-nacl)# permit tcp host 1.1.1.1 host any gt 8080**<br>**npu(config-ext-nacl)# deny udp any any** |
| | `[{lt <port-number (1-65535)>` | Indicates that TCP/ UDP traffic is to be permitted or denied to the NPU interface source port for which the port number is less than the value of this parameter. | **npu(config-ext-nacl)# permit tcp host 1.1.1.0 255.255.255.0 any lt 1111**<br>**npu(config-ext-nacl)# deny udp any host 1.1.1.1 lt 1010** |
| | `[{eq <port-number (1-65535)>` | Indicates that TCP/ UDP traffic is to be permitted or denied to the NPU interface source port for which the port number is equal to the value of this parameter. | **npu(config-ext-nacl)# permit tcp any 1.1.1.0 255.255.255.0 eq 8080**<br>**npu(config-ext-nacl)# deny udp any host 1.1.1.1 eq 4040** |
| | `range <port-number (1-65535)> <port-number (1-65535)> }]` | Indicates that TCP/ UDP traffic is to be permitted or denied the NPU interface source port for which the port number is within the range specified by this parameter. | **npu(config-ext-nacl)# permit tcp host 1.1.1.1 host 1.1.1.0 255.255.255.0 range 1010 8080**<br>**npu(config-ext-nacl)# deny udp host 1.1.1.1 any range 1010 4040** |

**Command Syntax**

```
npu(config-ext-nacl)# deny tcp {any | host <src-ip-address> |
<src-ip-address> <src-mask> } [{gt <port-number (1-65535)>  | lt
<port-number (1-65535)> |eq <port-number (1-65535)>  | range <port-number
(1-65535)> <port-number (1-65535)>}] {any | host <dest-ip-address> |
<dest-ip-address> <dest-mask>} {gt <port-number (1-65535)>   | lt
<port-number (1-65535)> | eq <port-number (1-65535)>  | range
<port-number (1-65535)> <port-number (1-65535)>}]
```

```
npu(config-ext-nacl)# deny udp {any | host <src-ip-address> |
<src-ip-address> <src-mask> } [{gt <port-number (1-65535)>  | lt
<port-number (1-65535)> |eq <port-number (1-65535)>  | range <port-number
(1-65535)> <port-number (1-65535)>}] {any | host <dest-ip-address> |
<dest-ip-address> <dest-mask>} {gt <port-number (1-65535)>   | lt
<port-number (1-65535)> | eq <port-number (1-65535)>  | range
<port-number (1-65535)> <port-number (1-65535)>}]
```

**Privilege Level** `10`

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `any \| host <src-ip-address> \| <src-ip-address> <src-mask>` | Indicates the source host for which incoming TCP/UDP traffic is permitted/denied. | Mandatory | N/A | For details, refer Table 4-18 |
| `[{gt <port-number (1-65535)> \| lt <port-number (1-65535)> \|eq <port-number (1-65535)> \| range <port-number (1-65535)> <port-number (1-65535)>}]` | Indicates the source port from which incoming TCP/UDP traffic is permitted/denied. | Optional | 0-65535 | For details, refer Table 4-18 |
| `any \| host <dest-ip-address> \| <dest-ip-address> <dest-mask>` | Indicates the destination IP address/subnet for which TCP/UDP traffic is permitted/denied. | Mandatory | N/A | For details, refer Table 4-18 |

| | | | | |
|---|---|---|---|---|
| {gt <port-number (1-65535)> \| lt <port-number (1-65535)> \| eq <port-number (1-65535)> \| range <port-number (1-65535)> <port-number (1-65535)>}] | Indicates the destination port to which TCP/UDP traffic is permitted/denied. | Optional | 0-65535 | For details, refer Table 4-18 |

**Command Modes**

Extended ACL configuration mode

### 4.3.9.1.3.2.2 Deleting a Permit/Deny Rule for TCP/UDP Traffic (Extended Mode)

Run the following commands to delete a Permit rule for TCP/UDP traffic from/to a specific IP address/port:

```
npu(config-ext-nacl)# no permit tcp {any | host <src-ip-address> |
<src-ip-address> <src-mask>} [{gt <port-number (1-65535)> | lt
<port-number (1-65535)> |eq <port-number (1-65535)> | range
<port-number (1-65535)> <port-number (1-65535)>}] {any | host
<dest-ip-address> | <dest-ip-address> <dest-mask>} {gt <port-number
(1-65535)>   | lt <port-number (1-65535)> | eq <port-number
(1-65535)> | range <port-number (1-65535)> <port-number
(1-65535)>}]
```

```
npu(config-ext-nacl)# no permit udp {any | host <src-ip-address> |
<src-ip-address> <src-mask>} [{gt <port-number (1-65535)> | lt
<port-number (1-65535)> |eq <port-number (1-65535)> | range
<port-number (1-65535)> <port-number (1-65535)>}] {any | host
<dest-ip-address> | <dest-ip-address> <dest-mask>} {gt <port-number
(1-65535)>   | lt <port-number (1-65535)> | eq <port-number
(1-65535)> | range <port-number (1-65535)> <port-number
(1-65535)>}]
```

Run the following commands to delete a Deny rule for TCP/UDP traffic from/to a specific IP address/port:

```
npu(config-ext-nacl)# no deny tcp {any | host <src-ip-address> |
<src-ip-address> <src-mask>} [{gt <port-number (1-65535)> | lt
<port-number (1-65535)> |eq <port-number (1-65535)> | range
<port-number (1-65535)> <port-number (1-65535)>}] {any | host
<dest-ip-address> | <dest-ip-address> <dest-mask>} {gt <port-number
(1-65535)>   | lt <port-number (1-65535)> | eq <port-number
(1-65535)> | range <port-number (1-65535)> <port-number
(1-65535)>}]
```

```
npu(config-ext-nacl)# no deny udp {any | host <src-ip-address> |
<src-ip-address> <src-mask>} [{gt <port-number (1-65535)> | lt
<port-number (1-65535)> |eq <port-number (1-65535)> | range
<port-number (1-65535)> <port-number (1-65535)>}] {any | host
<dest-ip-address> | <dest-ip-address> <dest-mask>} {gt <port-number
(1-65535)>   | lt <port-number (1-65535)> | eq <port-number
(1-65535)> | range <port-number (1-65535)> <port-number
(1-65535)>}]
```

**Command Syntax (for Permit Rule)**

```
npu(config-ext-nacl)# no permit tcp {any | host <src-ip-address> |
<src-ip-address> <src-mask> } [{gt <port-number (1-65535)>  | lt
<port-number (1-65535)> |eq <port-number (1-65535)>  | range <port-number
(1-65535)> <port-number (1-65535)>}] {any | host <dest-ip-address> |
<dest-ip-address> <dest-mask>} {gt <port-number (1-65535)>   | lt
<port-number (1-65535)> | eq <port-number (1-65535)>  | range
<port-number (1-65535)> <port-number (1-65535)>}]
```

```
npu(config-ext-nacl)# no permit udp {any | host <src-ip-address> |
<src-ip-address> <src-mask> } [{gt <port-number (1-65535)>  | lt
<port-number (1-65535)> |eq <port-number (1-65535)>  | range <port-number
(1-65535)> <port-number (1-65535)>}] {any | host <dest-ip-address> |
<dest-ip-address> <dest-mask>} {gt <port-number (1-65535)>   | lt
<port-number (1-65535)> | eq <port-number (1-65535)>  | range
<port-number (1-65535)> <port-number (1-65535)>}]
```

**Command Syntax (for Deny Rule)**

```
npu(config-ext-nacl)# no deny tcp {any | host <src-ip-address> |
<src-ip-address> <src-mask> } [{gt <port-number (1-65535)>  | lt
<port-number (1-65535)> |eq <port-number (1-65535)>  | range <port-number
(1-65535)> <port-number (1-65535)>}] {any | host <dest-ip-address> |
<dest-ip-address> <dest-mask>} {gt <port-number (1-65535)>   | lt
<port-number (1-65535)> | eq <port-number (1-65535)>  | range
<port-number (1-65535)> <deny-number (1-65535)>}]
```

```
npu(config-ext-nacl)# no deny udp {any | host <src-ip-address> |
<src-ip-address> <src-mask> } [{gt <port-number (1-65535)>  | lt
<port-number (1-65535)> |eq <port-number (1-65535)>  | range <port-number
(1-65535)> <port-number (1-65535)>}] {any | host <dest-ip-address> |
<dest-ip-address> <dest-mask>} {gt <port-number (1-65535)>   | lt
<port-number (1-65535)> | eq <port-number (1-65535)>  | range
<port-number (1-65535)> <port-number (1-65535)>}]
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| any \| host <src-ip-address> \| <src-ip-address> <src-mask> | Indicates the source host for which the Permit/Deny rule for incoming TCP/UDP traffic is to be deleted. | Mandatory | N/A | For details, refer Table 4-18 |
| [{gt <port-number (1-65535)> \| lt <port-number (1-65535)> \|eq <port-number (1-65535)> \| range <port-number (1-65535)> <port-number (1-65535)>}] | Indicates the source port for which the Permit/Deny rule for incoming TCP/UDP traffic is to be deleted. | Optional | 1-65535 | For details, refer Table 4-18 |

| | | | | |
|---|---|---|---|---|
| `any \| host <dest-ip-address> \| <dest-ip-address> <dest-mask>` | Indicates the NPU IP address/subnet for which the Permit/Deny rule for TCP/UDP traffic is to be deleted. | Mandatory | N/A | For details, refer Table 4-18 |
| `[{gt <port-number (1-65535)> \| lt <port-number (1-65535)> \|eq <port-number (1-65535)> \| range <port-number (1-65535)> <port-number (1-65535)>}]` | Indicates the NPU interface port for which the Permit/Deny rule for incoming TCP/UDP traffic is to be deleted. | Optional | 1-65535 | For details, refer Table 4-18 |

**Command Modes**

Extended ACL configuration mode

### 4.3.9.1.3.3 Configuring Permit/Deny Rules for ICMP Traffic

After you have created an ACL, you can configure Permit/Deny rules for ICMP traffic from/to specific a source and destination IP address/subnet.

**IMPORTANT**

You cannot configure Permit or Deny rules for an ACL that is associated with a Qos marking rule. You can either associate QoS marking rules or permit/deny rules with an ACL.

This section describes the commands to be used for:

- "Creating a Permit/Deny Rule for ICMP Traffic (Extended Mode)" on page 236
- "Deleting a Permit/Deny Rule for ICMP Traffic (Extended Mode)" on page 239

#### *4.3.9.1.3.3.1 Creating a Permit/Deny Rule for ICMP Traffic (Extended Mode)*

Run the following commands to specify the Permit/Deny rule for ICMP traffic from/to a specific source/destination IP address/subnet:

```
npu(config-ext-nacl)# permit icmp {any | host <src-ip-address> |
<src-ip-address> <mask>} {any | host <dest-ip-address> |
<dest-ip-address> <mask>}
```

```
npu(config-ext-nacl)# deny icmp {any | host <src-ip-address> |
<src-ip-address> <mask>} {any | host <dest-ip-address> |
<dest-ip-address> <mask>}
```

In the above commands, it is mandatory to specify the source IP address for which the Permit/Deny rule is to be created. If you do not specify the destination IP address/subnet mask, by default, traffic to all destination IP addresses is permitted/denied.

The following table lists the parameters and their descriptions in these commands:

**Table 4-19: Parameters for Configuring Permit/Deny Rules for ICMP Traffic**

| | Parameter | Description | Example |
|---|---|---|---|
| Source IP | any | Indicates that incoming ICMP traffic from any source IP address is permitted or denied. | **npu(config-ext-nacl)#permit icmp any**<br>**npu(config-ext-nacl)#deny icmp any** |
| | host <src-ip-address> | Indicates that incoming ICMP traffic from a specific source IP address is permitted or denied. | **npu(config-ext-nacl)#permit icmp host 1.1.1.1**<br>**npu(config-ext-nacl)#deny icmp host 1.1.1.1** |
| | <network-src-ip> <mask> | Indicates that incoming ICMP traffic is to be permitted or denied for a particular subnet. | **npu(config-ext-nacl)#permit icmp 1.1.1.0 255.255.255.0**<br>**npu(config-ext-nacl)#deny icmp host 1.1.1.0 255.255.255.0** |

Table 4-19: Parameters for Configuring Permit/Deny Rules for ICMP Traffic

| | Parameter | Description | Example |
|---|---|---|---|
| Destination IP address | any | Indicates that ICMP traffic destined to the NPU interface IP address is permitted or denied. | **npu(config-ext-nacl)#permit icmp host 1.1.1.1 any**<br>**npu(config-std-nacl)# deny host 1.1.1.1 host any** |
| | host <src-ip-address> | Indicates that ICMP traffic destined to the NPU interface destination IP address is permitted or denied. | **npu(config-std-nacl)# permit host any host 1.1.1.1**<br>**npu(config-ext-nacl)#deny icmp any host 1.1.1.1** |
| | <network-src-ip> <mask> | Indicates that ICMP traffic to the NPU interface subnet is to be permitted or denied. | **npu(config-ext-nacl)#permit icmp host any host 1.1.1.0 255.255.255.0**<br>**npu(config-ext-nacl)#deny icmp host any host 1.1.1.0 255.255.255.0** |

**Command Syntax**

```
npu(config-ext-nacl)# permit icmp { any | host <src-ip-address> |
<src-ip-address> <mask> }  { any | host <dest-ip-address> |
<dest-ip-address> <mask> }

npu(config-ext-nacl)# deny icmp { any | host <src-ip-address> |
<src-ip-address> <mask> }  { any | host <dest-ip-address> |
<dest-ip-address> <mask> }
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| { any \| host <src-ip-address> \| <src-ip-address> <mask> } | Indicates the source IP address/subnet for which incoming ICMP traffic is permitted/denied. | Mandatory | N/A | For details Table 4-19 |
| { any \| host <dest-ip-address> \| <dest-ip-address> <mask> } | Indicates the destination IP address/subnet for which ICMP traffic is permitted/denied. | Optional | any | For details Table 4-19 |

**Command Modes**

Global command mode

### 4.3.9.1.3.3.2 Deleting a Permit/Deny Rule for ICMP Traffic (Extended Mode)

Run the following commands to delete a Permit/Deny rule for ICMP traffic from/to a specific IP address/subnet:

```
npu(config-ext-nacl)# no permit icmp {any | host <src-ip-address> |
<src-ip-address> <mask>} {any | host <dest-ip-address> |
<dest-ip-address> <mask>}
```

```
npu(config-ext-nacl)# no deny icmp {any | host <src-ip-address> |
<src-ip-address> <mask>} {any | host <dest-ip-address> |
<dest-ip-address> <mask>}
```

**Command Syntax**

```
npu(config-ext-nacl)# no permit icmp { any | host <src-ip-address> |
<src-ip-address> <mask> }  { any | host <dest-ip-address> |
<dest-ip-address> <mask> }
```

```
npu(config-ext-nacl)# no deny icmp { any | host <src-ip-address> |
<src-ip-address> <mask> }  { any | host <dest-ip-address> |
<dest-ip-address> <mask> }
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{ any \| host <src-ip-address> \| <src-ip-address> <mask> }` | Indicates the source IP address/subnet for which the Permit/Deny rule for incoming ICMP traffic is to be deleted. | Mandatory | N/A | For details Table 4-19 |
| `{ any \| host <dest-ip-address> \| <dest-ip-address> <mask> }` | Indicates the destination IP address/subnet for which the Permit/Deny rule for ICMP traffic is to be deleted. | Optional | any | For details Table 4-19 |

**Command Modes**

Extended ACL configuration mode

#### 4.3.9.1.4 Terminating the ACL Configuration Mode

To terminate the standard ACL configuration mode and return to the global configuration mode, run the following command:

```
npu(config-std-nacl)# exit
```

To exit the extended ACL configuration mode and return to the global configuration mode, run the following command:

```
npu(config-ext-nacl)# exit
```

| | |
|---|---|
| **Command Syntax** | **npu(config-std-nacl)# exit**<br>**npu(config-ext-nacl) # exit** |
| **Privilege Level** | 10 |
| **Command Modes** | Standard/Extended ACL configuration mode |

### 4.3.9.2 Deleting an ACL

**To delete an ACL:**

1 Check if the ACL is attached to the interface. For more information about this command, refer Section 4.3.9.4.

2 Enable the interface configuration mode and de-attach the ACL. For details, refer Section 4.3.9.3.

3 Terminate the interface configuration mode to return to the global configuration mode (refer Section 4.3.9.3.4).

4 Run the following command to delete the ACL:

```
npu(config)# no ip access-list {standard <access-list-number
(1-99)> | extended <access-list-number (100-199)>}
```

**IMPORTANT**

An error may occur if:

- The ACL you are trying to delete is INACTIVE.
- The ACL number you have specified does not exist.

**Command Syntax**

```
npu(config)# no ip access-list {standard <access-list-number (1-99)> |
extended <access-list-number (100-199)>}
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{ standard <access-list-number (1-99)> \| extended <access-list-number (100-199)> }` | Indicates the ACL number of the standard or extended ACL to be deleted. | Mandatory | N/A | ■ Standard (1-99)<br>■ Extended (100-199) |

**Command Modes**

Global configuration mode

### 4.3.9.3 Attaching/De-attaching ACLs to/from an Interface

You can attach or de-attach an ACL to/from the following virtual interfaces.

- NPU
- All the AU interfaces

When an ACL is attached to an interface, it is in the ACTIVE state; it is in the INACTIVE state when it is de-attached from an interface.

To enable initial access to the NPU, the Standard ACL 1 is available by default, with a Permit rule allowing unrestricted access to the Local Management interface (Destination IP Address = 172.31.0.1, Source IP Address = Any). By default this ACL is attached to both the NPU and AUs.

**To attach/de-attach an ACL:**

1 Enable the interface configuration mode (refer Section 4.3.9.3.1).

2 You can now execute either of the following tasks:

   » Attach an ACL to an interface (refer Section 4.3.9.3.2).

   » De-attach an ACL from an interface (refer Section 4.3.9.3.3).

3 Terminate the interface configuration mode (refer Section 4.3.9.3.4).

### 4.3.9.3.1 Enabling the Interface Configuration Mode

ACLs are applied on traffic received from the DATA, MGMT or CSCD ports, and destined towards the following virtual interfaces:

- AUs
- NPU

By default, all traffic destined towards the AUs or the NPU is denied. Apply specific Permit ACLs to allow traffic to reach the AUs or the NPU. Run the following command to enable the interface configuration mode for the NPU:

```
npu(config)# interface npu-host
```

Run the following command to enable the interface configuration mode for all AUs:

```
npu(config)# interface all-au
```

After you have enabled the interface configuration mode, you can:

- Attach an ACL to an interface (Section 4.3.9.3.2)
- De-attach an ACL from an interface (Section 4.3.9.3.3)

### 4.3.9.3.2 Attaching an ACL to an interface

After you have enabled the interface configuration mode, run the following command to attach an ACL with an interface:

```
npu(config-if)# ip access-group {<access-list-number (1-199)> |
<access-list-name>}
```

**IMPORTANT**

An error may occur if:

- The ACL number/name that you have specified does not exist or is already attached to this interface.
- You are trying to attach an ACL to an interface (other than the NPU/all AUs).

**Command Syntax**

```
npu(config-if)# ip access-group {<access-list-number (1-199)> |
<access-list-name>}
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| {<access-list-number (1-199)> \| <access-list-name>} | Indicates the number or name of the ACL to be attached to this interface. | Mandatory | N/A | ■ 1-99<br>■ String |

**Command Modes**

Interface configuration mode

### 4.3.9.3.3 Deattaching an ACL from an Interface

Run the following command to de-attach an ACL from an interface:

```
npu(config-if)# no ip access-group {<access-list-number (1-199)> |
<access-list-name>}
```

**IMPORTANT**

An error may occur if the ACL number/name that you have specified does not exist or is already attached to this interface.

**Command Syntax**

```
npu(config-if)# no ip access-group {<access-list-number (1-199)> |
<access-list-name>}
```

**Privilege Level**

**10**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{<access-list-number (1-199)> \| <access-list-name>}` | Indicates the number/name of the ACL to be deattached from this interface. | Mandatory | N/A | ■ 1-99<br>■ String |

**Command Modes**

Interface configuration mode

### 4.3.9.3.4 Terminating the Interface Configuration Mode

To exit the interface configuration mode and return to the global configuration mode, run the following command:

```
npu(config-if)# exit
```

**Command Syntax**

```
npu(config-if)# exit
```

**Privilege Level**

10

**Command Modes**

Interface configuration mode

## 4.3.9.4 Displaying ACL Configuration Information

Run the following command to display the configuration information for a specific ACL:

```
npu# show access-lists [{<access-list-number (1-199)> |
<access-list-name}]
```

**IMPORTANT**

An error may occur if the ACL number/name you have specified does not exist.

**Command Syntax**

```
npu# show access-lists [{<access-list-number (1-199)> |
<access-list-name}]
```

**Privilege Level**

**1**

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[{<access-list-number (1-199)> \| <access-list-name}]` | Indicates the number or name of the ACL for which configuration information is to be displayed. If you do not provide the ACL number or name, configuration information is displayed for all ACLs. | Optional | N/A | ■ 1-199<br>■ String |

**Display Format (Standard)**

```
Standard IP Access List                 <ACL number>

---------------------------------------------------------------------

Access List Name(Alias)             :<ACL Name>

Interface List                      : <Interface Name>, <Interface Name>

Status                              : <value>

Source IP address                   : <value>

Source IP address mask              : <value>

Destination IP address              : <value>

Destination IP address mask         : <value>

Rule Action                         : <value>

Packet Match Count                  : <value>

Rule Row Status                     : <value>
```

**Display Format (Extended)**

```
Extended IP Access List          <ACL Number>
-----------------------------
Access List Name(Alias)          : <ACL Name>
Interface List                   : <Interface>, <Interface>
Status                           : <value>
Filter Protocol Type             : <value>
Source IP address                : <value>
Filter Source Port               : <value>
Rule Action                      : <value>
QoS Classifier ID                : <value>
Marking rule status              : <value>
```

**Command Modes**

Global command mode

## 4.3.10 Configuring the ASN-GW Functionality

**IMPORTANT**

Execute the procedures described in this section only if you are operating the NPU in the ASN-GW mode. Skip this section if you are operating the NPU in the Transparent mode.

The ASN-GW functionality indicates that the NPU executes the following functions:

- Network Decision Point (NWDP): Includes the following non-bearer plane functions:
  - Implementation of EAP Authenticator and AAA client
  - Termination of RADIUS protocol against the selected CSN AAA server (home or visited AAA server) for MS authentication and per-MS policy profile retrieval
  - Storage of the MS policy profile for as long as the MS is authenticated/authorized and remains in the ASN controlled by the specific ASN-GW
  - Generation of authentication key material
  - QoS service flow authorization entity
  - AAA accounting client
- Network Enforcement Point (NWEP) functions: Includes the following bearer plane functions:
  - Classification of downlink data into generic routing encapsulation (GRE) tunnels
  - Packet header suppression functionality
  - DHCP functionality
  - Handover functionality

The ASN-GW functionality is disabled if you are operating the NPU in the Transparent mode. If you are operating the NPU in the ASN-GW mode, you can choose to operate the NPU in either of the following modes:

- With HA support, that is, MIP services are implemented (not supported in the current release)
- Without HA support, that is, MIP services are not implemented.

**IMPORTANT**

The ASN-GW mode with HA support is not implemented because MIP services are not supported in the current release.

The following table lists the tasks for configuring the ASN-GW functionality.

Table 4-20: Tasks to be Executed for Configuring the ASN-GW Functionality

| Task | Required for Operating the NPU with HA Support | Required for Operating the NPU without HA Support |
|---|---|---|
| "Configuring the Next-hop IP Address-Network ID Mapping" on page 249 | Yes | Yes |
| "Configuring the IGMP Functionality" on page 252<br>**Note**: This feature is not supported in the current release. | Yes | Yes |
| "Configuring the MIP-Foreign Agent Functionality" on page 256<br>**Note**: This feature is not supported in the current release. | Yes | No |
| "Configuring the Proxy-MIP Client Functionality" on page 258<br>**Note**: This feature is not supported in the current release. | Yes | No |
| "Configuring the ASN Interface" on page 261 | Yes | Yes |
| "Managing the Authenticator Function" on page 263 | Yes | Yes |
| "Configuring the Data Path Function" on page 268 | Yes | Yes |
| "Configuring the Context Function" on page 272 | Yes | Yes |
| "Configuring the MS State Change Functionality" on page 275 | Yes | Yes |

Table 4-20: Tasks to be Executed for Configuring the ASN-GW Functionality

| Task | Required for Operating the NPU with HA Support | Required for Operating the NPU without HA Support |
|---|---|---|
| "Configuring the Connectivity Service Network Interface" on page 279 | Yes | Yes |
| "Configuring Bearer Plane QoS Marking Rules" on page 281 | Yes | Yes |
| "Managing Service Interfaces" on page 290 | Yes | Yes |
| "Configuring the AAA Client Functionality" on page 301 | Yes | Yes |
| "Managing Service Groups" on page 310 | Yes | Yes |
| "Configuring the Service Flow Authorization Functionality" on page 335 | Yes<br>(Configure only DHCP Proxy for a service group) | Yes<br>(Configure DHCP server, proxy or relay for a service group) |
| "Configuring PHS Rules" on page 386 | Yes | Yes |
| "Managing the ASN-GW Keep-Alive Functionality" on page 391 | Yes | Yes |

## 4.3.10.1 Configuring the Next-hop IP Address-Network ID Mapping

The NPU maintains the mapping of the BS network ID to the next-hop IP address. The next-hop IP address can be the IP address of an intermediate ASN-GW or the destination BS. Using this mapping, the NPU resolves the BS-ID to IP address.

This section describes the commands to be used for:

- "Configuring the Next-hop IP Address" on page 250
- "Displaying the Next-hop IP Address-Network ID Mapping" on page 251
- "Displaying the Next-hop IP Address-Network ID Mapping" on page 251

### 4.3.10.1.1 Configuring the Next-hop IP Address

To map the next-hop IP address for a specific network ID, run the following command:

```
npu(config)# idip <nw-id> <next-hop-ipaddr>
```

For example, run the following command to map the MAC address of the BS with the next-hop IP address:

```
npu(config)# idip 112233445566 10.0.0.1
```

**NOTE**

Refer to Section 4.3.10.2.1 for a list of existing next-hop IP address-network ID mappings.

**Command Syntax**

```
npu(config)# idip <nw-id> <next-hop-ipaddr>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<nw-id>` | Denotes the BS ID. This parameter is a MAC address, and should be specified without colons. | Mandatory | N/A | 6-byte ID |
| `<next-hop-ipaddr>` | Denotes the next hop IP address for a particular BS. | Mandatory | N/A | Valid IP Address |

**Command Modes**

Global configuration mode

### 4.3.10.1.2 Deleting Next-hop IP Address-Network ID Mappings

To delete a specific or all next-hop IP address-network ID mappings, run the following command:

```
npu(config)# no idip [<nw-id>]
```

⚠ **CAUTION**

Specify the network ID  if you want to delete a specific next-hop IP address-network ID mapping. Otherwise all the configured mappings are deleted.

**Command Syntax**

```
npu(config)# no idip [<nw-id>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<nw-id>` | Denotes the network ID(s) for which an IDIP context is to be removed.<br>Specify this parameter only if you want to delete a specific network ID.<br>If you do not specify a value for this parameter, all configured network IDs are deleted. | Mandatory | N/A | 6-byte ID |

**Command Modes**

Global configuration mode

### 4.3.10.1.3 Displaying the Next-hop IP Address-Network ID Mapping

To display the next-hop-IP address mapped to a network ID or all network IDs, run the following command:

```
npu# show idip [<nw-id>]
```

Specify the network ID if you want to display a particular the next-hop-IP address-network ID mapping. Do not specify a value for this parameter if you want to view all the next-hop-IP address-network ID mappings.

**Command Syntax**

```
npu# show idip [<nw-id>]
```

**Privilege Level** 1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<nw-id>]` | Denotes the network ID (s) for which you want to view the next-hop IP addresses already mapped to it.<br>Specify a value for this parameter if you want to view the next-hop IP address(es) defined for a specific network ID. If you do not specify any value for this parameter, all the existing entries for mappings of network IDs-next-hop IP addresses are displayed. | Optional | N/A | 6-byte ID |

**Display Format**

```
nw-id         next-hop-ip address
<Network ID 1>    <Ip Address>
<Network ID 2>    <Ip Address>
```

**Command Modes** Global command mode

### 4.3.10.2 Configuring the IGMP Functionality

**IMPORTANT**

The IGMP functionality is not supported in the current release.

The NPU serves as the IGMP proxy server between a group of MSs and the multicast router. In addition, it serves as a router for all MSs that are connected to it. It receives periodic IGMP reports for all MSs that are members of a multicast group. Based on these reports, the NPU maintains a database of members. Each time there is a change in the membership database, because of a member leaving or joining the group, the NPU sends a report to the multicast router. The NPU also serves as a host for the multicast router and sends membership reports in response to membership queries.

This section describes the commands to be used for:

- “Configuring IGMP Parameters” on page 253
- “Restoring the Default Configuration Parameters for the IGMP Functionality” on page 254
- “Displaying IGMP Configuration Information” on page 255
- “Displaying IGMP Membership Information” on page 255

### 4.3.10.2.1 Configuring IGMP Parameters

To configure the IGMP functionality, run the following command:

```
npu(config)# igmp [mcastrouter-version <version>] [robustness
<retransmissions>] [unsolicit-report-interval <timeout>]
[query-delaytime <timeout>]
```

**NOTE**

You can display configuration information for the IGMP functionality. For details, refer to Section 4.3.10.2.3.

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config)# igmp [mcastrouter-version <version>] [robustness
<retransmissions>] [unsolicit-report-interval <timeout>] [query-delaytime
<timeout>]
```

**Privilege Level**

15

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[mcastrouter-version <version>]` | Denotes the IGMP version of the multicast router. | Optional | IGMPv3 | ■ IGMPv2<br>■ IGMPv3 |
| `[robustness <retransmissions>]` | Determines the number of retransmissions of the IGMP reports sent by the NPU. | Optional | 2 | 1 - 2^8 |
| `[unsolicit-report-interval <timeout>]` | Denotes the interval, in seconds, between successive retransmissions of unsolicited IGMP reports sent by the NPU. | Optional | 1 | 1 - 100 |
| `[query-delaytime <timeout>]` | Denotes the interval, in seconds, between general queries sent by the multicast router. | Optional | 125 | 1 - 200 |

**Command Modes**

Global configuration mode

### 4.3.10.2.2 Restoring the Default Configuration Parameters for the IGMP Functionality

To restore the default configuration for the IGMP functionality, run the following command:

```
npu(config)# no igmp [mcastrouter-version] [robustness]
[unsolicit-report-interval] [query-delaytime]
```

**NOTE**

Refer to Section 4.3.10.2.1 for a description and default values of these parameters.

**Command Syntax**

```
npu(config)# no igmp [mcastrouter-version] [robustness]
[unsolicit-report-interval] [query-delaytime]
```

**Privilege Level**

15

**Command Modes**

Global configuration mode

#### 4.3.10.2.3 Displaying IGMP Configuration Information

To display configuration information for the IGMP functionality, run the following command:

**npu# show igmp**

**Command Syntax**

```
npu(config)# show igmp
```

**Privilege Level**

1

**Display Format**

```
IGMP Configuration:

mcastrouter-version = <value> robustness = <value>

unsolicit-report-interval = <value>

query-delaytime = <value>
```

**Command Modes**

Global command mode

#### 4.3.10.2.4 Displaying IGMP Membership Information

To display dynamic multicast group membership information, run the following command:

**npu# show igmp-membership**

**Command Syntax**

```
npu# show igmp-membership
```

**Command Syntax**

1

**Display Format**

```
IGMP Membership :

GrpMulticast-addr   Src-addrlist

<value>         <value> <value> ….
```

**Command Modes**

Global configuration mode

## 4.3.10.3 Configuring the MIP-Foreign Agent Functionality

**IMPORTANT**

The MIP-Foreign Agent functionality is not supported in the current release.

When the MS is MIP-enabled, the NPU serves as the Foreign Agent (FA) for transferring mobile IP messages between the MS and the HA. As the FA, the NPU is responsible for registering the MS in the network. It provides security by using the security associations (MIP keys) between the MS and FA, and FA and HA.

This section describes the commands to be used for:

- "Configuring Parameters for the MIP-FA Functionality" on page 256
- "Restoring the Default Configuration Parameters for the MIP-FA Functionality" on page 257
- "Displaying Configuration Information for the MIP-FA Functionality" on page 258

### 4.3.10.3.1 Configuring Parameters for the MIP-FA Functionality

To configure MIP-FA parameters, run the following command:

```
npu(config)# mip-fa [allowed-mslifetime <timeout>]
[agent-advertisements <no of agent advertisement>]
[advertisement-interval <timeout>]
```

**NOTE**

You can display configuration information for the MIP-FA functionality. For details, refer to Section 4.3.10.3.3.

**Command Syntax**

```
npu(config)# mip-fa [allowed-mslifetime <timeout>] [agent-advertisements
<no of agent advertisement>] [advertisement-interval <timeout>]
```

**Privilege Level**

15

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[allowed-mslifetime <timeout>]` | Denotes the maximum period, in seconds, for which the IP address allocated to the MS is active. | Optional | 9000 | 0-9000 |
| `[agent-advertisements <no of agent advertisement>]` | Denotes the maximum number of initial agent advertisements sent to the MS. | Optional | 3 | 0-5 |
| `[advertisement-interval <timeout>]` | Denotes the interval, in seconds, between successive agent advertisements. | Optional | 10 | 5-100 |

**Command Modes**

Global configuration mode

### 4.3.10.3.2 Restoring the Default Configuration Parameters for the MIP-FA Functionality

To restore the default configuration for the MIP-FA functionality, run the following command:

```
npu(config)# no mip-fa [allowed-mslifetime] [agent-advertisements]
[advertisement-interval]
```

**NOTE**

Refer to Section 4.3.10.3.1 for a description and default values of these parameters.

**Command Syntax**

```
npu(config)# no mip-fa [allowed-mslifetime] [agent-advertisements]
[advertisement-interval]
```

**Privilege Level**

15

**Command Modes**

Global configuration mode

### 4.3.10.3.3 Displaying Configuration Information for the MIP-FA Functionality

To display configuration information for the MIP-FA functionality, run the following command:

```
npu# show mip-fa
```

**Command Syntax**

```
npu# show mip-fa
```

**Privilege Level**

1

**Display Format**

```
MIP-FA Configuration :

allowed-mslifetime = <value>

agent-advertisements = <value>

advertisement-interval = <value>
```

**Command Modes**

Global command mode

## 4.3.10.4 Configuring the Proxy-MIP Client Functionality

**IMPORTANT**

The Proxy-MIP client functionality is not supported in the current release.

When the MS is MIP-incapable, the NPU provides the Proxy-MIP (MIP FA) client functionality, and manages MIP registration between the MS and the HA. This section describes the commands to be used for:

- "Configuring Parameters for the PMIP Client Functionality" on page 259

- "Restoring the Default Configuration Parameters for the PMIP Client Functionality" on page 260

- "Displaying Configuration Information for the PMIP Client Functionality" on page 261

### 4.3.10.4.1 Configuring Parameters for the PMIP Client Functionality

Run the following command to configure the PMIP client functionality to specify how registration of a MIP-incapable MS should be managed:

```
npu(config)# mip-client [mslifetime <timeout>] [mslifetime-guard
<percent>] [registration-retries <retransmissions>]
[registration-interval <timeout>]
```

**NOTE**

You can display configuration information for the PMIP client functionality. For details, refer to Section 4.3.10.4.3.

**IMPORTANT**

An error may occur if you provide an invalid for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config)# mip-client [mslifetime <timeout>] [mslifetime-guard
<percent>] [registration-retries <retransmissions>]
[registration-interval <timeout>]
```

**Privilege Level**

15

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[mslifetime <timeout>]` | Denotes the maximum period, in seconds, for which the HA will maintain the MIP binding. This information is sent in the MIP registration message. At the end of this period, the NPU de-registers the MS. | Optional | 9000 | 0-9000 |

| | | | | |
|---|---|---|---|---|
| `[mslifetime-guard <percent>]` | Denotes the period for which the PMIP remains active. The value of this parameter should be a percentage of the `mslifetime` parameter. At the end of this period, the PMIP attempts re-registration. | Optional | 65% | 0-100 |
| `[registration-retries <retransmissions>]` | Denotes the maximum number of registration requests that can be sent by the NPU. | Optional | 3 | 0-5 |
| `[registration-interval <timeout>]` | Denotes the interval between successive requests of an MS, in seconds, within which the MIP registration response should be sent by the HA. | Optional | 10 | 5-100 |

**Command Modes**

Global configuration mode

### 4.3.10.4.2 Restoring the Default Configuration Parameters for the PMIP Client Functionality

To restore the default configuration for the PMIP client functionality, run the following command:

```
npu(config)# no mip-client [mslifetime] [mslifetime-guard]
[registration-retries] [registration-interval]
```

**NOTE**

Refer to Section 4.3.10.4.1 for a description and default values of these parameters.

**Command Syntax**

```
npu(config)# no mip-client [mslifetime] [mslifetime-guard]
[registration-retries] [registration-interval]
```

**Privilege Level**

15

**Command Modes**

Global configuration mode

#### 4.3.10.4.3 Displaying Configuration Information for the PMIP Client Functionality

To display PMIP client configuration information, run the following command:

```
npu# show mip-client
```

**Command Syntax**

```
npu# show mip-client
```

**Privilege Level**

1

**Display Format**

```
PMIP-Client Configuration :
mslifetime = <value>
mslifetime-guard = <value>
registration-retries = <value>
registration-interval = <value>
```

**Command Modes**

Global command mode

### 4.3.10.5 Configuring the ASN Interface

The ASN interface is the NPU interface that is exposed towards the BS or another ASN gateway. You can configure ASN interface-specific information, such as the IP address to be used for the NPU to communicate with the BS and other ASN gateways.

This section describes the commands to be used for:

- "Assigning a Pre-configured IP Interface" on page 261
- "Displaying Configuration Information for the ASN Interface" on page 263

#### 4.3.10.5.1 Assigning a Pre-configured IP Interface

To assign a pre-configured IP interface to the ASN side, that is, the R4/R6 interface, run the following command:

```
npu(config)# asnif <ip-intf>
```

For the current release, specify `bearer` as the value of the `ip-intf` parameter. However, the IP address should already be configured for the bearer interface. For details, refer to "Configuring Static Routes" on page 211.

**NOTE**

You can display configuration information for ASN interface. For details, refer to Section 4.3.10.5.2.

**IMPORTANT**

An error may occur if you provide an invalid value for this parameter. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config)# asnif <ip-intf>
```

**Privilege Level**

15

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `asnif <ip-intf>` | Denotes the IP interface that is to be exposed towards the BS and other ASN gateways. Ensure that the IP address for the bearer interface is configured before executing this command.<br>**Note**: If you are modifying the ASN interface, save the current configuration (refer Section 4.3.4.1) and reset the NPU (Section 4.2.2.1) for the change to take effect. | Mandatory | N/A | bearer (only the bearer interface is supported in the current release) |

**Command Modes**

Global configuration mode

### 4.3.10.5.2 Displaying Configuration Information for the ASN Interface

To display the IP interface (R4/R6) of the ASN interface, run the following command:

```
npu# show asnif
```

| | |
|---|---|
| **Command Syntax** | `npu# show asnif` |
| **Privilege Level** | 1 |
| **Display Format** | `ASN Interface Configuration :`<br>`ASN IP Interface = <value>` |
| **Command Modes** | Global command mode |

## 4.3.10.6 Managing the Authenticator Function

The Authenticator function of the NPU manages MS authentication for accessing WiMAX network resources. It also maintains context information for each MS that has accessed or is trying to access the network. For this, it handles all key derivations and distribution. In addition, it uses AAA client functions to send RADIUS messages on the R3 interface.

This section describes the commands to be used for:

- "Configuring Parameters for the Authenticator Function" on page 263
- "Restoring the Default Configuration Parameters for the Authenticator Function" on page 266
- "Displaying Configuration Information for the Authenticator Function" on page 267

### 4.3.10.6.1 Configuring Parameters for the Authenticator Function

To configure the parameters of the Authenticator function, run the following command:

```
npu(config)# authenticator [eapidreq-retries <retransmissions>]
[eapidreq-interval <timeout>] [ntwentry-holdtime <timeout>]
[eaptransfer-retries <retransmissions>] [eaptransfer-interval
<timeout>] [reauth-attempts <counter>] [reauthcmplt-holdtime
<timeout>] [eaptransfer-roundtrips <counter>] [pmk-lifetime
<timeout>] [pmk-guardtime <timeout>] [authfailure-holdtime
<timeout>] [max-ntwentry <counter>]
```

**NOTE**

You can display configuration information for the Authenticator function. For details, refer to Section 4.3.10.6.3

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config)# authenticator [eapidreq-retries <retransmissions>]
[eapidreq-interval <timeout>] [ntwentry-holdtime <timeout>]
[eaptransfer-retries <retransmissions>] [eaptransfer-interval <timeout>]
[reauth-attempts <counter>] [reauthcmplt-holdtime <timeout>]
[eaptransfer-roundtrips <counter>] [pmk-lifetime <timeout>]
[pmk-guardtime <timeout>] [authfailure-holdtime <timeout>] [max-ntwentry
<counter>]
```

**Privilege Level**

15

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [eapidreq-retries <retransmissions>] | Denotes the number of times the NPU can retransmit the EAP ID request until it receives a EAP ID response. | Optional | 3 | 0-5 |
| [eapidreq-interval <timeout>] | Denotes the period, in milliseconds, for which the NPU should wait for the response to the request for the EAP ID. | Optional | 500 | 10-100000 |

| | | | | |
|---|---|---|---|---|
| `[ntwentry-holdtime <timeout>]` | Denotes the period, in seconds, within which the MS should be authenticated for initial entry into the network. If the MS is not authenticated within this period, the NPU terminates the request for network entry. | Optional | 5 | 0-100 |
| `[eaptransfer-retries <retransmissions>]` | Denotes the maximum number of times the MS can attempt for initial entry to the network. If the number of EAP transfers exceeds the value of this parameter, the NPU de-registers the MS. | Optional | 3 | 0-5 |
| `[eaptransfer-interval <timeout>]` | Denotes the period, in milliseconds, the NPU waits for the EAP identity response. | Optional | 500 | 10 - 100000 |
| `[reauth-attempts <counter>]` | Denotes the maximum number of times the NPU may handle a an MS/network-initiated re-authentication request. When the number of re-authentication attempts exceeds the value of this parameter, the MS is de-registered. | Optional | 3 | 0-10 |
| `[reauthcmplt-holdtime <timeout>]` | Denotes the period, in milliseconds, within which, re-authentication of the MS should be complete. If the MS is not authenticated within this period, the NPU reinitiates MS authentication. | Optional | 5000 | 10 - 100000 |
| `[eaptransfer-roundtrips <counter>]` | Denotes the number EAP roundtrips in one authentication/re-authentication process. | Optional | 4294967295 | 0 - 4294967295 |
| `[pmk-lifetime <timeout>]` | Denotes the period, in seconds, for which the MS authentication key is valid. At the end of this period, the NPU de-registers the MS. | Optional | 3600 | 60-86400 |

| | | | | |
|---|---|---|---|---|
| [pmk-guardtime <timeout>] | Denotes the duration of the guard timer for the MS authentication keys. the NPU initiates re-authentication for the MS after the pmk guard timer has expired. (The value of this timer is `pmk-lifetime` - `pmk-guardtime`.)<br>If the value of this parameter is 0, the guard timer is not started. | Optional | 0 | 0-86400 |
| [authfailure-holdtime <timeout>] | Denotes the period, in seconds, for which the MS context is retained after authentication failure. | Optional | 0 | 1-1024 |
| [max-ntwentry <counter>] | Denotes the maximum number of times that the NPU may handle a network entry request from an MS, after prior attempts for that MS has already failed. After the NPU has handled `max-ntwentry` number of attempts and its value is 0, the MS is assigned the unauthenticated mode. | Optional | 3 | 0-10 |

**Command Modes** Global configuration mode

### 4.3.10.6.2 Restoring the Default Configuration Parameters for the Authenticator Function

To restore the default configuration for the Authenticator function, run the following command:

```
npu(config)# no authenticator [eapidreq-retries]
[eapidreq-interval] [ntwentry-holdtime] [eaptransfer-retries]
[eaptransfer-interval] [reauth-attempts] [reauthcmplt-holdtime]
[eaptransfer-roundtrips] [pmk-lifetime] [pmk-guardtime]
[authfailure-holdtime] [max-ntwentry]
```

**NOTE**

Refer to Section 4.3.10.6.1 for a description and default values of these parameters.

**Command Syntax**

```
npu(config)# no authenticator [eapidreq-retries] [eapidreq-interval]
[ntwentry-holdtime] [eaptransfer-retries] [eaptransfer-interval]
[reauth-attempts] [reauthcmplt-holdtime] [eaptransfer-roundtrips]
[pmk-lifetime] [pmk-guardtime] [authfailure-holdtime] [max-ntwentry]
```

**Privilege Level**

15

**Command Modes**

Global configuration mode

### 4.3.10.6.3 Displaying Configuration Information for the Authenticator Function

To display configuration information for the Authenticator function, run the following command:

```
npu# show authenticator
```

**Command Syntax**

```
npu# show authenticator
```

**Privilege Level**

1

**Display Format**

```
Authenticator Function Configuration :
eapidreq-retries = <value>
eapidreq-interval = <value>
ntwentry-holdtime = <value>
eaptransfer-retries = <value>
eaptransfer-interval = <value>
reauth-attempts = <value>
reauthcmplt-holdtime = <value>
eaptransfer-roundtrips = <value>
pmk-lifetime = <value>
pmk-guardtime = <value>
authfailure-holdtime = <value>
max-ntwentry = <value>
```

**Command Modes**

Global command mode

## 4.3.10.7 Configuring the Data Path Function

The Data Path function controls the creation, maintenance, and deletion of data paths within the NPU. This section describes the commands to be used for:

- "Configuring Parameters for the Data Path Function" on page 268
- "Restoring the Default Parameters for the Data Path Function" on page 271
- "Displaying Configuration Information for the Data Path Function" on page 272

### 4.3.10.7.1 Configuring Parameters for the Data Path Function

To configure the parameters for the data path function, run the following command:

```
npu(config)# datapath [initpathregreq-retries <retransmissions>]
[initpathregreq-interval <timeout>] [msderegreq-retries
<retransmissions>] [msderegreq-interval <timeout>]
[pathregreq-retries <retransmissions>] [pathregreq-interval
<timeout>] [pathregrsp-retries <retransmissions>]
```

```
[pathregrsp-interval <timeout>] [pathregstart-interval <timeout>]
[mipwaitdhcp-holdtime <timeout>]
```

**NOTE**

You can display configuration information for the data path function. For details, refer to Section 4.3.10.7.3.

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config)# datapath [initpathregreq-retries <retransmissions>]
[initpathregreq-interval <timeout>] [msderegreq-retries
<retransmissions>] [msderegreq-interval <timeout>] [pathregreq-retries
<retransmissions>] [pathregreq-interval <timeout>] [pathregrsp-retries
<retransmissions>] [pathregrsp-interval <timeout>] [pathregstart-interval
<timeout>] [mipwaitdhcp-holdtime <timeout>]
```

**Privilege Level**

15

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [initpathregreq-retries <retransmissions>] | Denotes the maximum number of initial path registration request retransmissions that may be sent by the NPU. After the number of retransmissions has exceeded the value of this parameter, the MS de-registration procedure is initiated. | Optional | 3 | 0-5 |

| | | | | |
|---|---|---|---|---|
| [initpathregreq-interval <timeout>] | Denotes the interval, in milliseconds, after which the request for initial path registration should be complete. If the initial path registration request is not completed within this period, the NPU may retransmit the initial path registration request. | Optional | 1 | 10 - 3000 |
| [msderegreq-retries <retransmissions>] | Denotes the maximum number of MS deregistration request retransmissions, after which the MS is de-registered. | Optional | 3 | 0-5 |
| [msderegreq-interval <timeout>] | Denotes the MS deregistration response timeout, in milliseconds. | Optional | 30 | 5-500 |
| [pathregreq-retries <retransmissions>] | Denotes the maximum number of times the NPU may retransmit the path registration request. | Optional | 3 | 0-5 |
| [pathregreq-interval <timeout>] | Denotes the period, in milliseconds, with which the NPU should wait for the path registration response. If a response is not received within this period, the NPU retransmits the request. | Optional | 10 | 5- 100 |
| [pathregrsp-retries <retransmissions>] | Denotes the maximum number of times the NPU may retransmit the path response. | Optional | 3 | 0-5 |
| [pathregrsp-interval <timeout>] | Denotes the period, in milliseconds, within which the NPU should wait for an acknowledgement for the registration response. If a response is not received within this period, the NPU retransmits the response. | Optional | 10 | 5- 100 |

| | | | | |
|---|---|---|---|---|
| `[pathregstart-interval <timeout>]` | Indicates the period, in milliseconds, within which the path registration procedure is initiated, after the path pre-registration procedure is complete. If the path registration procedure is not completed within the period specified by this parameter, the MS is de-registered. | Optional | 1000 | 5- 2000 |
| `[mipwaitdhcp-holdtime <timeout>]` | Denotes the period, in seconds, for allocating the IP address, after the path registration procedure is complete. | Optional | 0 | 0 - 120 |

**Command Modes**

Global configuration mode

### 4.3.10.7.2 Restoring the Default Parameters for the Data Path Function

To restore the default configuration for the data path function, run the following command:

```
npu(config)# no datapath [initpathregreq-retries]
[initpathregreq-interval] [msderegreq-retries]
[msderegreq-interval] [pathregreq-retries] [pathregreq-interval]
[pathregrsp-retries] [pathregrsp-interval] [pathregstart-interval]
[mipwaitdhcp-holdtime]
```

**NOTE**

Refer to Section 4.3.10.7.1 for a description and default values of these parameters.

**Command Syntax**

```
npu(config)# no datapath [initpathregreq-retries]
[initpathregreq-interval] [msderegreq-retries] [msderegreq-interval]
[pathregreq-retries] [pathregreq-interval] [pathregrsp-retries]
[pathregrsp-interval] [pathregstart-interval] [mipwaitdhcp-holdtime]
```

**Privilege Level**

15

**Command Modes**

Global configuration mode

### 4.3.10.7.3 Displaying Configuration Information for the Data Path Function

To display configuration information for the Data Path function, run the following command:

```
npu# show datapath
```

**Command Syntax**

```
npu# show datapath
```

**Privilege Level**

1

**Display Format**

```
Data Path Function Configuration :
initpathregreq-retries = <value>
initpathregreq-interval = <value>
msderegreq-retries = <value>
msderegreq-interval = <value>
pathregreq-retries = <value>
pathregreq-interval = <value>
pathregrsp-retries = <value>
pathregrsp-interval = <value>
pathregstart-interval = <value>
mipwaitdhcp-holdtime <value>
```

**Command Modes**

Global command mode

## 4.3.10.8 Configuring the Context Function

The context function manages the contexts of various authenticated MSs. You can specify parameters pertaining to context creation and reports. This section describes the commands to be used for:

- "Configuring the Parameters for the Context Function" on page 273

- "Restoring the Default Configuration Parameters for the Context Function" on page 274
- "Displaying Configuration Information for the Context Function" on page 275

### 4.3.10.8.1 Configuring the Parameters for the Context Function

To configure the parameters for the context function, run the following command:

```
npu(config)# contextfn [contextreq-retries <retransmissions>]
[contextreq-interval <timeout>] [contextrprt-retries
<retransmissions>] [contextrprt-interval <timeout>]
```

**NOTE**

You can display configuration information for the context function. For details, refer to Section 4.3.10.8.3

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config)# contextfn [contextreq-retries <retransmissions>]
[contextreq-interval <timeout>] [contextrprt-retries <retransmissions>]
[contextrprt-interval <timeout>]
```

**Privilege Level**

15

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [contextreq-retries <retransmissions>] | Denotes the maximum number of times the NPU will retransmit a context request. | Optional | 3 | 1-5 |

| | | | | |
|---|---|---|---|---|
| [contextreq-interval <timeout>] | Denotes the period, in milliseconds, for which the NPU waits for a response to the context request. If the NPU does not receive a response to this request within the period specified by this timer, the NPU retransmits this request. | Optional | 10 | 5 - 100 |
| [contextrprt-retries <retransmissions>] | Denotes the maximum number of times, the NPU retransmits the context report. | Optional | 3 | 0-5 |
| [contextrprt-interval <timeout>] | Denotes the period, in milliseconds, for which the NPU waits for the context report acknowledgement. At the end of this period, the NPU retransmits the context report. | Optional | 3 | 0-5 |

**Command Modes**

Global configuration mode

### 4.3.10.8.2 Restoring the Default Configuration Parameters for the Context Function

To restore the default configuration for the context function, run the following command:

```
npu(config)# no contextfn [contextreq-retries]
[contextreq-interval] [contextrprt-retries] [contextrprt-interval]
```

**NOTE**

Refer to Section 4.3.10.8.1 for a description and default values of these parameters.

**Command Syntax**

```
npu(config)# no contextfn [contextreq-retries] [contextreq-interval]
[contextrprt-retries] [contextrprt-interval]
```

**Privilege Level**

15

**Command Modes**

Global configuration mode

### 4.3.10.8.3 Displaying Configuration Information for the Context Function

To display configuration information for the context function, run the following command:

```
npu# show contextfn
```

**Command Syntax**

```
npu# show contextfn
```

**Privilege Level**

1

**Display Format**

```
Context Function Configuration :

contextreq-retries = <value>

contextreq-interval = <value>

contextrprt-retries = <value>

contextrprt-interval = <value>
```

**Command Modes**

Global command mode

## 4.3.10.9 Configuring the MS State Change Functionality

The MS state change functionality manages MS states within an MS context. This section describes the commands to be used for:

- "Configuring Parameters for the MS State Change Functionality" on page 276
- "Restoring the Default Configuration Parameters for the MS State Change Functionality" on page 277
- "Displaying Configuration Information for the MS State Change Functionality" on page 278

#### 4.3.10.9.1 Configuring Parameters for the MS State Change Functionality

To configure the parameters for the MS State Change functionality, run the following command:

```
npu(config)# msscfn [msscrsp-retries <retransmissions>]
[msscrsp-interval <timeout>] [sbc-holdtime <timeout>] [reg-holdtime
<timeout>] [msscdrctv-retries <retransmissions>]
[msscdrctv-interval <timeout>]
```

**NOTE**

You can display configuration information for the MS state change functionality. For details, refer to Section 4.3.10.9.3.

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config)# msscfn [msscrsp-retries <retransmissions>] [msscrsp-interval
<timeout>] [sbc-holdtime <timeout>] [reg-holdtime <timeout>]
[msscdrctv-retries <retransmissions>] [msscdrctv-interval <timeout>]
```

**Privilege Level**

15

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [msscrsp-retries <retransmissions>] | Denotes the maximum number of times, the NPU retransmits the MS state change response. | Optional | 3 | 1-5 |
| [msscrsp-interval <timeout>] | Denotes the period, in milliseconds for which the NPU waits for an acknowledgement for the MS state change response. If the NPU does not receive an acknowledgement within this period, it retransmits the MS state change response. | Optional | 10 | 5- 500 |

| | | | | |
|---|---|---|---|---|
| `[sbc-holdtime <timeout>]` | Denotes the period, in milliseconds, within which the basic capabilities negotiation procedure should be completed. At the end of this period, the NPU starts the authentication/ registration procedure for the MS, depending on accepted authentication policy. | Optional | 5 | 0-100 |
| `[reg-holdtime <timeout>]` | Denotes the interval, in seconds, for the MS registration procedure timeout. After this interval, the NPU changes the MS state to the registered state, and initiates the data path creation procedure (for authenticated MSs). | Optional | 5 | 0-100 |
| `[msscdrctv-retries <retransmissions>]` | Denotes the maximum number of times, the NPU may retransmit the MS state change directive. | Optional | 3 | 0-5 |
| `[msscdrctv-interval <timeout>` | Denotes the period, in milliseconds, for which the NPU waits for an acknowledgement for the MS state change directive. If the NPU does not receive an acknowledgment within this period, it retransmits the state change directive. | Optional | 10 | 0-500 |

**Command Modes**

Global configuration mode

### 4.3.10.9.2 Restoring the Default Configuration Parameters for the MS State Change Functionality

To restore the default configuration for the MS State Change functionality, run the following command:

```
npu(config)# no msscfn [msscrsp-retries] [msscrsp-interval]
[sbc-holdtime] [reg-holdtime] [msscdrctv-retries]
[msscdrctv-interval]
```

**NOTE**

Refer to Section 4.3.10.9.1 for a description and default values of these parameters.

**Command Syntax**

```
npu(config)# no msscfn [msscrsp-retries] [msscrsp-interval]
[sbc-holdtime] [reg-holdtime] [msscdrctv-retries] [msscdrctv-interval]
```

**Privilege Level**

15

**Command Modes**

Global configuration mode

### 4.3.10.9.3 Displaying Configuration Information for the MS State Change Functionality

To display configuration information for the MS state change functionality, run the following command:

```
npu# show msscfn
```

**Command Syntax**

```
npu# show msscfn
```

**Privilege Level**

1

**Display Format**

```
MS State Change Function Configuration :

msscrsp-retries = <value>

msscrsp-interval = <value>

sbc-holdtime = <value>

reg-holdtime = <value>

msscdrctv-retries = <value>

msscdrctv-interval = <value
```

**Command Modes**

Global command mode

## 4.3.10.10 Configuring the Connectivity Service Network Interface

**IMPORTANT**

Skip this task. The MIP functionality is not supported in the current release.

The Connectivity Service Network (CSN) interface provides IP connectivity services for a set of subscribers. The gateway uses the CSN interface for R3 control traffic and R3 data traffic towards the core network. You can configure the parameters for the IP interface to be used as the network interface for R3 control traffic.

This section describes the commands to be used for:

- "Configuring Parameters for the CSN Interface" on page 279
- "Restoring the Default Configuration Parameters of the CSN Interface" on page 280
- "Displaying Configuration Information for the CSN Interface" on page 281

### 4.3.10.10.1 Configuring Parameters for the CSN Interface

To configure the CSN parameters, run the following command:

```
npu(config)# csnif [ip-intf <ip-intf>] [tun-mtu <size>] [tun-chksm]
```

**NOTE**

You can display configuration information for the CSN Interface. For details, refer to Section 4.3.10.10.3.

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config)# csnif [ip-intf <ip-intf>] [tun-mtu <size>] [tun-chksm]
```

**Privilege Level**

15

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[ip-intf <ip-intf>]` | Denotes a pre-defined IP interface to be used as a network interface for R3 control traffic and R3 data traffic.<br>**Note**: If you are modifying the CSN interface, save the current configuration (refer Section 4.3.4.1) and reset the NPU (Section 4.2.2.1) for the change to take effect. | Mandatory | N/A | bearer |
| `[tun-mtu <size>]` | Denotes the MTU for the IP-in-IP tunnel (used for R3 data traffic) on this interface. | Optional | 1450 | 1 - $2^{32}$ -1 |
| `[tun-chksm]` | Indicates that the tunnel checksum feature is enabled. If this feature is enabled, the checksum of the inner header is to be verified. | Optional | By default, this feature is disabled. | The presence/absence of this parameter indicates that the tunnel checksum feature is enabled/disabled. |

**Command Modes** Global configuration mode

### 4.3.10.10.2 Restoring the Default Configuration Parameters of the CSN Interface

To restore the default configuration for the CSN interface, run the following command. This command can also be used to disable the tunnel-checksum feature.

```
npu(config)# no csnif [tun-mtu] [tun-chksm]
```

**NOTE**

Refer to Section 4.3.10.10.1 for a description and default values of these parameters.

**Command Syntax**

```
npu(config)# no csnif [tun-mtu] [tun-chksm]
```

**Privilege Level**

15

**Command Modes**

Global configuration mode

### 4.3.10.10.3 Displaying Configuration Information for the CSN Interface

To display configuration information for the CSN interface, run the following command:

```
npu# show csnif
```

**Command Syntax**

```
npu# show csnif
```

**Privilege Level**

1

**Display Format**

```
CSN Interface Configuration :

ip-intf = <value>

tun-mtu = <value>

tun-chksm = <value>
```

**Command Modes**

Global command mode

## 4.3.10.11 Configuring Bearer Plane QoS Marking Rules

The bearer plane consists of tunnels between the ASN and CSN, and the BS and the NPU. R3 includes the bearer plane methods such as tunneling for enabling data transfer between the CSN and the ASN. R6 consists of the bearer plane protocols that implement the intra-ASN data path between the BS and the NPU.

You can define QoS marking rules for the bearer plane, based on parameters such as traffic priority, and the type of service, media, and interface.

Up to a maximum of 21 Bearer Plane QoS Marking Rules can be defined.

**To configure one or more QoS bearer plane marking rules:**

1. Enable the bearer plane QoS marking rules configuration mode (refer to Section 4.3.10.11.1)
2. You can now execute any of the following tasks:
   - » Configure the output parameters for bearer plane QoS marking rules (refer to Section 4.3.10.11.2)
   - » Restore the default parameters for bearer plane QoS marking rules (refer to Section 4.3.10.11.3)
3. Terminate the bearer plane QoS marking rules configuration mode (refer to Section 4.3.10.11.4)

In addition, you can, at any time, display configuration information (refer to Section 4.3.10.11.6)or delete an existing bearer plane QoS marking rule (refer to Section 4.3.10.11.5).

#### 4.3.10.11.1 Enabling the Bearer Plane QoS Marking Rule Configuration Mode\Creating a Bearer Plane QoS Marking Rule

To configure the parameters for the bearer plane QoS marking rules, first enable the bearer plane QoS marking rule configuration mode. Run the following command to enable the bearer plane QoS marking rules configuration mode. You can also use this command to create and enable the configuration mode for a new bearer plane QoS marking rule.

```
npu(config)# bearerqos <qos-alias> [<intf-type((1<R3> - 0<R6> )| 255<ANY>)>
    <srvc-type(0<UGS> | 1<RTVR> | 2<NRTVR> | 3<BE> | 4<ERTVR> | 255<ANY>)>
                <trfc-priority((0-7)|255)> <media-type> ]
```

**NOTE**

You can display configuration information for the bearer plane QoS marking rules. For details, refer to Section 4.3.10.11.6.

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

If you use this command to create a new QoS marking rule, the configuration mode for this rule is automatically enabled, after which you can execute any of the following tasks:

- Configure the output parameters for bearer plane QoS marking rules (refer to Section 4.3.10.11.2)
- Restore the default parameters for bearer plane QoS marking rules (refer to Section 4.3.10.11.3)

After executing the above tasks, you can terminate the bearer plane QoS marking rules configuration mode (refer to Section 4.3.10.11.4) and return to the global configuration mode.

**NOTE**

The granularity of the QoS definition to be applied to packets transmitted on the bearer plane depends upon the number of parameters that you specify. If any parameter is to be excluded from the definition, specify the value 255 for that parameter.

**Command Syntax**

```
npu(config)# bearerqos <qos-alias> [<intf-type((1<R3> - 0<R6>)| 255<ANY>)>
<srvc-type(0<UGS> | 1<RTVR> | 2<NRTVR> | 3<BE> | 4<ERTVR> | 255<ANY>)>
<trfc-priority((0-7)|255)> <media-type>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<qos-alias>` | Denotes the QoS alias of the QoS marking rule for which you want to enable the bearer plane QoS marking rules configuration mode. If you want to create a new QoS marking rule, specify a new alias and define the type of interface, service, and traffic priority that is applicable for that rule. | Mandatory | N/A | String (1 to 11 characters) |

| | | | | |
|---|---|---|---|---|
| `<intf-type((1<R3> - 0<R6>)\|255<ANY>)>` | Denotes the type of interface for which you are defining the bearer plane QoS rule. | Mandatory when creating a new Bearer Plane QoS Rule. | N/A | ■ 0: Indicates the R6 (internal) interface<br>■ 1: Indicates the R3 (external interface))<br>■ 255: Indicates that the parameter should be ignored for packets transmitted on both internal and external interfaces. |
| `<srvc-type(0<UGS> \| 1<RTVR> \| 2<NRTVR> \| 3<BE> \| 4<ERTVR> \| 255<ANY>)>` | Denotes the service type of the service flow (see “Specifying Service Flow Configuration Parameters” on page 341) provided as an input classification parameter for the bearer plane QoS rule. This parameter is used to match the outer-DSCP and VLAN-priority values for a service flow | Mandatory when creating a new Bearer Plane QoS Rule | N/A | ■ 0 (UGS)<br>■ 1 (RTVR)<br>■ 2 (NRTVR)<br>■ 3 (BE)<br>■ 4 ERTVR<br>■ 255 (ANY): Indicates that the parameter should be ignored for packets transmitted on both internal and external interfaces. |

| | | | | |
|---|---|---|---|---|
| `<trfc-priority ((0-7)\|255)>` | Denotes the traffic priority of the service flow (see "Specifying Service Flow Configuration Parameters" on page 341) provided as an input classification parameter for the bearer plane QoS rule. This parameter is used to match the outer-DSCP and VLAN-priority values for a service flow. | Mandatory when creating a new Bearer Plane QoS Rule | N/A | ■ 0-7, where 7 is highest<br>■ 255 (ANY): Indicates that the parameter should be ignored for packets transmitted on both internal and external interfaces. |
| `<media-type>` | Denotes the media type of the service flow (see "Specifying Service Flow Configuration Parameters" on page 341) provided as an input classification parameter for the bearer plane QoS rule. This parameter is used to match the outer-DSCP and VLAN-priority values for a service flow. | Mandatory when creating a new Bearer Plane QoS Rule | N/A | ■ String (1 to 14 characters)<br>■ ANY: Indicates that the parameter should be ignored for packets transmitted on both internal and external interfaces. |
| | | | | ■ |

**Command Modes** Global configuration mode

### 4.3.10.11.2 Configuring the Output Parameters for Bearer Plane QoS Marking Rules

After enabling the bearer plane QoS marking rules configuration mode you can configure the output parameters that should be applied on packets (that are created using the parameters specified in Section 4.3.10.11.1). Output parameters are a combination of the Outer-DSCP and VLAN priority values. These are populated in the outer DSCP and VLAN priority fields in the IP and Ethernet headers of these packets.

**IMPORTANT**

Enable the bearer plane QoS marking rule that you are configuring. By default, all bearer plane QoS marking rules are disabled.

Run the following command to configure the output parameters for this bearer plane QoS marking rule:

```
npu(config-bqos)# config [outer-dscp <integer(0-63>] [vlan-priority
<integer(0-7>] [qos enable]
```

**NOTE**

You can display configuration information for the bearer plane QoS marking rules. For details, refer to Section 4.3.10.11.6.

**IMPORTANT**

An error may occur if you provide an invalid  value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config-bqos)# config [outer-dscp <integer(0-63>] [vlan-priority
<integer(0-7>] [qos enable]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[outer-dscp <integer(0-63> ]` | Denotes the Differentiated Service Code Point (DSCP) value to be used for marking the packets, if the packet complies with the marking rules specified in Section 4.3.10.11.1. | Optional | 0 | ■ 0-63<br>■ |
| `[vlan-priority <integer(0-7>]` | Denotes the VLAN priority to be assigned to the packets if the packet meets the requirements of the marking rules specified in Section 4.3.10.11.1. | Optional | 0 | ■ 0-7, where 7 is the highest<br>■ |

| | | | | |
|---|---|---|---|---|
| `[qos enable]` | Indicates whether this QoS marking rule should be enabled. The absence of this flag indicates that this QoS flag is disabled. By default, a bearer plane QoS marking rule is disabled.<br>If you enable this QoS marking rule, packets on bearer plane that were created using the parameters in Section 4.3.10.11.1, the Outer DSCP and VLAN Priority fields in the IP header and Ethernet header, respectively are populated with the values you specify for the `outer-dscp` and `vlan-priority` parameters. | Optional | By default, the QoS marking rule is disabled. | The presence/absence of this flag indicates that this QoS flag is enabled/disabled. |

**Command Modes**

Bearer plane QoS marking rules configuration mode

### 4.3.10.11.3 Restoring the Default Configuration Parameters for the Bearer Plane QoS Output Marking Rules

Run the following command to restore the default configuration for this bearer plane QoS marking rule:

```
npu(config-bqos)# no {outer-dscp | vlan-priority | qos enable}
```

When you execute this command, it automatically disables this QoS marking rule.

**NOTE**

Refer to Section 4.3.10.11.2 for a description and default values of these parameters.

**Command Syntax**

```
npu(config-bqos)# no {outer-dscp | vlan-priority | qos enable}
```

**Privilege Level**

10

**Command Modes**

Bearer plane QoS marking rules configuration mode

### 4.3.10.11.4 Terminating the QoS Marking Rules Configuration Mode

Run the following command to terminate the marking rules configuration mode:

```
npu(config-bqos)# exit
```

**Command Syntax**

```
npu(config-bqos)# exit
```

**Privilege Level**

10

**Command Modes**

Bearer plane QoS marking rules configuration mode

### 4.3.10.11.5 Deleting Bearer Plane QoS Marking Rules

Run the following command to delete the a QoS marking rule:

```
npu(config)# no bearerqos [<qos-alias>]
```

⚠ **CAUTION**

Specify the QoS alias if you want to delete a specific bearer plane qoS marking rule. Otherwise all the configured bearer plane QoS marking rules are deleted.

**Command Syntax**

```
npu(config)# no bearerqos [<qos-alias>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<qos-alias>]` | Denotes the QoS alias of the bearer QoS marking rule that you want to delete. Specify a value for this parameter if you want to delete a specific bearer QoS marking rule.<br>Do not specify a value for this parameter if you want to delete all bearer QoS marking rules. | Optional | N/A | String |

**Command Modes**

Global configuration mode

### 4.3.10.11.6 Displaying Configuration Information for the Bearer Plane QoS Marking Rules

To display configuration information for specific or all bearer plane QoS marking rules, run the following command:

```
npu# show bearerqos [<qos-alias>]
```

Specify the QoS alias if you want to display configuration information for a particular bearer plane QoS marking rule. Do not specify a value for this parameter if you want to view configuration information for all bearer plane QoS marking rules.

**Command Syntax**

```
npu# show bearerqos [<qos-alias>]
```

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<qos-alias>]` | Denotes the QoS alias of the bearer QoS marking rule that you want to display.<br>Specify a value for this parameter if you want to display a specific bearer QoS marking rule. Do not specify a value for this parameter if you want to display all bearer QoS marking rules. | Optional | N/A | String |

**Display Format**

```
Bearer QoS Configuration :

qos-alias  intf-type srvc-type trfc-priority media-type inner-dscp
outer-dscp vlan-priority status

voip     <value>  <value>  <value>   <value>   <value>   <value>   enabled
```

**Command Modes**

Global command mode

## 4.3.10.12 Managing Service Interfaces

A Service Interface defines the parameters of the interface used by the NPU on the network side for services using the applicable Service Interface.

Up to 10 Service Interfaces may be defined.

**To configure a Service Interface:**

1 Enable the Service Interface configuration mode for the selected Service Interface (refer to Section 4.3.10.12.1)

2. You can now execute any of the following tasks:

   - Configure one or more of the parameters of the Service Interface (refer to Section 4.3.10.12.2)

   - Restore the default values of the Service Interface parameters (refer to Section 4.3.10.12.3)

   - Terminate the Service Interface configuration mode (refer to Section 4.3.10.12.4)

In addition, you can, at any time, display configuration information for one or all existing Service Interfaces (refer to Section 4.3.10.12.6) or delete an existing Service Interface (refer to Section 4.3.10.12.5).

### 4.3.10.12.1 Enabling the Service Interface Configuration Mode\Creating a Service Interface

To configure the parameters of a Service Interface, first enable the Service Interface configuration mode for the specific Service Interface. Run the following command to enable the Service Interface configuration mode. You can also use this command to create a new Service Interface.

```
npu(config)# srvc-intf [<string>] [{IP-IP|VLAN|QinQ}]
```

For example, to define a new IP-IP Service Interface named SI1, run the following command:

```
npu(config)# srvc-intf SI1 IP-IP
```

To enable the configuration mode for an existing Service Interface named SI1, run the following command:

```
npu(config)# srvc-intf SI1
```

If you use this command to create a new Service Interface, the configuration mode for this Service Interface is automatically enabled.

**NOTE**

The Bearer IP Interface (refer to "Configuring IP interfaces" on page 158) must be configured prior to creating IP-IP or VLAN service interfaces.

After enabling the configuration mode for a Service Interface you can execute any of the following tasks:

- Configure one or more of the Service Interface parameters (refer to Section 4.3.10.12.2)

- Restore the default values of non-mandatory parameters of the Service Interface (refer to Section 4.3.10.12.3)

After executing the above tasks, you can terminate the Service Interface configuration mode (refer to Section 4.3.10.12.4) and return to the global configuration mode.

**Command Syntax**

```
npu(config)# srvc-intf [<string>] [{IP-IP|VLAN|QinQ}]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<string>]` | The Service Interface alias of the Service Interface for which you want to enable the configuration mode. If you want to create a new Service Interface, specify a new alias and define the type of service interface (see below). | Mandatory | N/A | String (1 to 15 characters) |
| `[{IP-IP|VLAN |QinQ}]` | The Service Interface's type. | Optional | IP-IP | ■ IP-IP<br>■ VLAN<br>■ QinQ |

**Command Modes**

Global configuration mode

### 4.3.10.12.2 Configuring Service Interface Parameters

This section describes the commands for:

- "Configuring Parameter for IP-IP Service Interface"
- "Configuring Parameter for VLAN Service Interface"
- "Configuring Parameter for QinQ Service Interface"

#### 4.3.10.12.2.1 Configuring Parameter for IP-IP Service Interface

After enabling the IP-IP Service Interface configuration mode, run the following command to configure the IP-IP service interface parameters:

This command shall configure one or more parameters of the IP-IP Service Interface.

**npu(config-srvcif-ipip)# config** ([**descr** <string>] [**tun-srcaddr** <ip4addr>] {**tun-dstaddr** <ipv4addr>} [**tun-mtu** <size(556-1804)>] [**tun-chksm**])

**Command Syntax**

**npu(config-srvcif-ip-ip)# config** ([**descr** <string>] [**tun-srcaddr** <ip4addr>] {**tun-dstaddr** <ipv4addr>} [**tun-mtu** <size(556-1804)>] [**tun-chksm**])

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| config ([descr <string>] | A description of the Service Interface. | Optional | null | String (up to 70 characters) |
| [tun-srcaddr <ip4addr>] | The source IP address that indicates the point of origination of the tunnel for the service interface.<br>Must be the same as the Bearer IP Address. | Optional | 0.0.0.0 | Valid IP Address. |

| | | | | |
|---|---|---|---|---|
| {tun-dstaddr <ipv4addr>} | The destination IP address that indicates the point of termination of the tunnel for the service interface.<br>Shall be unique among all the Host Interfaces IP's (Bearer, Local-Management, Internal-Management, External-Management) and existing instances of Service Interface’s Tunnel Destination IP Address and  Default Gateway IP Address. Shall not be in the subnet of any Mgmt interface (ie. Local, External and Internal). | Optional | 0.0.0.0 | Valid IP Address. |
| [tun-mtu <size(556-1804 )>] | Denotes the MTU. | Optional | 1480 | 556-1804 |
| [tun-chksm] | Indicates that end-to-end checksumming mechanism on ServiceTunnel Interface is enabled. | Optional | By default, this feature is disabled. | The presence/absence of this flag indicates that this feature is enabled/ disabled. |

**Command Modes**

IP-IP Service Interface configuration mode

#### 4.3.10.12.2.2 Configuring Parameter for VLAN Service Interface

After enabling the VLAN Service Interface configuration mode, run the following command to configure the VLAN service interface parameters:

This command shall configure one or more parameters of the VLAN Service Interface.

```
npu(config-srvcif-vlan)# config ([descr <string>] [ServiceIfVlanId
<integer(1-4094>] [ServiceIfDfltGwIp <ipv4addr>] [tun-mtu
<integer(556-1804)>])
```

**Command Syntax**

```
npu(config-srvcif-vlan)# config ([descr <string>] [ServiceIfVlanId
<integer(1-4094>] [ServiceIfDfltGwIp <ipv4addr>] [tun-mtu
<integer(556-1804)>])
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| config [descr <string>] | Aa description of the service interface. | Optional | null | String (up to 70 characters) |
| ServiceIfVlanId <integer(1-4094>] | A Service Interface VLAN ID shall not conflict with other instances of Service Interface VLAN ID and VLAN IDs of Bearer, Local-Management and External-Management interaces. Shall also not conflict with CVID of any transparent MS. | Optional | 0 | 0-9, 11-4094 |
| [ServiceIfDfltGwIp <ipv4addr>] | The IP Address of the Default Gateway.<br>Shall be unique among all the Host Interfaces IP's (Bearer, Local-Management, Internal-Management, External-Management) and existing instances of Service Interface's Tunnel Destination IP Address and Default Gateway IP Address.<br>Should be in the same subnet.with the IP Address of the DHCP server/proxy/relay to be assigned to a service group using this service interface. Subnet mask is taken as default subnet mask i.e 255.255.255.0. | Optional | 0.0.0.0 | valid IP address |
| [tun-mtu <integer(556-1804)>] | The MTU | Optional | 1480 | 556-1804 |

**Command Modes**

VLAN Service Interface configuration mode

#### 4.3.10.12.2.3 Configuring Parameter for QinQ Service Interface

After enabling the QinQ Service Interface configuration mode, run the following command to configure the QinQ service interface parameters:

This command shall configure one or more parameters of the QinQ Service Interface.

**npu(config-srvcif-QinQ)# config** ([**descr** <string>] [**ServiceIfVlanId** <integer(1-4094>])

**Command Syntax**

**npu(config-srvcif-QinQ)# config** ([**descr** <string>] [**ServiceIfVlanId** <integer(1-4094>]])

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| config [descr <string>] | A description of the service interface. | Optional | null | String (up to 70 characters) |
| ServiceIfVlanId <integer(1-4094>] | A Service Interface VLAN ID shall not conflict with other instances of Service Interface VLAN ID and VLAN IDs of Bearer, Local-Management and External-Management interaces.  Shall also not conflict with CVID of any transparent MS. | Optional | 0 | 0-9, 11-4094 |

**Command Modes**

QinQ Service Interface configuration mode

### 4.3.10.12.3 Restoring the Default Configuration Parameters for a Service Interface

This section describes the commands for:

- "Restoring the Default Configuration Parameters for an IP-IP Service Interface"
- "Restoring the Default Configuration Parameters for a VLAN Service Interface"

### 4.3.10.12.3.1 Restoring the Default Configuration Parameters for an IP-IP Service Interface

Run the following command to restore the default configuration for IP-IP service interface tun-mtu and/or tun-chksm parameters:

**npu(config-srvcif-ipip)# no [tun-mtu] [tun-chksm]**

You can restore only one parameter to its default values by specifying only that parameter. To restore both parameters to their default value, run the command **npu(config-srvcif-ipip)# no.**

**NOTE**

Refer to Section 4.3.10.12.2.1 for a description and default values of these parameters.

**Command Syntax**

```
npu(config-srvcif-ipip)# no [tun-mtu] [tun-chksm]
```

**Privilege Level**

10

**Command Modes**

IP-IP Service Interface configuration mode

### 4.3.10.12.3.2 Restoring the Default Configuration Parameters for a VLAN Service Interface

Run the following command to restore the default configuration for a VLAN service interface tun-mtu parameter:

**npu(config-srvcif-vlan)# no [tun-mtu]**

**NOTE**

Refer to Section 4.3.10.12.2.2 for a description and default values of this parameter.

**Command Syntax**

```
npu(config-srvcif-vlan)# no [tun-mtu]
```

**Privilege Level**

10

**Command Modes**

VLAN Service Interface configuration mode

### 4.3.10.12.4 Terminating a Service Interface Configuration Mode

This section describes the commands for:

- "Terminating the IP-IP Service Interface Configuration Mode"
- "Terminating the VLAN Service Interface Configuration Mode"
- "Terminating the QinQ Service Interface Configuration Mode"

#### 4.3.10.12.4.1 Terminating the IP-IP Service Interface Configuration Mode

Run the following command to terminate the IP-IP service interface configuration mode:

```
npu(config-srvcif-ipip)# exit
```

**Command Syntax**

```
npu(config-srvcif-ipip)# exit
```

**Privilege Level**

10

**Command Modes**

IP-IP Service interface configuration mode

#### 4.3.10.12.4.2 Terminating the VLAN Service Interface Configuration Mode

Run the following command to terminate the vlan service interface configuration mode:

```
npu(config-srvcif-vlan)# exit
```

**Command Syntax**

```
npu(config-srvcif-vlan)# exit
```

**Privilege Level**

10

**Command Modes**

VLAN Service interface configuration mode

### 4.3.10.12.4.3 Terminating the QinQ Service Interface Configuration Mode

Run the following command to terminate the QinQ service interface configuration mode:

```
npu(config-srvcif-QinQ)# exit
```

**Command Syntax**

```
npu(config-srvcif-QinQ)# exit
```

**Privilege Level**

10

**Command Modes**

QinQ Service interface configuration mode

### 4.3.10.12.5 Deleting a Service Interface

You can, at any time, run the following command to delete service interface:

npu(config)# no srvc-intf [<intf-alias>]

**NOTE**

A Service Interface cannot be deleted if it is assigned to any Service Group.

A QinQ Service Interface cannot be deleted if it is assigned to a Service Flow (with a VPWS-QinQ Service Group). For details refer to "Configuring Service Flows" on page 339.

**Command Syntax**

```
npu(config)# no srvc-intf [intf-alias>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [intf-alias> ] | The alias of the Service interface which needs to be deleted | Mandatory | N/A | String |

**Command Modes**

Global configuration mode

### 4.3.10.12.6 Displaying Configuration Information for the Service Interface

To display configuration information for one or all service interfaces, run the following command:

```
npu# show srvc-intf <intf-alias>
```

Specify a value for the `intf-alias` parameter if you want to display configuration information for a particular service interface. Do not specify a value for this parameter if you want to view configuration information for all service interfaces.

**Command Syntax**

```
npu# show srvc-intf intf-alias>
```

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<intf-alias>` | The alias  of the service interface that you want to display. If you do not specify a value for this parameter, all the services interfaces that are configured, are displayed. | Optional | N/A | String |

**Display Format**

**IP-IP Service Interface**

```
% Asn-gateway Srvc Intf config
 Srvcif-Alias <string>
 SrvcifDescr <string>
 intf-type IP-IP
 SrvcifTunSrcIpAddr <IP address>
 SrvcifTunDstIpAddr <IP address>
 Tunnel-Chksum is <Disable/Enable>
 TunIPIPMTU <size>
```

**Display Format**

**VLAN Service Interface**

```
% Asn-gateway Srvc Intf config
 Srvcif-Alias <string>
 SrvcifDescr <string>
 intf-type VLAN
 SrvcifVlanId <vlan id>
 SrvcifDfltGwIpAddr <IP address>
 TunIPIPMTU <size>
```

**Display Format**

**QinQ Service Interface**

```
% Asn-gateway Srvc Intf config
 Srvcif-Alias <string>
 SrvcifDescr <string>
 intf-type QinQ
 Q-in-Q SrvcifVlanId <vlan id>
```

**Command Modes**

Global command mode

## 4.3.10.13 Configuring the AAA Client Functionality

The AAA client functionality enables configuration of one RADIUS client. The RADIUS client encapsulates the messages destined for the AAA server in RADIUS messages or decapsulates messages sent by the AAA server for the MS.

The RADIUS client can be assigned an independent self address, primary AAA server address, alternate AAA server address, shared secret, and protocol port.

In addition, you can also configure certain RADIUS parameters such as the NAS ID and the time zone offset that are applicable for all AAA clients.

This section describes the commands for:

- "Managing AAA Client Configuration" on page 301
- "Managing Global RADIUS Configuration Parameters" on page 307

### 4.3.10.13.1 Managing AAA Client Configuration

**To configure one or more AAA clients:**

1 Enable the AAA client configuration mode (`refer` to Section 4.3.10.13.1.1)

2 You can now execute any of the following tasks:

» Configure the AAA client parameters (refer to Section 4.3.10.13.1.2)

» Restore the default parameters for the AAA client (refer to Section 4.3.10.13.1.3)

3 Terminate the AAA client configuration mode (refer to Section 4.3.10.13.1.4)

In addition, you can, at any time, display configuration information (refer to Section 4.3.10.13.1.6)or delete an existing AAA client (refer to Section 4.3.10.13.1.5).

The following example illustrates the (sequence of) commands for enabling the AAA client configuration mode, configuring the parameters of the AAA client, and then terminating the AAA client configuration mode:

```
npu(config)# aaa-client wimax
```

```
npu(config-aaa)# config src-intf eth0 primary-serveraddr
172.16.104.61 auth-port 5678
```

```
npu(config-aaa)# exit
```

#### 4.3.10.13.1.1 Enabling the AAA Client Configuration Mode\ Creating a New AAA Client

To configure the AAA client parameters, first enable the AAA client configuration mode. Run the following command to enable the AAA client configuration mode. You can also use this command to create a new AAA client configuration mode.

```
npu(config)# aaa-client <client-alias>
```

In the current release only one AAA client can be created.

If you use this command to create a new AAA client, the configuration mode for this AAA client is automatically enabled, after which you can execute any of the following tasks:

- Configure the AAA client parameters (refer to Section 4.3.10.13.1.2)

- Restore the default parameters for the AAA client (refer to Section 4.3.10.13.1.3)

After executing these tasks, you can terminate the AAA client configuration mode and return to the global configuration mode (refer to Section 4.3.10.13.1.4).

**Command Syntax**

```
npu(config)# aaa-client <client-alias>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<client-alias>` | Denotes the client-alias of the AAA client for which the configuration mode is to be enabled.<br>If you want to create a new AAA client, specify the client-alias for the AAA client that you want to create. | Mandatory | N/A | String |

**Command Modes**

Global configuration mode

### 4.3.10.13.1.2 Configuring Parameters for the AAA Client

After enabling the AAA client configuration mode, run the following command to configure the parameters for the AAA client:

```
npu(config-aaa)# config [src-intf <ip-intf>] [primary-serveraddr
<ipv4addr>] [alternate-serveraddr <ipv4addr>] [rad-sharedsecret
<string>] [auth-port <port>] [acct-port <port>]
```

**NOTE**

You can display configuration information for a specific or all AAA clients. For details, refer to Section 4.3.10.13.1.6.

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config-aaa)# config [src-intf <ip-intf>] [primary-serveraddr
<ipv4addr>] [alternate-serveraddr <ipv4addr>] [rad-sharedsecret <string>]
[auth-port <port>] [acct-port <port>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[src-intf <ip-intf>]` | Indicates the IP address of the interface providing RADIUS client functionality. Must be the IP address of the Bearer interface.<br>**Note**: If you are modifying the service interface for the AAA client, save the current configuration (refer Section 4.3.4.1) and reset the NPU (Section 4.2.2.1) for the change to take effect. | Mandatory | N/A | IP address of bearer interface |
| `[primary-serveraddr <ipv4addr>]` | Denotes IPv4 address of the primary AAA server. It is mandatory to specify a value for this parameter if you do not configure an alternate server. | Optional | 0.0.0.0 | Valid IP Address |
| `[alternate-serveraddr <ipv4addr>]` | Denotes IPv4 address of the alternate AAA server.<br>It is mandatory to specify a value for this parameter if you do not configure a primary server. | Optional | N/A | Valid IP Address |
| `[rad-sharedsecret <string>]` | Denotes the shared secret between the AAA client and the AAA server. | Mandatory | N/A | String (1 to 49 characters) |
| `[auth-port <port>]` | Denotes the Authenticator port on which the AAA client listens to and sends RADIUS authentication messages. | Optional | 1812 | 0-65535 |

| | | | | | |
|---|---|---|---|---|---|
| | [acct-port <port>] | Denotes the accounting port on which the AAA client listens to and sends RADIUS accounting messages. | Optional | 1813 | 0-65535 |

**Command Modes**

AAA client configuration mode

### 4.3.10.13.1.3 Restoring the Default Configuration Parameters for the Authentication Port

Run the following command to restore the default configuration for the authentication port.

```
npu(config-aaa)# no [primary-serveraddr] [alternate-serveraddr]
[auth-port] [acct-port <port>]
```

When you execute this command for restoring the default values, it also deletes the current values for the primary-server and alternate-server address.

**NOTE**

Refer to Section 4.3.10.2.1 for a description and default values of these parameters.

**Command Syntax**

```
npu(config-aaa)# no [primary-serveraddr] [alternate-serveraddr]
[auth-port] [acct-port <port>]
```

**Privilege Level**

10

**Command Modes**

AAA client configuration mode

### 4.3.10.13.1.4 Terminating the AAA Client Configuration Mode

Run the following command to terminate the AAA client configuration mode:

```
npu(config-aaa)# exit
```

**Command Syntax**

```
npu(config-aaa)# exit
```

**Privilege Level**

10

**Command Modes** AAA client configuration mode

#### 4.3.10.13.1.5 Deleting the AAA Client

Run the following command to delete the AAA client:

```
npu(config)# no aaa-client [<client-alias>]
```

**CAUTION**

Specify the AAA client alias if you want to delete a specific AAA client. Otherwise all the configured AAA clients are deleted.

In the current release, only one AAA client can be configured.

**Command Syntax**

```
npu(config)# no aaa-client [<client-alias>]
```

**Privilege Level** 10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<client-alias>]` | Denotes the AAA client that is to be deleted. If you do not specify a value for this parameter, all the existing AAA clients, are deleted. | Optional | N/A | String |

**Command Modes** Global configuration mode

#### 4.3.10.13.1.6 Displaying Configuration Information for the AAA Client

To display one or all AAA clients, run the following command:

```
npu# show aaa-client [<client-alias>]
```

Specify the AAA client alias if you want to display configuration information for a particular AAA client. Do not specify a value for this parameter if you want to view configuration information for all AAA clients.

**Command Syntax**

```
npu# show aaa-client [<client-alias>]
```

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<client-alias>]` | Denotes the client-alias for which the associated AAA client information is to be displayed.<br>Specify a value for this parameter if you want to display information about a specific AAA client.<br>If you want to display information about all AAA clients, do not specify any value for this parameter. | Optional | N/A | String |

**Display Format**

```
AAA Client Configuration :

client-alias src-intf primary-servweraddr alternate-serveraddr
rad-sharedsecret auth-port acct-port

<value>   <value>  <value>      <value>          <value>      <value>
```

**Command Modes**

Global command mode

### 4.3.10.13.2 Managing Global RADIUS Configuration Parameters

Global RADIUS configuration parameters for AAA clients determine how AAA clients should send access requests. This section describes the commands to be used for:

- "Configuring Global RADIUS Parameters" on page 308
- "Restoring the Default Global RADIUS Configuration Parameters" on page 309

- "Displaying Global RADIUS Configuration Parameters" on page 310

### 4.3.10.13.2.1 Configuring Global RADIUS Parameters

To configure the global RADIUS configuration parameters to be used for all AAA clients, run the following command:

```
npu(config)# radius <[accessreq-retries <retransmissions>]
[accessreq-interval <timeout>] [nasid <nas-identifier>]
[timezone-offset <time-offset(0-86400)>] [mtu <framed mtu
size(1020-2000)>][RadiusAtrbtTypeServiceProfileName
<AtrbtTypeId(1-255)>]>
```

**NOTE**

You can display configuration information for global RADIUS parameters. For details, refer to Section 4.3.10.13.2.3

**IMPORTANT**

An error may occur if you provide an invalid  value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config)# radius <[accessreq-retries <retransmissions>]
[accessreq-interval <timeout>] [nasid <nas-identifier>] [timezone-offset
<time-offset(0-86400)>] [mtu <framed mtu size(1020-2000)>]
[RadiusAtrbtTypeServiceProfileName <AtrbtTypeId(1-255)>]>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [accessreq-retries <retransmissions>] | Denotes the maximum number of times the AAA client can resend the access request. | Optional | 3 | 0-5 |
| [accessreq-interval <timeout>] | Denotes the interval, in seconds, after which the AAA client can resend the access request. | Optional | 500 | 10-100000 |

| | | | | |
|---|---|---|---|---|
| [nasid <nas-identifier>] | Denotes the unique identifier of the ASNGW NAS. Sent in Access Request message only if configured. Should be in FQDN format. | Optional | null | String (up to 64 characters) |
| [timezone-offset <time-offset(0-86400)>] | Denotes the time zone offset, in seconds, from GMT at the NAS. | Optional | 0 | 0-86400 |
| [mtu <framed mtu size(1020-2000)>] | Denotes the MTU to be used for the AAA client functionality. | Optional | 2000 | 1020-2000 |
| [RadiusAtrbtTypeServiceProfileName <AtrbtTypeId(1-255)>] | Denotes the RADIUS attribute in which the ASN-GW shall expect to get the service profile name. For example, configure 11 if AAA uses Filter ID as the container of service profile name,<br>Use only unassigned freetext-type RADIUS attributes. | Optional | 11 | 1-255 |

**Command Modes**

Global configuration mode

#### 4.3.10.13.2.2 Restoring the Default Global RADIUS Configuration Parameters

To restore the default global RADIUS configuration used for AAA clients, run the following command:

```
npu(config)# no radius [accessreq-retries] [accessreq-interval]
[nasid] [timezone-offset] [mtu]
```

**NOTE**

Refer Section 4.3.10.13.2.1 for a description and default values of these parameters.

**Command Syntax**

```
npu(config)# no radius [accessreq-retries] [accessreq-interval] [nasid]
[timezone-offset] [mtu]
```

**Privilege Level**

10

**Command Modes**

Global configuration mode

### 4.3.10.13.2.3 Displaying Global RADIUS Configuration Parameters

To display global RADIUS configuration parameters used for all AAA clients, run the following command:

**npu# show radius**

**Command Syntax**

```
npu# show radius
```

**Privilege Level**

1

**Display Format**

```
Radius Configuration :

accessreq-retries = <value>

accessreq-interval = <value>

nasid = <value>

timezone-offset = <value>

mtu = <value>
```

**Command Modes**

Global command mode

## 4.3.10.14 Managing Service Groups

A service group is a group of MSs that are served by the same service provider or belong to the same service class. You can configure up to 10 service groups, where each of them is:

- Associated with a separate service interface (IP Service Groups only).

- Configured as any one of the following:
  - » DHCP server that allocates an IP address to the MS from the local pool (in the non-HA mode).
  - » DHCP relay that obtains the IP address using an external DHCP server (in the non-HA mode).
  - » DHCP proxy for either of the following boot modes:
    - ◊ Non-HA mode: The DHCP proxy assigns the MS, the IP address that was received from AAA in the MS profile or
    - ◊ HA mode: The DHCP proxy assigns the MS, the IP address received in the MS profile or obtains the IP address from HA using the mobile IP

**To configure a service group:**

1 Enable the service group configuration mode (refer to Section 4.3.10.14.1)

2 You can now execute any of the following tasks:

- » Configure the common parameters of a service group (refer to Section 4.3.10.14.2)
- » Enable the service group operation mode and configure the DHCP server/proxy/relay-specific parameters (refer to Section 4.3.10.14.4.1)

3 Terminate the service group configuration mode (refer to Section 4.3.10.14.5)

In addition, you can, at any time, display configuration information (refer to Section 4.3.10.15.2) or delete an existing service group (refer to Section 4.3.10.14.6).

### 4.3.10.14.1 Enabling the Service Group Configuration Mode\ Creating a New Service Group

To configure the parameters for the service group, first enable the service group configuration mode. Run the following command to enable the service group configuration mode or create the service group.

```
npu(config)# srvc-grp <grp-alias> [ServiceGrpType {IP | VPWS-QinQ | 
VPWS-Transparent}]
```

If you use this command to create a new service group, the configuration mode for this group is automatically enabled after which you can configure or restore the default parameters for this service group.

After enabling the service group configuration mode, you can execute any of the following tasks:

- Configure the common parameters for the service group (refer to Section 4.3.10.14.2)

- Enable the service group operation mode and configure the DHCP server/proxy/relay-specific parameters (refer to Section 4.3.10.14.4.1)

After executing these tasks, you can terminate the service group configuration mode (refer to Section 4.3.10.14.5).

**NOTE**

You can display configuration information for specific or all service groups. For details, refer to Section 4.3.10.15.2.

**Command Syntax**

```
npu(config)# srvc-grp <grp-alias> [ServiceGrpType {IP | VPWS-QinQ |
VPWS-Transparent}]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<grp-alias>` | Denotes the group-alias of the service group for which the service group configuration mode is to be enabled. If you want to create a new service group, specify the group alias to be assigned to the srevice group. | Mandatory | N/A | String (1 to 15 characters) |
| `[ServiceGrpType {IP \| VPWS-QinQ \| VPWS-Transparent} ]` | The Service group's type. | Optional | IP | - IP<br>- VPWS-QinQ<br>- VPWS-Transparent |

**Command Modes**

Global configuration mode

### 4.3.10.14.2 Configuring Common Parameters of a Service Group

After enabling the service group configuration mode, run the following command to configure common parameters for the service group:

```
npu(config-srvcgrp)# config {{[srvcif-alias <service interface>]
[waitdhcp-holdtime <timeout>] [dhcp-ownaddr <ipv4addr>]} |
{dhcp-server|dhcp-proxy|dhcp-relay} |{[<ServiceGrpIfAccounting
(enable|disable)>]}|{[<ServiceGrpIfMSLoopBack (enable|disable)>]}}
```

**NOTE**

This command is applicable for an IP Service Group. In VPWS-QinQ and VPWS-Transparent Service Groups only the accounting option (ServiceGrpIfAccounting (enable|disable)) is available.

```
This commands comprises 4 sub-commands:
```

1. npu(config-srvcgrp)# config {[srvcif-alias <service interface>] [waitdhcp-holdtime <timeout>] [dhcp-ownaddr <ipv4addr>]}
2. npu(config-srvcgrp)# config {dhcp-server|dhcp-proxy|dhcp-relay}
3. npu(config-srvcgrp)# config {[<ServiceGrpIfAccounting (enable|disable)>]}
4. npu(config-srvcgrp)# config {[<ServiceGrpIfMSLoopBack (enable|disable)>]}

**NOTE**

You can display configuration information for the service group. For details, refer to Section 4.3.10.15.2.

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config-srvcgrp)# config {{[srvcif-alias <service interface>]
[waitdhcp-holdtime <timeout>] [dhcp-ownaddr <ipv4addr>]} |
{dhcp-server|dhcp-proxy|dhcp-relay} |{[<ServiceGrpIfAccounting
(enable|disable)>]}|{[<ServiceGrpIfMSLoopBack (enable|disable)>]}}
```

**Privilege Level** 10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[srvcif-alias <service interface>]` | Denotes the pre-defined service interface alias to be used as the data path for traffic towards the core network.<br>Note that a Service Interface alias can be associated only to a single Service Group. | Mandatory | N/A | String |
| `[waitdhcp-holdtime <timeout>]` | Denotes the period, in seconds, for which the NPU waits for an IP address allocation trigger (MIP registration request / DHCP discover) from the MS.<br>If you specify the value of this parameter as 0, no timer is started and the NPU will wait infinitely for the IP address allocation trigger. | Optional | 0 | 0-86400 |

| | | | | |
|---|---|---|---|---|
| `[dhcp-ownaddr <ipv4addr>]` | Denotes the IPv4 address of the DHCP server/ relay/ proxy.<br>For a service group using a VLAN service interface, should be in same subnet with the Default Gateway configured for the service interface associated with the service group. Subnet mask is taken as the default subnet mask i.e 255.255.255.0.<br>Note: In DHCP Server mode, the DHCP server IP address must be in the same subnet but outside the range allocated for users address pool as provisioned in the DHCP Server. | Mandatory | N/A | Valid IP Address |
| `{dhcp-server \|dhcp-proxy\| dhcp-relay}` | Mode of IP address allocation used for subscribers: DHCP Server/ Proxy/ Relay. | Mandatory | N/A | ■ dhcp-server<br>■ dhcp-proxy<br>■ dhcp-relay |
| `{ServiceGrpIfAccounting {enable\| disable}}` | Denotes whether accounting is enabled or disabled for the service interface. | Optional | Enable | ■ Enable<br>■ Disable |
| `{ServiceGrpIfMsLoopBack {enable\| disable}}` | Denotes whether MS loopback is enabled or disabled for the service interface | Optional | Disable | ■ Enable<br>■ Disable |

**Command Modes**

Service group configuration mode

### 4.3.10.14.3 Enabling/Disabling VLAN Service Interface

Run the following commands to enable/disable the creation of a data-path for a VLAN Service:

To enable: **`npu(config-srvcgrp)#` config {[serviceVlanEnable]}**

To disable: **`npu(config-srvcgrp)#` no serviceVlanEnable**

| | |
|---|---|
| **Command Syntax** | `npu(config-srvcgrp)# config {[serviceVlanEnable]}`<br>`npu(config-srvcgrp)# no [<servicevlanEnable>` |
| **Privilege Level** | 10 |
| **Command Modes** | Service group configuration mode |

### 4.3.10.14.4 Configuring the DHCP Server/Proxy/Relay

**To configure the DHCP server/proxy/relay:**

1. Enable the service group operation mode for DHCP server/relay/proxy (refer to Section 4.3.10.14.4.1)
2. You can now execute one of the following tasks according to the selected DHCP mode:
   - » Configure the DHCP server (refer to Section 4.3.10.14.4.2)
   - » Configure the DHCP proxy (refer to Section 4.3.10.14.4.3)
   - » Configure the DHCP relay (refer to Section 4.3.10.14.4.4)

#### 4.3.10.14.4.1 Enabling the Service Group Operation Mode for DHCP Server//Proxy/Relay

Run the following command enable the DHCP (server/relay/proxy) configuration mode.

```
npu(config-srvcgrp)# config {dhcp-server|dhcp-proxy|dhcp-relay}
```

When you run this command, the DHCP server/proxy/relay configuration mode is enabled, after which you can execute the following tasks:

- Configure the DHCP server (refer to Section 4.3.10.14.4.2)
- Configure the DHCP proxy (refer to Section 4.3.10.14.4.3)
- Configure the DHCP relay (refer to Section 4.3.10.14.4.4)

**NOTE**

You cannot modify the configured DHCP mode. To change the DHCP mode you should first delete the Service Group and configure it again.

**Command Syntax**

```
npu(config-srvcgrp)# config {dhcp-server|dhcp-proxy|dhcp-relay}
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{dhcp-server|dhcp-proxy|dhcp-relay}` | Indicates whether the service group operation mode is to be enabled for the DHCP server, proxy or relay. | Mandatory | N/A | ■ dhcp-server<br>■ dhcp-proxy<br>■ dhcp-relay |

**Command Modes**

Service group configuration mode

### 4.3.10.14.4.2 Configuring the DHCP Server

After enabling the service group operation mode for the DHCP server, you can execute any of the following tasks:

- "Configuring DHCP Server Parameters" on page 318
- "Restoring Configuration Parameters for the DHCP Server" on page 320
- "Configuring Exclude IP Addresses for the DHCP Server" on page 321
- "Deleting Exclude IP Addresses for the DHCP Server" on page 322

**NOTE**

Before executing these tasks, ensure that you have enabled the DHCP server configuration mode. For details, refer to "Enabling the Service Group Operation Mode for DHCP Server//Proxy/Relay" on page 316.

### 4.3.10.14.4.2.1Configuring DHCP Server Parameters

Run the following command to configure the DHCP server:

```
npu(config-srvcgrp-dhcpserver)# config ([pool-minaddr <string>]
[pool-maxaddr <string>] [pool-subnet <string>] [dflt-gwaddr
<string>] [lease-interval <integer(24-2147483647)>]
[renew-interval <integer>] [rebind-interval <integer>]
[dnssrvr-addr <string>] [offerreuse-holdtime <integer>] [opt60
<string(30)>] [opt43 {[Name <string(64)>] [Value <string(64)>]}]
[Sname <string(64)>] [File <string(128)>])
```

**NOTE**

If DHCP IP pool (pool-minaddr and/or pool-maxaddr) need to be changed, the service group should be deleted and reconfigured with the new DHCP IP pool.

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config-srvcgrp-dhcpserver)# config ([pool-minaddr <string>]
[pool-maxaddr <string>] [pool-subnet <string>] [dflt-gwaddr
<string>] [lease-interval <integer(24-2147483647)>]
[renew-interval <integer>] [rebind-interval <integer>]
[dnssrvr-addr <string>] [offerreuse-holdtime <integer>] [opt60
<string(30)>] [opt43 {[Name <string(64)>] [Value <string(64)>]}]
[Sname <string(64)>] [File <string(128)>])
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[pool-minaddr <string>]` | Denotes the minimum (lowest) IP address of the address pool to be used for address allocation for MSs from this Service Group. | Optional | 0.0.0.0 | Valid IP Address |

| | | | | |
|---|---|---|---|---|
| **[[pool-maxaddr <string>]** | Denotes the maximum (highest) IP address of the address pool configuration. | Optional | 255.255.255.255 | Valid IP Address |
| **[pool-subnet <string>]** | The IP subnet mask to be provided by local DHCP Service with IP address for MSs from this Service Group. | Optional | 255.255.255.255 | IP subnet |
| **[dflt-gwaddr <string>]** | IP address of Default Gateway to be provided by local DHCP Service with IP address for MS from this Service Group. | Optional | 0.0.0.0 | Valid IP Address |
| **[lease-interval <integer(24-2147483647)> ]** | Lease time in seconds of IP address allocated for MS from this Service Group. | Optional | 86400 | **24-2147483647** |
| **[renew-interval <integer>]** | Denotes the period, after which, the MS can request for renewal of the lease which has expired. Specify the value of this parameter as a percentage of the `lease-interval` parameter | Optional | 50 | 1-100 |
| **[rebind-interval <integer>]** | Denotes the rebind interval maintained as a percentage of the lease interval. This is passed to the MS (DHCP client). | Optional | 75 | 1-99 |
| **[dnssrvr-addr <string>]** | IP Address of the first DNS Server to be provisioned to MS from this Group.t | Optional | 0.0.0.0 | Valid IP Address |
| **[offerreuse-holdtime <integer>]** | Denotes the Offer Reuse time in seconds of IP address offered to MS from this Service Group. | Optional | 5 | 1-120 |
| **[opt60 <string(30)> ]** | Configures option 60.<br>An empty string (null) means that DHCP Option 60 is disabled. | Optional | <dslforum.org> | String (up to 30 characters).<br>Null (empty string) disables Option 60. |

| | | | | |
|---|---|---|---|---|
| **[opt43 {[Name <string(64)> ]** | Configures option 43 Name | Optional | Internet Gateway Device. ManagementServer.URL | String (up to 64 characters) |
| **[Value <string(64)> ]** | Configures option 43 Value | Optional | empty string | String (up to 64 characters) |
| **[Sname <string(64)> ]** | Configures the server host name. This parameter is sent in dhcp-offer / dhcp-ack messages and may be used by certain CPEs. | Optional | empty string | String (up to 64 characters) |
| **[File <string(128) >]** | Configures the boot file name. This parameter is sent in dhcp-offer / dhcp-ack messages and may be used by certain CPEs. | Optional | empty string | String (up to 128 characters) |

**Command Modes**

Service Group-DCHP server configuration mode

### *4.3.10.14.4.2.2Restoring Configuration Parameters for the DHCP Server*

Run the following command to restore the default values of one or several DHCP server parameters. This command can be used to delete the DNS server address configuration (if specified).

```
npu(config-srvcgrp-dhcpserver)# no [lease-interval]
[renew-interval] [rebind-interval] [dnssrvr-addr]
[offerreuse-holdtime]
```

Specify one or several parameters to restore the specified parameters to their default values. Do not specify any parameter to restore all of these parameters to their default values.

**NOTE**

Refer to Section 4.3.10.14.4.2.1 for a description and default values of these parameters.

**Command Syntax**

```
npu(config-srvcgrp-dhcpserver)# no [lease-interval] [renew-interval]
[rebind-interval] [dnssrvr-addr] [offerreuse-holdtime]
```

**Privilege Level**

10

**Command Modes**

Service group-DHCP server configuration mode

### 4.3.10.14.4.2.3Configuring Exclude IP Addresses for the DHCP Server

Run the following command to configure exclude IP addresses for the DHCP server:

```
npu(config-srvcgrp-dhcpserver)# exclude-addr <no. of Addrs (1-9)>
<ipv4addr> [<ipv4addr>] ….
```

In each command you may add up to 9 IP addresses to be excluded. The total number of excluded IP addresses is up to a maximum of 16384.

**IMPORTANT**

An error may occur if you provide an invalid IP address. Refer the syntax description for more information about the appropriate values and format for configuring this parameters.

**Command Syntax**

```
npu(config-srvcgrp-dhcpserver)# exclude-addr <no. of Addrs (1-9)>
<ipv4addr> [<ipv4addr>] ….
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<no. of Addrs (1-9)>` | The number of IP addresses to be excluded | Mandatory | N/A | 1-9 |
| `<ipv4addr>` | Denotes the exclude IP address that will not be assigned to an MS by the DHCP server.<br>The number of IP address entries must match the value defined by the no. of Addrs parameter. | Mandatory | N/A | Valid IP address |

**Command Modes**

Service group-DCHP server configuration mode

#### 4.3.10.14.4.2.4Deleting Exclude IP Addresses for the DHCP Server

Run the following command to delete one or several excluded IP addresses for the DHCP server:

```
npu(config-srvcgrp-dhcpserver)# no exclude-addr <no. of Addrs
(1-9)> <ipv4addr> [<ipv4addr>] …
```

Run the following command (without specifying the parameters) to delete all excluded IP addresses for the DHCP server:

```
npu(config-srvcgrp-dhcpserver)# no exclude-addr
```

The deleted exclude IP addresses are no longer excluded when the DHCP server allocates the IP addresses. That is, the server may allocate these IP addresses to the MS.

**Command Syntax**

```
npu(config-srvcgrp-dhcpserver)# no exclude-addr no. of Addrs (1-9)>
<ipv4addr> [<ipv4addr>] …
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<no. of Addrs (1-9)>` | The number of excluded IP addresses to be deleted.<br>Do not specify any value if you want to remove all the exclude IP addresses specified for that DHCP server. | Optional | N/A | 1-9 |
| `<ipv4addr>` | Denotes an IP address that you want to remove from the list of exclude IP addresses.<br>The number of IP address entries must match the value defined by the no. of Addrs parameter.<br>Do not specify any value if you want to remove all the exclude IP addresses specified for that DHCP server. | Optional | N/A | Valid IP address |

**Command Modes**

Service group-DHCP server configuration mode

### *4.3.10.14.4.2.5Terminating the DHCP Server Configuration Mode*

Run the following command to terminate the DHCP server configuration mode:

```
npu(config-srvcgrp-dhcpserver)# exit
```

**Command Syntax**

```
npu(config-srvcgrp-dhcpserver)# exit
```

**Privilege Level**

10

**Command Modes**

Service group-DHCP server configuration mode

### 4.3.10.14.4.3 Configuring the DHCP Proxy

After enabling the service group operation mode for the DHCP proxy, you can execute the following tasks:

- "Specifying DHCP Proxy Configuration Parameters" on page 324
- "Restoring the Default Configuration Parameters for the DHCP Proxy" on page 327
- "Terminating the DHCP Proxy Configuration Mode" on page 327

#### *4.3.10.14.4.3.1Specifying DHCP Proxy Configuration Parameters*

Run the following command to configure the DHCP proxy:

```
npu(config-srvcgrp-dhcpproxy)# config ([offerreuse-holdtime
<integer>] [lease-interval <integer>] [dnssrvr-addr <string>]
[pool-subnet <string>] [dflt-gwaddr <string>] [renew-interval
<integer>] [rebind-interval <integer>] [opt60 <string(30)>] [opt43
{[Name <string(64)>] [Value <string(64)>]}] [Sname <string(64)>]
[File <string(128)>])
```

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config-srvcgrp-dhcpproxy)# config ([offerreuse-holdtime
<integer>] [lease-interval <integer>] [dnssrvr-addr <string>]
[pool-subnet <string>] [dflt-gwaddr <string>] [renew-interval
<integer>] [rebind-interval <integer>] [opt60 <string(30)>] [opt43
{[Name <string(64)>] [Value <string(64)>]}] [Sname <string(64)>]
[File <string(128)>])
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[offerreuse-holdtime <integer>]` | Denotes the duration in seconds within which the MS should send a DHCP request to accept the address sent by the NPU.<br>If the MS does not accept the address within this period, the MS is deregistered. | Optional | 5 | 0-120 |
| `[lease-interval <integer>]` | Lease time in seconds of IP address allocated for MS from this Service Group.<br>In the Proxy mode, this value is used if appropriate parameter is not received in RADIUS Access-Accept. | Optional | 86400 | 24 - 4294967295 |
| `[dnssrvr-addr <string>]` | IP Address of the first DNS Server to be provisioned to MS from this Group.<br>In the Proxy mode, this value is used if appropriate parameter is not received in RADIUS Access-Accept | Optional | 0.0.0.0 | Valid IP Address |
| `[pool-subnet <string>]` | The IP subnet mask to be provided by local DHCP Service with IP address for MSs from this Service Group. In the Proxy mode, this value is used if appropriate parameter is not received in RADIUS Access-Accept. | Optional | 255.255.255.255 | IP subnet |
| `[dflt-gwaddr <string>]` | IP address of Default Gateway to be provided by local DHCP Service with IP address for MS from this Service Group.<br>In theProxy mode, this value is used if appropriate parameter is not received in RADIUS Access-Accept. | Optional | 0.0.0.0 | Valid IP Address |

| | | | | |
|---|---|---|---|---|
| **[renew-interval <integer>]** | Denotes the period, after which, the MS can request for renewal of the lease which has expired. Specify the value of this parameter as a percentage of the `lease-interval` parameter.<br>This value is used if appropriate parameter is not received in RADIUS Access-Accept. | Optional | 50 | 1-100 |
| **[rebind-interval <integer>]** | Denotes the rebind interval maintained as a percentage of the lease interval. This is passed to the MS (DHCP client).<br>This value is used if appropriate parameter is not received in RADIUS Access-Accept. | Optional | 75 | 1-99 |
| **[opt60 <string(30)>]** | Configures option 60. | Optional | <dslforum.org> | String (up to 30 characters) |
| **[opt43 {[Name <string(64)>]** | Configures option 43 Name | Optional | Internet Gateway Device. ManagementServer.URL | String (up to 64 characters) |
| **[Value <string(64)>]** | Configures option 43 Value | Optional | empty string | String (up to 64 characters) |
| **[Sname <string(64)>]** | Configures the proxy host name. This parameter is sent in dhcp-offer / dhcp-ack messages and may be used by certain CPEs. | Optional | empty string | String (up to 64 characters) |
| **[File <string(128)>]** | Configures the boot file name. This parameter is sent in dhcp-offer / dhcp-ack messages and may be used by certain CPEs. | Optional | empty string | String (up to 128 characters) |

| | |
|---|---|
| **Command Modes** | Service group-DHCP proxy configuration mode |

### 4.3.10.14.4.3.2Restoring the Default Configuration Parameters for the DHCP Proxy

Run the following command to restore the default values of one or several DHCP proxy parameters. This command can also be used to delete the configured DNS server address (if specified).

```
npu(config-srvcgrp-dhcpproxy)# no [offerreuse-holdtime]
[lease-interval] [dnssrvr-addr][renew-interval] [rebind-interval]
```

Specify one or several parameters to restore the specified parameters to their default values. Do not specify any parameter to restore all of these parameters to their default values.

**NOTE**

Refer Section 4.3.10.14.4.3.1 for a description and default values of these parameters.

| | |
|---|---|
| **Command Syntax** | `npu(config-srvcgrp-dhcpproxy)# no [offerreuse-holdtime] [lease-interval] [dnssrvr-addr][renew-interval] [rebind-interval]` |
| **Privilege Level** | 10 |
| **Command Modes** | Service group-DHCP proxy configuration mode |

### 4.3.10.14.4.3.3Terminating the DHCP Proxy Configuration Mode

Run the following command to terminate the DHCP proxy configuration mode:

```
npu(config-srvcgrp-dhcpproxy)# exit
```

| | |
|---|---|
| **Command Syntax** | `npu(config-srvcgrp-dhcpproxy)# exit` |
| **Privilege Level** | 10 |

**Command Modes**

Service group-DHCP proxy configuration mode

## 4.3.10.14.4.4 Configuring the DHCP Relay

After enabling the service group operation mode for the DHCP relay, you can execute any of the following tasks:

- "Configuring the DHCP Relay Parameters" on page 328
- "Terminating the DHCP Relay Configuration Mode" on page 332

### *4.3.10.14.4.4.1Configuring the DHCP Relay Parameters*

Run the following command to configure the DHCP server address for the DHCP relay:

```
npu(config-srvcgrp-dhcprelay)# config ([server-addr <ipV4Addr>]
[{EnableOpt82|DisableOpt82}])
```

**IMPORTANT**

An error may occur if you provide an invalid value for the DHCP server address. Refer the syntax description for more information about the appropriate values and format for configuring this parameters.

**Command Syntax**

```
npu(config-srvcgrp-dhcprelay)# config ([server-addr <ipV4Addr>]
[{EnableOpt82|DisableOpt82}])
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[server-addr <ipv4addr>]` | Denotes the IP address of the external DHCP server, | Mandatory | N/A | Valid IP Address |
| `[{EnableOpt82\|DisableOpt82}]` | Denotes whether DHCP option 82 is enabled or disabled. | Optional | Disable Opt82 | ■ EnableOpt82<br>■ DisableOpt82 |

**Command Modes**

Service group-DHCP relay configuration mode

### 4.3.10.14.4.4.2Configuring the DHCP Relay Option 82 Parameters

If Option 82 for the DHCP Relay is enabled, run the following command to configure suboptions of option 82 of DHCP messages:

```
npu(config-srvcgrp-dhcprelay-Opt82)# config ([Subopt1value
{Default|MSID|BSID|NASID|NASIP|Full-NAI|Domain|AsciiFrStrng
<string(32)>|BinFrStrng <string(32)>}] [Subopt2value
{Default|MSID|BSID|NASID|NASIP|Full-NAI|Domain|AsciiFrStrng
<string(32)>|BinFrStrng <string(32)>}] [Subopt6value
{Default|MSID|BSID|NASID|NASIP|Full-NAI|Domain|AsciiFrStrng
<string(32)>|BinFrStrng <string(32)>}] [{Subopt7value [service-type]
[vendor-specific] [session-timeout]}] [{EnableUnicast|DisableUnicast}])
```

**IMPORTANT**

- For DhcpRlOpt82SubOpt1BinFrstrng value, enter hex string without spaces.
- If Opt82Unicast is enabled then DHCP relay agent appends option 82 to all DHCP messages (unicast and broadcast).
- If Opt82Unicast is disabled (default) then DHCP relay agent appends option 82 only to broadcast DHCP request messages.

**Command Syntax**

```
npu(config-srvcgrp-dhcprelay-Opt82)# config ([Subopt1value
{Default|MSID|BSID|NASID|NASIP|Full-NAI|Domain|AsciiFrStrng
<string(32)>|BinFrStrng <string(32)>}] [Subopt2value
{Default|MSID|BSID|NASID|NASIP|Full-NAI|Domain|AsciiFrStrng
<string(32)>|BinFrStrng <string(32)>}] [Subopt6value
{Default|MSID|BSID|NASID|NASIP|Full-NAI|Domain|AsciiFrStrng
<string(32)>|BinFrStrng <string(32)>}] [{Subopt7value [service-type]
[vendor-specific] [session-timeout]}] [{EnableUnicast|DisableUnicast}])
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [Subopt1value {Default \| MSID \| BSID \| NASID \| NASIP \| Full-NAI \| Domain \| AsciiFrStrng <string(32)> \| BinFrStrng <string(32)>}] | Configures the suboption 1 (Agent Circuit ID) of DHCP option 82.<br>For AsciiFrStrng (string enter up to 32 characters,<br>For BinFrStrng (string enter a string of up to 32 hexadecimal digits (no spaces). | Optional | Not Set | ■ Default<br>■ MSID<br>■ BSID<br>■ NASID<br>■ NASIP<br>■ Full-NAI<br>■ Domain<br>■ AsciiFrStrng (string32)<br>■ BinFrStrng (string32) |
| [Subopt2value {Default \| MSID \| BSID \| NASID \| NASIP \| Full-NAI \| Domain \| AsciiFrStrng <string(32)> \| BinFrStrng <string(32)>} | Configures the suboption 2 (Agent Remote ID) of DHCP option 82.<br>For AsciiFrStrng (string enter up to 32 characters,<br>For BinFrStrng (string enter a string of up to 32 hexadecimal digits (no spaces). | Optional | Not Set | ■ Default<br>■ MSID<br>■ BSID<br>■ NASID<br>■ NASIP<br>■ Full-NAI<br>■ Domain<br>■ AsciiFrStrng (string32)<br>■ BinFrStrng (string32) |

| | | | | |
|---|---|---|---|---|
| [Subopt6value {Default \| MSID \| BSID \| NASID \| NASIP \| Full-NAI \| Domain \| AsciiFrStrng <string(32)> \| BinFrStrng <string(32)>}] | Configures the suboption 6 (Agent Subscriber ID )of DHCP option 82.<br>For AsciiFrStrng (string enter up to 32 characters,<br>For BinFrStrng (string enter a string of up to 32 hexadecimal digits (no spaces). | Optional | Not Set | ■ Default<br>■ MSID<br>■ BSID<br>■ NASID<br>■ NASIP<br>■ Full-NAI<br>■ Domain<br>■ AsciiFrStrng (string32)<br>■ BinFrStrng (string32) |
| [{Subopt7value [service-type] [vendor-specific ] [session-timeout]}] | Configures the suboption 7 of DHCP option 82.<br>Allows enabling/disabling the use of suboption 7 by specifying it. In addition, allows enabling/disabling the following attributes (by specifying attributes to be enabled) if suboption 7 is enabled:<br>■ service-type (attribute 6)<br>■ vendor-specific (attribute 26)<br>■ session-timeout (attribute 27) | Optional | | |
| [{EnableUnicast \| DisableUnicast}]) | Indicates whether the Unicast parameter is enabled or disabled. | Optional | Disable | ■ Enable<br>■ Disable |

**Command Mode**

Service group-DHCP relay-option 82 configuration mode

### 4.3.10.14.4.4.3Removing the DHCP Relay suboption values

Run the following command to remove one, several or all of the Suboption values configured by the user for DHCP Option 82.

npu(config-srvcgrp-dhcprelay-opt82)# no [Subopt1value] [Subopt2value] [Subopt6value] [Subopt7value]

**Command Syntax**

npu(config-srvcgrp-dhcprelay-opt82)# no [Subopt1value] [Subopt2value] [Subopt6value] [Subopt7value]

**Privilage Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| no [Subopt1value] [Subopt2value] [Subopt6value] [Subopt7value] | Indicates the removal status of DHCP Option 82 suboptions.<br>If no suboption is specified, the values of all suboptions will be removed. | Optional | N/A | N/A |

**Command Mode**

Service group-DHCP relay-Option 82 configuration mode

### 4.3.10.14.4.4.4Terminating the DHCP Relay Configuration Mode

Run the following command to terminate the DHCP relay configuration mode for this service group:

```
npu(config-srvcgrp-dhcprelay)# exit
```

**Command Syntax**

```
npu(config-srvcgrp-dhcprelay)# exit
```

**Privilege Level**

10

**Command Modes** Service group-DHCP relay configuration mode

### 4.3.10.14.5 Terminating the Service Group Configuration Mode

Run the following command to terminate the service group configuration mode:

```
npu(config-srvcgrp)# exit
```

**Command Syntax**

```
npu(config-srvcgrp)# exit
```

**Privilege Level** 10

**Command Modes** Service group configuration mode

### 4.3.10.14.6 Deleting a Service Group

You can, at any time, run the following command to delete a service group:

```
npu(config)# no srvc-grp <grp-alias>
```

**NOTE**

A Service  Group cannot be deleted if it is assigned to a Service Flow. For details refer to "Configuring Service Flows" on page 339.

**Command Syntax**

```
npu(config)# no srvc-grp <grp-alias>
```

**Privilege Level** 10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<grp-alias>` | Denotes the group-alias for which the service group to be deleted. | Mandatory | N/A | String |

**Command Modes**

Global configuration mode

### 4.3.10.14.7 Displaying Configuration Information for the Service Group

To display configuration information for one service group or for all service groups, run the following command:

```
npu# show srvc-grp [<grp-alias>]
```

**Command Syntax**

```
npu# show srvc-grp [<grp-alias>]
```

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<grp-alias>]` | Denotes the group-alias for which the service group to be displayed.<br>If no grp-alias is specified, the parameters of all service groups will be displayed. | Optional | N/A | String |

**Display Format**

```
According to configured DHCP mode and other parameters.
```

## 4.3.10.15 Configuring the Service Flow Authorization Functionality

The Service Flow Authorization (SFA) functionality handles creation/ maintenance of pre-provisioned service flows for MS. It maps the AAA parameters (service profile name) received from the AAA server to pre-configured WiMAX-specific QoS parameters in the NPU. The SFA functionality enables you to configure multiple service profiles with multiple service flows and classification rules.

This section describes the commands to be used for:

- "Configuring the SFA PHS Functionality" on page 335
- "Displaying Configuration Information for the SFA PHS Functionality" on page 336
- "Configuring Service Profiles" on page 336
- "Configuring Classification Rules" on page 355

### 4.3.10.15.1 Configuring the SFA PHS Functionality

To configure the SFA functionality with respect to PHS Rules, run the following command:

To enable PHS: npu(config)# sfa phs-enable

To disable PHS: npu(config)# no sfa phs-enable

The default configuration is PHS Disable.

**NOTE**

You can display configuration information for the SFA functionality. For details, refer Section 4.3.10.15.2.

For details on PHS Rules, refer to "Configuring PHS Rules" on page 386.

**Command Syntax**

```
npu(config)# sfa phs-enable

npu(config)# no sfa phs-enable
```

**Privilege Level**

10

**Command Modes**

Global configuration mode

### 4.3.10.15.2 Displaying Configuration Information for the SFA PHS Functionality

To display the current configuration information for the SFA PHS functionality, run the following command:

```
npu# show sfa
```

**Command Syntax**

```
npu# show sfa
```

**Privilege Level**

1

**Display Format**

```
SFA Configuration :

PHS <Enable/Disable>
```

**Command Modes**

Global command mode

### 4.3.10.15.3 Configuring Service Profiles

The NPU allows for guaranteed end-to-end QoS for user traffic across the ASN. The QoS approach is connection-oriented, whereby user traffic is classified into "service flows." A service flow is a unidirectional stream of packets, either in the downlink or uplink direction, associated with a certain set of QoS requirements such as maximum latency. The QoS requirements for service flows are derived from "service profiles" defined by the operator. A service profile is a set of attributes shared by a set of service flows. For instance, an operator might define a service profile called "Internet Gold" that will include QoS and other definitions to be applied to service flows associated with users subscribed to the operator's "Internet Gold" service package.

The factory default configuration includes an ‘empty” (no defined Service Flows) Service Profile with the name Default. If enabled, it will be used if profile descriptor is missing in service provisioning or if received profile descriptor is disabled. Up to 63 additional Service Profiles may be created.

**To configure one or more service profiles:**

1. Enable the service profile configuration mode (refer to Section 4.3.10.15.3.1)
2. You can now execute any of the following tasks:
   - Configure the parameters for this service profile (refer to Section 4.3.10.15.3.2)
   - Manage service flow configuration for this service profile (refer to Section 4.3.10.15.3.3)
   - Delete service flows (refer to Section 4.3.10.15.3.3.7)
3. Terminate the service profile configuration mode (refer to Section 4.3.10.15.3.4)

You can, at any time, display configuration information (refer to Section 4.3.10.15.3.5) or delete an existing service profile (refer to Section 4.3.10.15.3.6).

### 4.3.10.15.3.1 Enabling the Service Profile Configuration Mode\Creating a New Service Profile

To configure the parameters for a service profile, first enable the service profile configuration mode. Run the following command to enable the service profile configuration mode. You can also use this command to create a new service profile.

```
npu(config)# srvc-profile <profile-name>
```

If you use this command to create a new service profile, the configuration mode for this rule is automatically enabled, after which you can execute any of the following tasks:

- Configure the parameters for this service profile (refer to Section 4.3.10.15.3.2)
- Manage service flow configuration for this service profile (refer to Section 4.3.10.15.3.3)
- Delete service flows (refer to Section 4.3.10.15.3.3.7)

After you have executed these tasks, terminate the service profile configuration mode (refer to Section 4.3.10.15.3.4) to return to the service group configuration mode.

**Command Syntax**

```
npu(config)# srvc-profile <profile-name>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<profile-name>` | Denotes the name of the service profile for which the configuration mode is to be enabled.<br>If you are creating a new service profile, specify the name of the new service profile. The configuration mode is automatically enabled for the new service profile. | Mandatory | N/A | String (1 to 11 characters) |

**Command Modes**

Global configuration mode

### 4.3.10.15.3.2 Enabling/Disabling the Service Profile

After enabling the service profile configuration mode, run the following command to enable this service profile:

```
npu(config-srvcprfl)# config profile-enable
```

A service profile can be enabled only if at least one service flow is configured.

To disable this service profile, run the following command:

```
npu(config-srvcprfl)# no profile-enable
```

`The default mode is Disabled.`

**NOTE**

You can display configuration information for specific or all service profiles. For details, refer to Section 4.3.10.15.3.5.

**Command Syntax**

```
npu(config-srvcprfl)# config profile enable
npu(config-srvcprfl)# config profile enable
```

**Privilege Level**

10

**Command Modes**

Service profile configuration mode

### 4.3.10.15.3.3 Configuring Service Flows

Service flows are unidirectional stream of packets, either in the downlink or uplink direction, associated with a certain set of QoS requirements such as maximum latency and minimum rate. Based on certain classification rules, service flows are transported over the R1 air interface in 802.16e connections, identified by connection IDs, and identified by GRE keys over the R6 interface in GRE tunnels. In addition, the ASN-GW can mark outgoing traffic in the R3 interface for further QoS processing within the CSN.

Up to 12 Service Flows can be defined for each Service Profile.

➤ **After enabling the service profile configuration mode, execute the following tasks to configure service flows within this service profile:**

1 Enable the service flow configuration mode (refer to Section 4.3.10.15.3.3.1)

2 You can now execute any of the following tasks:

  » Configure the parameters for this service flow (refer to Section 4.3.10.15.3.3.2)

  » Restore the default parameters for this service flow (refer to Section 4.3.10.15.3.3.3)

  » Configure uplink/downlink classification rule names (refer to Section 4.3.10.15.3.3.4)

3 Terminate the service flow configuration mode (refer to Section 4.3.10.15.3.3.6)

You can, at any time delete an existing service flow (refer to Section 4.3.10.15.3.3.7).

#### 4.3.10.15.3.3.1Enabling the Service Flow Configuration Mode\ Creating a New Service Flow

To configure the parameters for a service flow, first enable the service flow configuration mode. Run the following command to enable the service flow configuration mode. You can also use this command to create a new service flow.

**npu(config-srvcprfl)# flow** [<flow-id (1-255)] [**ServiceGrpAlias** <srvc-grp-alias>] [**ServiceIfAlias** <string>]

If you use this command to create a new service flow, the configuration mode for this service flow is automatically enabled, after which you can execute any of the following tasks:

- Configure the parameters for this service flow (refer to Section 4.3.10.15.3.3.2)
- Restore the default parameters for this service flow (refer to Section 4.3.10.15.3.3.3)
- Configure uplink/downlink classification rule names (refer to Section 4.3.10.15.3.3.4)

After you have executed these tasks, you can terminate the service flow configuration mode, and return to the service profile configuration mode (refer to Section 4.3.10.15.3.3.6).

**Command Syntax**

**npu(config-srvcprfl)#flow** [<flow-id (1-255)] [**ServiceGrpAlias** <srvc-grp-alias>] [**ServiceIfAlias** <string>]

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `flow [<flow-id (1-255)]` | Denotes the flow ID of the service flow for which the service flow configuration mode is to be enabled. If you are creating a new service flow, specify the service flow ID of the new service flow. The configuration mode is automatically enabled for the new service flow. | Mandatory | N/A | 1-255 |
| `[ServiceGrpAlias <srvc-grp-alias>]` | Indicates the Reference Name for an existing service group to be used by the service flow.<br>VPWS-QinQ and VPWS Transparent Service Groups are applicable only for Service Flows of the Default Service Profile. | Mandatory when creating a new flow | N/A | An existing Service Group Alias. |
| `[ServiceIfAlias <string>]` | Indicates the Reference Name for an existing QinQ service interface.<br>Applicable only if the assigned Service Group is of type VPWS-QinQ (in a VLANCS Service Flow of the Default Service Profile). | Mandatory when creating a new flow, only if the type of the specified ServiceGrpAlias is VPWS-QinQ. | N/A | An existing QinQ Service Interface. |

### *4.3.10.15.3.3.2Specifying Service Flow Configuration Parameters*

**Command Modes** Service profile configuration mode

After enabling the service flow configuration mode, run the following command to configure the parameters for this service flow:

```
npu(config-srvcprfl-flow)# config ([flow-type <type (1)>] [cs-type
<type (1 | 4)>] [media-type <string>] [uldatadlvry-type
<type(0<UGS> | 1<RTVR> | 2<NRTVR> | 3<BE> | 4<ERTVR> | 255<ANY>)>]
[ulqos-maxsustainedrate <value(10000-10000000)>]
[ulqos-trafficpriority <value(0-7)>] [dldatadlvry-type
<type(0<UGS> | 1<RTVR> | 2<NRTVR> | 3<BE> | 4<ERTVR> | 255<ANY>)>]
[dlqos-maxsustainedrate <value(10000-10000000)>]
[dlqos-trafficpriority <value(0-7)>] [ulSfQosMinReservedRate
<integer>] [ulSfQosMaxLatency <integer>] [ulSfQosToleratedJitter
<integer)>] [ulSfQosUnsolicitedGrantInterval <integer(0-65535)>]
[ulSfQosSduSize <integer(0-255)>] [dlSfQosMinReservedRate
<integer>] [dlSfQosMaxLatency <integer>] [dlSfQosToleratedJitter
<integer>] [dlSfQosSduSize <integer(0-255)>])
```

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config-srvcprfl-flow)# config ([flow-type <type (1)>] [cs-type <type
(1 | 4)>] [media-type <string>] [uldatadlvry-type <type(0<UGS> | 1<RTVR>
| 2<NRTVR> | 3<BE> | 4<ERTVR> | 255<ANY>)>] [ulqos-maxsustainedrate
<value(10000-10000000)>] [ulqos-trafficpriority <value(0-7)>]
[dldatadlvry-type <type(0<UGS> | 1<RTVR> | 2<NRTVR> | 3<BE> | 4<ERTVR> |
255<ANY>)>] [dlqos-maxsustainedrate <value(10000-10000000)>]
[dlqos-trafficpriority <value(0-7)>] [ulSfQosMinReservedRate <integer>]
[ulSfQosMaxLatency <integer>] [ulSfQosToleratedJitter <integer)>]
[ulSfQosUnsolicitedGrantInterval <integer(0-65535)>] [ulSfQosSduSize
<integer(0-255)>] [dlSfQosMinReservedRate <integer>] [dlSfQosMaxLatency
<integer>] [dlSfQosToleratedJitter <integer>] [dlSfQosSduSize
<integer(0-255)>])
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[flow-type <type (1)>]` | Denotes the type of flow, that is, bi-directional (1) or multicast (2).<br>multicast (2) is not supported in current release. | Optional | 1 | ■ 1: Indicates bi-directional |

| | | | | |
|---|---|---|---|---|
| `[cs-type <type (1 \| 4)>]` | Convergence Sublayer Type. This parameter is applied to both UL and DL Service Flows.<br>Must match the type of service group referenced by ServiceGrpAlias during creation of the flow: IPv4CS should be selected if the assigned Service Group is .of type IP. VLANCS should be selected if the assigned Service Group is either VPWS-Transparent or VPWS-QinQ. | Optional | 1 (IPv4CS) | ■ 1: IPv4CS.<br>4: VLANCS |
| `[media-type <string>]` | Describes the type of media carried by the service flow. | Optional | Null | String, up to 32 characters |
| `[uldatadlvry-type <type(0<UGS> \| 1<RTVR> \| 2<NRTVR> \| 3<BE> \| 4<ERTVR> \| 255<ANY>)>]` | Denotes the data delivery type for uplink traffic carried by the service flow. | Optional | 3 (BE) | 0-4 or 255 for ANY. |
| `[ulqos-maxsustainedrate <value(10000-10000000)>]` | Denotes the maximum sustained traffic rate, in bps, for uplink traffic carried by the service flow.<br>Although available for all service flows, applicable only for service flows with the appropriate uplink data delivery type (NRTVR, RTVR, BE, ERTVR, ANY) | Optional | 250000 | 10000-10000000 bps |
| `[ulqos-trafficpriority <value(0-7)>]` | Denotes the traffic priority to be applied to the uplink traffic carried by the service flow. | Optional | 0 | 0-7, where 0 is lowest and 7 is highest |

| | | | | |
|---|---|---|---|---|
| `[dldatadlvry-type <type(0<UGS> \| 1<RTVR> \| 2<NRTVR> \| 3<BE> \| 4<ERTVR> \| 255<ANY>)>]` | Denotes the data delivery type for the downlink traffic carried by the service flow. | Optional | 3 (BE) | 0-4 or 255 for ANY. |
| `[dlqos-maxsustainedrate <value(10000-10000000)>]` | Denotes the maximum sustained traffic rate, in bps, for the downlink traffic carried by the service flow.<br>Although available for all service flows, applicable only for service flows with the appropriate downlink data delivery type (NRTVR, RTVR, BE, ERTVR, ANY) | Optional | 250000 | 10000-10000000 bps |
| `[dlqos-trafficpriority <value(0-7)>]` | Denotes the traffic priority to be applied to the downlink traffic carried by the service flow. | Optional | 0 | 0-7, where 7 is highest |
| `[ulSfQosMinReservedRate <integer>]` | tthe minimum rate in bps reserved for this uplink service flow.<br>Although available for all service flows, applicable only for service flows with the appropriate uplink data delivery type (UGS, NRTVR, RTVR, ERTVR).<br>For NRTVER, RTVR and ERTVR-cannot be higher than ulqos-maxsustainedrate. | Optional | 250000 | 0- 10000000 |

| | | | | |
|---|---|---|---|---|
| [ulSfQosMaxLatency <integer>] | The maximum latency in ms allowed in the uplink.<br>Although available for all service flows, applicable only for service flows with the appropriate uplink data delivery type (UGS, RTVR, ERTVR).<br>If uplink data delivery type is ERTVR or UGS,the default value should be 90ms. | Optional | 500 | 0- 4294967295 |
| [ulSfQosToleratedJitter <integer)>] | the maximum delay variation (jitter) in milliseconds  for this uplink service flow.<br>Although available for all service flows, applicable only for service flows with the appropriate uplink data delivery type (UGS, ERTVR) | Optional | 0 | 0- 4294967295 |
| [ulSfQosUnsolicitedGrantInterval <integer(0-65535)>] | The nominal interval in ms between successive data grant opportunities for this uplink service flow.<br>Although available for all service flows, applicable only for service flows with the appropriate uplink data delivery type (UGS, RTVR, ERTVR).<br>Must be lower than ulSfQosMaxLatency. | Optional | 20 | 0-65535 |
| [ulSfQosSduSize <integer(0-255)>] | Represents the number of bytes in the fixed size SDU. This parameter may be used for a UGS service flow when the length of IP packets on the data plane is fixed and known in advance.<br>Although available for all service flows, applicable only for service flows with the appropriate uplink data delivery type (UGS). | Optional | 49 | 0-255 |

| | | | | |
|---|---|---|---|---|
| `[dlSfQosMinReservedRate <integer>]` | tthe minimum rate in bps reserved for this downlink service flow.<br>Although available for all service flows, applicable only for service flows with the appropriate downlink data delivery type  (UGS, NRTVR, RTVR, ERTVR)<br>For NRTVER, RTVR and ERTVR-cannot be higher than dlqos-maxsustainedrate. | Optional | 250000 | 0- 10000000 |
| `[dlSfQosMaxLatency <integer>]` | The maximum latency in ms allowed in the downlink.<br>Although available for all service flows, applicable only for service flows with the appropriate downlink data delivery type (UGS, RTVR, ERTVR).<br>If uplink data delivery type is ERTVR or UGS,the default value should be 90ms. | Optional | 500 | 0- 4294967295 |
| `[dlSfQosToleratedJitter <integer)>]` | the maximum delay variation (jitter) in milliseconds  for this downlink service flow.<br>Although available for all service flows, applicable only for service flows with the appropriate downlink data delivery type (UGS, ERTVR) | Optional | 0 | 0- 4294967295 |
| `[dlSfQosSduSize <integer(0-255)>]` | Represents the number of bytes in the fixed size SDU. This parameter may be used for a UGS service flow when the length of IP packets on the data plane is fixed and known in advance.<br>Although available for all service flows, applicable only for service flows with the appropriate downlink data delivery type (UGS). | Optional | 49 | 0-255 |

**Command Modes**

Service profile-service flow configuration mode

### 4.3.10.15.3.3.3Restoring the Default Service Flow Configuration Parameters

Run the following command to restore the default values of one or several parameters for this service flow:

```
npu(config-srvcprfl-flow)#  no [cs-type] [media-type]
[uldatadlvry-type] [ulqos-maxsustainedrate]
[ulqos-trafficpriority] [dldatadlvry-type]
[dlqos-maxsustainedrate]
[dlqos-trafficpriority][ulSfQosMinReservedRate]
[ulSfQosMaxLatency] [ulSfQosToleratedJitter]
[ulSfQosUnsolicitedGrantInterval] [ulSfQosSduSize]
[dlSfQosMinReservedRate] [dlSfQosMaxLatency]
[dlSfQosToleratedJitter] [dlSfQosSduSize]
```

Do not specify ant parameter to restore all parameters to their default values.

**NOTE**

Refer to Section 4.3.10.15.3.3.2 for a description and default values of these parameters.

**Command Syntax**

```
npu(config-srvcprfl-flow)# no [cs-type] [media-type]
[uldatadlvry-type] [ulqos-maxsustainedrate]
[ulqos-trafficpriority] [dldatadlvry-type]
[dlqos-maxsustainedrate]
[dlqos-trafficpriority][ulSfQosMinReservedRate]
[ulSfQosMaxLatency] [ulSfQosToleratedJitter]
[ulSfQosUnsolicitedGrantInterval] [ulSfQosSduSize]
[dlSfQosMinReservedRate] [dlSfQosMaxLatency]
[dlSfQosToleratedJitter] [dlSfQosSduSize]
```

**Privilege Level**

10

**Command Modes**

Service profile-service flow configuration mode

### 4.3.10.15.3.3.4Configuring Uplink/Downlink Classification Rule Names

After enabling the service flow configuration mode, run the following commands to configure up to a maximum of 6 uplink and 6 downlink classification rules:

```
npu(config-srvcprfl-flow)# ulclsf-rulename <num_of_rule_names
(1-6)> <rulename> [<rulename>] [...]
```

```
npu(config-srvcprfl-flow)# dlclsf-rulename <num_of_rule_names
(1-6)> <rulename> [<rulename>] [...]
```

After you have executed these tasks, you can terminate the service flow configuration mode, and return to the service profile configuration mode (Section 4.3.10.15.3.3.6). For more information about configuring classification rules, refer "Configuring Classification Rules" on page 355.

**Command Syntax**

```
npu(config-srvcprfl-flow)# ulclsf-rulename <num_of_rule_names (1-6)>
<rulename> [<rulename>] [...]
```

```
npu(config-srvcprfl-flow)# dlclsf-rulename <num_of_rule_names (1-6)>
<rulename> [<rulename>] [...]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<num_of_rule_names (1-6)>` | Indicates the number of uplink/downlink classification rules to be created | Mandatory | N/A | 1-6 |

| | | | | |
|---|---|---|---|---|
| `<rulename>` | Indicates the name of the uplink/downlink classification rule to be linked to this service flow. Use the classification rule name to reference the appropriate classification rule.<br>For VLANCS service flows the linked uplink and downlink classification rules should be the same. This is because the VLANCS classificaion rules define the CVID (Customer VLAN ID), that should be the same for uplink and downlink flows.<br>The number of rule name entries must match the number defined in `num_of_rule_names.`<br>For more information about creating classification rules, refer to Section 4.3.10.15.4.1. | Mandatory | N/A | Valid classification rule name |

**Command Modes**

Service profile-service flow configuration mode

### 4.3.10.15.3.3.5Deleting Uplink/Downlink Classification Rule Names

After enabling the service flow configuration mode, run the following commands to delete uplink/downlink classification rules:

```
npu(config-srvcprfl-flow)# no ulclsf-rulename [<num_of_rulenames
(1-6)> <rulename> [<rulename>] ...]
```

```
npu(config-srvcprfl-flow)# no dlclsf-rulename [<num_of_rulenames
(1-6)> <rulename> [<rulename>] ...]
```

After you have executed these commands, you can terminate the service flow configuration mode, and return to the service profile configuration mode (refer to Section 4.3.10.15.3.3.6)

**Command Syntax**

```
npu(config-srvcprfl-flow)# no ulclsf-rulename [<num_of_rulenames (1-6)>
<rulename> [<rulename>] ...]

npu(config-srvcprfl-flow)# no dlclsf-rulename [<num_of_rulenames (1-6)>
<rulename> [<rulename>] ...]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<num_of_rulenames (1-6)>` | Indicates the number of uplink/downlink classification rules to be deleted. | Mandatory | N/A | 1-6 |
| `<rulename>` | Indicates the name of the uplink/downlink classification rule to be deleted from to this service flow. Use the classification rule name to reference the appropriate classification rule.<br>The number of rule name entries must match the number defined in `num_of_rule_names`. | Mandatory | N/A | Valid classification rule name |

**Command Modes**

Service profile-service flow configuration mode

### 4.3.10.15.3.3.6Terminating the Service Flow Configuration Mode

Run the following command to terminate the service flow configuration mode:

```
npu(config-srvcprfl-flow)# exit
```

**Command Syntax**

```
npu(config-srvcprfl-flow)# exit
```

**Privilege Level**

10

**Command Modes**

Service profile-service flow configuration mode

### 4.3.10.15.3.3.7Deleting Service Flows

You can, at any time, run the following command to delete one or all service flows:

```
npu(config-srvcprfl)# no flow [<flow-id>]
```

⚠

**CAUTION**

Specify the flow ID if you want to delete a specific service flow. Otherwise all the configured service flows are deleted.

**Command Syntax**

```
npu(config-srvcprfl)# no flow [<flow-id>]
```

**Privilege Level**

10

**Command Syntax**

```
npu(config-srvcprfl)# no flow [<flow-id>]
```

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<flow-id>]` | Denotes the flow ID of the service flow to be deleted.<br>If you do nort specify a value for this parameter, all the service flows are deleted. | Optional | N/A | 0-$2^{32}$ |

**Command Modes**

Service profile configuration mode

### 4.3.10.15.3.4 Terminating the Service Profile Configuration Mode

Run the following command to terminate the service profile configuration mode:

```
npu(config-srvcprfl)# exit
```

**Command Syntax**

```
npu(config-srvcprfl)# exit
```

**Privilege Level**

10

**Command Modes**

Service profile configuration mode

### 4.3.10.15.3.5 Displaying Configuration Information for Service Profiles

To display all or specific service profiles, run the following command:

```
npu# show srvc-profile [<profile-name>]
```

Specify the profile name if you want to display configuration information for a particular service profile. Do not specify a value for this parameter if you want to view configuration information for all service profile.

**IMPORTANT**

An error may occur if you provide an invalid service profile name. Refer the syntax description for more information about the appropriate values and format for configuring this parameter.

**Command Syntax**

```
npu# show srvc-profile [<profile-name>]
```

**Privilege Level**

1

### Syntax Description

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<profile-name>]` | Indicates the name of the service profile for which configuration information is to be displayed.<br>If you do not specify a value for this parameter, configuration information is displayed for all service profiles. | Optional | N/A | String |

**Display Format**

```
Srvc Profile  <value>

status <value>

flow-id <value>

flow-type <value>

srvc-grp <value>

Service-If <value or null>

CS-type <value>

Media-Type <value>

UL-flowDataDeliveryType <value>

UL-flowQosMaxSustainedRate <value>

UL-flowQosTrafficPrority <value>

DL-flowDataDeliveryType <value>

DL-flowQosMaxSustainedRate <value>

DL-flowQosTrafficPrority <value>

UL-MinReservedTrafficRate <value>

UL-MaxLatencey <value>

UL-ToleratedJitter <value>

UL-UnsolicitedGrantInterval <value>

UL-SduSize <value>

DL-MinReservedTrafficRate <value>

DL-MaxLatencey <value>

DL-ToleratedJitter <value>

DL-UnsolicitedGrantInterval <value>

DL-SduSize <value>

UL-Rulenames :<value>, <value>.....

DL-Rulenames :<value>, <value>....

flow-id <value>...........
```

**Command Modes**

Global configuration mode

### 4.3.10.15.3.6 Deleting Service Profiles

Run the following command to delete one or all service profiles:

```
npu(config)# no srvc-profile [<profile-name>]
```

**NOTE**

The Default Service Profile cannot be deleted.

**CAUTION**

Specify the profile name if you want to delete a specific service profile. Otherwise all the configured service profiles (excluding the Default Service Profile) are deleted.

**Command Syntax**

```
npu(config)# no srvc-profile [<profile-name>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<profile-name>]` | Denotes the name of the service profile you want to delete. Specify this parameter only if you want to delete a specific service profile. | Optional | N/A | String |

**Command Modes**

Global configuration mode

## 4.3.10.15.4 Configuring Classification Rules

Classification rules are user-configurable rules that are used to classify packets transmitted on the bearer plane. You can associate one or more classification rules with a particular service profile (For details, refer to Section 4.3.10.15.3.3.4).

You can define an L3 classification rule with respect to the following criteria:

- IP ToS/DSCP
- IP protocol (such as UDP or TCP)

- IP source address (an address mask can be used to define a range of addresses or subnet)
- IP destination address (an address mask can be used to define a range of addresses or subnet)
- Source port range
- Destination port range

You can define an L2 classification rule based on the Customer VLAN ID (CVID).

Classification rules can be specified for:

- Downlink data is classified by the ASN-GW into GRE tunnels, which, in turn, are mapped into 802.16e connections in the air interface
- Uplink data is classified by the MS into 802.16e connections, and with respect to classification rules defined in the service profile provisioned in the ASN-GW and downloaded to the MS when establishing a connection.

For instance, you can define an L3 downlink classification rule that will classify traffic to a certain MS with a DSCP value of 46 into a UGS connection, and all other traffic to the MS into a best effort connection. In addition, an uplink L3 classification rule can be defined that will classify traffic from this MS with a UDP destination port higher than 5000 into a UGS connection, and all other traffic from the MS into a best effort connection.

Up to a maximum of 100 classification rules can be created.

**To configure one or more L3 classification rules:**

1 Enable the L3 classification rules configuration mode (refer to Section 4.3.10.15.4.1)

2 You can now execute any of the following tasks:

- » Configure the parameters for this classification rule (refer to Section 4.3.10.15.4.2)
- » Restore the default parameters for this classification rule (refer to Section 4.3.10.15.4.3)
- » Manage protocol configuration (refer to Section 4.3.10.15.4.4)
- » Manage source address configuration (seeSection 4.3.10.15.4.5)
- » Manage destination address configuration (refer to Section 4.3.10.15.4.6)
- » Manage source port configuration (refer to Section 4.3.10.15.4.7)
- » Manage destination port configuration (refer to Section 4.3.10.15.4.8)

3 Terminate the L3 classification rules configuration mode (refer to Section 4.3.10.15.4.9)

You can, at any time, display configuration information (refer to Section 4.3.10.15.4.13) or delete an existing classification rule (refer to Section 4.3.10.15.4.14), protocol lists (refer to Section 4.3.10.15.4.4.5), source addresses (refer to Section 4.3.10.15.4.5.5), destination addresses (refer to Section 4.3.10.15.4.6.5), source ports (refer to Section 4.3.10.15.4.7.5), or destination ports (refer to Section 4.3.10.15.4.8.5) configured for this classification rule.

**To configure one or more L2 classification rules:**

1 Enable the L2 classification rules configuration mode (refer to Section 4.3.10.15.4.1)

2 You can now execute any of the following tasks:

- » Configure the parameters for this classification rule (refer to Section 4.3.10.15.4.10)
- » Clear the configuration of this classification rule (refer to Section 4.3.10.15.4.11)
- » Terminate the L2 classification rules configuration mode (refer to Section 4.3.10.15.4.12)

You can, at any time, display configuration information (refer to Section 4.3.10.15.4.13) or delete an existing classification rule (refer to Section 4.3.10.15.4.14).

#### 4.3.10.15.4.1 Enabling the Classification Rule Configuration Mode\ Creating a New Classification Rule

To configure the parameters for a classification rule, first enable the classification rule configuration mode. Run the following command to enable the classification rule configuration mode. You can also use this command to create a new classification rule.

```
npu(config)# clsf-rule <rulename> [clsfRuleType {L2 | L3}]
```

If you use this command to create a new classification rule, the configuration mode for this rule is automatically enabled.

After enabling the classification rule configuration mode for an L3 rule you can execute any of the following tasks:

- Configure the parameters for this classification rule (refer to Section 4.3.10.15.4.2).
- Restore the default parameters for this classification rule (refer to Section 4.3.10.15.4.3)
- Manage protocol configuration (refer to Section 4.3.10.15.4.4)
- Manage source address configuration (refer to Section 4.3.10.15.4.5)
- Manage destination address configuration (refer to Section 4.3.10.15.4.6)
- Manage source port configuration (refer to Section 4.3.10.15.4.7)
- Manage destination port configuration (refer to Section 4.3.10.15.4.8)

After you have executed these tasks, you can terminate the classification rules configuration mode (refer to Section 4.3.10.15.4.9).

After enabling the classification rule configuration mode for an L2 rule you can execute any of the following tasks:

- Configure the parameters for this classification rule (refer to Section 4.3.10.15.4.10).

- Clear the current configuration of this classification rule (refer to Section 4.3.10.15.4.11)

After you have executed these tasks, you can terminate the classification rules configuration mode (refer to Section 4.3.10.15.4.12).

**Command Syntax**

```
npu(config)# clsf-rule <rulename> [clsfRuleType {L2 | L3}]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<rulename>` | Denotes the name of the classification rule. | Mandatory | N/A | String (1 to 11 characters) |
| `[clsfRuleType {L2 \| L3}]` | The type of classifier: L2 or L3. | Optional when creating a new rule. | L3 | ■ L2<br>■ L3 |

**Command Modes**

Global configuration mode

#### 4.3.10.15.4.2 Specifying Configuration Parameters for the L3 Classification Rule

After enabling the classification rules configuration mode for an L3 classification rule, run the following command to configure the parameters for this classification rule:

```
npu(config-clsfrule)# config [priority <priority(0-255)>]
[phs-rulename <rulename>] [iptos-low <value(0-63)>] [iptos-high
<value(0-63)>] [iptos-mask <value(0-63)>] [iptos-enable]
```

**NOTE**

You can display configuration information for specific or all classification rules. For details, refer to Section 4.3.10.15.4.13.

**Command Syntax**

```
npu(config-clsfrule)# config [priority <priority(0-255)>] [phs-rulename
<rulename>] [iptos-low <value(0-63)>] [iptos-high <value(0-63)>]
[iptos-mask <value(0-63)>] [iptos-enable]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[priority <priority(0-255)>]` | Denotes the priority level to be assigned to the classification rule. | Optional | 0 | 0-255 |
| `[phs-rulename <rulename>]` | Indicates the Packet Header Suppression (PHS) rule name to be associated with the classification rule. Specify the PHS rulename if you want to perform PHS for this flow. For more information about configuring PHS rules, refer Section 4.3.10.16. | Optional | None | String<br>An existing PHS rule name. |
| `[iptos-low <value(0-63)>]` | Denotes the value of the lowest IP TOS field to define the lowest value where the range can begin. | Optional | 0 | 0-63 |
| `[iptos-high <value(0-63)>]` | Denotes the value of highest IP TOS field to define the highest value where the range can end. | Optional | 0 | 0-63 |
| `[iptos-mask <value(0-63)>]` | Denotes the mask for IP TOS value.This mask is applied to the TOS field received in the IP header to be matched within the TOS range configured. | Optional | 0 | 0-63 |

| | | | | |
|---|---|---|---|---|
| [iptos-enable] | Indicates whether the use of TOS-based classification is to be enabled. | Optional | By default, the use of TOS-based classification is disabled. | The presence/absence of this flag indicates that the use of TOS-based classification should be enabled/disabled. |

**Command Modes**

L3 Classification rules configuration mode

### 4.3.10.15.4.3 Restoring the Default Parameters for the L3 Classification Rule

Run the following command to restore the default configuration for this classification rule.

```
npu(config-clsfrule)# no [priority] [iptos-low] [iptos-high]
[iptos-mask] [iptos-enable][phs-rulename]
```

**NOTE**

Refer to Section 4.3.10.15.4.3 for a description and default values of these parameters.

**Command Syntax**

```
npu(config-clsfrule)# no [priority] [iptos-low] [iptos-high]
[iptos-mask] [iptos-enable] [phs-rulename]
```

**Privilege Level**

10

**Command Modes**

L3 Classification rules configuration mode

### 4.3.10.15.4.4 Managing Protocol Configuration for the L3 Classification Rule

L3 classification rules can classify the packet, based on the value of IP protocol field. You can configure the value of IP protocol for a given classification rule.

**To configure one or more IP protocols:**

1 Enable the IP protocol configuration mode (refer to Section 4.3.10.15.4.4.1)

2 Enable/disable protocol lists (refer to Section 4.3.10.15.4.4.2 and Section 4.3.10.15.4.4.3)

3 Terminate the protocol configuration mode (refer to Section 4.3.10.15.4.4.4)

In addition, you can, at any time, delete an existing protocol list (refer to Section 4.3.10.15.4.4.5).

The following example illustrates the (sequence of) commands for enabling the IP protocol configuration mode, enabling IP protocol 100, and then terminating the protocol lists configuration mode:

```
npu(config-clsfrule)# ip-protocol

npu(config-clsfrule-protocol)# protocol-enable 1 100

npu(config-clsfrule-protocol)# exit
```

### 4.3.10.15.4.4.1Enabling the IP Protocol Configuration Mode

Run the following command to enable the IP protocol configuration mode.

```
npu(config-clsfrule)# ip-protocol
```

You can now enable or disable a protocol list (refer to Section 4.3.10.15.4.4.2 and Section 4.3.10.15.4.4.3).

| | |
|---|---|
| **Command Syntax** | `npu(config-clsfrule)# ip-protocol` |
| **Privilege Level** | 10 |
| **Command Modes** | L3 Classification rules configuration mode |

### 4.3.10.15.4.4.2Enabling Protocol Lists

After enabling the protocol configuration mode, run the following command to enable one or more IP protocol lists:

```
npu(config-clsfrule-protocol)# protocol-enable <number of
protocols(1-6)> <protocol1> [<protocol2>] [...]
```

**Command Syntax**

```
npu(config-clsfrule-protocol)# protocol-enable <number of protocols(1-6)>
<protocol1> [<protocol2>] [...]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<number of protocols(1)>` | Indicates the number of protocol lists to be enabled. In the current release, only one protocol can be enabled per classification rule. | Mandatory | N/A | 1 |
| `<protocol1> [<protocol2>] [...]` | Indicates the IP protocols to be enabled. In the current release, only one protocol can be enabled per classification rule. | Mandatory | N/A | 0-255 (Using standard IANA protocol values) |

**Command Modes**

L3 Classification rules-IP protocol configuration mode

### 4.3.10.15.4.4.3Disabling Protocol Lists

After enabling the protocol configuration mode, run the following command to disable one or more IP protocol lists:

```
npu(config-clsfrule-protocol)# no protocol-enable <number of
protocols(1-6)> <protocol1> [<protocol2>] [...]
```

**Command Syntax**

```
npu(config-clsfrule-protocol)# no protocol-enable <number of
protocols(1-6)> <protocol1> [<protocol2>] [...]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<number of protocols(1-6)>` | Indicates the number of protocol lists to be disabled.<br>In the current release, only one protocol can be enabled per classification rule. | Mandatory | N/A | 1 |
| `<protocol1> [<protocol2>] [...]` | Indicates the protocols to be disabled. You are required to specify at least one protocol that is to be disabled.<br>In the current release, the single previously enabled protocol should be defined. | Mandatory | N/A | 0-255 |

**Command Modes** L3 Classification rules-IP protocol configuration mode

### 4.3.10.15.4.4.4Terminating the Protocol Configuration Mode

Run the following command to terminate the IP protocol configuration mode:

```
npu(config-clsfrule-protocol)# exit
```

**Command Syntax**

```
npu(config-clsfrule-protocol)# exit
```

**Privilege Level** 10

**Command Modes** L3 Classfication rule-IP protocol configuration mode

### 4.3.10.15.4.4.5Deleting Protocol Lists

You can, at any time, run the following command to delete all protocol lists:

```
npu(config-clsfrule)# no ip-protocol
```

| | |
|---|---|
| **Command Syntax** | `npu(config-clsfrule)# no ip-protocol` |
| **Privilege Level** | 10 |
| **Command Modes** | L3 Classfication rule-IP protocol configuration mode |

### 4.3.10.15.4.5 Managing Source Address Configuration for the L3 Classification Rule

Classification rules can classify the packet, based on the source address of the packet. You can configure the value of source address for a given classification rule.

**To configure one or more source addresses:**

1. Enable the source address configuration mode (refer to Section 4.3.10.15.4.5.1)
2. You can now execute any of the following tasks:
   - Configure the address mask (refer to Section 4.3.10.15.4.5.2)
   - Disable the source address (refer to Section 4.3.10.15.4.5.3)
3. Terminate the source address configuration mode (refer to Section 4.3.10.15.4.5.4)

You can, at any time, delete an existing source address (refer to Section 4.3.10.15.4.5.5).

The following example illustrates the (sequence of) commands for enabling the source address configuration mode, configuring the address mask, and then terminating the source address configuration mode:

```
npu(config-clsfrule)# srcaddr 10.203.155.20

npu(config-clsfrule-srcaddr)# config addr-enable addr-mask
255.255.0.0

npu(config-clsfrule-srcaddr)# exit
```

#### 4.3.10.15.4.5.1Enabling the Source Address Configuration Mode\ Creating a New Source Address

To configure the parameters for a source address, first enable the source address configuration mode. Run the following command to enable the source address configuration mode. You can also use this command to create a new source address.

```
npu(config-clsfrule)# srcaddr <ipv4addr>
```

If you use this command to specify a new source address, the configuration mode for the newly created source address is automatically enabled, after which you can execute any of the following tasks:

- Configure the address mask (refer to Section 4.3.10.15.4.5.2)
- Disable the source address (refer to Section 4.3.10.15.4.5.3)

After you have executed these tasks, terminate the source address configuration mode to return to the service classification rule configuration mode (refer to Section 4.3.10.15.4.5.4).

**IMPORTANT**

An error may occur if you provide an invalid source IP address. Refer the syntax description for more information about the appropriate value and format for configuring this parameter.

**Command Syntax**

```
npu(config-clsfrule)# srcaddr <ipv4addr>
```

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| <ipv4addr> | Denotes the IPv4 address of the source address for which the configuration mode is to be enabled. If you want to create a new source address, specify the value for the new source address. The source address configuration mode is automatically enabled. | Mandatory | N/A | Valid IP Address |

**Command Modes**

L3 Classification rules configuration mode

### 4.3.10.15.4.5.2Configuring the Address Mask

After enabling the source address configuration mode, run the following command to configure the address mask for the source address.

```
npu(config-clsfrule-srcaddr)# config [addr-enable] [addr-mask
<value>]
```

You can also run this command to enable a source address that is currently disabled. For details, refer to “Disabling the Source Address” on page 368.

**IMPORTANT**

An error may occur if you provide an invalid address mask for the source address. Refer the syntax description for more information about the appropriate value and format for this parameter.

**Command Syntax**

```
npu(config-clsfrule-srcaddr)# config [addr-enable] [addr-mask <value>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [addr-enable] | Indiactes that the use of the associated source address is enabled for the classification rule that you are configuring. If the use of this address is disabled, the associated source address is ignored while classifying the packet. | Optional | By default, the use of the associated source address is disabled. | The presence/absence of this flag indicates that the use of the associated source address is enabled/disabled. |
| [addr-mask <value>] | Denotes the mask field that is used to specify a range of source addresses. | Optional | 255.255.255.255 | Valid address mask |

**Command Modes**

L3 Classification rules-source address configuration mode

### 4.3.10.15.4.5.3Disabling the Source Address

You can run the following command to disable the source address that is currently enabled:

```
npu(config-clsfrule-srcaddr)# no addr-enable
```

**IMPORTANT**

To enable this source address, run the following command:

```
npu(config-clsfrule-srcaddr)# config [addr-enable] [addr-mask <value>]
```

For details, refer to "Configuring the Address Mask" on page 367.

**Command Syntax**

```
npu(config-clsfrule-srcaddr)# no addr-enable
```

**Privilege Level**

10

**Command Modes**

L3 Classification rules-source address configuration mode

### 4.3.10.15.4.5.4Terminating the Source Address Configuration Mode

Run the following command to terminate the source address configuration mode:

```
npu(config-clsfrule-srcaddr)# exit
```

**Command Syntax**

```
npu(config-clsfrule-srcaddr)# exit
```

**Privilege Level**

10

**Command Modes**

L3 Classfication rule-source address configuration mode

### 4.3.10.15.4.5.5Deleting Source Addresses

You can, at any time, run the following command to delete one or all source addresses

```
npu(config-clsfrule)# no srcaddr [<ipv4addr>]
```

**CAUTION**

Specify the IP address  if you want to delete a specific source address. Otherwise all the configured source addresses are deleted.

**IMPORTANT**

An error may occur if you provide an invalid IP address. Refer the syntax description for more information about the appropriate values and format for configuring this parameter.

**Command Syntax**

```
npu(config-clsfrule)# no srcaddr [<ipv4addr>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<ipv4addr>]` | Denotes the IPv4 address of the source address that you want to delete from a classification rule.<br>Specify this parameter only if you want to delete a specific source address. If you do not specify a value for this parameter, all the configured source addresses of the classification rule will be deleted. | Optional | N/A | Valid IP Address |

**Command Modes**

L3 Classification rules configuration mode

### 4.3.10.15.4.6 Managing Destination Address Configuration for the L3 Classification Rule

Classification rules can classify the packet, based on the destination address of the packet. You can configure the value of destination address for a given classification rule.

➤ **To configure one or more destination addresses:**

1 Enable the destination address configuration mode (refer to Section 4.3.10.15.4.6.1)

2 You can now execute any of the following tasks:

» Configure the address mask (refer to Section 4.3.10.15.4.6.2)

» Disable the destination address (refer to Section 4.3.10.15.4.6.3)

3 Terminate the destination address configuration mode (refer to Section 4.3.10.15.4.6.4)

In addition, you can, at any time, delete an existing destination address (refer to Section 4.3.10.15.4.6.5).

The following example illustrates the (sequence of) commands for enabling the source address configuration mode, configuring the address mask, and then terminating the destination address configuration mode:

```
npu(config-clsfrule)# dstaddr 10.203.155.22

npu(config-clsfrule-dstaddr)# config addr-enable addr-mask
0.0.255.255

npu(config-clsfrule-srcaddr)# exit
```

#### *4.3.10.15.4.6.1Enabling the Destination Address Configuration Mode\ Creating a New Destination Address*

To configure the parameters for a destination address, first enable the destination address configuration mode. Run the following command to enable the destination address configuration mode. You can also use this command to create a new destination address.

```
npu(config-clsfrule)# dstaddr <ipv4addr>
```

If you use this command to specify a new destination address, the configuration mode for the newly created destination address is automatically enabled, after which you can execute any of the following tasks:

- Configure the address mask (refer to Section 4.3.10.15.4.6.2)k

- Disable the destination address (refer to Section 4.3.10.15.4.6.3)

After you execute these tasks, you can terminate the destination address configuration mode (refer to Section 4.3.10.15.4.6.4) and return to the classification rules configuration mode.

**IMPORTANT**

An error may occur if you provide an invalid destination IP address. Refer the syntax description for more information about the appropriate values and format for configuring this parameter.

**Command Syntax**

```
npu(config-clsfrule)# dstaddr <ipv4addr>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<ipv4addr>` | Denotes the IPv4 address of the destination address for which the configuration mode is to be enabled. If you want to create a new destination address, specify the value for the new destination address. The destination address configuration mode is automatically enabled. | Mandatory | N/A | Valid IP Address |

**Command Modes**

L3 Classification rules configuration mode

### 4.3.10.15.4.6.2Configuring the Address Mask

Run the following command to configure the address mask for the destination address.

```
npu(config-clsfrule-dstaddr)# config [addr-enable] [addr-mask
<value>]
```

You can also run this command to enable a destination address that is currently disabled. For details, refer to “Disabling the Destination Address” on page 372.

**IMPORTANT**

An error may occur if you provide an invalid address mask. Refer the syntax description for more information about the appropriate values and format for configuring this parameter.

**Command Syntax**

```
npu(config-clsfrule-dstaddr)# config [addr-enable] [addr-mask <value>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [addr-enable] | Indicates that the use of the associated destination address is enabled for the classification rule that you are configuring. If the use of this address is disabled, the associated destination address is ignored while classifying the packet. | Optional | By default, the use of the associated destination address is disabled. | The presence/absence of this flag indicates that the use of the associated destination address is enabled/disabled. |
| [addr-mask <value>] | Denotes the mask field that is used to specify a range of destination addresses. | Optional | 255.255.255.255 | Valid address mask |

**Command Modes**

L3 Classification rules-destination address configuration mode

### 4.3.10.15.4.6.3Disabling the Destination Address

Run the following command to disable the destination address that is currently enabled:

```
npu(config-clsfrule-dstaddr)# no addr-enable
```

**Command Syntax**

```
npu(config-clsfrule-dstaddr)# no addr-enable
```

**Privilege Level**

10

**Command Modes**

L3 Classification rules-destination address configuration mode

### 4.3.10.15.4.6.4Terminating the Destination Address Configuration Mode

Run the following command to terminate the destination address configuration mode:

```
npu(config-clsfrule-dstaddr)# exit
```

**Command Syntax**

```
npu(config-clsfrule-dstaddr)# exit
```

**Privilege Level**

10

**Command Modes**

L3 Classfication rule-destination address configuration mode

### 4.3.10.15.4.6.5Deleting Destination Addresses

You can, at any time, run the following command to delete one or all destination addresses

```
npu(config-clsfrule)# no dstaddr [<ipv4addr>]
```

**CAUTION**

Specify the IP address if you want to delete a specific destination address. Otherwise all the configured destination addresses are deleted.

**IMPORTANT**

An error may occur if you provide an invalid IP address. Refer the syntax description for more information about the appropriate values and format for configuring this parameter.

**Command Syntax**

```
npu(config-clsfrule)# no dstaddr [<ipv4addr>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<ipv4addr>]` | Denotes the IPv4 address of the destination address that you want to delete from a classification rule.<br>Specify this parameter only if you want to delete a specific destination address. | Optional | N/A | Valid IP Address |

**Command Modes**

L3 Classification rules configuration mode

#### 4.3.10.15.4.7 Managing Source Port Configuration for the L3 Classification Rule

Classification can be based on the source port of the packet. You can configure the value of a source port for a given classification rule.

**To configure one or more source ports:**

1. Enable the source port configuration mode (refer to Section 4.3.10.15.4.7.1)
2. Enable/disable the source port range (refer to Section 4.3.10.15.4.7.2/Section 4.3.10.15.4.7.3)
3. Terminate the source port configuration mode (refer to Section 4.3.10.15.4.7.4)

In addition, you can, at any time, delete an existing source port configuration (refer to Section 4.3.10.15.4.7.5).

The following example illustrates the (sequence of) commands for enabling the source port configuration mode, enabling the source port range, and then terminating the source port configuration mode:

```
npu(config-clsfrule)# srcport 20 50
npu(config-clsfrule-srcport)# port-enable
npu(config-clsfrule-srcport)# exit
```

#### 4.3.10.15.4.7.1Enabling the Source Port Configuration Mode\ Creating a New Source Port

To configure the parameters for a source port, first enable the source port configuration mode. Run the following command to enable the source port configuration mode. You can also use this command to create a new source port.

```
npu(config-clsfrule)# srcport <start-port> <end-port>
```

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

If you use this command to specify a new source port, the configuration mode for the newly created source port is automatically enabled, after which you can enable/disable the source port range (refer to Section 4.3.10.15.4.7.2/Section 4.3.10.15.4.7.3).

You can then terminate the source port configuration mode (refer to Section 4.3.10.15.4.7.4) and return to the classification rules configuration mode.

**Command Syntax**

```
npu(config-clsfrule)# srcport <start-port> <end-port>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<start-port>` | Denotes the starting value of port range to be configured. | Mandatory | N/A | 1-65535 |
| `<end-port>` | Denotes the end value of port range to be configured. | Mandatory | N/A | 1-65535 |

**Command Modes**

L3 Classification rules configuration mode

### 4.3.10.15.4.7.2Enabling the Source Port Range

Run the following command to enable the source port range:

```
npu(config-clsfrule-srcport)# port-enable
```

You can also run this command to enable a source port range that is currently disabled. For details, refer to “Disabling the Source Port Range” on page 376.

**Command Syntax**

```
npu(config-clsfrule-srcport)# port-enable
```

**Privilege Level**

10

**Command Modes**

L3 Classification rules-source port configuration mode

### 4.3.10.15.4.7.3Disabling the Source Port Range

Run the following command to disable the source port range that is currently enabled:

```
npu(config-clsfrule-srcport)# no port-enable
```

**IMPORTANT**

To enable this source port range, run the following command:

```
npu(config-clsfrule-srcport)# port-enable
```

For details, refer to “Enabling the Source Port Range” on page 376.

**Command Syntax**

```
npu(config-clsfrule-srcport)# no port-enable
```

**Privilege Level**

10

**Command Modes** L3 Classification rules-source port configuration mode

### 4.3.10.15.4.7.4Terminating the Source Port Configuration Mode

Run the following command to terminate the source port configuration mode:

```
npu(config-clsfrule-srcport)# exit
```

**Command Syntax**

```
npu(config-clsfrule-srcport)# exit
```

**Privilege Level** 10

**Command Modes** L3 Classfication rule-source port configuration mode

### 4.3.10.15.4.7.5Deleting Source Ports

Run the following command to delete one or all source ports

```
npu(config-clsfrule)# no srcport [<start-port> <end-port>]
```

**CAUTION**

Specify the start and end port numbers  if you want to delete a specific souce port. Otherwise all the configured source ports are deleted.

**IMPORTANT**

An error may occur if you provide an invalid value for the `start-port` and `end-port` parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config-clsfrule)# no srcport [<start-port> <end-port>]
```

**Privilege Level** 10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<start-port>` | Denotes the starting value of port range to be deleted. | Optional | N/A | 1-65535 |
| `<end-port>` | Denotes the end value of port range to be deleted. | Optional | N/A | 1-65535 |

**Command Modes**

L3 Classification rules configuration mode

### 4.3.10.15.4.8 Managing Destination Port Configuration for the L3 Classification Rule

Classification can be based on the destination port of the packet. You can configure the value of a destination port for a given classification rule.

**To configure one or more destination ports:**

1. Enable the destination port configuration mode (refer to Section 4.3.10.15.4.8.1)
2. Enable/disable the destination port range (refer to Section 4.3.10.15.4.8.2/Section 4.3.10.15.4.8.3)
3. Terminate the destination port configuration mode (refer to Section 4.3.10.15.4.8.4)

In addition, you can, at any time, delete an existing destination port configuration (refer to Section 4.3.10.15.4.8.5).

The following example illustrates the (sequence of) commands for enabling the destination port configuration mode, enabling the destination port range, and then terminating the destination port configuration mode:

```
npu(config-clsfrule)# dstport 50 400

npu(config-clsfrule-dstport)# port-enable

npu(config-clsfrule-dstport)# exit
```

### 4.3.10.15.4.8.1Enabling the Destination Port Configuration Mode\ Creating a New Destination Port

To configure the parameters for a destination port, first enable the destination port configuration mode. Run the following command to enable the destination port configuration mode. You can also use this command to create a new destination port.

```
npu(config-clsfrule)# dstport <start-port> <end-port>
```

If you use this command to specify a new destination port, the configuration mode for the newly created destination port is automatically enabled, after which you can enable/disable the destination port range (refer to Section 4.3.10.15.4.8.2/Section 4.3.10.15.4.8.3). After executing these tasks, you can terminate the destination port configuration mode (refer to Section 4.3.10.15.4.8.4).

**IMPORTANT**

An error may occur if you provide an invalid value for the `start-port` and `end-port` parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config-clsfrule)# dstport <start-port> <end-port>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<start-port>` | Denotes the starting value of port range to be configured. | Mandatory | N/A | 1-65535 |
| `<end-port>` | Denotes the end value of port range to be configured. | Mandatory | N/A | 1-65535 |

**Command Modes**

L3 Classification rules configuration mode

### 4.3.10.15.4.8.2Enabling the Destination Port Range

You can run the following command to enable the destination port range:

```
npu(config-clsfrule-dstport)# port-enable
```

You can also run this command to enable a destination port range that is currently disabled. For details, refer to “Disabling the Destination Port Range” on page 380.

**Command Syntax**

```
npu(config-clsfrule-dstport)# port-enable
```

**Privilege Level**

10

**Command Modes**

L3 Classification rules-destination port configuration mode

## 4.3.10.15.4.8.3Disabling the Destination Port Range

You can run the following command to disable the destination port range that is currently enabled:

```
npu(config-clsfrule-dstport)# no port-enable
```

**IMPORTANT**

To enable this destination port range, run the following command:

```
npu(config-clsfrule-dstport)# port-enable
```

For details, refer to “Enabling the Destination Port Range” on page 379.

**Command Syntax**

```
npu(config-clsfrule-srcport)# no port-enable
```

**Privilege Level**

10

**Command Modes**

L3 Classification rules-destination port configuration mode

## 4.3.10.15.4.8.4Terminating the Destination Port Configuration Mode

Run the following command to terminate the destination port configuration mode:

```
npu(config-clsfrule-dstport)# exit
```

**Command Syntax**

```
npu(config-clsfrule-dstport)# exit
```

**Privilege Level**

10

**Command Modes**

L3 Classfication rule-destination port configuration mode

### 4.3.10.15.4.8.5Deleting Destination Ports

Run the following command to delete one or all destination ports

```
npu(config-clsfrule)# no dstport [<start-port> <end-port>]
```

**CAUTION**

Specify the start and end port numbers  if you want to delete a specific destination port. Otherwise all the configured destination ports are deleted.

**IMPORTANT**

An error may occur if you provide an invalid value for the `start-port` and `end-port` parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config-clsfrule)# no dstport [<start-port> <end-port>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<start-port>` | Denotes the starting value of port range to be deleted. | Optional | N/A | 1-65535 |
| `<end-port>` | Denotes the end value of port range to be deleted. | Optional | N/A | 1-65535 |

**Command Modes**

L3 Classification rules configuration mode

### 4.3.10.15.4.9 Terminating the L3 Classification Rule Configuration Mode

Run the following command to terminate the L3 classification rules configuration mode:

```
npu(config-clsfrule)# exit
```

**Command Syntax**

```
npu(config-clsfrule)# exit
```

**Command Modes**

L3 Classification rules configuration mode

### 4.3.10.15.4.10Specifying Configuration Parameters for the L2 Classification Rule

After enabling the classification rules configuration mode for an L2 classification rule, run the following command to configure the parameters for this classification rule:

```
npu(config-clsfrule-L2)# cvid <value(1-4094)>
```

**NOTE**

You can display configuration information for specific or all classification rules. For details, refer to Section 4.3.10.15.4.13.

**Command Syntax**

```
npu(config-clsfrule-L2)# cvid <value(1-4094)>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| cvid <value(1-4094)> | Denotes the Customer VLAN ID value to be assigned to the classification rule. | Mandatory | N/A | 1-4094 |

| | |
|---|---|
| **Command Modes** | L2 Classification rules configuration mode |

### 4.3.10.15.4.11Clearing the configuration of the L3 Classification Rule

Run the following command to clear the configuration of this classification rule (removing the configured cvid):

```
npu(config-clsfrule-L2)# no cvid
```

After clearing the configuration you can define a new cvid for this classification rule.

| | |
|---|---|
| **Command Syntax** | `npu(config-clsfrule-L2)# no cvid` |
| **Privilege Level** | 10 |
| **Command Modes** | L2 Classification rules configuration mode |

### 4.3.10.15.4.12Terminating the L2 Classification Rule Configuration Mode

Run the following command to terminate the L2 classification rules configuration mode:

```
npu(config-clsfrule-L2)# exit
```

| | |
|---|---|
| **Command Syntax** | `npu(config-clsfrule-L2)# exit` |
| **Command Modes** | L2 Classification rules configuration mode |

### 4.3.10.15.4.13Displaying Configuration Information for Classification Rules

To display all or specific classification rules, run the following command:

```
npu# show clsf-rule [<rulename>]
```

Specify the classification rule name if you want to display configuration information for a particular rule. Do not specify a value for this parameter if you want to view configuration information for all classification rules.

**IMPORTANT**

An error may occur if you provide an invalid value for the `rulename` parameter. Refer the syntax description for more information about the appropriate values and format for configuring this parameters.

**Command Syntax**

```
npu# show clsf-rule [<rulename>]
```

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<rulename>]` | Denotes the name of the classification rule that you want to display.<br>Specify this parameter only if you want to display a specific classification rule. If you do not specify a rule name, it displays all configured classification rules. | Optional | N/A | String |

**Display Format for each L3 rule**

```
Classification Rule Configuration :

 ClsfRulename <value>

 clsfRuleType: L3

 Priority <value>

 Phs rulename <value>

 IpTosLow <value>  IpTosHigh <value>  IpTosMask <value>  IpTosEnable <0/1>

 clsfRuleSrcAddr <value>  clsfRuleMask <value>  SrcAddrEnable <0/1>

 clsfRuleDstAddr <value>  clsfRuleAddrMask <value>  DstAddrenable <0/1>

 clsfRuleSrcPort Start <value>  clsfRuleSrcPort End <value>
clsfRulePortEnable <0/1>

 clsfRuleDstPort Start <value>  clsfRuleDstPort End <value>
clsfRulePortEnable <0/1>
```

**Display Format for each L2 rule**

```
ClsfRulename <value>

clsfRuleType: L2

Cvid <value>
```

**Command Modes**

Global command mode

#### 4.3.10.15.4.14Deleting Classification Rules

Run the following command to delete one or all classification rules:

```
npu(config)# no clsf-rule [<rulename>]
```

**CAUTION**

Specify the rule name  if you want to delete a specific classification. Otherwise all the configured classification rules are deleted.

**Command Syntax**

```
npu(config)# no clsf-rule [<rulename>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [<rulename>] | Denotes the name of the classification rule that you want to delete. Specify this parameter only if you want to delete a specific classification rule, otherwise all configured classification rules are deleted. | Optional | N/A | String |

**Command Modes**

Global configuration mode

## 4.3.10.16 Configuring PHS Rules

Packet Header Suppression (PHS) is a mechanism that conserves air-interface bandwidth by removing parts of the packet header that remain constant along the traffic session. PHS operates by allowing the MS and ASN-GW to associate PHS rules to each service flow.

When PHS is enabled, a repetitive portion of the payload headers of higher layers is suppressed in the MAC SDU by the sending entity and restored by the receiving entity. At the uplink, the sending entity is the MS and the receiving entity is the NPU. At the downlink, the sending entity is the NPU, and the receiving entity is the MS. If PHS is enabled at the MAC connection, each MAC SDU is prefixed with a PHSI, which references the Payload Header Suppression Field (PHSF).

For instance, the ASN-GW will associate a PHS rule to each provisioned service flow intended for VoIP traffic that will suppress the IP address field from the IP header and other unvarying fields (e.g. protocol version) from the IP and RTP headers. The PHS rules are provisioned on a per-service profile name basis. (For details, refer Section 4.3.10.15.4.)

PHS rules define:

- Header fields that need to be suppressed
- Static values that can be configured for the suppressed header fields

**To configure one or more PHS rules:**

1 Enable the PHS rules configuration mode (refer to Section 4.3.10.16.1)

2 Configure the parameters for the PHS rule (refer to Section 4.3.10.16.2)

3 Terminate the PHS rules configuration mode (refer to Section 4.3.10.16.3)

You can, at any time, display configuration information (refer to Section 4.3.10.16.5) or delete an existing PHS rules (refer to Section 4.3.10.16.4).

The following example illustrates the (sequence of) commands for enabling the PHS rules configuration mode, configuring the parameters of a PHS rule, and then terminating the PHS configuration mode, should be executed as shown in the example below:

```
npu(config)# phs-rule phs-rule1
npu(config-phsrule)# config field
0000000000000000000000000FFFFFFFF00000000 mask 000F00 verify 0 size
20
```

```
npu(config-phsrule)# exit
```

### 4.3.10.16.1 Enabling the PHS Rules Configuration Mode /Creating a New PHS Rule

To configure the parameters for a PHS rule, first enable the PHS rules configuration mode. Run the following command to enable the PHS rules configuration mode. You can also use this command to create a new PHS rule.

```
npu(config)# phs-rule <rulename>
```

If you use this command to create a new PHS rule, the configuration mode for this PHS rule is automatically enabled, after which you can configure the parameters for the PHS rule (refer to Section 4.3.10.16.2). You can then terminate the PHS rules configuration mode (refer to Section 4.3.10.16.3) and return to the global configuration mode.

**Command Syntax**

```
npu(config)# phs-rule <rulename>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<rulename>` | Denotes the PHS rule for which the PHS configuration mode is to be enabled. | Mandatory | N/A | String (1 to 11 characters) |

**Command Modes**

Global configuration mode

### 4.3.10.16.2 Configuring Parameters for the PHS Rule

Run the following command to configure the parameters of the PHS rule:

```
npu(config-phsrule)# config <[field <value>] [mask <value>] [verify
<value>] [size <value>]>
```

**NOTE**

You can display configuration information for specific or all PHS rules. For details, refer Section 4.3.10.16.5.

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config-phsrule)# config <[field <value>] [mask <value>] [verify
<value>] [size <value>]>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [field <value>] | Denotes the PHSF value, that is, the header string to be suppressed. | Mandatory | N/A | String. This parameter is of format "0x0000000000000000000000000000000000000000". Here Octet(x), x=20 bytes, each Byte will represent two characters when used as string like in xml file. |

| | | | | |
|---|---|---|---|---|
| [mask <value>] | Indicates the PHSM, which contains the bit-mask of the PHSF with the bits set that is to be suppressed. | Mandatory | N/A | String This parameter is of format "0x000000". Here Octet(x), x=3 bytes, each Byte will represent two characters when used as string like in xml file. |
| [verify <value>] | Indicates whether the PHS header is to be verified. | Optional | 0 (No) | ■ 0: Indicates that the PHS header should be verified.<br>■ 1: Indicates that the PHS header should not be verified. |
| [**size** <value>] | Indicates the size in bytes of the header to be suppressed. | Mandatory | N/A | 0-20 |

**Command Modes**

PHS rules configuration mode

### 4.3.10.16.3 Terminating the PHS Rules Configuration Mode

Run the following command to terminate the PHS rules configuration mode:

```
npu(config-phsrule)# exit
```

**Command Syntax**

```
npu(config-phsrule)# exit
```

**Privilege Level**

10

**Command Modes**

PHS rulesconfiguration mode

### 4.3.10.16.4 Deleting PHS Rules

Run the following command to delete one or all PHS rules:

```
npu(config)# no phs-rule [<rulename>]
```

**CAUTION**

Specify the rule name  if you want to delete a specific PHS rule. Otherwise all the configured PHS rules are deleted.

**Command Syntax**

```
npu(config)# no phs-rule [<rulename>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [<rulename>] | Denotes the rule name of the PHS rule that you want to delete.<br>Specify a value for this parameter if you want to delete a specific PHS rule. Do not specify a value for this parameter, if you want to delete all PHS rules. | Optional | N/A | String |

**Command Modes**

Classfication rule-IP protocol configuration mode

### 4.3.10.16.5 Displaying Configuration Information for PHS Rules

To display all or specific PHS rules, run the following command:

```
npu# show phs-rule [<rulename>]
```

Specify the rule name if you want to display configuration information for a particular PHS rule. Do not specify a value for this parameter if you want to view configuration information for all PHS rule.

**IMPORTANT**

An error may occur if you provide an invalid value for the `rulename` parameter. Refer the syntax description for more information about the appropriate values and format for configuring this parameter.

**Command Syntax**

```
npu# show phs-rule [<rulename>]]
```

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [<rulename>] | Denotes the rule name of the PHS rule that you want to delete.<br>Specify a value for this parameter if you want to delete a specific PHS rule. Do not specify a value for this parameter, if you want to delete all PHS rules. | Optional | N/A | String |

**Display Format**

```
PHS Configuration :

rulename field    mask   verify   size

<value>  <value> <value> <value> <value>

…….
```

**Command Modes**

Global command mode

## 4.3.10.17 Managing the ASN-GW Keep-Alive Functionality

Once an MS enters the network, its context is stored in ASN entities (BS, ASN-GW). Dynamically, MS context could be transferred/updated (during HO and re-authentication) to other entities or duplicated to other entities (separation between anchor functions such as Authenticator, Data Path and Relay Data Path).

In certain cases, such as entity reset, other entities are not aware of service termination of an MS in that entity, and keep maintaining the MS context. This may result in service failure, excessive consumption of memory resources and accounting mistakes.

The keep-alive mechanism should be used to clear MS context from all network entities when it is de-attached from the BS, and de-register MS from the network when its context becomes unavailable in one of its serving function locations.

When the keep-alive mechanism is enabled the ASN-GW periodically polls other ASN entities-of-interest (BSs and other ASN-GW) and waits for their responses. In case of no keep-alive response, the ASN-GW shall make further actions, such as clearing the applicable MS(s) context.

The ASN-GW builds a list of BS-of-interest and ASN-GW-of-interest which it must poll. ASN-GW shall poll other ASN-GW in case data-path was established over R4 during inter-ASN HO (hierarchical data-path establishment).

The list shall be dynamically updated; the ASN-GW tracks all BSID(s) in all MS(s) contexts it holds, and dynamically updates the list of BSs-of-interest. When a new MS is attached to a BS that does not exist in the list, it will be added it to the list. When the last MS(s) with specific BSID makes network exit, the ASN-GW shall remove the BS from the list.

The same dynamic behavior applies also to ASN-GW-of-interest list. When hierarchical data-path is established, the Data Path Function ASN-GW updates its ASN-GW-of-Interest list with Relay Data Path ASN-GW and vice-versa. The trigger is R4 data-path creation.

The ASN-GW periodically polls the BS(s) and ASN-GW(s) for keep-alive. The polling mechanism is independent and unrelated for every BS-of-interest or ASN-GW-of-interest the ASN-GW polls.

The keep-alive mechanism uses configurable retry timer and retries counter. Upon expiration of the retry timer, the ASN-GW resends the ASN Keep-Alive request message. Upon expiration of the retries counter, the ASN-GW assumes failure of the polled BS/ASN-GW and clears the contexts of all MS(s) served by that BS/ASN-GW.

In addition, the ASN-GW verifies that for each polled entity that the "Last-Reset-Time" UTC value of poll N+1 is equal to the value of poll N. If the "Last-Reset-Time" UTC value of poll N+1 is higher than the value of poll N, this mean that the BS/ASN-GW went through reset state during the interval between two consecutive polls. In this case, the ASN-GW shall clear all MS(s) contexts, served by that specific BS/ASN-GW that are "older" than BS/ASN-GW life after reset (through calculation of difference between polled entity "Last-Reset-Time" received on poll N+1 and self UTC).

If the ASN-GW is the authenticator for the MS(s) the failing BS served, then in addition to context clearance it also sends R3 Accounting-Request (Stop) message including a release indication to AAA.

If ASN-GW is the Data Path Function for the MS(s) that the failing BS/Relay Data Path ASN-GW served, then in addition to context clearance it also sends R4 NetExit_MS_State_Change_Req (or equivalent - according to R6 IOT spec procedure) message to the Authenticator which in turn sends R3 Accounting-Request (Stop) message including a release indication to AAA

When keep-alive fails, ASN-GW generates an alarm and log the event.

Regardless of the enable/disable status of the keep-alive mechanism in the ASN-GW, it replies to ASN_Keep_Alive_Req received from other ASN-GWs/BSs with ASN_Keep_Alive_Rsp. that includes also its "Last-Reset-Time". It responds only if all its functions operate properly. In case one of the functions fails, the ASN-GW shall not respond to the keep-alive poll.

### 4.3.10.17.1 Configuring ASN-GW Keep-Alive Parameters

To configure one or several keep-alive parameters, run the following command:

**npu(config)# set keep-alive ([asnGwKeepAliveTmr** <integer (10-1000)>] [**asnGwKeepAliveRtxLmt** <integer (1-10)>] [**asnGwKeepAliveRespTmr** <integer (100-10000)>] [**asnKeepAliveEnable** <enable|disable>])

**Command Syntax**

```
npu(config)# set keep-alive ([asnGwKeepAliveTmr <integer (10-1000)>]
[asnGwKeepAliveRtxLmt <integer (1-10)>] [asnGwKeepAliveRespTmr <integer
(100-10000)>] [asnKeepAliveEnable <enable|disable>])
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[asnGwKeepAliveTmr <integer (10-1000)>]` | The period In seconds between polling sessions.<br>asnGwKeepAliveTmr x 1000 (value in milliseconds) cannot be lower than asnGwKeepAliveRespTmr x (asnGwKeepAliveRtxLmt +1). | Optional | 60 | 10-1000 |
| `[asnGwKeepAliveRtxLmt <integer (1-10)>]` | Maximum number of retries if asnGwKeepAliveRespTmr has expired without getting a response. | Optional | 3 | 1-10 |
| **`[asnGwKeepAliveRespTmr`** `<integer (100-10000)>`**`]`** | Time in milliseconds to wait for a response before initiating another polling attempt or reaching a decision that the polled entity has failed (if the maximum number of retries set by asnGwKeepAliveRtxLmt has been reached). | Optional | 500 | 100-10000 |
| `[asnKeepAliveEnable <enable\|disable>]` | Enable/Disable the ASN-GW keep-alive mechanism. | Optional | disable | ■ enable<br>■ disable |

**Command Modes**

Global configuration mode

### 4.3.10.17.2 Displaying Configuration Information for ASN-GW Keep-Alive Parameters

To display the ASN-GW keep-alive parameters, run the following command:

```
npu# show keep-alive
```

**Command Syntax**

```
npu# show keep-alive
```

**Privilege Level**

1

**Display Format**

```
% Asn-gateway Keep Alive Configuration
asnGwKeepAliveEnable : <enable/disable>
asnGwKeepAliveTmr : <value>
asnGwKeepAliveRtxLmt : <value>
asnGwKeepAliveRespTmr : <value>
```

**Command Modes**

Global cpmmand mode

## 4.3.11 Configuring Logging

Logs can be generated to record events that occur with respect to the following system modules:

- System startup procedures: Refers to all procedures/events that occur during system startup.
- NPU/AU upgrade procedures: Refers to all the procedures executed while upgrading the NPU/AU.
- Fault management procedures: Refers to internal processes that are executed for monitoring erroneous conditions or fault conditions.
- System performance procedures: Refers to internal processes that are executed for monitoring system performance.
- Shelf management procedures: Refers to internal processes that are executed for monitoring the health and temperature of all hardware components (other than the NPU) such as the AU, PIU and PSU.
- WiMAX signaling protocols: Refers to all the protocols that implement the ASN-GW functionality.
- User interface: Refers to the command line or remote management interface used for executing all user-initiated events such as system shut down or reset.

- AU Manager: Refers to all internal processes used for fault, configuration, and performance management for AU.

**IMPORTANT**

The Syslog utility is used to implement the logging feature for 4Motion.

You can specify the severity level for which log messages are to be generated for each module. Logs are generated for events for which the severity level is equal to or higher than the configured level. The following are the severity levels that you can configure for each module:

- Emergency
- Alert
- Critical
- Error
- Warning
- Notice
- Information

By default, system-level logging is enabled. The system stores a maximum of 1000 log and trace messages. The system stores log and trace messages using the cyclic buffer method. That is, when there are more than 1000 messages, the system overwrites the oldest log and trace messages.

**IMPORTANT**

It is recommended that you periodically make backups of log messages before these are overwritten. For details, refer to “Making a Backup of Log Files on the NPU Flash” on page 403.

To configure logging, first specify system-level logging that is applicable across the entire system. You can then configure logging, individually for each system module. This section describes the commands to be used for:

- “Managing System-level Logging” on page 397
- “Configuring Module-level Logging” on page 406

## 4.3.11.1 Managing System-level Logging

System-level logging refers to all the procedures to be executed for managing logging for the entire system. To manage system-level logging:

- Enable/disable logging across the entire system, and specify the destination (a file on the local system or on an external server) where logs are to be maintained.

- Make periodic backups of log files.

You can, at any time, view the current log destination or delete log files from the NPU flash. After you have enabled/disabled system-level logging and specified the destination for storing log messages, you can configure logging separately for each module. This section describes the commands to be used for:

- "Enabling System-level Logging" on page 397

- "Disabling Logging to File or Server" on page 399

- "Displaying System-level Logs" on page 401

- "Displaying the Current Log Destination" on page 402

- "Making a Backup of Log Files on the NPU Flash" on page 403

- "Deleting Backup Log Files from the NPU Flash" on page 405

### 4.3.11.1.1 Enabling System-level Logging

You can enable logging for the entire system and specify the destination where logs should be written. The destination can be either written to:

- File

- External server (Log files are sent to the external server in the Syslog log format. The Syslog daemon on the external server can save these log messages in the appropriate format depending upon the server configuration.)

By default, system-level logging is enabled. To view whether the system-level logging is enabled/disabled for logging to file or server. For details, refer Section 4.3.11.1.4.

The system maintains a maximum of 1000 log and trace messages. The system stores log and trace messages using the cyclic buffer method. That is, when there are more than 1000 messages, the system overwrites the oldest log and trace messages.

**IMPORTANT**

If you have enabled writing of log messages to file, it is recommended that you periodically make a backup of this log file. This is because log messages that are written to file are deleted after system reset. For more information about making backups of log files on the NPU flash, refer to Section 4.3.11.1.5.

To enable system-level logging, run the following command:

```
npu(config)# log destination {file | server <IP address>}
```

**NOTE**

After you execute this command, logging is enabled for the entire system. You may also configure logging separately for each system module. For details, refer to Section 4.3.11.2.

**IMPORTANT**

An error may occur if:

- Logging is already enabled for the requested destination (file or server).
- Logging is enabled to a server with a different IP address. Because logging can be enabled to only one external server, you can specify another server IP address after you disable logging to the existing server IP address. For more information about disabling logging to server, refer "Disabling Logging to File or Server" on page 399.
- An internal error has occurred.
- You have specified the IP address in an invalid format. Specify the IP address in the format, XXX.XXX.XXX.XXX.

**Command Syntax**

```
npu(config)# log destination {file | server <IP address>}
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{file|server <IP address>}` | Indicates whether logs are to be written to a file or server. | Mandatory | N/A | ■ **file**: Indicates that logs are to be written to a file. (Logs written to file are not maintained after system reset; periodically save the log file to flash.) For details, refer to Section 4.3.11.1.5.<br>■ **server**: Indicates that logs are to be written to an external server. Specify the server IP address of the server in the format, XXX.XXX.XXX.XXX. |

**Command Modes** Global configuration mode

### 4.3.11.1.2 Disabling Logging to File or Server

To disable logging to file or server, run the following command:

```
npu(config)# no log destination {file | server <IP address>}
```

**IMPORTANT**

An error may occur if:

- Logging is already disabled for the requested destination (file or server).
- An internal error has occurred.
- The server IP address that you have specified does not exist.

**Command Syntax**

```
npu(config)# no log destination {file | server <IP address>}
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{file|server <IP address>}` | Indicates whether the system-level logs are to be disabled for a file or server. | Mandatory | N/A | - `file`: Indicates that system-level logging to a file is to be disabled.<br>- `server<ip address>`: Indicates that system-level logging to a server is to be disabled. Specify the IP address if you want to disable logging to a specific server. Otherwise logging is disabled for the server that was last enabled for logging. Provide the IP address in the format, XXX.XXX.XXX.XXX. |

**Command Modes**

Global configuration mode

### 4.3.11.1.3 Displaying System-level Logs

To display system-level logs, run the following command:

```
npu# show logs
```

When you run this command, all the log messages are displayed. (4Motion maintains a maximum of 1000 log and trace messages.) If you want to filter log messages to be displayed, run the following command to specify the filter criteria:

```
npu# show logs [filter | grep <string>]
```

For example, if you want to view log messages pertaining to only Error logs, run the following command:

```
npu# show logs filter|grep ERROR
```

**IMPORTANT**

An error may occur if:

- There are no logs to be displayed.
- The log files are inaccessible or an internal error occurred while processing the result.

**Command Syntax**

```
npu# show logs [filter | grep <string>]
```

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[filter | grep <string>]` | Indicates the criteria for filtering the log messages to be displayed. | Optional | N/A | String |

**Command Modes**

Global command mode

### 4.3.11.1.4 Displaying the Current Log Destination

To view the current log destination, that is, whether logs are written to file or an external server, run the following command:

```
npu# show log destination
```

**IMPORTANT**

An error may occur if an internal error occurs when you execute this command.

**Command Syntax**

```
npu# show log destination
```

**Privilege Level**

1

**Display Format**

```
Logfile(<file name>)   :  Enabled/Disabled
Log Server(<IP address>) :  Enabled/Disabled
```

**Command Modes**

Global command mode

### 4.3.11.1.5 Making a Backup of Log Files on the NPU Flash

The system stores a maximum of 1000 log and trace messages in the log file, after which the oldest messages are overwritten. This log file resides in the TFTP boot directory (/tftpboot/management/system_log/) of the NPU. You can TFTP this file from the NPU flash. You can display the list of log files residing on the NPU flash. For details, refer Section 4.3.11.1.7.

In addition, logs written to file are not maintained after system reset. If you have enabled writing of logs to file, it is recommended that you periodically make a backup of log messages on the NPU flash.

**IMPORTANT**

You can display a list of log files that are currently residing on the NPU flash. For details, refer Section 4.3.11.1.7.

When you make a backup of log files on the NPU flash, the last 1000 log and trace messages are stored in a compressed file, which is saved on the NPU flash. There is no limit on the number of log files that can be saved unless there is inadequate space on the NPU flash.

**IMPORTANT**

Trace messages are also written to the same file as log messages (provided you have enabled writing of trace messages to file.) When you make a backup of log files written to file, the backup file also contains trace messages (provided you have enabled writing of trace messages to file). For more information about configuring traces, refer Section 4.11.1.1.

Run the following command to make a backup of the log and trace messages (written to file), on the NPU flash:

```
npu(config)# save log file <file name.gz>
```

When you run this command, the last 1000 log and trace messages are stored in the compressed file, which is saved on the NPU flash.

**IMPORTANT**

An error may occur if:

- You have specified the file name in an invalid format. Because the backup log file is a compressed file, always suffix the file name with **.gz**.
- The length of the file name has exceeded 255 characters.
- The system was unable to compress the file or save the compressed file to flash.
- A processing error has occurred.

**Command Syntax**

```
npu(config)# save log file <file name>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<file name>` | Indicates the name of the compressed file that contains the last 1000 log and trace messages. Always suffix the file name with **.gz**. | Mandatory | N/A | <file name>.gz |

**Command Modes**

Global configuration mode

### 4.3.11.1.6 Deleting Backup Log Files from the NPU Flash

You can delete the backup log files from the NPU flash. It is recommended that you periodically make a backup of these log files, and delete these from the NPU flash.

**IMPORTANT**

Trace and log messages are stored in the same backup file on the NPU flash. When you execute this procedure, trace messages are also deleted from the NPU flash. For details, refer to "Managing System-level Tracing" on page 822.

To delete log and trace backup files from the NPU flash, run the following command:

```
npu(config)# erase log file [<file name>]
```

**CAUTION**

Specify the file name  if you want to delete a specific backup file. Otherwise all the backup files residing in the NPU flash are deleted.

**IMPORTANT**

An error may occur if:

- The file name that you have specified does not exist.
- A processing error has occurred.

**Command Syntax**

```
npu(config)# erase log file [<file name>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[<file name>]` | Indicates the name of the compressed log file to be deleted. If you do not specify the file name, all the log files residing in the NPU flash are deleted.<br>Always suffix the file name with **.gz**. | Optional | N/A | <file name>.gz |

**Command Modes** Global configuration mode

### 4.3.11.1.7 Displaying Log Files Residing on the NPU Flash

You can display a list of log files that are residing on the NPU flash. For details, refer Section 4.10.4.

## 4.3.11.2 Configuring Module-level Logging

You can configure logging (enable/disable) separately for the following modules, and define the severity level for which logging is required:

- System startup procedures
- NPU/AU upgrade procedures
- Fault management procedures
- System performance procedures
- Shelf management procedures
- WiMAX signaling protocols
- User interface
- AU management procedures

This section describes the commands to be used for:

- "Configuring the Log Severity Level" on page 407
- "Displaying Configuration Information for Module-level Logging" on page 409
- "Disabling Module-level Logging" on page 410

### 4.3.11.2.1 Configuring the Log Severity Level

You can configure the severity level for logs to be generated for each module. This means that if an event occurs for a module for which the severity level is equal to or higher than the configured level, a log is generated. The following are the severity levels (highest to lowest) that can be configured for each module:

- Emergency
- Alert
- Critical
- Error
- Warning
- Notice
- Information

**IMPORTANT**

By default, logging is enabled for all modules, and the severity level is Error. The severity levels recorded in 4Motion log messages are defined in RFC 3164.

To specify the severity level for each module for which logs are to be created, run the following command:

```
npu(config)# log level
[{StartupMgr|SWDownload|FaultMgr|PerfMgr|ShelfMgr|SIGASN|UserIF|AU
Mgr}] {EMERG|ALERT|CRIT|ERROR|WARN|NOTICE|INFO}
```

The parameters in this command correspond to the system modules/procedures listed in the following table:

**Table 4-21: Modules for which Logging can be Enabled**

| Parameter | Refers to... |
|---|---|
| `StartupMgr` | System startup procedures |
| `SWDownload` | Software upgrade procedures |
| `FaultMgr` | Fault management procedures |
| `ShelfMgr` | Shelf management procedures |
| `SIGASN` | WiMAX signaling protocols |
| `UserIF` | User-initiated procedures |
| `AUMgr` | Internal processes used for managing AU |
| `PerfMgr` | Performance management procedures |

Specify the module name if you want to configure the severity level separately for this module. If you do not specify the name of the module, the severity level that you configure in this command is applied to all modules.

For example, run the following command if you want logs to be created for WiMAX signaling protocols when the severity level is Warning or higher:

```
npu(config)# log level SIGASN WARN
```

Or run the following command to set the severity level to Error for all modules:

```
npu(config)# log level ERROR
```

**NOTE**

You can display the currently configured severity levels for each module. For details, refer Section 4.3.11.2.2.

**Command Syntax**

```
npu(config)# log level
[{StartupMgr|SWDownload|FaultMgr|PerfMgr|ShelfMgr|SIGASN|UserIF|AUMgr}]
{EMERG|ALERT|CRIT|ERROR|WARN|NOTICE|INFO}
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[{StartupMgr|SWDownload|FaultMgr|PerfMgr|ShelfMgr|SIGASN|UserIF|AUMgr}]` | Indicates the name of the module for which the severity level is to be specified.<br>If you do not specify any value for this parameter, the severity level that you specify is applied for all modules. For more information about these parameters, refer Table 4-21. | Optional | N/A | StartupMgr<br>SWDownload<br>FaultMgr<br>PerfMgr<br>ShelfMgr<br>SIGASN<br>UserIF<br>AUMgr |
| `{EMERG|ALERT|CRIT|ERROR|WARN|NOTICE|INFO}` | Indicates the severity level to be applied to a particular or all modules. | Mandatory | Error | EMERG<br>ALERT<br>CRIT<br>ERROR<br>WARN<br>NOTICE<br>INFO |

**Command Modes**

Global configuration mode

#### 4.3.11.2.2 Displaying Configuration Information for Module-level Logging

To display the log level configured for one or all modules, run the following command.

```
npu(config)# show log level
[{StartupMgr|SWDownload|FaultMgr|PerfMgr|ShelfMgr|SIGASN|UserIF|AU
Mgr}]
```

Specify the module for which you want to view the configured severity level. If you do not specify the name of the module, the log level configured for all modules is displayed.

**Command Syntax**

```
npu(config)# show log level
[{StartupMgr|SWDownload|FaultMgr|PerfMgr|ShelfMgr|SIGASN|UserIF|AUMgr}]
```

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[{StartupMgr|SWDownload|FaultMgr|PerfMgr|ShelfMgr|SIGASN|UserIF|AUMgr}]` | Indicates the name of the module for which you want to view the configured severity level. For more information about these parameters, refer Table 4-21.<br>If you do not specify any value for this parameter, the severity level is displayed for all modules. | Optional | N/A | ■ StartupMgr<br>■ SWDownload<br>■ FaultMgr<br>■ PerfMgr<br>■ ShelfMgr<br>■ SIGASN<br>■ UserIF<br>■ AUMgr |

**Display Format**

```
Module Name     :   Log level
<Module Name>   :   <Log Level>
```

**Command Modes**

Global configuration mode

### 4.3.11.2.3 Disabling Module-level Logging

To disable logging for one or all system modules, run the following command:

```
npu(config)# no log level
[{StartupMgr|SWDownload|FaultMgr|PerfMgr|ShelfMgr|SIGASN|UserIF|AUMgr}]
```

Specify the name of the module if you want to disable logging for a specific module. If you do not specify the module name, logging is disabled for all modules.

**Command Syntax**

```
npu(config)# no log level
[{StartupMgr|SWDownload|FaultMgr|PerfMgr|ShelfMgr|SIGASN|UserIF|AUMgr}]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[{StartupMgr|SWDownload|FaultMgr|PerfMgr|ShelfMgr|SIGASN|UserIF|AUMgr}]` | Indicates the name of the module for which logging is to be disabled.<br>If you do not specify any value for this parameter, logging is disabled for all parameters. For more information about these modules, refer Table 4-21. | Optional | N/A | ■ StartupMgr<br>■ SWDownload<br>■ FaultMgr<br>■ PerfMgr<br>■ ShelfMgr<br>■ SIGASN<br>■ UserIF<br>■ AUMgr |

**Command Modes**

Global configuration mode

## 4.3.12 Configuring Performance Data Collection

You can configure 4Motion to periodically collect and store performance counters with respect to the following groups:

- NPU Counters Groups (per-NPU counters):
  - NPU DATA port
  - NPU MGMT port
  - NPU CASCADE port
  - AU ports
  - NPU internal-management interface
  - NPU external-management interface
  - NPU local-management interface
  - NPU bearer interface
  - Service Flow Authorization functionality
  - Data path functionality
  - AAA client functionality
  - Authenticator function
  - Context function
  - DHCP proxy functionality
  - DHCP relay functionality
  - DHCP server functionality
  - MS state change functionality

- AU Counters Groups (per-BS counters)
  - De-Registration
  - Integrity
  - Mobility
  - Network Entry (NE)
  - Traffic
  - Utilization
  - General
  - All MS Basic Mode
  - Specific MS Advanced Mode (not supported in current release)

For details on the performance data counters collected for each group refer to the relevant 4Motion Performance Monitoring document.

You can specify the group for which performance data is to be stored and collected, and the interval after which this data should be fetched.

The data is stored in an XML file called, prf_yyyymmddhhmm.xml.gz in the path, TFTP/boot/Management/Performance Manager. The system maintains this data for a maximum of 24 hours after which it is deleted. It is recommended that you periodically make a backup of these files on an external server.

You can enable/disable collection of performance data for each group separately. In addition, you can specify the interval after which this data should be obtained from each group. This section describes:

- "Enabling Collection and Storage of Historical Performance Data" on page 414
- "Disabling Collection and Storage of Performance Data" on page 417
- "Displaying the Status of Performance Data Collection" on page 419

### 4.3.12.1 Enabling Collection and Storage of Historical Performance Data

4Motion collects and stores performance data for the a number of system groups (refer to Section 4.3.12). To enable collection and storage of performance data for a group, run the following command:

To enable collection and storage of performance data for an NPU counters group:

```
npu(config)# group enable {pmNpuBckhlPort | pmNpuMgmtPort |
pmNpuCascPort | pmAuPort | pmNpuIntMgmtIf | pmNpuExtMgmtIf |
pmNpuLclMgmtIf | pmNpuBearerIf | pmSfa | pmDatapathFn | pmAaaClient
| pmAuthenticator | pmContextFn | pmDhcpProxy | pmDhcpRelay |
pmDhcpServer | pmMsStateChangeFn}
```

To enable collection and storage of performance data for an AU counters group:

```
npu(config)# group enable au { pmBsDeRegistration | pmBsIntegrity |
pmBsMobility | pmBsNetworkEntry | pmBsTraffic | pmBsUtilization |
pmBsGeneral | pmbsallmsbasicmode | pmbsspecificmsadvancedmode}
```

**NOTENOTE**

Using this command, you can enable collection of performance data for only one group at a time. For example, run the following command if you want to enable performance data collection and storage for the data path function:

```
npu(config)# group enable pmDatapathFn
```

You can display whether performance data collection is currently enabled or disabled for a particular group. For details, refer Section 4.3.12.3.

The parameters in this command correspond to the groups listed in the following tables:

**Table 4-22: NPU Counters Groups for which Performance Data can be Collected**

| Parameter Name | Refers to... |
|---|---|
| **pmNpuBckhlPort** | NPU DATA port |
| **pmNpuMgmtPort** | NPU MGMT port |
| **pmNpuCascPort** | NPU CASCADE port |
| **pmAuPort** | AU ports |
| **pmNpuIntMgmtIf** | NPU internal-management interface |
| **pmNpuExtMgmtIf** | NPU external-management interface |
| **pmNpuLclMgmtIf** | NPU local-management interface |

Table 4-22: NPU Counters Groups for which Performance Data can be Collected

| Parameter Name | Refers to... |
|---|---|
| **pmNpuBearerIf** | NPU bearer interface |
| **pmSfa** | Service flow authorization |
| **pmDatapathFn** | Data path functionality |
| **pmAaaClient** | AAA client functionality |
| **pmAuthenticator** | Authenticator function |
| **pmContextFn** | Context function |
| **pmDhcpProxy** | DHCP proxy functionality |
| **pmDhcpRelay** | DHCP relay functionality |
| **pmDhcpServer** | DHCP server functionality |
| **pmMsStateChangeFn** | MS state change functionality |

Table 4-23: AU Counters Groups for which Performance Data can be Collected

| Parameter Name | Refers to... |
|---|---|
| **pmBsDeRegistration** | De-Registration |
| **pmBsIntegrity** | Integrity |
| **pmBsMobility** | Mobility |
| **pmBsNetworkEntry** | Network Entry |
| **pmBsTraffic** | Traffic |
| **pmBsUtilization** | Utilization |
| **pmBsGeneral** | General |
| **pmbsallmsbasicmode** | All MS Basi Modec |
| **pmbsspecificmsadvancedmode** | Specific MS Advanced Mode (not supported in current release) |

For example, run the following command if you want to enable performance data collection for the NPU DATA port:

```
npu(config)# group enable pmNpuBckhlPort
```

When you run this command, collection and storage of performance data is enabled for the DATA port counters.

**NOTENOTE**

When you enable collection of performance data collection, the data is stored in a file called, **prf_yyyymmddhhmm.xml.gz** in the path, **TFTP/boot/Management/Performance Manager**. It is recommended that you periodically make a backup of these files on an external server.

After you have enabled collection and storage of performance data is fetched every quarter of an hour.

**IMPORTANT**

An error may occur if run this command when you are operating the NPU in the Transparent mode and want to enable performance data storage and collection for the following WiMAX signaling protocol groups:

- Service Flow Authorization functionality
- Data path functionality
- AAA client functionality
- Authenticator function
- Context function
- DHCP proxy functionality
- DHCP relay functionality
- DHCP server functionality
- MS state change functionality

**Command Syntax**

```
npu(config)# group enable {pmNpuBckhlPort | pmNpuMgmtPort | pmNpuCascPort
| pmAuPort | pmNpuIntMgmtIf | pmNpuExtMgmtIf | pmNpuLclMgmtIf |
pmNpuBearerIf | pmSfa | pmDatapathFn | pmAaaClient | pmAuthenticator |
pmContextFn | pmDhcpProxy | pmDhcpRelay | pmDhcpServer |
pmMsStateChangeFn}
```

```
npu(config)# group enable au { pmBsDeRegistration | pmBsIntegrity |
pmBsMobility | pmBsNetworkEntry | pmBsTraffic | pmBsUtilization |
pmBsGeneral | pmbsallmsbasicmode | pmbsspecificmsadvancedmode}
```

**Privilege Level**

10

**Syntax Description**

| | Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|---|
| **For NPU groups:** | {pmNpuBckhlPort\|pmNpuMgmtPort\|pmNpuCascPort\|pmAuPort \| pmNpuIntMgmtIf pmNpuExtMgmtIf \|pmNpuLclMgmtIf\|pmNpuBearerIf\|pmSfa\|pmDatapathFn\|pmAaaClient\|pmAuthenticator\|pmContextFn\|pmDhcpProxy\|pmDhcpRelay\|pmDhcpServer \|pmMsStateChangeFn} | For a description of each parameter in this command, refer to Table 4-22. | Mandatory | N/A | Refer to Table 4-22. |
| **For AU groups** | {pmBsDeRegistration \| pmBsIntegrity\|pmBsMobility\|pmBsNetworkEntry\|pmBsTraffic\|pmBsUtilization\| pmBsGeneral\| pmbsallmsbasicmode\|pmbsspecificmsadvancedmode} | For a description of each parameter in this command, refer to Table 4-23 | Mandatory | N/A | Refer to Table 4-23. |

**Command Modes**

Global configuration mode

## 4.3.12.2 Disabling Collection and Storage of Performance Data

To disable collection and storage of performance data for one group, run the following command:

To disable collection and storage of performance data for an NPU counters group:

```
npu(config)# no group enable {pmNpuBckhlPort | pmNpuMgmtPort |
pmNpuCascPort | pmAuPort | pmNpuIntMgmtIf | pmNpuExtMgmtIf |
pmNpuLclMgmtIf | pmNpuBearerIf | pmSfa | pmDatapathFn | pmAaaClient
| pmAuthenticator | pmContextFn | pmDhcpProxy | pmDhcpRelay |
pmDhcpServer | pmMsStateChangeFn}
```

To disable collection and storage of performance data for an NPU counters group:

```
npu(config)# no group enable au { pmBsDeRegistration | pmBsIntegrity
| pmBsMobility | pmBsNetworkEntry | pmBsTraffic | pmBsUtilization |
pmBsGeneral | pmbsallmsbasicmode | pmbsspecificmsadvancedmode}
```

**NOTENOTE**

Using this command, you can disable collection of performance data for only one group at a time. For more information about the group names in this command, refer to Table 4-22.

For example, run the following command if you want to disable performance data collection and storage for the data path function:

```
npu(config)# no group enable pmDatapathFn
```

**Command Syntax**

```
npu(config)# no group enable {pmNpuBckhlPort | pmNpuMgmtPort |
pmNpuCascPort | pmAuPort | pmNpuIntMgmtIf | pmNpuExtMgmtIf |
pmNpuLclMgmtIf | pmNpuBearerIf | pmSfa | pmDatapathFn | pmAaaClient |
pmAuthenticator | pmContextFn | pmDhcpProxy | pmDhcpRelay | pmDhcpServer
| pmMsStateChangeFn}
```

```
npu(config)# no group enable au { pmBsDeRegistration |
pmBsIntegrity | pmBsMobility | pmBsNetworkEntry | pmBsTraffic |
pmBsUtilization | pmBsGeneral | pmbsallmsbasicmode |
pmbsspecificmsadvancedmode}
```

**Privilege Level**

10

**Syntax Description**

| | Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|---|
| **For NPU groups** | {pmNpuBckhlPort\|pmNpuMgmtPort\|pmNpuCascPort\|pmAuPort \| pmNpuIntMgmtIf pmNpuExtMgmtIf \|pmNpuLclMgmtIf\|pmNpuBearerIf\|pmSfa\|pmDatapathFn\|pmAaaClient\|pmAuthenticator\|pmContextFn\|pmDhcpProxy\|pmDhcpRelay\|pmDhcpServer \|pmIgmp\|pmMsStateChangeFn} | For a description of each parameter in this command, refer Table 4-22. | Mandatory | N/A | Refer to Table 4-22 |
| **For AU groups** | {pmBsDeRegistration \| pmBsIntegrity\|pmBsMobility\|pmBsNetworkEntry\|pmBsTraffic\|pmBsUtilization\| pmBsGeneral\| pmbsallmsbasicmode\|pmbsspecificmsadvancedmode} | For a description of each parameter in this command, refer to Table 4-23 | Mandatory | N/A | Refer to Table 4-23. |

**Command Modes** Global configuration mode

## 4.3.12.3 Displaying the Status of Performance Data Collection

To display whether collection and storage of performance data is enabled/disabled for a group, run the following command:

To display the status for an NPU counters group:

```
npu# show group status {pmNpuBckhlPort | pmNpuMgmtPort |
pmNpuCascPort | pmAuPort | pmNpuIntMgmtIf | pmNpuExtMgmtIf |
pmNpuLclMgmtIf | pmNpuBearerIf | pmSfa | pmDatapathFn | pmAaaClient
| pmAuthenticator | pmContextFn | pmDhcpProxy | pmDhcpRelay |
pmDhcpServer | pmMsStateChangeFn}
```

To display the status for an AU counters group:

```
npu# show au group status { pmBsDeRegistration | pmBsIntegrity |
pmBsMobility | pmBsNetworkEntry | pmBsTraffic | pmBsUtilization |
pmBsGeneral | pmbsallmsbasicmode | pmbsspecificmsadvancedmode}
```

**IMPORTANT**

An error may occur if run this command when you are operating the NPU in the Transparent mode and want to display performance data collection for the following WiMAX signaling protocol groups:

- Service Flow Authorization functionality
- Data path functionality
- AAA client functionality
- Authenticator function
- Context function
- DHCP proxy functionality
- DHCP relay functionality
- DHCP server functionality
- MS state change functionality

**Command Syntax**

```
npu# show group status {pmNpuBckhlPort | pmNpuMgmtPort | pmNpuCascPort |
pmAuPort | pmNpuIntMgmtIf | pmNpuExtMgmtIf | pmNpuLclMgmtIf |
pmNpuBearerIf | pmSfa | pmDatapathFn | pmAaaClient | pmAuthenticator |
pmContextFn | pmDhcpProxy | pmDhcpRelay | pmDhcpServer |
pmMsStateChangeFn}
```

```
npu# show au group status { pmBsDeRegistration | pmBsIntegrity |
pmBsMobility | pmBsNetworkEntry | pmBsTraffic | pmBsUtilization |
pmBsGeneral | pmbsallmsbasicmode | pmbsspecificmsadvancedmode}
```

**Privilege Level**

1

**Syntax Description**

| | Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|---|
| **For NPU groups** | `{pmNpuBckhlPort\|pmNpuMgmtPort\|pmNpuCascPort\|pmAuPort \| pmNpuIntMgmtIf pmNpuExtMgmtIf \|pmNpuLclMgmtIf\|pmNpuBearerIf\|pmSfa\|pmDatapathFn\|pmAaaClient\|pmAuthenticator\|pmContextFn\|pmDhcpProxy\|pmDhcpRelay\|pmDhcpServer \|pmIgmp\|pmMsStateChangeFn}` | For a description of each parameter in this command, refer Table 4-22. | Mandatory | N/A | Refer to Table 4-22 |
| **For AU groups** | `{pmBsDeRegistration \| pmBsIntegrity\|pmBsMobility\|pmBsNetworkEntry\|pmBsTraffic\|pmBsUtilization\| pmBsGeneral\| pmbsallmsbasicmode\|pmbsspecificmsadvancedmode}` | For a description of each parameter in this command, refer Table 4-23 | Mandatory | N/A | Refer to Table 4-23. |

**Display Format**

```
<Group Name>   <Status>
```

**Command Modes**

Global command mode

## 4.3.13 Configuring the SNMP/Trap Manager

This section describes the commands for:

## 4.3.13.1 Configuring the SNMP Manager

To enable 4Motion configuration over SNMP, you are required to first configure the SNMP Manager. You can configure up to five SNMP Managers for the 4Motion system. This section describes the commands to be executed for:

**NOTE**

An existing SNMP Manager entry cannot be modify. To modify the parameters of an SNMP Manager, delete the entry and add a new entry with the required parameters.

### 4.3.13.1.1 Adding an SNMP Manager

You can configure upto five SNMP Managers. To add an SNMP Manager, run the following command:

```
npu(config)# snmp-mgr [ReadCommunity <string>] [ReadWriteCommunity
<string>]
```

You can display configuration information for existing SNMP Managers. For details, refer Section 4.3.13.1.3.

**IMPORTANT**

An error may occur if you have specified:

- More than five entries for the SNMP Manager
- Duplicate entries

| | |
|---|---|
| **Command Syntax** | `npu(config)# snmp-mgr [ReadCommunity <string>] [ReadWriteCommunity <string>]` |
| **Privilege Level** | 10 |

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `[ReadCommunity <string>]` | IThe SNMP Read Community string allowing execution of SNMP Get operations. | Optional | public | String (up to 10 characters and case-sensitive) |
| `[ReadWriteCommunity <string>]` | The SNMP Read/Write Community string allowing execution of SNMP Set and Get operations. | Optional | private | String (up to 10 characters and case-sensitive) |

**Command Modes**

Global configuration mode

### 4.3.13.1.2 Deleting an Entry for the SNMP Manager

To delete an SNMP Manager entry, run the following command:

```
npu(config)# no snmp-mgr index <integer>
```

**IMPORTANT**

An error may occur if you provide an incorrect index number for the SNMP Manager to be deleted. To display the index numbers for configured SNMP Managers, refer Section 4.3.13.1.3.

**Command Syntax**

```
npu(config)# no snmp-mgr index <integer>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<integer>` | Indicates the index number of the SNMP Manager to be deleted. Should be an index of an existing SNMP Manager. | Mandatory | N/A | 1-5 |

**Command Modes**

Global configuration mode

#### 4.3.13.1.3 Displaying Configuration Information for SNMP Managers

To display configuration information for all SNMP Managers, run the following command:

```
npu# show snmp-mgr
```

**IMPORTANT**

An error may occur if there is no existing SMNP Manager entry.

**Command Syntax**

```
npu# show snmp-mgr
```

**Privilege Level**

1

**Display Format**

```
                                   Snmp Manager Table
                              --------------------------------
Manager Index:(1) Read Only Community:(<value>) Read WriteCommunity:
(<value>)
```

**Command Modes**

Global command mode

### 4.3.13.2 Configuring the Trap Manager

The SNMP Agent can send traps to multiple Trap Managers, for which an entry exists in the 4Motion system. After you have created an entry for a Trap Manager, you are required to enable the Trap Manager. You can, at any time, disable a Trap Manager for the 4Motion system.

This section describes the commands for:

- "Adding/Modifying a Trap Manager entry" on page 425
- "Deleting an Entry for the Trap Manager" on page 426
- "Enabling/Disabling the Trap Manager" on page 427

- "Displaying Configuration Information for Trap Managers" on page 427
- "Displaying the Trap Rate Limit" on page 428

### 4.3.13.2.1 Adding/Modifying a Trap Manager entry

You can configure up to five Trap Manager entries for the 4Motion system. To add a Trap Manager entry, or to modify an existing entry, run the following command:

```
npu(config)# trap-mgr ip-source <ip_addr> [Port <(0-65535)>]
[TrapCommunity <string>] [EnableFlag <integer(1 for enable, 2 for
disable)>]
```

You can view configuration information for existing Trap Managers. For details, refer Section 4.3.13.2.4.

**IMPORTANT**

An error may occur if :

- You have specified invalid values for the IP address, Trap Community or port.
- The IP address is already configured for another Trap Manager.
- You are trying to create more than five Trap Managers. (You can configure up to five Trap Managers for the 4Motion system.

**Command Syntax**

```
npu(config)# trap-mgr ip-source <ip_addr> [Port <(0-65535)>]
[TrapCommunity <string>] [EnableFlag <integer(1 for enable, 2 for
disable)>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<ip_addr>` | Indicates the IP address of the Trap Manager to be added or modified.<br>Must be unique (the same IP address cannot be assigned to more than one Manager) | Mandatory | N/A | Valid IP address |

| | | | | |
|---|---|---|---|---|
| `[Port <(0-65535)>]` | Indicates the port number on which the Trap Manager will listen for messages from the Agent. | Optional | 162 | 0-65535 |
| `[TrapCommunity <string>]` | Indicates the name of the community of the Trap Manager. | Optional | public | String (up to 10 characters and case-sensitive) |
| `[EnableFlag<integer(1 for enable, 2 for disable)>]` | Indicates whether traps sending to the Trap Manager is to be enabled. or disabled | Optional | 1 | ■ 1: Indicates enable<br>■ 2 Indicates disable |

**Command Modes**

Global configuration mode

### 4.3.13.2.2 Deleting an Entry for the Trap Manager

To delete a Trap Manager, run the following command:

```
npu(config)# no trap-mgr ip-source <ip_addr>
```

**IMPORTANT**

An error may occur if the IP address you have specifed does not exist.

**Command Syntax**

```
npu(config)# no trap-mgr ip-source <ip_addr>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<ip_addr>` | Indicates the IP address of the Trap Manager to be deleted. | Mandatory | N/A | Valid IP address |

**Command Modes**

Global configuration mode

### 4.3.13.2.3 Enabling/Disabling the Trap Manager

Traps are sent to a particular Trap Manager only if it is enabled. Run the following commands to enable/disable the Trap Manager that you have created.

**NOTE**

By default, all Trap Managers are enabled.

```
npu(config)# trap-mgr enable ip-source <ip_addr>

npu (config)# trap-mgr disable ip-source <ip_addr>
```

**NOTE**

These enable/disable commands have functionality that is identical to the EnableFlag parameter (see "Adding/Modifying a Trap Manager entry" on page 425).

**IMPORTANT**

An error may occur if the IP address that you ave specified does not exist in the Trap Manager index.

**Command Syntax**

```
npu(config)#  trap-mgr enable ip-source <ip_addr>

npu (config)# trap-mgr disable ip-source <ip_addr>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<ip_addr>` | Indicates the IP address of the Trap Manager to be enabled/disabled. | Mandatory | N/A | Valid IP Address |

**Command Modes**

Global configuration mode

### 4.3.13.2.4 Displaying Configuration Information for Trap Managers

To display configuration information for the configured Trap Managers, run the following command:

```
npu# show trap-mgr
```

**IMPORTANT**

An error may occur if no Trap Manager has been configured.

**Command Syntax**

```
npu# show trap-mgr
```

**Privilege Level**

1

**Display Format**

```
                 Trap Manager Table

           -------------------------------

Trap Manager Ip:(10.203.153.149) Port:(162) Community:(public)  Control
Register: (Enable)
```

**Command Modes**

Global command mode

### 4.3.13.2.5 Displaying the Trap Rate Limit

To display the trap rate limit, run the following command:

```
npu# show trap-rate-limit
```

**Command Syntax**

```
npu# show trap-rate-limit
```

**Privilege Level**

1

**Display Format**

```
Maximum number of traps sent is 20 traps per second.
```

**Command Modes**

Global command mode

## 4.3.14 Configuring the 4Motion Shelf

The 4Motion shelf comprises the following components:

- NPU card: Serves as the shelf controller that manages and monitors all the shelf components. In addition, it provides backbone Ethernet connectivity via a 10/100/1000 Base-T network interface. The shelf contains one active and one redundant NPU card.

**IMPORTANT**

NPU redundancy is not supported in the current release.

- AU: Is responsible for wireless network connection establishment and for bandwidth management. The shelf contains six active and one redundant AU.

- PSU: Accepts 48V DC input and provides 5, 3.3, +/-12V DC output. There are four PSUs in the shelf and work in load-sharing mode.

- PIU: Serves as a 48V power source for PSU. One active and one redundant PIU are provided in the shelf.

- GPS: An external GPS receiver is used to synchronizes the air link frames of Intra-site and Inter-site located sectors to ensure that in all sectors the air frame will start at the same time, and that all sectors will switch from transmit (downlink) to receive (uplink) at the same time. In addition, the GPS synchronizes frame numbers that are transmitted by the AU.

- AVU: Includes a 1U high integral chamber for inlet airflow and a 1U high fan tray with an internal alarm module. The AVU comprises 10 brush-less fans, where 9 fans are sufficient for cooling a fully loaded chassis.

- Power Feeder: The PIU can support a maximum current of 58 A (@-40.5 VDC). In certain installations with a relatively high number of ODUs this current may not be sufficient to power the shelf and all the ODUs. In such installations the ODU Power Feeder is used as an additional power source providing power (-48 VDC) to ODUs. It transfers transparently all signals between the AU and the ODU, while injecting DC power received from an external source. Each ODU Power Feeder unit can serve up to four ODUs.

This section describes the commands to be used for:

- “Configuring the PSU/PIU Modules” on page 430
- “Configuring the GPS” on page 433
- “Managing Power Feeders Configuration” on page 447
- “Managing Dry-contact Input Alarms” on page 450
- “Managing Dry-contact Output Alarms” on page 455
- “Configuring the Location Information for the 4Motion Shelf” on page 460
- “Configuring the Unique Identifier for the 4Motion Shelf” on page 462

## 4.3.14.1 Configuring the PSU/PIU Modules

This section describes the commands to be used for:

- “Enabling/Disabling the PSU, and PIU Modules” on page 430
- “Configuring the PIU Hardware Version” on page 432

### 4.3.14.1.1 Enabling/Disabling the PSU, and PIU Modules

You can use the CLI to configure the administrative status of the PSU/PIU modules to enable or disable.

**IMPORTANT**

An alarm is raised if you enable a PSU or PIU that is already powered down, or you disable a PSU or PIU that is already powered up.

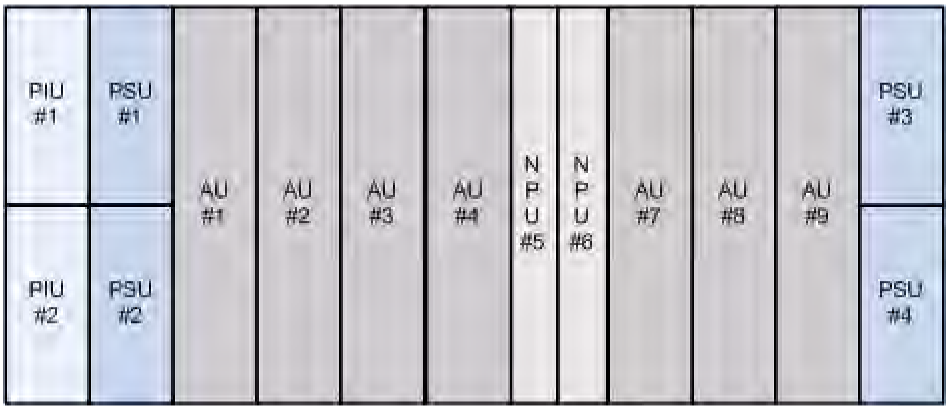
Run the following command to enable/disable the PSU/PIU modules:

```
npu(config)# enable {PSU | PIU} <slot id>
```

```
npu(config)# disable {PSU | PIU} <slot id>
```

Specify the slot ID of the PSU or PIU to be enabled. The following figure depicts the slot ID of the 4Motion shelf components:

**Figure 4-1: Slot IDs of Shelf Components**



For example, if you want to enable PSU, slot# 3, and disable the PIU, slot# 1, run the following command:

```
npu(config)# enable PSU 3
```

```
npu(config)# disable PIU 1
```

**IMPORTANT**

An error may occur if you specify a PSU slot ID that is not in the range, 1-4, or a PIU slot ID that is not in the range 1-2.

Remember that a minimum AU-to-PSU/PIU ratio should always be maintained. The following table lists the required active AU-to-PSU ratio. Before disabling the PSU module, ensure that this ratio is maintained.

**IMPORTANT**

Ensure that the NPU to PSU/PIU ratio is also maintained. At least one PSU and PIU should always be active to support the NPU.

**Table 4-24: Active AU-to-PSU Ratio**

| If the number of Active AUs is... | Number of active PSUs should be... | Number of Active PIU |
|---|---|---|
| 1-4 | 2 | 1 |
| 5-7 | 3 | 1 |

**Command Syntax**

```
npu(config)# enable {PSU | PIU} <slot id>
npu(config)# disable {PSU | PIU} <slot id>
```

**Privilege Level** 10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `{PSU | PIU}` | Indicates whether the PSU or PIU slot is to be enabled or disabled. | Mandatory | N/A | ■ PSU<br>■ PIU |
| `<slot id>` | Indicates the slot ID of the PSU/PIU that you want to enable or disable. Refer Figure 4-1 for more information about the slot ID assigned to each PIU/PSU module on the 4Motion chassis. | Mandatory | N/A | ■ 1-4 for PSU slot<br>■ 1-2 for PIU slot |

**Command Modes** Global configuration mode

### 4.3.14.1.2 Configuring the PIU Hardware Version

You need to manually configure the PIU hardware version that is currently in use. The system periodically checks whether the configured and actual hardware versions are identical. If there is a difference in the configured and actual versions, an alarm is raised.

To configure the PIU hardware version, run the following command:

```
npu(config)# PIU <slot id (1-2)> hw_version <version (0-7)>
```

**Command Syntax**

```
npu(config)# PIU <slot id (1-2)> hw_version <version (0-7)>
```

**Privilege Level** 10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<slot id (1-2)>` | Indicates the PIU slot ID for which the hardware version is to be configured. | Mandatory | N/A | 1-2 |
| `hw_version <version (0-7)>` | Indicates the hardware version to be configured for the PIU slot. | Mandatory | N/A | 0-7 |

**Command Modes**

Global configuration mode

## 4.3.14.2 Configuring the GPS

The GPS is used to synchronize the air link frames of Intra-site and Inter-site located sectors to ensure that in all sectors the air frame will start at the same time, and that all sectors will switch from transmit (downlink) to receive (uplink) at the same time. This synchronization is necessary to prevent Intra-site and Inter-site sectors interference. In addition, the GPS synchronizes frame numbers that are transmitted by the AU.

**IMPORTANT**

Implementation of GPS synchronization is based on the assumption that all sectors are operating with the same frame size and with the same DL/UL ratio.

The GPS clock generates a 1PPS signal with accuracy of $10^{-11}$ and maximum jitter of 100ns, and is connected to the 4Motion shelf via the GPS SYNC IN connector on the front panel of the NPU. The GPS clock requirements can be reached by an outdoor installed GPS unit when it is synchronized to a minimum number of (user-configurable) satellites.

This section describes the commands to be used for:

- “Configuring the GPS Clocks” on page 434
- “Configuring General Configuration Parameters for the GPS” on page 437
- “Configuring the Date and Time” on page 439
- “Configuring the Position” on page 440

- "Configuring the Clock Mode" on page 441
- "Configuring the Required Number of Satellites" on page 442
- "Displaying GPS Clocks Parameters" on page 443
- "Displaying GPS General Configuration Parameters" on page 444
- "Displaying the Date and Time Parameters" on page 445
- "Displaying the Position Parameters" on page 446
- "Displaying the Clock Mode Parameter" on page 446
- "Displaying the Number of Satellite Parameters" on page 447

#### 4.3.14.2.1 Configuring the GPS Clocks

The GPS clock parameters determines the source for the main clocks in the system. To configure the GPS clock, you are required to enable/disable:

**IMPORTANT**

Reset the system for changes in the GPS clock configuration to be applied to the entire system.

- External 1PPS: Determines the air-frame start time. Assuming that all systems use the same air-frame size and DL/UL Ratio, then, when the 1PPS clock is received from a GPS system, this mechanism ensures inter-site and intra-site synchronization among all sectors, preventing cross interference and saturation problems. When using the internal 1PPS clock (derived from the selected 16 MHz clock source), only intra-site synchronization among sectors can be achieved. You can either enable the external 1PPS clock source or use the internal 1PPS clock source derived from the selected 16 MHz clock. By default, the External IPPS clock is enabled. When using a GPS for synchronization, the 1PPS clock is received from the GPS receiver and must be enabled for proper operation.

**NOTE**

If the external 1PPS GPS clock is enabled:

- The concatenated slave NPU 16Mhz created from local 16MHz TCXO/OCXO at the NPU provides holdover when the GPS loses synchronization with its satellites.
- Configure the GPS parameters listed in section, Section 4.3.14.2.2.

- External 16MHz: Generates all the main clocking signals in the system, including the internal 1PPS clock. Using an external, accurate 16 MHz clock source will enable better hold-over of the 1PPS clock upon temporary loss (or reduced reliability when receiving less than 4 satellites) of the external 1PPS clock. This will allow a longer time of continued operation before appearance of interferences due to clock drifts among BSs. You can either enable the external 16 MHz clock source or use the internal 16 MHz clock source. By default, the external 16MHz clock is disabled. In the current release MHz clock must be disabled.

To configure the GPS clock, run the following command:

```
npu(config)# set clock ([ External1PPS {Enable | Disable} ] [
External16MHz {Enable | Disable} ])
```

For example, to configure the internal 1PPS clock at the NPU to synchronize the air frames for inter-site and intra-site sectors:

```
npu(config)# set clock External1PPS Disable
```

| | |
|---|---|
| **Command Syntax** | `npu(config)# set clock ([External1PPS {Enable | Disable}] [External16MHz {Enable | Disable}])` |
| **Privilege Level** | 10 |

### Syntax Description

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `External1PPS {Enable \| Disable}` | Indicates whether the external 1PPS clock is enabled or disabled.<br>If the External 1PPs clock is enabled, synchronization of air frames for inter-site and intra-site sectors should be managed by the external 1PPS GPS clock. If the External 1PPS clock is disabled, it indicates that the internal 1PPS at the NPU is used to synchronize air frames for inter-site and intra-site sectors.<br>When using a GPS, External 1PPS clock must be enabled for proper operation of the system. | Optional | Enable | ■ Enable<br>■ Disable |
| `External16MHz {Enable \| Disable}` | Indicates whether the External 16Mhz clock is enabled or disabled.<br>If the external 16 MHz is enabled, the NPU should receive 16Mhz signal from the master NPU. This parameter should be enabled only if the NPU clock mode is slave. If the NPU clock mode is master, the MPU drives the 16Mhz signal towards the slave NPUs.<br>In the current release External 16MHz clock must be disabled. | Optional | Disable | ■ Enable<br>■ Disable |

### Command Modes

Global configuration mode

### 4.3.14.2.2 Configuring General Configuration Parameters for the GPS

**IMPORTANT**

Skip this section if you have selected the internal 1PPS clock. For more information about configuring the GPS clock, refer Section 4.3.14.2.1.

The GPS general configuration parameters determine how the GPS should function with respect to the 4Motion system. Depending upon the values defined for these parameters, you can configure the GPS clock (external 1PPS and 16MHz), and the UTC time. Run the following command to configure the global configuration parameters for the GPS:

```
npu(config)# gps config ( [Type {Trimble | None}] [AdaptorRequired
{Yes | No}][HoldoverPassedTout <expiry_interval(0-2880)>]
[HoldoverPassTxOperationStop {True | False}][AlmanacUsableTime
<expiry_interval(0-4320)>] [EphemerisUsableTime
<expiry_interval(0-168)>] [IntervalToReadGPSTime{Hourly | Daily |
Monthly | Yearly}] [TimeToReadGPSTime <HH:MM:SS,DD/MM>]))
```

**IMPORTANT**

An error may occur if:

Time to read GPS time is not in valid format. Correct format is  hh:mm:ss, dd/mm: Minute and Second should be within range of 0 to 60, Hour should be within the range of 0 to 23, days should be in the range 1 to 31 and  Month should be within the range of 1 to 12, also day should be valid in accodance with month.

**Command Syntax**

```
npu(config)# gps config gps config ( [Type {Trimble | None}]
[AdaptorRequired {Yes | No}][HoldoverPassedTout
<expiry_interval(0-2880)>] [HoldoverPassTxOperationStop {True |
False}][AlmanacUsableTime <expiry_interval(0-4320)>]
[EphemerisUsableTime <expiry_interval(0-168)>]
[IntervalToReadGPSTime{Hourly | Daily | Monthly | Yearly}]
[TimeToReadGPSTime <HH:MM:SS,DD/MM>]))
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| `Type {Trimble \| None}]` | Indicates the type of GPS connected to 4Motion. | Optional | Trimble | Trimble<br>None |
| `[AdaptorRequired {Yes \| No}]` | Indicates whether a GPS adaptor is required. The NPU can be connected to an extenal GPS adaptor that allows the NPU to connect to multiple GPS interfaces/1PPS /16Mhz clocks. In the current release a GPS adapter is not supported. | Optional | No | Yes<br>No |
| `[HoldoverTimeout <expiry_interval (0-2880)>]` | Indicates the period, in minutes, for which the NPU provides holdover when the GPS loses synchronization with its satellites. | Optional | 720 | 0 - 2880 |
| `[HoldoverPassTxOperationStop {True \| False}]` | Indicates whether the AU modules should stop data transmission if the GPS loses synchronization with its satellites and the holdover timeout has occurred. | Optional | True | True<br>False |
| `[AlmanacUsableTime <expiry-interval(0-4320)>]` | Indicates the maximum period, in hours, for which the Almanac time is valid when the GPS is reset. | Optional | 720 | 0-4320 |
| `[EphemerisUsableTime <expiry-interval(0-168)>]` | Indicates the maximum period, in hours, for which the Ephemeris time is valid when the GPS is reset. | Optional | 4 | 0-168 |
| `[IntervalToReadGPSTime {Hourly \| Daily \| Monthly \| Yearly}]` | Indicates the interval after which the NPU should obtain the GPS time for frame synchronization, and send it to the AU. | Optional | Daily | Hourly<br>Daily<br>Monthly<br>Yearly |
| `[TimeToReadGPSTime <HH:MM:SS,DD/MM>]` | Indicates the time when the NPU should obtain the GPS time for frame synchronization. . | Optional | 04:05 | `HH:MM:SS,DD/MM` |

| | |
|---|---|
| **Command Modes** | Global configuration mode |

### 4.3.14.2.3 Configuring the Date and Time

The UTC time is used to configure the following:

- Local time: Differs from the UTC time with respect to the value you have specified for the `localUTCDiff` and DST parameters. The local time is equal to the sum of the UTC time, the value of the `localUTCDiff` parameter (local offset from UTC time) and DST (daylight saving time offset). For more information about configuring this parameter, "Configuring the GPS Clocks" on page 434. You can use the CLI to display the current local time. For details, refer the section, "Displaying the Date and Time Parameters" on page 445.

- System time: Refers to the operating system (kernel) time that is identical to the UTC time when the system boots up. The system time is updated every hour with the time received from the GPS receiver.

- Real Time Clock (RTC) time: Refers to the time maintained by the board's hardware clock. By default, the RTC time is set to 1st January, 1970. The RTC time is updated every hour with the UTC time that is received from the GPS receiver or that you have configured from the CLI. The RTC time is used for creating the timestamp for log and trace messages, performance data collection files, and for managing the interval after which a backup of the configuration file should be maintained and performance data should be collected.

Execute the following command to configure the date and time parameters. If the GPS is synchronized to its satellites and is connected to 4Motion, the UTC time is provided by the GPS. Otherwise the UTC time that you configure is used instead.

To configure the date and time parameters, run the following command:

```
npu(config)# set date [UTC <HH:MM:SS,DD/MM/YYYY>] [LocalUTCDiff
<+/-HH:MM>] [DST <(0-2)>]
```

**IMPORTANT**

An error may occur if :

1) UTC time is not in the valid format i.e. hh: mm: ss, dd/mm/yyyy.

2) Local UTCDiff is not valid format i.e. +/-hh:mm

3) Local UTC Diff is out of the range between -12 to +13 or it is not in steps of 30 minutes.

4) DST is out of range i.e between 0 to 2

**Command Syntax**

```
npu(config)# set date [UTC <HH:MM:SS,DD/MM/YYYY>] [LocalUTCDiff
<+/-HH:MM>] [DST <(0-2)>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| UTC <HH:MM:SS,DD/MM/YYYY> | Indicates the UTC time to be used for 4Motion if not available from GPS. | Mandatory | N/A | Use the format:<br>HH:MM: SS, DD/MM/YYYY |
| LocalUTCDiff <+/-HH:MM> | The local offset from UTC | Optional | +00:00 | +/-HH:MM<br>HH: -12 to +13<br>MM: 00 or 30 |
| DST <(0-2)> | Daylight Saving Time offset of the local clock | Optional | 0 | 0-2 |

**Command Modes**

Global configuration mode

### 4.3.14.2.4 Configuring the Position

The position configuration enables setting the location’s parameters when GPS is not used (Type=None).

To configure the position parameters, run the following command:

```
npu(config)# set position ([Latitude <xxx.xxx,N/S>] [Longitude
<xxx.xxx,E/W>] [Altitude (-300.0 - 9000.0)])
```

**IMPORTANT**

An error may occur if :

1) Latitude, longitude and altitude are configured while GPS type is not "None".

2) Latitude is not in valid format i.e. lll.mmm,a where a is either N or S

3) Longitude is not in valid format i.e. lll.mmm,a where a is either E or W.

4) Altitude is not in valid range i.e. +-300.0 to 9000.0.

**Command Syntax**

```
npu(config)# set position ([Latitude <xxx.xxx,N/S>] [Longitude
<xxx.xxx,E/W>] [Altitude (-300.0 - 9000.0)])
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| Latitude <xxx.xxx,N/S> | Indicates the latitude where the 4Motion shelf is currently positioned. Configure only if GPS Type is None. | Optional | 000.000.N | Use the format, lll.mmm.a (where lll.mmm is in degrees and the value of a is either N or S) |
| Longitude <xxx.xxx,E/W> | Indicates the longitude where the 4Motion shelf is currently positioned. Configure only if GPS Type is None. | Optional | 000.000.E | Use the format, lll.mmm.a (where ll.mmm is in degrees and the value of a is either E or W) |
| `Altitude (-300.0 - 9000.0)])` | Indicates the altitude (in meters) where the 4Motion shelf is currently positioned. Configure only if GPS Type is None. | Optional | 0.0 | -300.0 to 9000.0 |

**Command Modes**

Global configuration mode

### 4.3.14.2.5 Configuring the Clock Mode

The Clock Mode parameter enables defining the functionality of the NPU when GPS chaining is used. In the current release GPS chaining is not supported and the clock mode must be set to Master.

To configure the clock mode parameter, run the following command:

```
npu(config)# set npu ClockMode {Master | Redundant | Slave}
```

**IMPORTANT**

An error may occur if setting to any option other than Master because current release supports only the Master option.

**Command Syntax**

```
npu(config)# set npu ClockMode {Master | Redundant | Slave}
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| npu ClockMode {Master \| Redundant \| Slave} | Indicates the clocks functionality of the NPU when GPS chaining is used. GPS chaining is not supportyed in current release and this parameter must be set to its default value of Master. | Optional | Master | Master<br>(other options not supported in current release) |

**Command Modes**

Global configuration mode

### 4.3.14.2.6 Configuring the Required Number of Satellites

The satellite parameter enables configured the minimum number of satellites required for maintaining synchronization and for renewing synchronization after synchronization loss.

To configure the satellite parameters, run the following command:

```
npu(config)# set satellite ([MinNumOfSatForHoldoverReturn <range
(1-12)>] [MaxNumOfSatBeforeSyncLoss <range (0-11)>])
```

**IMPORTANT**

1) An error can occur while configuring MinNumOfSatForHoldoverReturn if Minimum number of satellite for holdover return is less than Maximum number of satellite before synchronization loss.

2) An error can occur while configuring MaxNumOfSatBeforeSyncLoss if Maximum number of satellite before synchronization is more than Minimum number of satellite for holdover return.

**Command Syntax**

```
npu(config)# set satellite ([MinNumOfSatForHoldoverReturn <range (1-12)>]
[MaxNumOfSatBeforeSyncLoss <range (0-11)>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| MinNumOfSatForHoldoverReturn <range (1-12)> | Indicates the minimum number of satellites that should be received for resuming synchronization (exiting holdover status) after loss of synchronization. | Optional | 2 | 1-12 |
| MaxNumOfSatBeforeSyncLoss <range (0-11)> | Indicates the minimum number of satellites required for maintaining synchronization. | Optional | 1 | 0-11 |

**Command Modes**

Global configuration mode

### 4.3.14.2.7 Displaying GPS Clocks Parameters

To display the GPS clock configuration parameters, run the following command:

```
npu# show clock status [{CurrentExternal1PPS |
ConfiguredExternal1PPS | CurrentExtrnal16MHz |
ConfiguredExternal16MHz}]
```

**Command Syntax**

```
npu# show clock status [{CurrentExternal1PPS |
ConfiguredExternal1PPS | CurrentExtrnal16MHz |
ConfiguredExternal16MHz}
```

**Privilege Level**

1

**Syntax Description**

For a detailed description of each parameter in this command, refer the section, "Configuring the GPS Clocks" on page 434.

Both Current and Configured values for each clock are provided (the parameters are applied after reset)

**Display Format**

```
Configured External 1PPS Status      :Enable/ Disable

Current External 1PPS Status         :Enable/ Disable

Configured External 16MHz Status     :Enable/ Disable

Current External 16MHz Status        :Enable/ Disable
```

**Command Modes**

Global command mode

### 4.3.14.2.8 Displaying GPS General Configuration Parameters

To display the GPS general configuration parameters, run the following command:

```
npu# show gps config [{ Type | SoftwareVersion [{ Navigation |
Signal }] | AdaptorRequired | HoldoverPassedTout |
HoldoverPassTxOperationStop | AlmanacUsableTime |
EphemerisUsableTime | IntervalToReadGPSTime | TimeToReadGPSTime} ]
```

**Command Syntax**

```
npu# show gps config [{ Type | SoftwareVersion [{ Navigation | Signal }] |
AdaptorRequired | HoldoverPassedTout | HoldoverPassTxOperationStop |
AlmanacUsableTime | EphemerisUsableTime | IntervalToReadGPSTime |
TimeToReadGPSTime} ]
```

**Privilege Level**

1

**Syntax Description**

For a detailed description of each parameter in this command, refer the section, "Configuring General Configuration Parameters for the GPS" on page 437.

**Display Format**

```
Configured GPS Type                     :
GPS Navigation Processor SW Version     :
GPS Signal Processor SW version         :
Adaptor Required                        :
Holdover Timeout                        :
HoldoverPassedTxOperationStop           :
Almanac Usable Time                     :
Ephemeris Usable Time                   :
Interval To Read Gps Time               :
Time To Read Gps Time                   :
```

**Command Modes**

Global command mode

In addition to the configuration parameters, the SW Versions of the GPS Navigation and Signal Processors are also displayed (if available).

### 4.3.14.2.9 Displaying the Date and Time Parameters

To display the current date parameters, run the following command:

```
npu# show date [{Local | UTC | LocalUTCDiff | DST}]
```

**Command Syntax**

```
npu# show date [{Local | UTC | LocalUTCDiff | DST}]
```

**Privilege Level**

1

**Syntax Description**

For a detailed description of each parameter in this command, refer the section, “Configuring the Date and Time” on page 439.

**Display Format**

```
Local Time            :
UTC Time              :
Local UTC Offset      :
Daylight Saving Time  :
```

**Command Modes**

Global command mode

In addition to the configurable parameters, the calculated Local Time is also displayed.

### 4.3.14.2.10 Displaying the Position Parameters

To display the current position parameters, run the following command:

```
npu# show position [{Latitude | Longitude | Altitude}]
```

**Command Syntax**

```
npu# show position [{Latitude | Longitude | Altitude}]
```

**Privilege Level**

1

**Syntax Description**

For a detailed description of each parameter in this command, refer the section, "Configuring the Position" on page 440.

**Display Format**

```
Latitude        :
Longitude       :
Altitude        :
```

**Command Modes**

Global command mode

### 4.3.14.2.11 Displaying the Clock Mode Parameter

To display the current clock mode parameter, run the following command:

```
npu# show npu clock mode
```

**Command Syntax**

```
npu# show npu clock mode
```

**Privilege Level**

1

**Syntax Description**

For a detailed description of the parameter in this command, refer the section, “Configuring the Clock Mode” on page 441.

**Display Format**

```
NPU Clock Mode    : Master
```

**Command Modes**

Global command mode

### 4.3.14.2.12 Displaying the Number of Satellite Parameters

To display the current satellite parameters, run the following command:

**npu# show satellite [{MinNumOfSatForHoldoverReturn | MaxNumOfSatBeforeSyncLoss | NumOfSatelliteAvailable}]**

**Command Syntax**

```
npu#   show satellite [{MinNumOfSatForHoldoverReturn |
MaxNumOfSatBeforeSyncLoss | NumOfSatelliteAvailable}]
```

**Privilege Level**

1

**Syntax Description**

For a detailed description of each parameter in this command, refer the section, “Configuring the Required Number of Satellites” on page 442.

**Display Format**

```
Max Satellites Before Sync Loss      :
Min Satellites For Holdover Return   :
Number of Satellites Acquired        :
```

**Command Modes**

Global command mode

In addition to the configurable parameters, the current number of satellites acquired by the GPS receiver is also displayed.

## 4.3.14.3 Managing Power Feeders Configuration

The Power Feeder configuration enables specifying the AU port connected to each Power Feeder port.

### 4.3.14.3.1 Configuring Power Feeders

To configure the AU ports connected to the ports of a specific Power Feeder, run the following command:

```
npu(config)# config pfUnitNo <pfunit no (1-4)> pfPortNo <pfport no
(1-4)> pfAuSlotNoDestination <AuslotNoDestination (-1,1-4,7-9)>
pfAuPortNoDestination <pfAuPortNoDestination (-1,1-4)>
```

**Command Syntax**

```
npu(config)# config pfUnitNo <pfunit no (1-4)> pfPortNo <pfport no (1-4)>
pfAuSlotNoDestination <AuslotNoDestination (-1,1-4,7-9)>
pfAuPortNoDestination <pfAuPortNoDestination (-1,1-4)>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Prese<br>nce | Default Value | Possible Values |
|---|---|---|---|---|
| **pfUnitNo <pfunit no (1-4)>** | The Power Feeder unit number. | Mandatory | N/A | 1-4 |
| **pfPortNo <pfport no (1-4)>**<br>Each combination of Power Feeder Unit Number and Port Number can appear in a maximum of one Power Feeder instance | The Power Feeder port number | Mandatory | N/A | 1-4 |
| **pfAuSlotNoDestination <AuslotNoDestination (-1,1-4,7-9)>** | The AU Slot number.<br>-1 means none. | Mandatory | -1 (none) | -1 (none), 1-4, 7-9 |

| | | | | |
|---|---|---|---|---|
| **pfAuPortNoDestination <pfAuPortNoDestination (-1,1-4)>**<br>Each combination of AU Slot Number and Port Number can appear in a maximum of one Power Feeder instance (excluding combinations with a none value). | The AU Port number.<br>-1 means none. | Mandatory | -1 (none) | -1 (none), 1-4 |

**Command Modes**

Global configuration mode

### 4.3.14.3.2 Displaying Configuration Information for Power Feeders

To display configuration information for all defined Power Feeders, run the following command:

```
npu# show power-feeder configuration
```

**Command Syntax**

```
npu# show power-feeder configuration
```

**Privilege Level**

1

**Display Format** (for each configured instance)

```
PfUnitNo : <value>, PfPortNo : <value>, AuPortNo : <value>, AuSlotNo :
<value>

........
```

**Command Modes**

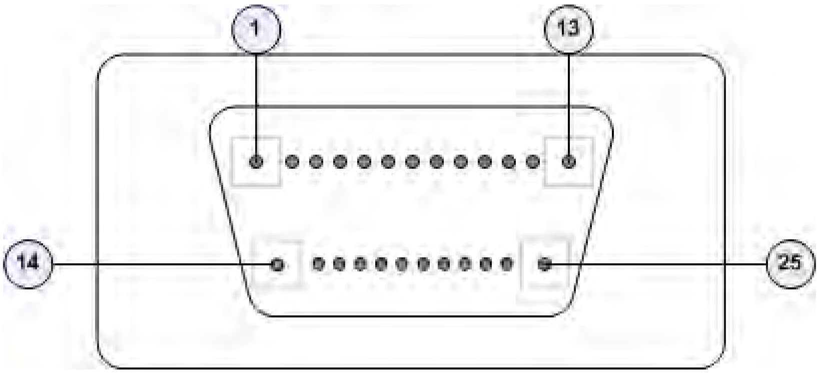
Global command mode

## 4.3.14.4 Managing Dry-contact Input Alarms

Dry-contact input alarms are external devices that are connected to the 4Motion unit, and notify the system when there is a change in external conditions. When the system receives this notification, an SNMP trap is sent to the EMS. For example, a device such as a temperature sensor that is connected to the 4Motion unit, and configured to function as a dry-contact input alarm, can raise an alarm to the system when there is a sudden change in the room temperature. The system then sends an SNMP trap to the EMS, notifying the administrator of the change indicated by the external device.

Dry contact input alarms are connected to the 4Motion system via a 25-pin micro D-Type ALRM-IN/OUT connector on the NPU front panel. The following figure depicts the ALRM-IN/OUT connector, and the pin numbers assigned to each pin:

**Figure 4-2: 25-pin Micro D-Type ALRM-IN/OUT Connector**



You can configure upto eight dry contact input alarms, each mapping to a different pin number. This section describes the commands to be executed for:

- “Mapping a Dry-contact Input Alarm to an Alarm Condition” on page 450
- “Disabling Dry-contact Input Alarms” on page 454

### 4.3.14.4.1 Mapping a Dry-contact Input Alarm to an Alarm Condition

Dry contact alarms are connected to the 4Motion unit via the 25-pin micro D-Type ALRM-IN/OUT connector on the front panel of the NPU. You can configure upto eight dry contact input alarms, each connected to a different pin on the ALRM-IN/OUT connector. Each alarm can then map to any of the following alarm conditions. If the external dry-contact alarm detects that any of these conditions is fulfilled, an alarm is raised, and a corresponding trap is sent to the EMS.

**IMPORTANT**

Dry-contact input alarms are a means to raise a trap to the EMS when a change in conditions is notified by the external device. However, the trap may not reach the EMS because of trap rate limiting, network congestion or for reasons relating to the external equipment. Alvarion does not assume responsiblity for traps that are lost.

- Commercial power failure
- Fire
- Enclosure door open
- High temperature
- Flood
- Low fuel
- Low battery threshold
- Generator failure
- Intrusion detection
- External equipment failure

To map the a dry contact alarm to an alarm condition, run the following command:

```
npu(config)# dry-contact IN <alarm_num (1-8)> alarm
{CommercialPowerFailure | Fire | EnclosueDoorOpen | HighTemperature
| Flood | LowFuel | LowBatteryThreshold | GeneratorFailure |
IntrusionDetection | ExternalEquipmentFailure}
```

In this command, the `alarm_num` parameter maps to a pin on the ALRM IN-OUT connector.

The following table lists the pin numbers of the 25-pin micro D-Type ALRM-IN/OUT connector corresponding to the alarm number you are configuring:

**Table 4-25: Pin Numbers Corresponding to Dry Contact Input Alarm Numbers**

| Pin Number | Alarm Number |
|---|---|
| 3 and 15 | 1 |
| 4 and 16 | 2 |
| 5 and 17 | 3 |
| 6 and 18 | 4 |
| 7 and 19 | 5 |
| 8 and 20 | 6 |
| 9 and 21 | 7 |
| 10 and 22 | 8 |

Refer Figure 4-2 for a diagrammatic representation of the 25-pin micro D-Type ALRM-IN/OUT connector and the numbers assigned to each pin.

**NOTE**

For more information about displaying the alarm conditions currently mapped to the micro D-Type ALRM-IN/OUT connector pins, refer Section 4.3.14.6.

**Command Syntax**

```
npu(config)# dry-contact IN <alarm_num (1-8)> alarm
{CommercialPowerFailure | Fire | EnclosueDoorOpen | HighTemperature |
Flood | LowFuel | LowBatteryThreshold | GeneratorFailure |
IntrusionDetection | ExternalEquipmentFailure}
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<alarm_num (1-8)>` | Indicates the alarm number of the dry contact input alarm that is to be mapped to an alarm condition. This alarm number corresponds to a pin on the 25-pin micro D-Type jack .<br>For more information about the pin numbers that correspond to the alarm number, refer Table 4-25. | Mandatory | N/A | 1-8 |

| | | | | |
|---|---|---|---|---|
| `alarm {CommercialPowerFailure \| Fire \| EnclosueDoorOpen \| HighTemperature \| Flood \| LowFuel \| LowBatteryThreshold \| GeneratorFailure \| IntrusionDetection \| ExternalEquipmentFailure` | Indicates the alarm condition to be mapped to a pin number. | Mandatory | N/A | CommercialPowerFailure<br>Fire<br>EnclosueDoorOpen<br>HighTemperature<br>Flood<br>LowFuel<br>LowBatteryThreshold<br>GeneratorFailure<br>IntrusionDetection External<br>ExternalEquipmentFailure (can be used for defining a condition other than the ones specified by the other parameters in this command) |

**Command Modes**

Global configuration mode

### 4.3.14.4.2 Disabling Dry-contact Input Alarms

To disable a dry contact input alarm mapped to a specific alarm condition, run the following command:

```
npu(config)# no dry-contact IN <alarm_num (1-8)>
```

**NOTE**

For more information about mapping dry contact alarms to an alarm condition, refer to "Mapping a Dry-contact Input Alarm to an Alarm Condition" on page 450. For more information about displaying the alarm condition currently mapped to an alarm, refer to "Displaying Configuration Information for Dry-contact Input/Output Alarms" on page 458.

**Command Syntax**

```
npu(config)# no dry-contact IN <alarm_num (1-8)>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<alarm_num (1-8)>` | Indicates the alarm number of the dry contact input alarm alarm that is to be disabled. The value of this parameter should be between 1 and 8.<br>For more information about the pin numbers that correspond to the alarm number, refer Table 4-25. | Mandatory | N/A | 1-8 |

**Command Modes**

Global configuration mode

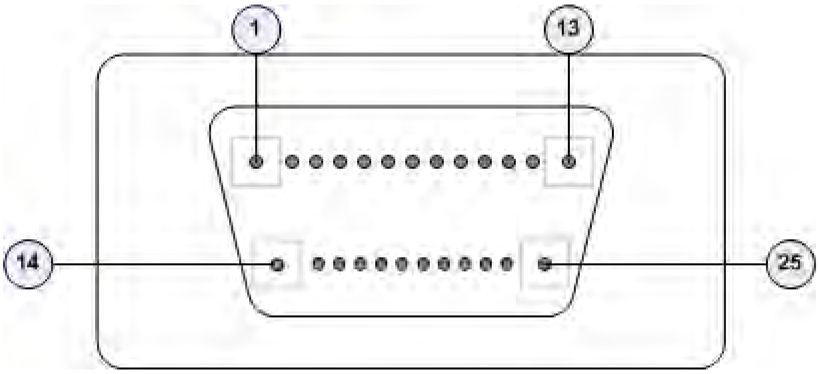
### 4.3.14.5 Managing Dry-contact Output Alarms

Dry-contact output alarms are raised by the system to notify an external device connected to the 4Motion unit about a change in the system state. The external monitoring entity may take the appropriate action after receiving the notification from the 4Motion system.

You can use the CLI to raise an alarm to the external entity that is connected to the dry contact output pin. After the system returns to its normal state, you can clear the dry contact output alarm that you had raised.

Dry contact output alarms are connected to the 4Motion system via a 25-pin micro D-Type ALRM-IN/OUT connector on the NPU front panel. The following figure depicts the ALRM-IN/OUT connector, and the pin numbers assigned to each pin:

**Figure 4-3: 25-pin Micro D-Type ALRM-IN/OUT Connector**



You can configure upto three dry contact output alarms, each mapping to a different pin number. This section describes the commands used for:

- "Raising Dry-contact Output Alarms" on page 456
- "Clearing Dry-contact Output Alarms" on page 457

### 4.3.14.5.1 Raising Dry-contact Output Alarms

You can raise a dry contact output alarm to any external entity that is connected to the 4Motion unit via the 25-pin micro D-Type jack on the NPU front panel. To raise a dry contact output alarm, run the following command:

```
npu(config)# dry-contact OUT <alarm_num (1-3)> alarm <alarm name >
```

In this command, the alarm_num parameter maps to a specific pin of the micro D-Type ALRM-IN/OUT connector. The following table lists the pin numbers of the 25-pin micro D-Type ALRM-IN/OUT connector corresponding to the alarm number you are configuring:

**Table 4-26: Pin Numbers Corresponding to Dry Contact Output Alarm Numbers**

| Pin Number | Corresponding Alarm Number |
|---|---|
| 1(FIX) - 2(N.C) - 14(N.O) | 1 |
| 11(FIX)- 12(N.C) - 13(N.O) | 2 |
| 23(FIX) - 24(N.C) - 25(N.O) | 3 |

In this table, N.C denotes Not Closed, and N.O denotes Not Open.

Refer Figure 4-3 for a diagrammatic representation of the 25-pin micro D-Type ALRM-IN/OUT connector and the numbers assigned to each pin.

**NOTE**

After you have raised an alarm, clear this alarm when the system state returns to its normal condition. For information, refer to, "Clearing Dry-contact Output Alarms" on page 457. For more information about displaying configuration information about a dry contact output alarm, refer to "Displaying Configuration Information for Dry-contact Input/Output Alarms" on page 458.

**Command Syntax**

```
npu(config)# dry-contact OUT <alarm_num (1-3)> alarm <alarm name >
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<alarm_num (1-3)>` | Indicates the alarm number of the dry contact output alarm that is to be configured. This alarm number corresponds to a pin on the 25-pin micro D-Type jack .<br>For more information about pin numbers that correspond to the alarm number, refer Table 4-26. | Mandatory | N/A | 1-3 |
| `alarm <alarm name>` | Indicates the name of the dry-contact alarm to be raised. | Mandatory | N/A | Up to 256 characters |

**Command Modes**

Global configuration mode

### 4.3.14.5.2 Clearing Dry-contact Output Alarms

After the system returns to its normal state, run the following command to clear the dry-contact output alarm that you had raised:

```
npu(config)# no dry-contact OUT <alarm_num (1-3)>
```

After you run this command, the alarm that you had raised is cleared.

**NOTENOTE**

For more information about raising a dry contact ouput alarm, refer to “Raising Dry-contact Output Alarms” on page 456.

**Command Syntax**

```
npu(config)# no dry-contact OUT <alarm_num (1-3)>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| <alarm_num (1-3)> | Indicates the alarm number of the dry contact output alarm alarm that is to be disabled.<br>For more information about the pin numbers that correspond to the alarm number, refer Table 4-26. | Mandatory | N/A | 1-3 |

**Command Modes**

Global configuration mode

### 4.3.14.6 Displaying Configuration Information for Dry-contact Input/Output Alarms

To display configuration information for dry-contact input/output alarms, run the following command:

```
npu# show dry-contact {IN | OUT} [<alarm_num>]
```

If you want to display configuration information for input or output alarms, specify **IN** or **OUT**. You can also specify the pin number if you want to view configuration information for particular pin used for connecting an external device to the 4Motion unit.

For example, run the following command if you want to display configuration information for the dry contact input alarm connected to the 4Motion unit via pin# 8 on the NPU panel:

```
npu# show dry-contact IN 8
```

If you want to display configuration information for all dry contact alarms, run the following command:

```
npu# show dry-contact
```

**NOTE**

An error may occur if you have specified an incorrect pin number for a particular input/output alarm. For more information about the correct pin-to-alarm number mapping, refer Table 4-25 and Table 4-26.

**Command Syntax**

```
npu# show dry-contact {IN | OUT} [<alarm_num>]
```

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| {IN\|OUT} | Indicates whether configuration information is to be displayed for input or output alarms. If you do not specify this value, configuration information is displayed for all input and output alarms. | Optional | N/A | ■ IN<br>■ OUT |

| | | | | |
|---|---|---|---|---|
| [<alarm_num>] | Denotes the alarm number of the input or output alarm for which configuration information is to be displayed.<br>Refer Figure 4-2 and Figure 4-3 for more information about the numbers assigned to the pins used for connecting dry contact alarms. | Optional | N/A | ■ 1-8 for input alarms<br>■ 1-3 for output alarms |

**Display Format**

```
Dry-Contact Input Alarm:

AlarmNumber   AlarmName   InputBlocking

<alarm num>   <alarm name>  <Yes or No>


Dry-Contact Output Alarm:

AlarmNumber  AlarmStatus  AlarmName

<alarm num>    <On or Off>   <name>
```

**Command Modes**

Global command mode

### 4.3.14.7 Configuring the Location Information for the 4Motion Shelf

The site location parameters provide general information on the site. Run the following command to configure the 4Motion shelf location information, such as the rack number and location:

```
npu(config)# site {Name <name (32)> | Address <address(32)> |
RackLocation <rack no. + position in rack (32)> | ContactPerson
<name (32)> | AsnName <name (32)> |Region <area (32)> |ProductType
BMAX_4M_Macro}
```

For example, run the following command if you want to specify the site name:

```
npu(config)# site name Site 12
```

**IMPORTANT**

An error may occur if the length of any of these parameters exceeds the specified range. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config)# site (Name <name (32)> | Address <address(32)> |
RackLocation <rack no. + position in rack (32)> | ContactPerson <name
(32)> |AsnName <name (32)> |Region <area (32)> |ProductType
BMAX_4M_Macro)
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| Name <name (256)>} | Indicates the name of the 4Motion shelf. | Optional | N/A | String (up to 32 characters) |
| Address <address (256)>} | Indicates the address of the 4Motion site. | Optional | N/A | String (up to 32 characters) |
| RackLocation <rack no. + position in rack (256)>} | Indicates the rack number and location of the 4Motion shelf. | Optional | N/A | String (up to 32 characters) |
| ContactPerson <name (256)> | Indicates the name of person who is administering the 4Motion shelf. | Optional | | String (up to 32 characters) |
| AsnName <name (256)> | Indicates the name of the Access Service Network for which 4Motion is serving as the ASN gateway. | Optional | N/A | String (up to 32 characters) |
| Region <area (256)> | Indicates the region where the site is located. | Optional | N/A | String (up to 32 characters) |
| ProductType BMAX_4M_Macro | Indicates the product type. In the current release it cannot be changed from the default of BMAX_4M_Macro | Optional | BMAX_4M_Macro | BMAX_4M_Macro |

**Command Modes**

Global configuration mode

### 4.3.14.8 Configuring the Unique Identifier for the 4Motion Shelf

The Site Identifier (Site ID) is used by the management system as identifier of the site and must be unique in the managed network.

The default value 0 is not a valid Site Identifier: it indicates that the Site Identifier was not configured and a valid Site Identifier must be configured. A BTS with Site Identifier 0 will not be discovered by AlvariSTAR.

Since the Site Identifier is used by AlvariSTAR to identify the site, it is highly recommended not to modify it. If necessary, you must follow the Site Number Change process described in the AlvariSTAR Device Manager User Manual.

To configure a unique identifier for the 4Motion shelf, run the following command:

```
npu(config)# site identifier <site id <0-999999>>
```

**NOTE**

To display the 4Motion shelf identifer, refer to "Displaying the Unique Identifier for the 4Motion Shelf" on page 783.

**Command Syntax**

```
npu(config)# site identifier <site id <0-999999>>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| `<site id <0-999999>>` | Indicates the ID of the 4Motion shelf. | Mandatory | N/A | 0-999999 |

**Command Modes**

Global configuration mode

# 4.4 Managing MS in ASN-GW

This section describes the MS level commands.

- "Manual MS De-registration"
- "Displaying MS Information"

## 4.4.1 Manual MS De-registration

Run the following command to initiate the de-registration process of the MS with the specified NAI value or of all MSs.

```
npu(config)# de-reg ms {nai <nai-string> | all}
```

**IMPORTANT**

An error may occur if NAI value is not specified. Refer to the syntax description for more information about the appropriate values and format for configuring this parameter.

An error may occur also for "MS not found", in case no MS with the specified NAI is registered at ASNGW.

**Command Syntax**

```
npu(config)# de-reg ms {nai <nai-string> | all}
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| de-reg ms {nai <nai-string> \| all} | Initiates the de-registration of the MS with the specified NAI value.If "all" is specified then, deregister all the MSs. | Mandatory | N/A | String |

**Command Modes**

Global configuration mode

## 4.4.2 Displaying MS Information

Run the following command to view the MS context information of the specified NAI/MSID.

npu# show ms info [{nai|msid}<nai/msid string>]

**IMPORTANT**

An error may occur if invalid NAI or invalid MSID is provided. Refer the syntax description for more information about the appropriate values and format for configuring this parameter.

**Command Syntax**

npu# show ms info [{nai|msid}<nai/msid string>]

**Privilege Level**

1

**Display Format**

```
MS context Info:

NAI = <value>

MS ID = <value>

Serving BS ID =

Serving Flow ID1 = <value>

Serving Flow GRE key = <value>

Serving Flow Direction = <Uplink | Downlink>

MS Flow Service Group IP = <value>|

Serving Flow IDn = <value>

Serving Flow GRE key = <value>

Serving Flow Direction = <Uplink | Downlink>

MS Flow Service Group IP = <value>
```

**Command Modes**

Global command mode

# 4.5 Managing AUs

Up to seven AU objects can be created and configured, corresponding to the AU cards that can be installed in slots 1-4, 7-9 of the shelf.

**NOTE**

In Release 2.0 up to 3 AUs may be used for service provisioning.

**To configure an AU:**

1. Enable the AU configuration mode for the selected AU (refer to Section 4.5.1)
2. You can now execute any of the following tasks:
   - Configure one or more of the parameters tables of the AU (refer to Section 4.5.2)
   - Restore the default values of parameters in one or more of the parameters tables of the AU (refer to Section 4.5.3)
3. Terminate the AU configuration mode (refer to Section 4.5.4)

In addition, you can, at any time, display configuration and status information for each of the parameters tables of the AU (refer to Section 4.5.6) or delete an existing AU object (refer to Section 4.3.10.11.5).

## 4.5.1 Enabling the AU Configuration Mode\Creating an AU Object

To configure the parameters of an AU, first enable the AU configuration mode for the specific AU. Run the following command to enable the AU configuration mode. You can also use this command to create a new AU object. A new AU object is created with default values for all parameters.

```
npu (config)# au <(1 to 4 StepSize 1) | (7 to 9 StepSize 1)>
```

Specify the slot ID of the AU to be configured/created. See Figure 4-1 for slot assignment in the shelf.

For example, to configure the AU in slot# 1, run the following command:

```
npu (config)# au 1
```

**IMPORTANT**

An error occurs if you specify an AU slot ID that is not in the range, 1-4, or 7-9.

If you use this command to create a new AU, the configuration mode for this AU is automatically enabled, after which you can execute any of the following tasks:

- Configure one or more of the parameters tables of the AU (refer to Section 4.5.2)
- Restore the default values of parameters in one or more of the parameters tables of the AU (refer to Section 4.5.3)

After executing the above tasks, you can terminate the AU configuration mode (refer to Section 4.5.4) and return to the global configuration mode.

**Command Syntax**

```
npu (config)# au <(1 to 4 StepSize 1) | (7 to 9 StepSize 1)>
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| <(1 to 4 StepSize 1) \| (7 to 9 StepSize 1)> | The slot ID of the AU to be configured | Mandatory | N/A | ■ 1-4<br>■ 7-9 |

**Command Modes**

Global configuration mode

**NOTE**

The following examples are for au configuration mode for au-1 .

## 4.5.2 Configuring AU Parameters

After enabling the AU configuration mode you can configure the following parameters tables:

- Properties (refer to Section 4.5.2.1)
- Control (refer to Section 4.5.2.2)
- Connectivity (refer to Section 4.5.2.3)
- Reserved (refer to Section 4.5.2.4)

### 4.5.2.1 Configuring Properties

The properties table enables configuring the main properties of the required AU card and controlling the power on each of the AU's ODU ports.

To configure the properties parameters, run the following command:

**npu(config-au-1)# properties** [required-type {typeThree | typeTwo}] [required-ports {four}] [required-bandwidth {fourteen | twenty | notrequired}] [port-1-power {shutDown | noShutDown}] [port-2-power {shutDown | noShutDown}] [port-3-power {shutDown | noShutDown | NA}] [port-4-power {shutDown | noShutDown | NA}]

**NOTE**

You can display configuration information for the AU properties. For details, refer to Section 4.5.6.1.

**IMPORTANT**

An error may occur if you provide an invalid value for any of these parameters. Refer the syntax description for more information about the appropriate values and format for configuring these parameters.

**Command Syntax**

```
npu(config-au-1)# properties [required-type {typeThree | typeTwo}
] [required-ports {four} ] [required-bandwidth {fourteen | twenty
| notrequired} ] [port-1-power {shutDown | noShutDown} ]
[port-2-power {shutDown | noShutDown} ] [port-3-power {shutDown |
noShutDown | NA} ] [port-4-power {shutDown | noShutDown | NA} ]
```

**Privilege Level**

10

**Syntax Description**

| **Parameter** | **Description** | **Presence** | **Default Value** | **Possible Values** |
|---|---|---|---|---|
| [required-type {typeThree \| ttypeTwo} ] | Defines the AU card configuration required.<br>In the current release only typeTwo AU is available. | Optional | typeThree | ■ typeThree<br>■ typeTwo |
| [required-ports {two \| four} ] | Defines the No of AU card ODU ports required.<br>In the current release only four-ports AU is available. | Optional | Four | ■ Four |
| [required-bandwidth {fourteen \| twenty \| notrequired} ] | Defines the AU card Bandwidth (in MHz) required.<br>In the current release all cards can support up to 20 MHz, except to previous generation cards that can support up to 14 MHz. | Optional | Twenty | ■ Fourteen<br>■ Twenty<br>■ notrequired |
| [port-1-power {shutDown \| noShutDown} ] | Controls power from AU card port 1 to ODU | Optional | No Shutdown | ■ shutDown<br>■ noShutDown |
| [port-2-power {shutDown \| noShutDown} ] | Controls power from AU card port 2 to ODU. | Optional | No Shutdown | ■ shutDown<br>■ noShutDown |
| [port-3-power {shutDown \| noShutDown \| NA} ] | Controls power from AU card port 3 to ODU.<br>The NA (Not Applicable) option is not relevant for a four-ports AU. | Optional | No Shutdown | ■ shutDown<br>■ noShutDown<br>■ NA |
| [port-4-power {shutDown \| noShutDown \| NA} ] | Controls power from AU card port 4 to ODU.<br>The NA (Not Applicable) option is not relevant for a four-ports AU. | Optional | No Shutdown | ■ shutDown<br>■ noShutDown<br>■ NA |

**Command Modes**

au configuration mode

### 4.5.2.2 Configuring the Control Parameter

The control parameters enables controlling the operation of the AU.

To configure the control parameter, run the following command:

**npu(config-au-1)#** control shutdown-operation {normalOperation | reset | shutdown}

**Command Syntax**

```
npu(config-au-1)# control shutdown-operation {normalOperation |
reset | shutdown}
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| shutdown-operation {normalOperation \| reset \| shutdown} | Controls the operation of the AU card: Normal Operation, Shutdown (disable power to card) or Reset. | Mandatory | normal Operation | ■ normalOperation<br>■ reset<br>■ shutdown |

**Command Modes**

au configuration mode

### 4.5.2.3 Configuring Connectivity

The connectivity tables enables configuring the connectivity parameters for the Ethernet interface of the AU. In the current release the interface operates in 802.1q mode: In this mode, the interface accepts only VLAN-tagged packets. All packets received without VLAN tags are dropped.

To configure the connectivity parameters, run the following command:

```
npu(config-au-1)# connectivity [maxframesize <(1518 to 9000
StepSize 1)>] [bearervlanid <(0 to 4092 StepSize 1)>]
```

**Command Syntax**

```
npu (config-au-1)# connectivity [maxframesize <(1518 to 9000
StepSize 1)>] [bearervlanid <(0 to 4092 StepSize 1)>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [maxframesize <(1518 to 9000 StepSize 1)>] | The maximum frame size (in Bytes) that can be accepted on the Ethernet interface of the AU. Larger packets will be dropped.<br>In 802.1q encapsulation mode the actual minimal frame size (including VLAN tag) is 1522 bytes, which is also the default.<br>Must be configured to the same value as the mtu parameter for this interface in the NPU. | Optional | 1522 | 1518 to 9000 |
| [bearervlanid <(0 to 4092 StepSize 1)>] | The VLAN ID of packets on the Ethernet interface of the AU. It must be configured to the same value as the if_vlan parameter of the bearer interface in the NPU.<br>Note that VLAN 10 is used for internal management and cannot be used the bearer VLAN. | Optional | 11 | 0-4092 |

**Command Modes**

au-1 configuration mode

## 4.5.2.4 Configuring AU Reserved Parameters

As the name implies, the reserved parameters table enables configuring up to 9 parameters that are reserved for possible future use. In the current release none of the reserved parameters is being used.

To configure the AU reserved parameters, run the following command:

```
npu(config-au-1)# au-reserved [reserved-1 <string (32)>]
[reserved-2 <string (32)>] [reserved-3 <string (32)>] [reserved-4
<string (32)>] [reserved-5 <string (32)>] [reserved-6 <string
(32)>] [reserved-7 <string (32)>] [reserved-8 <string (32)>]
[reserved-9 <string (32)>]
```

**Command Syntax**

```
npu (config-au-1)# au-reserved [reserved-1 <string (32)>]
[reserved-2 <string (32)>] [reserved-3 <string (32)>] [reserved-4
<string (32)>] [reserved-5 <string (32)>] [reserved-6 <string
(32)>] [reserved-7 <string (32)>] [reserved-8 <string (32)>]
[reserved-9 <string (32)>]
```

**Privilege Level**

10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [reserved-N<string (32)>] (N=1-9) | Reserved parameter number N | Optional | null (an empty string) | A string of 32 printable characters. |

**Command Modes**

au configuration mode

## 4.5.3 Restoring Default Values for AU Configuration Parameters

After enabling the AU configuration mode you can restore the default values for parameters in the following parameters tables:

- Properties (refer to Section 4.5.3.1)
- Control (refer to Section 4.5.3.2)
- Connectivity (refer to Section 4.5.3.3)
- Reserved (refer to Section 4.5.3.4)

### 4.5.3.1 Restoring the Default Values of Properties Parameters

To restore the some or all of the Properties parameters to their default value, run the following command:

```
npu(config-au-1)# no properties [required-type] [required-ports]
[required-bandwidth] [port-1-power] [port-2-power] [port-3-power]
[port-4-power]
```

You can restore only selected parameters to their default value by specifying only those parameter. For example, to restore only the required type to the default value (threeDSP), run the following command:

```
npu(config-au-1)# no properties required-type
```

The parameter will be restored to its default value, while the other parameters will remain unchanged.

To restore all properties parameters to their default value, run the following command:

```
npu(config-au-1)# no properties
```

**NOTE**

Refer to Section 4.5.2.1 for a description and default values of these parameters.

**Command Syntax**

```
npu(config-au-1)# no properties [required-type] [required-ports]
[required-bandwidth] [port-1-power] [port-2-power] [port-3-power]
[port-4-power]
```

**Privilege Level**

10

**Command Modes**

au configuration mode

### 4.5.3.2 Restoring the Default Value of the Control Parameter

To restore the Control parameter to the default value (normalOperation), run the following command:

```
npu(config-au-1)# no control
```

**Command Syntax**

```
npu(config-au-1)# no control
```

**Privilege Level**

10

**Command Modes**

Global configuration mode

### 4.5.3.3 Restoring the Default Values of Connectivity Parameters

To restore Connectivity parameters do their default value, run the following command:

```
npu(config-au-1)# no connectivity [maxframesize] [bearervlanid]
```

You can restore only one of the parameters to its default value by specifying only that parameter. For example, to restore only the maximum frame size to the default (1522), run the following command:

```
npu(config-au-1)# no connectivity maxframesize
```

The maximum frame size will be restored to its default value, while the bearervlanid parameter will remain unchanged.

To restore both parameters to their default value, run the following command:

```
npu(config-au-1)# no connectivity
```

**NOTE**

Refer to Section 4.5.2.3 for a description and default values of these parameters.

**Command Syntax**

```
npu(config-au-1)# no connectivity [maxframesize] [bearervlanid]
```

**Privilege Level**

10

**Command Modes**

au configuration mode

### 4.5.3.4 Restoring the Default Values of AU Reserved Parameters

To restore the AU Reserved parameters to their default value, run the following command:

```
npu(config-au-1)# no au-reserved [reserved-1] [reserved-2]
[reserved-3] [reserved-4] [reserved-5] [reserved-6] [reserved-7]
[reserved-8] [reserved-9]
```

You can restore only selected parameters to their default value by specifying only those parameter. For example, to restore only the reserved-1 parameter to its default values, run the following command:

```
npu(config-au-1)# no au-reserved reserved-1
```

This parameter will be restored to the default value, while the other parameters will remain unchanged.

To restore all parameters to their default value, run the following command:

```
npu(config-au-1)# no au-reserved
```

**NOTE**

Refer to Section 4.5.2.4 for a description and default values of these parameters.

**Command Syntax**

```
npu(config-au-1)# no au-reserved [reserved-1] [reserved-2]
[reserved-3] [reserved-4] [reserved-5] [reserved-6] [reserved-7]
[reserved-8] [reserved-9]
```

**Privilege Level**

10

**Command Modes**

Global configuration mode

## 4.5.4 Terminating the AU Configuration Mode

Run the following command to terminate the au configuration mode:

```
npu(config-au-1)# exit
```

**Command Syntax**

**npu(config-au-1)# exit**

**Privilege Level** 10

**Command Modes** au-1 configuration mode

## 4.5.5 Deleting an AU Object

Run the following command to delete an AU object:

```
npu(config)# no au <(1 to 4 StepSize 1) | (7 to 9 StepSize 1)>
```

**IMPORTANT**

An associated AU (specified in a Sector Association) cannot be deleted.

**Command Syntax**

```
npu(config)# no au <(1 to 4 StepSize 1) | (7 to 9 StepSize 1)>
```

**Privilege Level** 10

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| <(1 to 4 StepSize 1) \| (7 to 9 StepSize 1)> | The slot ID of the AU card | Mandatory | N/A | 1-4, 7-9 |

**Command Modes** Global configuration mode

## 4.5.6 Displaying Configuration and Status Information for AU Parameters

You can display the current configuration and (where applicable) additional status information for the following parameters tables:

- Properties (refer to Section 4.5.6.1)

- Control (refer to Section 4.5.6.2)
- Connectivity (refer to Section 4.5.6.3)
- Reserved (refer to Section 4.5.6.4)

### 4.5.6.1 Displaying Configuration and Status Information for AU Properties

To display configuration and status information for the properties of a specific or all AU objects, run the following command:

**npu# show properties au** [<(1 to 4 StepSize 1) | (7 to 9 StepSize 1)>]

Specify the au slot ID (1-4, 7-9) if you want to display configuration and status information for a particular AU. Do not specify a value for this parameter if you want to view configuration and status information for all existing AU objects.

**Command Syntax**

**npu# show properties au** [<(1 to 4 StepSize 1) | (7 to 9 StepSize 1)>]

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [<(1 to 4 StepSize 1) \| (7 to 9 StepSize 1)>] | The slot ID of the AU<br>Specify a value for this parameter if you want to display the properties of a specific AU. Do not specify a value for this parameter if you want to display the properties of all AUs. | Optional | N/A | 1-4, 7-9 |

**Display Format**

(for each existing AU object if requested for all AUs)

```
SlotNo.                  :<value>
RequiredType             :<value>
RequiredPorts            :<value>
RequiredBandwidth(MHz)   :<value>
InstalledStatus          :<value>
InstalledType            :<value> (0 for notinstalled AU)
InstalledPorts           :<value> (0 for notinstalled AU)
InstalledBandwidth(MHz)  :<value> (0 for notinstalled AU)
HWVersion                :<value> (null for notinstalled AU)
HWRevision               :<value> (null for notinstalled AU)
SerialNo.                :<value> (null for notinstalled AU)
BootVersion              :<value> (null for notinstalled AU)
IFVersion                :<value> (null for notinstalled AU)
IFRevision               :<value> (null for notinstalled AU)
Port1PowertoODU          :<value>
Port2PowertoODU          :<value>
Port3PowertoODU          :<value>
Port4PowertoODU          :<value>
```

**Command Modes**

Global command mode

In addition to the configurable parameters, the following status parameters are also displayed:

| Parameter | Description | Possible Values |
|---|---|---|
| InstalledStatus | Indicates whether an AU card is installed in the slot.<br>Following parameters are applicable only for installed AU. | ■ installed (1)<br>■ notinstalled (0) |

| Parameter | Description | Possible Values |
|---|---|---|
| InstalledType | The AU Type. | ■ threeDSP (1)<br>■ twoDSP (2)<br>■ other (3)<br>■ auNotDetected (4) |
| InstalledPorts | The number of ODU ports. | two (1)<br>four (2)<br>other (3)<br>auNotDetected (4) |
| InstalledBandwidth(MHz) | The bandwidth supported by the AU. | fourteen (1)<br>twenty (2)<br>other (3)<br>auNotDetected (4) |
| HWVersion | AU HW Version number | <number> |
| HWRevision | AU HW Revision number | <number> |
| SerialNo. | AU Serial number | <number> |
| BootVersion | AU Boot SW Version number | <string> |
| IFVersion | AU IF Version number | <number> |
| IFRevision | AU HW Revision number | <number> |

### 4.5.6.2 Displaying Configuration for AU Control

To display configuration for the Control parameter of a specific or all AU objects, run the following command:

**npu# show control au** [<(1 to 4 StepSize 1) | (7 to 9 StepSize 1)>]

Specify the au slot ID (1-4, 7-9) if you want to display configuration information for a particular AU. Do not specify a value for this parameter if you want to view configuration information for all existing AU objects.

**Command Syntax**

**npu# show control au** [<(1 to 4 StepSize 1) | (7 to 9 StepSize 1)>]

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [<(1 to 4 StepSize 1) \| (7 to 9 StepSize 1)>] | The slot ID of the AU<br>Specify a value for this parameter if you want to display the control parameter of a specific AU. Do not specify a value for this parameter if you want to display the control parameters of all AUs. | Optional | N/A | 1-4, 7-9 |

**Display Format**

(for each existing AU object if requested for all AUs)

```
SlotNo.                    :<value>
AUPowerControl             :<value>
```

**Command Modes**

Global command mode

### 4.5.6.3 Displaying Configuration Information for AU Connectivity Parameters

To display configuration information for the connectivity parameters of a specific or all AU objects, run the following command:

**npu# show connectivity au** [<(1 to 4 StepSize 1) | (7 to 9 StepSize 1)>]

Specify the au slot ID (1-4, 7-9) if you want to display configuration for a particular AU. Do not specify a value for this parameter if you want to view configuration for all existing AU objects.

The displayed information includes also configured values for relevant parameters that are configured for the internal management interface of the NPU.

**Command Syntax**

**npu# show connectivity au** [<(1 to 4 StepSize 1) | (7 to 9 StepSize 1)>]

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [<(1 to 4 StepSize 1) \| (7 to 9 StepSize 1)>] | The slot ID of the AU<br>Specify a value for this parameter if you want to display the connectivity parameters of a specific AU. Do not specify a value for this parameter if you want to display the connectivity parameters of all AUs. | Optional | N/A | 1-4, 7-9 |

**Display Format**

(for each existing AU object if requested for all AUs)

```
SlotNo.                        :<value>

EncapsulationMode              :vlanAwareBridging(0)

MaxFrameSize(Bytes)            :<value>

InternalManagementVLANID       :<value>

BearerVLANID                   :<value>

InternalManagementIPAddress    :<value>

InternalManagementIPSubnetMask :<value>
```

**Command Modes**

Global command mode

In addition to the configurable parameters, the following status parameters are also displayed:

| Parameter | Description | Possible Values |
|---|---|---|
| EncapsulationMode | The Ethernet encapsulation mode of the card's Ethernet port (hard coded in production). | vlanAwareBridging(0) |
| InternalManagementVLANID | The VLAN ID Management of the shelf.(hard coded in production) | 0-4092 |

| | | |
|---|---|---|
| InternalManagementIPAddress | IP Address of the internainterface of the AU. Acquired via DHCP. | IP address |
| InternalManagementIPSubnetMask | Subnet Mask of the internainterface of the AU. Acquired via DHCP. | Subnet mask |

### 4.5.6.4 Displaying Configuration Information for AU Reserved Parameters

To display configuration information for the reserved parameters of a specific or all AU objects, run the following command:

**npu# show au-reserved au** [<(1 to 4 StepSize 1) | (7 to 9 StepSize 1)>]

Specify the au slot ID (1-4, 7-9) if you want to display configuration for a particular AU. Do not specify a value for this parameter if you want to view configuration for all existing AU objects.

**Command Syntax**

**npu# show au-reserved au** [<(1 to 4 StepSize 1) | (7 to 9 StepSize 1)>]

**Privilege Level**

1

**Syntax Description**

| Parameter | Description | Presence | Default Value | Possible Values |
|---|---|---|---|---|
| [<(1 to 4 StepSize 1) \| (7 to 9 StepSize 1)>] | The slot ID of the AU<br>Specify a value for this parameter if you want to display the reserved parameters of a specific AU. Do not specify a value for this parameter if you want to display the reserved parameters of all AUs. | Optional | N/A | 1-4, 7-9 |