Alteon OS™
ISCLI Reference

Nortel 10Gb Uplink Ethernet Switch Module for IBM BladeCenter®
Version 1.2

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Solutions by

NORTEL

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Contents

Preface

The Alteon OS *Command Reference* describes how to configure and use the software with your GbE Switch Module (GbESM). This guide lists each command, together with the complete syntax and a functional description, from the IS Command Line Interface (ISCLI).

For documentation on installing the switches physically, see the *Installation Guide* for your GbESM.

Who Should Use This Book

This *Command Reference* is intended for network installers and system administrators engaged in configuring and maintaining a network. The administrator should be familiar with Ethernet concepts, IP addressing, the IEEE 802.1d Spanning Tree Protocol, and SNMP configuration parameters.

How This Book Is Organized

Chapter 1 "ISCLI Basics," describes how to connect to the switch and access the information and configuration commands. This chapter provides an overview of the command syntax, including command modes, global commands, and shortcuts.

Chapter 2 "Information Commands," shows how to view switch configuration parameters.

Chapter 3 "Statistics Commands," shows how to view switch performance statistics.

Chapter 4 "Configuration Commands," shows how to configure switch system parameters, ports, VLANs, Spanning Tree Protocol, SNMP, Port Mirroring, IP Routing, Port Trunking, and more.

Chapter 5 "Operations Commands," shows how to use commands which affect switch performance immediately, but do not alter permanent switch configurations (such as temporarily disabling ports). The commands describe how to activate or deactivate optional software features.

Chapter 6 "Boot Options," describes the use of the primary and alternate switch images, how to load a new software image, and how to reset the software to factory defaults.

Chapter 7 "Maintenance Commands," shows how to generate and access a dump of critical switch state information, how to clear it, and how to clear part or all of the forwarding database.

"Index" includes pointers to the description of the key words used throughout the book.

Typographic Conventions

The following table describes the typographic styles used in this book.

Table 1 Typographic Conventions

Typeface or Symbol	Meaning
angle brackets < >	Indicate a variable to enter based on the description inside the brackets. Do not type the brackets when entering the command. Example: If the command syntax is `ping` *<IP address>* you enter **`ping 192.32.10.12`**
bold body text	Indicates objects such as window names, dialog box names, and icons, as well as user interface objects such as buttons, and tabs.
`bold Courier text`	Indicates command names, options, and text that you must enter. Example: Use the **`show ip arp`** command.
braces { }	Indicate required elements in syntax descriptions where there is more than one option. You must choose only one of the options. Do not type the braces when entering the command. Example: If the command syntax is **`show portchannel {`***<1-11>*`**|hash|information}`** you enter: **`show portchannel`** *<1-11>* or **`show portchannel hash`** or **`show portchannel information`**
brackets [ ]	Indicate optional elements in syntax descriptions. Do not type the brackets when entering the command. Example: If the command syntax is **`show ip ospf interface [`***<1-128>*`**]`** you enter **`show ip ospf interface`** or **`show ip ospf interface`** *<1-128>*
italic text	Indicates variables in command syntax descriptions. Also indicates new terms and book titles. Example: If the command syntax is **`show spanning-tree stp`** *<1-128>* *<1-128>* represents a number between 1-128.

Table 1 Typographic Conventions

Typeface or Symbol	Meaning
`plain Courier text`	Indicates command syntax and system output, for example, prompts and system messages. Example: `configure terminal`
vertical line |	Separates choices for command keywords and arguments. Enter only one of the choices. Do not type the vertical line when entering the command. Example: If the command syntax is **`show portchannel {`***`<1-11>`***`|hash|information}`** you must enter: **`show portchannel`** *<1-11>* or **`show portchannel hash`** or **`show portchannel information`**

How to Get Help

If you need help, service, or technical assistance, see the “Getting help and technical assistance” appendix in the Nortel 10Gb Uplink Ethernet Switch Module for IBM BladeCenter *Installation Guide*.

CHAPTER 1

ISCLI Basics

Your GbE Switch Module (GbESM) is ready to perform basic switching functions right out of the box. Some of the more advanced features, however, require some administrative configuration before they can be used effectively.

This guide describes the individual ISCLI commands available for the GbESM.

The ISCLI provides a direct method for collecting switch information and performing switch configuration. Using a basic terminal, the ISCLI allows you to view information and statistics about the switch, and to perform any necessary configuration.

This chapter explains how to access the IS Command Line Interface (ISCLI) for the switch.

Accessing the ISCLI

The first time you start the GbESM, it boots into Alteon OS CLI. To access the ISCLI, enter the following command and reset the GbESM:

```
Main# boot/mode ISCLI
```

To access the Alteon OS CLI, enter the following command from the ISCLI and reload the GbESM:

```
Router(config)# boot cli-mode aos
```

The switch retains your CLI selection, even when you reset the configuration to factory defaults. The CLI boot mode is not part of the configuration settings.

If you downgrade the switch software to an earlier release, it will boot into Alteon OS CLI. However, the switch retains the CLI boot mode, and will restore your CLI choice.

ISCLI command modes

The ISCLI has three major command modes listed in order of increasing privileges, as follows:

- User EXEC mode
  This is the initial mode of access. By default, password checking is disabled for this mode, on console.
- Privileged EXEC mode
  This mode is accessed from User EXEC mode. A password is required to enter Privileged EXEC mode. The default password is **`enable`**.
- Global Configuration mode
  This mode allows you to make changes to the running configuration. If you save the configuration, the settings survive a reload of the GbESM. Several sub-modes can be accessed from the Global Configuration mode. For more details, see Table 1-1 on page 18.

Each mode provides a specific set of commands. The command set of a higher-privilege mode is a superset of a lower-privilege mode — all lower-privilege mode commands are accessible when using a higher-privilege mode.

Table 1-1 lists the ISCLI command modes.

Table 1-1 ISCLI Command Modes

Command Mode/Prompt	Command used to enter or exit
User EXEC `Router>`	Default mode, entered automatically on console Exit: **`exit`** or **`logout`**
Privileged EXEC `Router#`	Enter Privileged EXEC mode, from User EXEC mode: **`enable`** Exit to User EXEC mode: **`disable`** Quit ISCLI: **`exit`** or **`logout`**
Global Configuration `Router(config)#`	Enter Global Configuration mode, from Privileged EXEC mode: **`configure terminal`** Exit to Privileged EXEC: **`end`** or **`exit`**
Interface IP Configuration `Router(config-ip-if)#`	Enter Interface IP Configuration mode, from Global Configuration mode: **`interface ip`** *<1-128>* Exit to Global Configuration mode: **`exit`** Exit to Privileged EXEC mode: **`end`**
Port Configuration `Router(config-if)#`	Enter Port Configuration mode, from Global Configuration mode: **`interface port`** *<port alias or number>* Exit to Privileged EXEC mode: **`exit`** Exit to Global Configuration mode: **`end`**

Table 1-1 ISCLI Command Modes

Command Mode/Prompt	Command used to enter or exit
VLAN Configuration `Router(config-vlan)#`	Enter VLAN Configuration mode, from Global Configuration mode: **`vlan`** *<1-4095>* Exit to Global Configuration mode: **`exit`** Exit to Privileged EXEC mode: **`end`**
OSPF Configuration `Router(config-router-ospf)#`	Enter OSPF Configuration mode, from Global Configuration mode: **`router ospf`** Exit to Global Configuration mode: **`exit`** Exit to Privileged EXEC mode: **`end`**
BGP Configuration `Router(config-router-bgp)#`	Enter BGP Configuration mode, from Global Configuration mode: **`router bgp`** Exit to Global Configuration mode: **`exit`** Exit to Privileged EXEC mode: **`end`**
RIP Configuration `Router(config-router-rip)#`	Enter RIP Configuration mode, from Global Configuration mode: **`router rip`** Exit to Global Configuration mode: **`exit`** Exit to Privileged EXEC mode: **`end`**
Route Map Configuration `Router(config-route-map)#`	Enter Route Map Configuration mode, from Global Configuration mode: **`route-map`** *<1-32>* Exit to Global Configuration mode: **`exit`** Exit to Privileged EXEC mode: **`end`**
VRRP Configuration `Router(config-vrrp)#`	Enter VRRP Configuration mode, from Global Configuration mode: **`router vrrp`** Exit to Global Configuration mode: **`exit`** Exit to Privileged EXEC mode: **`end`**

Global Commands

Some basic commands are recognized throughout the ISCLI command modes. These commands are useful for obtaining online help, navigating through the interface, and for saving configuration changes.

For help on a specific command, type the command, followed by `help`.

Table 1-2 Description of Global Commands

Command	Action
?	Provides more information about a specific command or lists commands available at the current level.
exit	Go up one level in the command mode structure.
copy running-config startup-config	Write configuration changes to non-volatile flash memory.
exit	Exit from the command line interface and log out.
ping	Use this command to verify station-to-station connectivity across the network. The format is as follows: **ping** <*host name*> | <*IP address*> [*tries (1-32)*> *[msec delay*]] Where *IP address* is the hostname or IP address of the device, *tries* (optional) is the number of attempts (1-32), *msec delay* (optional) is the number of milliseconds between attempts. The DNS parameters must be configured if specifying hostnames.
traceroute	Use this command to identify the route used for station-to-station connectivity across the network. The format is as follows: **traceroute** <*host name*>| <*IP address*> [<*max-hops (1-32)*> [*msec delay*]] Where *IP address* is the hostname or IP address of the target station, *max-hops* (optional) is the maximum distance to trace (1-16 devices), and *delay* (optional) is the number of milliseconds for wait for the response. The DNS parameters must be configured if specifying hostnames.
telnet	This command is used to telnet out of the switch. The format is as follows: **telnet** <*hostname*> | <*IP address*> [port] Where *IP address* is the hostname or IP address of the device.
show history	This command brings up the history of the last 10 commands.
console-log	Enables or disables console logging for the current session.

Command Line Interface Shortcuts

Command Abbreviation

Most commands can be abbreviated by entering the first characters which distinguish the command from the others in the same mode. For example, consider the following full command and a valid abbreviation:

```
Router(config)# spanning-tree stp 2 bridge hello 2
```

or

```
Router(config)# sp stp 2 br h 2
```

Tab Completion

By entering the first letter of a command at any prompt and pressing <Tab>, the ISCLI will display all available commands or options that begin with that letter. Entering additional letters further refines the list of commands or options displayed. If only one command fits the input text when <Tab> is pressed, that command is supplied on the command line, waiting to be entered.

User Access Levels

To enable better switch management and user accountability, three levels or *classes* of user access have been implemented on the GbE Switch Module. Levels of access to CLI, Web management functions, and screens increase as needed to perform various switch management tasks. Conceptually, access classes are defined as follows:

- **user**: Interaction with the switch is completely passive—nothing can be changed on the GbE Switch Module. Users may display information that has no security or privacy implications, such as switch statistics and current operational state information.
- **oper**: Interaction with the switch is completely passive—nothing can be changed on the GbE Switch Module. Users may display information that has no security or privacy implications, such as switch statistics and current operational state information.
- **admin**: Administrators are the only ones that may make permanent changes to the switch configuration—changes that are persistent across a reboot/reset of the switch. Administrators can access switch functions to configure and troubleshoot problems on the GbE Switch Module. Because administrators can also make temporary (operator-level) changes as well, they must be aware of the interactions between temporary and permanent changes.

Access to switch functions is controlled through the use of unique surnames and passwords. Once you are connected to the switch via local Telnet, remote Telnet, or SSH, you are prompted to enter a password. The default user names/password for each access level are listed in the following table.

NOTE – It is recommended that you change default switch passwords after initial configuration and as regularly as required under your network security policies.

Table 1-3 User Access Levels

User Account	Description and Tasks Performed	Password
User	The User has no direct responsibility for switch management. He or she can view all switch status information and statistics, but cannot make any configuration changes to the switch.	`user`
Operator	The Operator has no direct responsibility for switch management. He or she can view all switch status information and statistics, but cannot make any configuration changes to the switch.	`oper`
Administrator	The superuser Administrator has complete access to all command modes, information, and configuration commands on the GbE Switch Module, including the ability to change both the user and administrator passwords.	`admin`

NOTE – With the exception of the "admin" user, access to each user level can be disabled by setting the password to an empty value.

Idle Timeout

By default, the switch will disconnect your Telnet session after five minutes of inactivity. This function is controlled by the following command, which can be set from 1 to 60 minutes:

`system idle` *<1-60>*

Command mode: Global Configuration

CHAPTER 2

Information Commands

You can view configuration information for the switch in both the user and administrator command modes. This chapter discusses how to use the command line interface to display switch information.

Table 2-1 Information Commands

Command Syntax and Usage
`show interface link` Displays configuration information about each port, including: ■ Port alias and number ■ Port speed ■ Duplex mode (half, full, or auto) ■ Flow control for transmit and receive (no or yes) ■ Link status (up, down, or disabled) **Command mode:** All For details, see page 85.
`show interface information` Displays port status information, including: ■ Port alias ■ Whether the port uses VLAN Tagging or not ■ Port Fast Fowarding status ■ FDB Learning status ■ Flooding of unknown destination MAC status ■ Port VLAN ID (PVID) ■ Port name ■ VLAN membership **Command mode:** All For details, see page 86.
`show geaport` Displays the GbESM port mapping between the two Gigabit Ethernet Aggregators (GEA). **Command mode:** All For details, see page 87.

Table 2-1 Information Commands

Command Syntax and Usage
`show transceiver` Displays the status of the Small Form Pluggable (SFP) transceiver module on each Fiber External Port. **Command mode:** All For details, see page 88.
`show information-dump` Dumps all switch information available (10K or more, depending on your configuration). If you want to capture dump data to a file, set your communication software on your workstation to capture session data prior to issuing the dump commands. **Command mode:** All

System Information

The information provided by each command option is briefly described in Table 2-2 on page 26, with pointers to where detailed information can be found.

Table 2-2 System Information Commands

Command Syntax and Usage
`show sys-info` Displays system information, including: ■ System date and time ■ Switch model name and number ■ Switch name and location ■ Time of last boot ■ MAC address of the switch management processor ■ IP address of the management interface ■ Hardware version and part number ■ Software image file and version number ■ Configuration name ■ Log-in banner, if one is configured **Command mode:** All For details, see page 38.
`show logging messages` Displays most recent syslog messages. **Command mode:** All For details, see page 39.

Table 2-2 System Information Commands

Command Syntax and Usage
show access user Displays configured user names and their status. **Command mode:** All except User EXEC

SNMPv3 System Information

SNMP version 3 (SNMPv3) is an extensible SNMP Framework that supplements the SNMPv2 framework by supporting the following:

- a new SNMP message format
- security for messages
- access control
- remote configuration of SNMP parameters

For more details on the SNMPv3 architecture please refer to RFC2271 to RFC2276.

Table 2-3 SNMPv3 commands

Command Syntax and Usage
show snmp-server v3 user Displays User Security Model (USM) table information. **Command mode:** All To view the table, see page 29.
show snmp-server v3 view Displays information about view, subtrees, mask and type of view. **Command mode:** All To view a sample, see page 30.
show snmp-server v3 access Displays View-based Access Control information. **Command mode:** All To view a sample, see page 30.
show snmp-server v3 group Displays information about the group that includes, the security model, user name, and group name. **Command mode:** All To view a sample, see page 32.

Table 2-3 SNMPv3 commands

Command Syntax and Usage
`show snmp-server v3 community` Displays information about the community table information. **Command mode:** All To view a sample, see page 32.
`show snmp-server v3 target-address` Displays the Target Address table information. **Command mode:** All To view a sample, see page 33.
`show snmp-server v3 target-parameters` Displays the Target parameters table information. **Command mode:** All To view a sample, see page 34.
`show snmp-server v3 notify` Displays the Notify table information. **Command mode:** All To view a sample, see page 35.
`show snmp-server v3` Displays all the SNMPv3 information. **Command mode:** All To view a sample, see page 36.

SNMPv3 USM User Table Information

The User-based Security Model (USM) in SNMPv3 provides security services such as authentication and privacy of messages. This security model makes use of a defined set of user identities displayed in the USM user table. The following command displays SNMPv3 user information:

`show snmp-server v3 user`

Command mode: All

The USM user table contains the following information:

- the user name
- a security name in the form of a string whose format is independent of the Security Model
- an authentication protocol, which is an indication that the messages sent on behalf of the user can be authenticated
- the privacy protocol

```
usmUser Table:
User Name                       Protocol
------------------------------- -------------------------------
adminmd5                        HMAC_MD5, DES PRIVACY
adminsha                        HMAC_SHA, DES PRIVACY
v1v2only                        NO AUTH,  NO PRIVACY
```

Table 2-4 USM User Table Information Parameters

Field	Description
`User Name`	This is a string that represents the name of the user that you can use to access the switch.
`Protocol`	This indicates whether messages sent on behalf of this user are protected from disclosure using a privacy protocol. Alteon OS supports DES algorithm for privacy. The software also supports two authentication algorithms: MD5 and HMAC-SHA.

SNMPv3 View Table Information

The user can control and restrict the access allowed to a group to only a subset of the management information in the management domain that the group can access within each context by specifying the group's rights in terms of a particular MIB view for security reasons.

The following command displays the SNMPv3 View Table:

`show snmp-server v3 view`

Command mode: All

```
View Name            Subtree                 Mask           Type
-----------------    ------------------   --------------  --------
iso                  1.3                                  included
v1v2only             1.3                                  included
v1v2only             1.3.6.1.6.3.15                       excluded
v1v2only             1.3.6.1.6.3.16                       excluded
v1v2only             1.3.6.1.6.3.18                       excluded
```

Table 2-5 SNMPv3 View Table Information Parameters

Field	Description
`View Name`	Displays the name of the view.
`Subtree`	Displays the MIB subtree as an OID string. A view subtree is the set of all MIB object instances which have a common Object Identifier prefix to their names.
`Mask`	Displays the bit mask.
`Type`	Displays whether a family of `view subtrees` is included or excluded from the MIB view.

SNMPv3 Access Table Information

The access control sub system provides authorization services.

The vacmAccessTable maps a group name, security information, a context, and a message type, which could be the read or write type of operation or notification into a MIB view.

The View-based Access Control Model defines a set of services that an application can use for checking access rights of a group. This group's access rights are determined by a read-view, a write-view and a notify-view. The read-view represents the set of object instances authorized for the group while reading the objects. The write-view represents the set of object instances authorized for the group when writing objects. The notify-view represents the set of object instances authorized for the group when sending a notification.

The following command displays SNMPv3 access information:

`show snmp-server v3 access`

Command mode: All

```
Group Name Prefix Model   Level       Match  ReadV   WriteV   NotifyV
---------- ------ ------- ------      ------  ------  ------   -----
v1v2grp          snmpv1  noAuthNoPriv exact  iso      iso    v1v2only
admingrp          usm     authPriv     exact  iso      iso       iso
```

Table 2-6 SNMPv3 Access Table Information

Field	Description
`Group Name`	Displays the name of group.
`Prefix`	Displays the prefix that is configured to match the values.
`Model`	Displays the security model used, for example, SNMPv1, or SNMPv2 or USM.
`Level`	Displays the minimum level of security required to gain rights of access. For example, `noAuthNoPriv`, `authNoPriv`, or `auth-Priv.`
`Match`	Displays the match for the contextName. The options are: `exact` and `prefix`.
`ReadV`	Displays the MIB view to which this entry authorizes the read access.
`WriteV`	Displays the MIB view to which this entry authorizes the write access.
`NotifyV`	Displays the Notify view to which this entry authorizes the notify access.

SNMPv3 Group Table Information

A group is a combination of security model and security name that defines the access rights assigned to all the security names belonging to that group. The group is identified by a group name.

The following command displays SNMPv3 group information:

`show snmp-server v3 group`

Command mode: All

```
Sec Model    User Name                       Group Name
----------   ------------------------------  --------------------
snmpv1       v1v2only                        v1v2grp
usm          adminmd5                        admingrp
usm          adminsha                        admingrp
```

Table 2-7 SNMPv3 Group Table Information Parameters

Field	Description
`Sec Model`	Displays the security model used, which is any one of: USM, SNMPv1, SNMPv2, and SNMPv3.
`User Name`	Displays the name for the group.
`Group Name`	Displays the access name of the group.

SNMPv3 Community Table Information

This command displays the community table information stored in the SNMP engine.

The following command displays SNMPv3 community information:

`show snmp-server v3 community`

Command mode: All

```
Index      Name       User Name           Tag
---------- ---------- ------------------- ----------
trap1      public     v1v2only            v1v2trap
```

Table 2-8 SNMPv3 Community Table Parameters

Field	Description
`Index`	Displays the unique index value of a row in this table
`Name`	Displays the community string, which represents the configuration.
`User Name`	Displays the User Security Model (USM) user name.
`Tag`	Displays the community tag. This tag specifies a set of transport endpoints from which a command responder application accepts management requests and to which a command responder application sends an SNMP trap.

SNMPv3 Target Address Table Information

The following command displays SNMPv3 target address information:

`show snmp-server v3 target-address`

Command mode: All

This command displays the SNMPv3 target address table information, which is stored in the SNMP engine.

```
Name       Transport Addr  Port Taglist    Params
---------- --------------- ---- ---------- ---------------
trap1      47.81.25.66     162  v1v2trap   v1v2param
```

Table 2-9 SNMPv3 Target Address Table Information Parameters

Field	Description
`Name`	Displays the locally arbitrary, but unique identifier associated with this `snmpTargetAddrEntry`.
`Transport Addr`	Displays the transport addresses.
`Port`	Displays the SNMP UDP port number.
`Taglist`	This column contains a list of tag values which are used to select target addresses for a particular SNMP message.
`Params`	The value of this object identifies an entry in the snmpTargetParamsTable. The identified entry contains SNMP parameters to be used when generating messages to be sent to this transport address.

SNMPv3 Target Parameters Table Information

The following command displays SNMPv3 target parameters information:

`show snmp-server v3 target-parameters`

Command mode: All

```
Name            MP Model   User Name          Sec Model  Sec Level
--------------- --------   --------------     ---------  ---------
v1v2param       snmpv2c    v1v2only           snmpv1     noAuthNoPriv
```

Table 2-10 SNMPv3 Target Parameters Table Information

Field	Description
`Name`	Displays the locally arbitrary, but unique identifier associated with this `snmpTargeParamsEntry`.
`MP Model`	Displays the Message Processing Model used when generating SNMP messages using this entry.
`User Name`	Displays the `securityName`, which identifies the entry on whose behalf SNMP messages will be generated using this entry.
`Sec Model`	Displays the security model used when generating SNMP messages using this entry. The system may choose to return an `inconsistentValue` error if an attempt is made to set this variable to a value for a security model which the system does not support.
`Sec Level`	Displays the level of security used when generating SNMP messages using this entry.

SNMPv3 Notify Table Information

The following command displays the SNMPv3 Notify Table:

`show snmp-server v3 notify`

Command mode: All

```
Name                Tag
------------------- -------------------
v1v2trap            v1v2trap
```

Table 2-11 SNMPv3 Notify Table Information

Field	Description
`Name`	The locally arbitrary, but unique identifier associated with this `snmpNotifyEntry`.
`Tag`	This represents a single tag value which is used to select entries in the `snmpTargetAddrTable`. Any entry in the `snmpTargetAddrTable` that contains a tag value equal to the value of this entry, is selected. If this entry contains a value of zero length, no entries are selected.

SNMPv3 Dump Information

The following command displays SNMPv3 information:

`show snmp-server v3`

Command mode: All

```
usmUser Table:
User Name                       Protocol
------------------------------- -------------------------------
adminmd5                        HMAC_MD5, DES PRIVACY
adminsha                        HMAC_SHA, DES PRIVACY
v1v2only                        NO AUTH,  NO PRIVACY

vacmAccess Table:
Group Name Prefix Model   Level        Match ReadV   WriteV  NotifyV
---------- ------ ------- ---------- ------ ------- --------  ------
v1v2grp           snmpv1  noAuthNoPriv exact  iso     iso     v1v2only
admingrp          usm     authPriv     exact  iso     iso     iso

vacmViewTreeFamily Table:
View Name            Subtree           Mask            Type
-------------------- ---------------  ------------    --------------
iso                  1.3                               included
v1v2only             1.3                               included
v1v2only             1.3.6.1.6.3.15                    excluded
v1v2only             1.3.6.1.6.3.16                    excluded
v1v2only             1.3.6.1.6.3.18                    excluded

vacmSecurityToGroup Table:
Sec Model  User Name                       Group Name
---------- -------------------------------  ----------------------
snmpv1     v1v2only                        v1v2grp
usm        adminsha                        admingrp

snmpCommunity Table:
Index      Name       User Name            Tag
---------- ---------- -------------------- ----------
snmpNotify Table:
Name                 Tag
-------------------- --------------------
snmpTargetAddr Table:
Name       Transport Addr  Port Taglist    Params
---------- --------------- ---- ---------- ---------------
snmpTargetParams Table:
Name                 MP Model User Name           Sec Model Sec Level
-------------------- -------- ------------------  --------- -------
```

BladeCenter Information

The following command displays information about the BladeCenter chassis:

`show system chassis`

Command mode: All

```
IBM BladeCenter Chassis Related Information:

    Switch Module Bay = 1
    Chassis Type      = Enterprise
    POST Results      = 0xff

    Management Module Control -

        Default Configuration         = FALSE
        Skip Extended Memory Test     = FALSE
        Disable External Ports        = FALSE
        POST Diagnostics Control      = Normal Diagnostics

        Control Register              = 0x19
        Extended Control Register     = 0x00

    Management Module Status Reporting -

        Device PowerUp Complete       = TRUE
        Over Current Fault            = FALSE
        Fault LED                     = OFF
        Primary Temperature Warning   = OK
        Secondary Temperature Warning = OK

        Status Register               = 0x40
        Extended Status Register      = 0x01
```

Chassis information includes details about the chassis and the management module settings.

General System Information

The following command displays system information:

show sys-info

Command mode: All

```
System Information at  0:16:42 Wed Jan  3, 2007
Time zone: No timezone configured

Nortel  10Gb Uplink Ethernet Switch Module

Switch is up 5 days, 2 hours, 16 minutes and 42 seconds.
Last boot:  0:00:47 Wed Jan  3, 2007 (power cycle)

MAC address: 00:11:58:ad:a3:00  Management IP Address (if 128):
10.90.90.97
Software Version 1.2.0 (FLASH image1), factory default configura-
tion.

PCBA Part Number:      317857-A
FAB Number:            EL4512011
Serial Number:         YJ1WDW47N277
Manufacturing Date:
Hardware Revision:     0
Board Revision:        0
PLD Firmware Version:  5.0

Temperature Sensor 1 (Warning):   42.5 C (Warn at 85.0 C/
Recover at 79.0 C)
Temperature Sensor 2 (Shutdown):  44.0 C (Warn at 93.0 C/
Recover at 86.0 C)
Temperature Sensor 3 (Exhaust):   42.5 C
Temperature Sensor 4 (Inlet):     42.5 C

Switch is in I/O Module Bay 0
```

NOTE – The display of temperature will come up only if the temperature of any of the sensors exceeds the temperature threshold. There will be a warning from the software if any of the sensors exceeds this temperature threshold. The switch will shut down if the power supply overheats.

System information includes:

- System date and time
- Switch model

- Switch name and location
- Time of last boot
- MAC address of the switch management processor
- IP address of IP interface #1
- Hardware version and part number
- Software image file and version number
- Configuration name
- Log-in banner, if one is configured

Show Recent Syslog Messages

The following command displays system log messages:

`show logging messages`

Command mode: All

```
Date     Time       Criticality level       Message
Jul  8  17:25:41    NOTICE       system: link up on port INT1
Jul  8  17:25:41    NOTICE       system: link up on port INT8
Jul  8  17:25:41    NOTICE       system: link up on port INT7
Jul  8  17:25:41    NOTICE       system: link up on port INT2
Jul  8  17:25:41    NOTICE       system: link up on port INT1
Jul  8  17:25:41    NOTICE       system: link up on port INT4
Jul  8  17:25:41    NOTICE       system: link up on port INT3
Jul  8  17:25:41    NOTICE       system: link up on port INT6
Jul  8  17:25:41    NOTICE       system: link up on port INT5
Jul  8  17:25:41    NOTICE       system: link up on port EXT4
Jul  8  17:25:41    NOTICE       system: link up on port EXT1
Jul  8  17:25:41    NOTICE       system: link up on port EXT3
Jul  8  17:25:41    NOTICE       system: link up on port EXT2
Jul  8  17:25:41    NOTICE       system: link up on port INT3
Jul  8  17:25:42    NOTICE       system: link up on port INT2
Jul  8  17:25:42    NOTICE       system: link up on port INT4
Jul  8  17:25:42    NOTICE       system: link up on port INT3
Jul  8  17:25:42    NOTICE       system: link up on port INT6
Jul  8  17:25:42    NOTICE       system: link up on port INT5
Jul  8  17:25:42    NOTICE       system: link up on port INT1
Jul  8  17:25:42    NOTICE       system: link up on port INT6
```

Each syslog message has a criticality level associated with it, included in text form as a prefix to the log message. One of eight different prefixes is used, depending on the condition that the administrator is being notified of, as shown below.

- EMERG: indicates the system is unusable
- ALERT: Indicates action should be taken immediately
- CRIT: Indicates critical conditions
- ERR: indicates error conditions or errored operations
- WARNING: indicates warning conditions
- NOTICE: indicates a normal but significant condition
- INFO: indicates an information message
- DEBUG: indicates a debug-level message

User Status

The following command displays user status information:

show access user

Command mode: All except User EXEC

```
Usernames:
  user     - enabled - offline
  oper     - disabled - offline
  admin    - Always Enabled - online 1 session
Current User ID table:
  1: name paul   , dis, cos user    , password valid, offline
Current strong password settings:
  strong password status: disabled
```

This command displays the status of the configured usernames.

Layer 2 Information

The following table lists general Layer 2 information commands. The following sections contain more detailed commands

Table 2-12 Layer 2 Information Commands

Command Syntax and Usage
`show dot1x information` Displays 802.1x Information. **Command mode:** All For details, see page 50.
`show spanning-tree` In addition to seeing if STG is enabled or disabled, you can view the following STG bridge information: ■ Priority ■ Hello interval ■ Maximum age value ■ Forwarding delay ■ Aging time You can also see the following port-specific STG information: ■ Port alias and priority ■ Cost ■ State **Command mode:** All
`show spanning-tree stp {`*<1-128>***`} information`** Displays information about a specific Spanning Tree Group. **Command mode:** All For details, see page 52.
`show spanning-tree mstp cist information` Displays Common internal Spanning Tree (CIST) bridge information, including the following: ■ Priority ■ Hello interval ■ Maximum age value ■ Forwarding delay You can also view port-specific CIST information, including the following: ■ Port number and priority ■ Cost ■ State **Command mode:** All For details, see page 58.

Table 2-12 Layer 2 Information Commands

Command Syntax and Usage
`show portchannel information` When trunk groups are configured, you can view the state of each port in the various trunk groups. **Command mode:** All For details, see page 60.
`show vlan` Displays VLAN configuration information for all configured VLANs, including: ■ VLAN Number ■ VLAN Name ■ Status ■ Port membership of the VLAN **Command mode:** All For details, see page 61.
`show failover` Displays Layer 2 Failover information. **Command mode:** All For details, see page 62.
`show layer2 information` Dumps all Layer 2 switch information available (10K or more, depending on your configuration). If you want to capture dump data to a file, set your communication software on your workstation to capture session data prior to issuing the dump commands. **Command mode:** All

FDB Information

The forwarding database (FDB) contains information that maps the media access control (MAC) address of each known device to the switch port where the device address was learned. The FDB also shows which other ports have seen frames destined for a particular MAC address.

NOTE – The master forwarding database supports up to 16K MAC address entries on the MP per switch.

Table 2-13 FDB Information Commands

Command Syntax and Usage
`show mac-address-table address` *<MAC address>* Displays a single database entry by its MAC address. You are prompted to enter the MAC address of the device. Enter the MAC address using the format, `xx:xx:xx:xx:xx:xx`. For example, `08:00:20:12:34:56`. You can also enter the MAC address using the format, `xxxxxxxxxxxx`. For example, `080020123456`. **Command mode:** All
`show mac-address-table port` *<port alias or number>* Displays all FDB entries for a particular port. **Command mode:** All
`show mac-address-table vlan` *<1-4095>* Displays all FDB entries on a single VLAN. **Command mode:** All
`show mac-address-table` Displays all entries in the Forwarding Database. **Command mode:** All For more information, see page 44.
`show mac-address-table state {flood|forward|ifmac|ignore|trunk|unknown}` Displays all FDB entries for a particular state. **Command mode:** All

Show All FDB Information

The following command displays Forwarding Database information:

`show mac-address-table`

Command mode: All

```
    MAC address     VLAN  Port  Trnk  State
----------------  ----  ----  ----  -----
00:04:38:90:54:18    1  EXT4         FWD
00:09:6b:9b:01:5f    1  INT13        FWD
00:09:6b:ca:26:ef 4095  MGT          FWD
00:0f:06:ec:3b:00 4095  MGT          FWD
00:11:43:c4:79:83    1  EXT4         FWD
00:11:f9:36:71:00 4095  MGT          FWD
00:13:0a:4d:3c:00 4095  MGT          FWD
```

An address that is in the forwarding (`FWD`) state, means that it has been learned by the switch. When in the trunking (`TRK`) state, the port field represents the trunk group number. If the state for the port is listed as unknown (`UNK`), the MAC address has not yet been learned by the switch, but has only been seen as a destination address. When an address is in the unknown state, no outbound port is indicated, although ports which reference the address as a destination will be listed under “Reference ports.”

If the state for the port is listed as an interface (`IF`), the MAC address is for a standard VRRP virtual router.

Clearing Entries from the Forwarding Database

To delete a MAC address from the forwarding database (FDB) or to clear the entire FDB, refer to “Forwarding Database Maintenance” on page 273.

Link Aggregation Control Protocol Information

Use these commands to display LACP status information about each port on a GbE Switch Module.

Table 2-14 LACP Information Commands

Command Syntax and Usage
show lacp aggregator {<*port alias or number*>**}** Displays detailed information about the LACP aggregator used by the selected port. **Command mode:** All
show lacp Displays the configured global LACP settings. **Command mode:** All
show lacp information Displays a summary of LACP information. **Command mode:** All For details, see page 45.

Link Aggregation Control Protocol

The following command displays LACP information:

show lacp information

Command mode: All

```
port  lacp  adminkey  operkey  selected  prio    attached  trunk
                                                    aggr
-----------------------------------------------------------------
INT1  active     30       30         y     32768      17     19
INT2  active     30       30         y     32768      17     19
INT3  off        19       19         n     32768      --     --
INT4  off        20       20         n     32768      --     --
...
```

LACP dump includes the following information for each external port in the GbESM:

- lacp
  Displays the port's LACP mode (active, passive, or off)
- adminkey
  Displays the value of the port's *adminkey*.

- operkey
  Shows the value of the port's operational key.
- selected
  Indicates whether the port has been selected to be part of a Link Aggregation Group.
- prio
  Shows the value of the port priority.
- attached aggr
  Displays the aggregator associated with each port.
- trunk
  This value represents the LACP trunk group number.

GVRP Information

Use these commands to display Generic VLAN Registration Protocol (GVRP) status information for the GbE Switch Module.

Table 2-15 GVRP Information Commands

Command Syntax and Usage
`show gvrp gvr` Displays general GVRP information. **Command mode:** All
`show gvrp gvd` Displays GVRP VLAN database information. **Command mode:** All For details, see page 47.
`show gvrp gid` Displays information about the GVRP GID state machine. **Command mode:** All For details, see page 48.
`show gvrp ring` Displays information about the GVRP port ring. **Command mode:** All For details, see page 49.

Show GVRP VLAN Database Information

The following command displays GVRP VLAN information:

`show gvrp gvd`

Command mode: All

```
GVRP (ENABLED) VLAN DATABASE
============================
VLAN 1, registration state FIXED
static ports  INT1-INT14 EXT1-EXT4
dynamic ports  empty

VLAN 10, registration state NORMAL
static ports  empty
dynamic ports  INT2 EXT4
```

The GVRP VLAN Database table provides basic GVRP information for each VLAN, as follows:

- GVRP Registration state:
  - Normal: The VLAN responds normally to GVRP registration information. Dynamic VLANs have a normal registration state.
  - Fixed: The VLAN ignores GVRP registration information. Static VLANs have a fixed registration state.
  - Forbidden: The VLAN does not participate in GVRP. The management VLAN 4095 has a forbidden registration state.

NOTE – Management VLAN 4095 is not registered in GVRP. The switch declines any Join request received for VLAN 4095, and generates a syslog message.

- Static port members
- Dynamic port members

Show GID State Machine Information

The following command displays GVRP GID state machine information:

`show gvrp gid`

Command mode: All

```
GID machines for VLAN 10, index 2, gvrp_state: NORMAL

in_use: TRUE - enabled: TRUE
Static ports:  empty
Dynamic ports:  INT2 EXT4
Combined ports:  INT2 EXT4
Port  App Reg|Port  App Reg|Port  App Reg|Port  App Reg|Port  App Reg|
-------------|-------------|-------------|-------------|-------------|
INT1   -   - |INT2   QA INn|INT3   -   - |INT4   -   - |INT5   -   - |
-------------|-------------|-------------|-------------|-------------|
INT6   -   - |INT7   -   - |INT8   -   - |INT9   -   - |INT10  -   - |
-------------|-------------|-------------|-------------|-------------|
INT11  -   - |INT12  -   - |INT13  -   - |INT14  -   - |EXT1   -   - |
-------------|-------------|-------------|-------------|-------------|
EXT2   -   - |EXT3   -   - |EXT4   QA INn|
-------------|-------------|-------------|
```

For each GVRP-registered VLAN, the GID State Machine table indicates the GVRP participation of switch ports. It also displays the ports' current Applicant and Registrar states.

Table 2-16 lists the possible GVRP applicant states for the port. The applicant advertises the port's GVRP state to other devices in the network.

Table 2-16 GVRP Port Applicant States

State	Description
VA	Very anxious, Active member
AA	Anxious, Active member
QA	Quiet, Active member
LA	Leaving, Active member
VP	Very anxious, Passive member
AP	Anxious, Passive member
QP	Quiet, Passive member
VO	Very anxious, Observer
AO	Anxious, Observer
QO	Quiet, Observer
LO	Leaving, Observer

Table 2-17 lists the possible GVRP registrar states for the port. The registrar receives GVRP messages from other GVRP participants on the network. Registrar states are further defined as follows:

- **Normal registration**: The registrar responds normally to incoming GPDUs. Corresponding states are displayed as INn, LV, and MT.
- **Fixed registration**: The registrar ignores all GPDUs, and remains in the IN state. Corresponding states are displayed as INr, LVr, and MTr.
- **Forbidden registration**: The registrar ignores all GPDUs, and remains in the MT state. Corresponding states are displayed as INf, LVf, and MTf.

Table 2-17 GVRP Port Registrar States

State	Description
IN	The GVRP port's Registrar has registered with the VLAN on this network.
LV	The GVRP port's Registrar has received a Leave message. The registrar is timing out the GVRP registration on the VLAN. If there is no declaration for this VLAN before the Leave timer expires, the Registrar state becomes MT (empty).
MT	The GVRP port's Registrar has withdrawn from this VLAN on this network.

Show GID Port Ring Information

The following command displays GVRP port ring information:

`show gvrp ring`

Command mode: All

```
PORT RING
=========
port EXT4, enabled, connected
port EXT3, enabled, connected
```

The port ring table shows whether individual ports are participating in GVRP (as shown above), or if the ports are members of a trunk group (as shown below).

```
PORT RING
=========
trunk 1, enabled, connected
```

802.1x Information

The following command displays 802.1x information:

`show dot1x information`

Command mode: All

```
System capability : Authenticator
System status     : disabled
Protocol version  : 1
                                      Authenticator    Backend
Port    Auth Mode    Auth Status        PAE State     Auth State
-----  ------------  ------------  --------------  ----------
 INT1  force-auth    authorized    initialize      initialize
*INT2  force-auth    authorized    initialize      initialize
*INT3  force-auth    authorized    initialize      initialize
*INT4  force-auth    authorized    initialize      initialize
*INT5  force-auth    authorized    initialize      initialize
*INT6  force-auth    authorized    initialize      initialize
*INT7  force-auth    authorized    initialize      initialize
*INT8  force-auth    authorized    initialize      initialize
 INT9  force-auth    authorized    initialize      initialize
 INT10 force-auth    authorized    initialize      initialize
*INT11 force-auth    authorized    initialize      initialize
*INT12 force-auth    authorized    initialize      initialize
*INT13 force-auth    authorized    initialize      initialize
*INT14 force-auth    authorized    initialize      initialize
 MGT   force-auth    authorized    initialize      initialize
 EXT1  force-auth    authorized    initialize      initialize
 EXT2  force-auth    authorized    initialize      initialize
*EXT3  force-auth    authorized    initialize      initialize
 EXT4  force-auth    authorized    initialize      initialize
------------------------------------------------------------------
* - Port down or disabled
```

NOTE – The sample screens that appear in this document might differ slightly from the screens displayed by your system. Screen content varies based on the type of BladeCenter unit that you are using and the firmware versions and options that are installed.

The following table describes the IEEE 802.1x parameters.

Table 2-18 802.1x Parameter Descriptions

Parameter	Description
Port	Displays each port's alias.
`Auth Mode`	Displays the Access Control authorization mode for the port. The Authorization mode can be one of the following: ■ force-unauth ■ auto ■ force-auth
`Auth Status`	Displays the current authorization status of the port, either authorized or unauthorized.
`Authenticator PAE State`	Displays the Authenticator Port Access Entity State. The PAE state can be one of the following: ■ initialize ■ disconnected ■ connecting ■ authenticating ■ authenticated ■ aborting ■ held ■ forceAuth
Backend Auth State	Displays the Backend Authorization State. The Backend Authorization state can be one of the following: ■ initialize ■ request ■ response ■ success ■ fail ■ timeout ■ idle

Spanning Tree Information

The following command displays Spanning Tree information:

`show spanning-tree stp {`*<1-128>***`} information`**

Command mode: All

```
------------------------------------------------------------------
upfast disabled, update 40
------------------------------------------------------------------
Spanning Tree Group 1: On (STP/PVST+)
Static VLANs:  1 10
Dynamic VLANs: 30

Current Root:            Path-Cost  Port Hello MaxAge FwdDel
 8000 00:16:60:f9:1e:00        0  (null)    2     20     15

Parameters:  Priority  Hello  MaxAge  FwdDel  Aging
              32768      2      20      15     300

Port  Priority   Cost   FastFwd     State      Designated Bridge     Des Port
----  --------   ----   --------   -------     --------------------  --------
INT1         0      0        n    FORWARDING  *
INT2         0      0        n    FORWARDING  *
INT3         0      0        n    FORWARDING  *
INT4         0      0        n    FORWARDING  *
INT5         0      0        n    FORWARDING  *
INT6         0      0        n    FORWARDING  *
INT7         0      0        n    FORWARDING  *
INT8         0      0        n    FORWARDING  *
INT9         0      0        n     DISABLED   *
INT10        0      0        n    FORWARDING  *
INT11        0      0        n    FORWARDING  *
INT12        0      0        n    FORWARDING  *
INT13        0      0        n    FORWARDING  *
INT14        0      0        n    FORWARDING  *
EXT1       128      2        n     DISABLED
EXT2       128      2        n     DISABLED
EXT3       128      2        n    FORWARDING    8000-00:16:60:f9:1e:00    8013
EXT4       128      4!       n    FORWARDING    8000-00:16:60:f9:1e:00    8014
* = STP turned off for this port.
! = Automatic path cost.
```

NOTE – The sample screens that appear in this document might differ slightly from the screens displayed by your system. Screen content varies based on the type of BladeCenter unit that you are using and the firmware versions and options that are installed.

The switch software uses the IEEE 802.1d Spanning Tree Protocol (STP). In addition to seeing if STG is enabled or disabled, you can view the following STG bridge information:

- Priority
- Hello interval
- Maximum age value
- Forwarding delay
- Aging time

You can also see the following port-specific STG information:

- Slot number
- Port alias and priority
- Cost
- State

The following table describes the STG parameters.

Table 2-19 Spanning Tree Parameter Descriptions

Parameter	Description
`Priority` (bridge)	The bridge priority parameter controls which bridge on the network will become the STG root bridge.
`Hello`	The hello time parameter specifies, in seconds, how often the root bridge transmits a configuration bridge protocol data unit (BPDU). Any bridge that is not the root bridge uses the root bridge hello value.
`MaxAge`	The maximum age parameter specifies, in seconds, the maximum time the bridge waits without receiving a configuration bridge protocol data unit before it reconfigure the STG network.
`FwdDel`	The forward delay parameter specifies, in seconds, the amount of time that a bridge port has to wait before it changes from learning state to forwarding state.
`Aging`	The aging time parameter specifies, in seconds, the amount of time the bridge waits without receiving a packet from a station before removing the station from the Forwarding Database.
`priority` (port)	The port priority parameter helps determine which bridge port becomes the designated port. In a network topology that has multiple bridge ports connected to a single segment, the port with the lowest port priority becomes the designated port for the segment.

Table 2-19 Spanning Tree Parameter Descriptions (Continued)

Parameter	Description
`Cost`	The port path cost parameter is used to help determine the designated port for a segment. Generally speaking, the faster the port, the lower the path cost. A setting of 0 indicates that the cost will be set to the appropriate default after the link speed has been auto negotiated.
`State`	The state field shows the current state of the port. The state field can be either `BLOCKING`, `LISTENING`, `LEARNING`, `FORWARDING`, or `DISABLED`.
`Designated Bridge`	The Designated Bridge shows information about the bridge connected to each port, if applicable. Information includes the priority (hex) and MAC address of the Designated Bridge.
`Designated Port`	The identifier of the port on the Designated Bridge to which this port is connected.

RSTP/MSTP Information

The following command displays RSTP/MSTP information:

`show spanning-tree stp {`*<1-128>***`} information`**

Command mode: All

```
Spanning Tree Group 1: On (RSTP)
VLANs:  1

Current Root:            Path-Cost  Port Hello MaxAge FwdDel Aging
 8000 00:11:58:ae:39:00        0    EXT4     2    20     15   300

Parameters:  Priority  Hello  MaxAge  FwdDel  Aging
              32768      2      20      15     300

Port  Prio  Cost     State  Role Designated Bridge      Des Port   Type
----- ---- --------- -----  ---- ---------------------- --------  -----
INT1     0         0  DSB *
INT2     0         0  DSB *
INT3     0         0  FWD *
INT4     0         0  DSB *
INT5     0         0  DSB *
INT6     0         0  DSB *
INT7     0         0  DSB *
INT8     0         0  DSB *
INT9     0         0  DSB *
INT10    0         0  DSB *
INT11    0         0  DSB *
INT12    0         0  DSB *
INT13    0         0  DSB *
INT14    0         0  DSB *
EXT1   128      2000  FWD   DESG 8000-00:11:58:ae:39:00    8011     P2P
EXT2   128      2000  DISC  BKUP 8000-00:11:58:ae:39:00    8011     P2P
EXT3   128      2000  FWD   DESG 8000-00:11:58:ae:39:00    8013     P2P
EXT4   128     20000  DISC  BKUP 8000-00:11:58:ae:39:00    8013   Shared
* = STP turned off for this port.
```

NOTE – The sample screens that appear in this document might differ slightly from the screens displayed by your system. Screen content varies based on the type of BladeCenter unit that you are using and the firmware versions and options that are installed.

You can configure the switch software to use the IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) or the IEEE 802.1s Multiple Spanning Tree Protocol (MSTP).
If RSTP/MSTP is turned on, you can view RSTP/MSTP bridge information for the Spanning Tree Group, including the following:

- Priority
- Hello interval
- Maximum age value
- Forwarding delay
- Aging time

You can view port-specific RSTP information, including the following:

- Port number and priority
- Cost
- State

The following table describes the STP parameters in RSTP or MSTP mode.

Table 2-20 RSTP/MSTP Parameter Descriptions

Parameter	Description
Current Root	The Current Root shows information about the root bridge for the Spanning Tree. Information includes the priority (hex) and MAC address of the root.
`Priority` (bridge)	The bridge priority parameter controls which bridge on the network will become the STP root bridge.
`Hello`	The hello time parameter specifies, in seconds, how often the root bridge transmits a configuration bridge protocol data unit (BPDU). Any bridge that is not the root bridge uses the root bridge hello value.
`MaxAge`	The maximum age parameter specifies, in seconds, the maximum time the bridge waits without receiving a configuration bridge protocol data unit before it reconfigures the STP network.
`FwdDel`	The forward delay parameter specifies, in seconds, the amount of time that a bridge port has to wait before it changes from learning state to forwarding state.
`Aging`	The aging time parameter specifies, in seconds, the amount of time the bridge waits without receiving a packet from a station before removing the station from the Forwarding Database.

Table 2-20 RSTP/MSTP Parameter Descriptions (Continued)

Parameter	Description
`Prio` (port)	The port priority parameter helps determine which bridge port becomes the designated port. In a network topology that has multiple bridge ports connected to a single segment, the port with the lowest port priority becomes the designated port for the segment.
`Cost`	The port path cost parameter is used to help determine the designated port for a segment. Generally speaking, the faster the port, the lower the path cost. A setting of 0 indicates that the cost will be set to the appropriate default after the link speed has been auto negotiated.
`State`	The State field shows the current state of the port. The State field in RSTP or MSTP mode can be one of the following: `Discarding (DISC)`, `Learning (LRN)`, `Forwarding (FWD), or Disabled (DSB)`.
`Role`	The Role field shows the current role of this port in the Spanning Tree. The port role can be one of the following: Designated (DESG), Root (ROOT), Alternate (ALTN), Backup (BKUP), Disabled (DSB), Master (MAST), or Unknown (UNK).
`Designated Bridge`	The Designated Bridge shows information about the bridge connected to each port, if applicable. Information includes the priority (hex) and MAC address of the Designated Bridge.
`Designated Port`	The port ID of the port on the Designated Bridge to which this port is connected.
`Type`	Type of link connected to the port, and whether the port is an edge port. Link type values are AUTO, P2P, or SHARED.

Common Internal Spanning Tree Information

The following command displays Common Internal Spanning Tree (CIST) information:

`show spanning-tree mstp cist information`

Command mode: All

```
Common Internal Spanning Tree:

VLANs:  2-4094

Current Root:            Path-Cost  Port MaxAge FwdDel
 8000 00:11:58:ae:39:00        0       0     20     15

Cist Regional Root:       Path-Cost
 8000 00:11:58:ae:39:00        0

Parameters:  Priority  MaxAge  FwdDel  Hops
              32768      20      15    20
Port  Prio  Cost     State  Role Designated Bridge      Des Port Hello Type
----- ---- --------- -----  ---- ---------------------- -------- ----- ----
INT1     0         0  DSB *
INT2     0         0  DSB *
INT3     0         0  FWD *
INT4     0         0  DSB *
INT5     0         0  DSB *
INT6     0         0  DSB *
INT7     0         0  DSB *
INT8     0         0  DSB *
INT9     0         0  DSB *
INT10    0         0  DSB *
INT11    0         0  DSB *
INT12    0         0  DSB *
INT13    0         0  DSB *
INT14    0         0  DSB *
MGT      0         0  FWD *
EXT1   128     20000  FWD   DESG 8000-00:11:58:ae:39:00    8011   2    P2P
EXT2   128     20000  DISC  BKUP 8000-00:11:58:ae:39:00    8011   2    P2P
EXT3   128     20000  FWD   DESG 8000-00:11:58:ae:39:00    8013   2    P2P
EXT4   128     20000  DISC  BKUP 8000-00:11:58:ae:39:00    8013   2    Shared
* = STP turned off for this port.
```

NOTE – The sample screens that appear in this document might differ slightly from the screens displayed by your system. Screen content varies based on the type of BladeCenter unit that you are using and the firmware versions and options that are installed.

In addition to seeing if Common Internal Spanning Tree (CIST) is enabled or disabled, you can view CIST bridge information, including the following:

- Priority
- Maximum age value
- Forwarding delay

You can view port-specific CIST information, including the following:

- Port number and priority
- Cost
- Link type and Port type

The following table describes the CIST parameters.

Table 2-21 CIST Parameter Descriptions

Parameter	Description
CIST Root	The CIST Root shows information about the root bridge for the Common Internal Spanning Tree (CIST). Values on this row of information refer to the CIST root.
CIST Regional Root	The CIST Regional Root shows information about the root bridge for this MSTP region. Values on this row of information refer to the regional root.
`Priority` (bridge)	The bridge priority parameter controls which bridge on the network will become the STP root bridge.
`Hello`	The hello time parameter specifies, in seconds, how often the root bridge transmits a configuration bridge protocol data unit (BPDU). Any bridge that is not the root bridge uses the root bridge hello value.
`MaxAge`	The maximum age parameter specifies, in seconds, the maximum time the bridge waits without receiving a configuration bridge protocol data unit before it reconfigure the STP network.
`FwdDel`	The forward delay parameter specifies, in seconds, the amount of time that a bridge port has to wait before it changes from learning state to forwarding state.
`priority` (port)	The port priority parameter helps determine which bridge port becomes the designated port. In a network topology that has multiple bridge ports connected to a single segment, the port with the lowest port priority becomes the designated port for the segment.

Table 2-21 CIST Parameter Descriptions

Parameter	Description
`Cost`	The port path cost parameter is used to help determine the designated port for a segment. Generally speaking, the faster the port, the lower the path cost. A setting of 0 indicates that the cost will be set to the appropriate default after the link speed has been auto negotiated.
`State`	The state field shows the current state of the port. The state field can be either `Discarding (DISC), Learning (LRN)`, or `Forwarding (FWD)`.
`Role`	The Role field shows the current role of this port in the Spanning Tree. The port role can be one of the following: Designated (DESG), Root (ROOT), Alternate (ALTN), Backup (BKUP), Disabled (DSB), Master (MAST), or Unknown (UNK).
`Designated Bridge`	The Designated Bridge shows information about the bridge connected to each port, if applicable. Information includes the priority (hex) and MAC address of the Designated Bridge.
`Designated Port`	The port ID of the port on the Designated Bridge to which this port is connected.
`Type`	Type of link connected to the port, and whether the port is an edge port. Link type values are AUTO, P2P, or SHARED.

Trunk Group Information

The following command displays Trunk Group information:

`show portchannel information`

Command mode: All

```
Trunk group 1, port state:
  EXT1: STG  1 forwarding
  EXT2: STG  1 forwarding
```

When trunk groups are configured, you can view the state of each port in the various trunk groups.

NOTE – If Spanning Tree Protocol on any port in the trunk group is set to `forwarding`, the remaining ports in the trunk group will also be set to `forwarding`.

VLAN Information

The following command displays VLAN information:

`show vlan`

Command mode: All

```
VLAN                Name                 Status            Ports
----  -------------------------------  ------  --------------------
1     Default VLAN                     ena     INT1-INT14 EXT1-EXT4
10     VLAN 10                          ena      INT1
11    *VLAN 11                          ena      EXT3
30    *VLAN 30                          ena      EXT4
4095   Mgmt VLAN                        ena      INT1-INT14 MGT

(*) = Dynamically created VLAN

Private-VLAN  Type      Mapped-To  Status     Ports
------------ --------- ---------- ---------- -----------------
1000         primary    1001-1014  ena        EXT1 EXT2
1001         isolated   1000       ena        INT1
1002         community  1000       ena        INT2
1003         community  1000       ena        INT3
```

NOTE – The sample screens that appear in this document might differ slightly from the screens displayed by your system. Screen content varies based on the type of BladeCenter unit that you are using and the firmware versions and options that are installed.

This information display includes all configured VLANs and all member ports that have an active link state. Port membership is represented in slot/port format.

VLAN information includes:

- VLAN Number
- VLAN Name
- Status
- Port membership of the VLAN
- Protocol-based VLAN information
- Whether the VLAN is a GVRP dynamic VLAN
- Private VLAN configuration

Failover Information

The following command displays Layer 2 Failover information.

`show failover`

Command mode: All

```
Current global Failover setting: OFF
Current global VLAN Monitor settings: OFF

Current Trigger 1 setting: disabled
limit 0
Auto Monitor settings:

Current Trigger 2 setting: disabled
limit 0
Auto Monitor settings:

Current Trigger 3 setting: disabled
limit 0
Auto Monitor settings:
...
```

Layer 3 Information

The following table lists general Layer 3 information commands. The following sections contain more detailed commands

Table 2-22 Layer 3 Information Commands

Command Syntax and Usage
`show ip information` Displays IP Information. For details, see page 64. IP information, includes: ■ IP interface information: Interface number, IP address, subnet mask, VLAN number, and operational status. ■ Default gateway information: Metric for selecting which configured gateway to use, gateway number, IP address, and health status ■ IP forwarding information: Enable status, `lnet` and `lmask` ■ Port status **Command mode:** All
`show ip vrrp information` Displays VRRP information. **Command mode:** All For details, see page 81.
`show layer3` Dumps all Layer 3 switch information available (10K or more, depending on your configuration). If you want to capture dump data to a file, set your communication software on your workstation to capture session data prior to issuing the dump commands. **Command mode:** All

IP Routing Information

Using the commands listed below, you can display all or a portion of the IP routes currently held in the switch.

Table 2-23 Route Information Commands

Command Syntax and Usage
`show ip route address` *<IP address>* Displays a single route by destination IP address. **Command mode:** All
`show ip route gateway` *<IP address>* Displays routes to a single gateway. **Command mode:** All
`show ip route type {indirect|direct|local|broadcast|martian|multi-cast}` Displays routes of a single type. **Command mode:** All For a description of IP routing types, see Table 2-24 on page 65.
`show ip route tag {fixed|static|addr|rip|ospf|bgp|broadcast|multi-cast|martian}` Displays routes of a single tag. **Command mode:** All For a description of IP routing types, see Table 2-25 on page 66.
`show ip route interface` *<1-128>* Displays routes on a single interface. **Command mode:** All
`show ip route` Displays all routes configured in the switch. **Command mode:** All For more information, see page 65.

Show All IP Route Information

The following command displays IP route information:

`show ip route`

Command mode: All

```
Status code: * - best
    Destination         Mask          Gateway        Type      Tag     Metr If
 --------------- --------------- --------------- --------- --------- ---- --
* 11.0.0.0        255.0.0.0       11.0.0.1        direct    fixed          211
* 11.0.0.1        255.255.255.255 11.0.0.1        local     addr           211
* 11.255.255.255  255.255.255.255 11.255.255.255  broadcast broadcast     211
* 12.0.0.0        255.0.0.0       12.0.0.1        direct    fixed           12
* 12.0.0.1        255.255.255.255 12.0.0.1        local     addr            12
* 12.255.255.255  255.255.255.255 12.255.255.255  broadcast broadcast       12
* 13.0.0.0        255.0.0.0       11.0.0.2        indirect  ospf          2 211
* 47.0.0.0        255.0.0.0       47.133.88.1     indirect  static          24
* 47.133.88.0     255.255.255.0   47.133.88.46    direct    fixed           24
* 172.30.52.223   255.255.255.255 172.30.52.223   broadcast broadcast        2
* 224.0.0.0       224.0.0.0       0.0.0.0         martian   martian
* 224.0.0.5       255.255.255.255 0.0.0.0         multicast addr
```

The following table describes the `Type` parameters.

Table 2-24 IP Routing Type Parameters

Parameter	Description
`indirect`	The next hop to the host or subnet destination will be forwarded through a router at the `Gateway` address.
`direct`	Packets will be delivered to a destination host or subnet attached to the switch.
`local`	Indicates a route to one of the switch's IP interfaces.
`broadcast`	Indicates a broadcast route.
`martian`	The destination belongs to a host or subnet which is filtered out. Packets to this destination are discarded.
`multicast`	Indicates a multicast route.

The following table describes the `Tag` parameters.

Table 2-25 IP Routing Tag Parameters

Parameter	Description
`fixed`	The address belongs to a host or subnet attached to the switch.
`static`	The address is a static route which has been configured on the GbE Switch Module.
`addr`	The address belongs to one of the switch's IP interfaces.
`rip`	The address was learned by the Routing Information Protocol (RIP).
`ospf`	The address was learned by Open Shortest Path First (OSPF).
`bgp`	The address was learned via Border Gateway Protocol (BGP)
`broadcast`	Indicates a broadcast address.
`martian`	The address belongs to a filtered group.

ARP Information

The ARP information includes IP address and MAC address of each entry, address status flags (see Table 2-27 on page 67), VLAN and port for the address, and port referencing information.

Table 2-26 ARP Information Commands

Command Syntax and Usage
`show ip arp find` *<IP address>* Displays a single ARP entry by IP address. **Command mode:** All
`show ip arp interface` *<port alias or number>* Displays the ARP entries on a single port. **Command mode:** All
`show ip arp vlan` *<1-4095>* Displays the ARP entries on a single VLAN. **Command mode:** All

Table 2-26 ARP Information Commands

Command Syntax and Usage
show ip arp Displays all ARP entries. including: ■ IP address and MAC address of each entry ■ Address status flag (see below) ■ The VLAN and port to which the address belongs ■ The ports which have referenced the address (empty if no port has routed traffic to the IP address shown) **Command mode:** All For more information, see page 67.
show ip arp reply Displays the ARP address list: IP address, IP mask, MAC address, and VLAN flags. **Command mode:** All

Show All ARP Entry Information

The following command displays ARP information:

show ip arp

Command mode: All

```
  IP address     Flags    MAC address       VLAN  Port
  -------------- ----- ----------------- ---- ----
  47.80.22.1            00:e0:16:7c:28:86    1  INT6
  47.80.23.243     P    00:03:42:fa:3b:30    1
  47.80.23.245          00:c0:4f:60:3e:c1    1  INT6
  190.10.10.1      P    00:03:42:fa:3b:30   10
```

Referenced ports are the ports that request the ARP entry. So the traffic coming into the referenced ports has the destination IP address. From the ARP entry (the referenced ports), this traffic needs to be forwarded to the egress port (port INT6 in the above example).

The `Flag` field is interpreted as follows:

Table 2-27 ARP Dump Flag Parameters

Flag	Description
P	Permanent entry created for switch IP interface.
R	Indirect route entry.
U	Unresolved ARP entry. The MAC address has not been learned.

ARP Address List Information

The following command displays ARP address list information:

`show ip arp reply`

Command mode: All

```
    IP address         IP mask         MAC address    VLAN Flags
  ---------------  ---------------  -----------------  ----  -----
  205.178.18.66    255.255.255.255  00:70:cf:03:20:04         P
  205.178.50.1     255.255.255.255  00:70:cf:03:20:06     1
  205.178.18.64    255.255.255.255  00:70:cf:03:20:05     1
```

BGP Information

Table 2-28 BGP Peer Information Commands

Command Syntax and Usage
show ip bgp neighbor information Displays BGP peer information. **Command mode:** All See page 69 for a sample output.
show ip bgp neighbor summary Displays peer summary information such as AS, message received, message sent, up/down, state. **Command mode:** All See page 70 for a sample output.
show ip bgp information Displays the BGP routing table. **Command mode:** All See page 70 for a sample output.

BGP Peer information

Following is an example of the information provided by the following command:

show ip bgp neighbor information

Command mode: All

```
BGP Peer Information:

  3: 2.1.1.1         , version 0, TTL 1
    Remote AS: 0, Local AS: 0, Link type: IBGP
    Remote router ID: 0.0.0.0,    Local router ID: 1.1.201.5
    BGP status: idle, Old status: idle
    Total received packets: 0, Total sent packets: 0
    Received updates: 0, Sent updates: 0
    Keepalive: 0, Holdtime: 0, MinAdvTime: 60
    LastErrorCode: unknown(0), LastErrorSubcode: unspecified(0)
    Established state transitions: 0

  4: 2.1.1.4         , version 0, TTL 1
    Remote AS: 0, Local AS: 0, Link type: IBGP
    Remote router ID: 0.0.0.0,    Local router ID: 1.1.201.5
    BGP status: idle, Old status: idle
    Total received packets: 0, Total sent packets: 0
    Received updates: 0, Sent updates: 0
    Keepalive: 0, Holdtime: 0, MinAdvTime: 60
    LastErrorCode: unknown(0), LastErrorSubcode: unspecified(0)
    Established state transitions: 0
```

BGP Summary information

Following is an example of the information provided by the following command:

`show ip bgp neighbor summary`

Command mode: All

```
   BGP Peer Summary Information:
        Peer          V    AS     MsgRcvd  MsgSent Up/Down   State
     --------------- - -------- -------- -------- -------- ----------
  1: 205.178.23.142  4      142      113      121 00:00:28 established
  2: 205.178.15.148  0      148        0        0 never     connect
```

Dump BGP Information

Following is an example of the information provided by the following command:

`show ip bgp information`

Command mode: All

```
 Status codes: * valid, > best, i - internal
Origin codes: i - IGP, e - EGP, ? - incomplete
    Network          Next Hop        Metr  LcPrf Wght  Path
   --------------- ---------------  ----- ---- ----- --------------
*> 10.0.0.0         205.178.21.147      1        256 147 148 i
*>i205.178.15.0     0.0.0.0                          0 i
*                   205.178.21.147      1        128 147 i
*> 205.178.17.0     205.178.21.147      1        128 147 i
   13.0.0.0         205.178.21.147      1        256 147 {35} ?

The 13.0.0.0 is filtered out by rrmap; or, a loop detected.
```

OSPF Information

Table 2-29 OSPF Information Commands

Command Syntax and Usage
show ip ospf general-information Displays general OSPF information. **Command mode:** All See page 72 for a sample output.
show ip ospf area information Displays area information for a particular area index. If no parameter is supplied, it displays area information for all the areas. **Command mode:** All
show ip ospf interface [*<1-127>***]** Displays interface information for a particular interface. If no parameter is supplied, it displays information for all the interfaces. **Command mode:** All See page 73 for a sample output.
show ip ospf area-virtual-link information Displays information about all the configured virtual links. **Command mode:** All
show ip ospf neighbor Displays the status of all the current neighbors. **Command mode:** All
show ip ospf summary-range *<0-2>* Displays the list of summary ranges belonging to non-NSSA areas. **Command mode:** All
show ip ospf summary-range-nssa *<0-2>* Displays the list of summary ranges belonging to NSSA areas. **Command mode:** All
show ip ospf routes Displays OSPF routing table. **Command mode:** All See page 75 for a sample output.
show ip ospf information Displays the OSPF information. **Command mode:** All

OSPF General Information

The following command displays general OSPF information:

`show ip ospf general-information`

Command mode: All

```
OSPF Version 2
Router ID: 10.10.10.1
Started at 1663 and the process uptime is 4626
Area Border Router: yes, AS Boundary Router: no
LS types supported are 6
External LSA count 0
External LSA checksum sum 0x0
Number of interfaces in this router is 2
Number of virtual links in this router is 1
16 new lsa received and 34 lsa originated from this router
Total number of entries in the LSDB 10
Database checksum sum 0x0
Total neighbors are 1, of which
                                  2 are >=INIT state,
                                  2 are >=EXCH state,
                                  2 are =FULL state
Number of areas is 2, of which 3-transit 0-nssa
        Area Id : 0.0.0.0
        Authentication : none
        Import ASExtern : yes
        Number of times SPF ran : 8
        Area Border Router count : 2
        AS Boundary Router count : 0
        LSA count : 5
        LSA Checksum sum : 0x2237B
        Summary : noSummary
```

OSPF Interface Information

The following command displays OSPF interface information:

show ip ospf interface {*<1-127>***}**

Command mode: All

```
Ip Address 10.10.12.1, Area 0.0.0.1, Admin Status UP
   Router ID 10.10.10.1, State DR, Priority 1
   Designated Router (ID) 10.10.10.1, Ip Address 10.10.12.1
   Backup Designated Router (ID) 10.10.14.1, Ip Address 10.10.12.2
   Timer intervals, Hello 10, Dead 40, Wait 1663, Retransmit 5,
                Poll interval 0, Transit delay 1
   Neighbor count is 1   If Events 4, Authentication type none
```

OSPF Database Information

Table 2-30 OSPF Database Information Commands

Command Syntax and Usage
show ip ospf database advertising-router *<router ID>* Takes advertising router as a parameter. Displays all the Link State Advertisements (LSAs) in the LS database that have the advertising router with the specified router ID, for example: 20.1.1.1. **Command mode:** All
show ip ospf database asbr-summary [advertising-router *<router ID>***| link-state-id** *<A.B.C.D>***|self]** Displays ASBR summary LSAs. The usage of this command is as follows: a) `asbrsum adv-rtr 20.1.1.1` displays ASBR summary LSAs having the advertising router 20.1.1.1. b) `asbrsum link_state_id 10.1.1.1` displays ASBR summary LSAs having the link state ID 10.1.1.1. c) `asbrsum self` displays the self advertised ASBR summary LSAs. d) `asbrsum` with no parameters displays all the ASBR summary LSAs. **Command mode:** All

Table 2-30 OSPF Database Information Commands

Command Syntax and Usage
show ip ospf database database-summary Displays the following information about the LS database in a table format: a) the number of LSAs of each type in each area. b) the total number of LSAs for each area. c) the total number of LSAs for each LSA type for all areas combined. d) the total number of LSAs for all LSA types for all areas combined. No parameters are required. **Command mode:** All
show ip ospf database external [advertising-router *<router ID>***|link-state-id** *<A.B.C.D>***|self]** Displays the AS-external (type 5) LSAs with detailed information of each field of the LSAs. **Command mode:** All
show ip ospf database network [advertising-router *<router ID>***|link-state-id** *<A.B.C.D>***|self]** Displays the network (type 2) LSAs with detailed information of each field of the LSA.network LS database. **Command mode:** All
show ip ospf database nssa Displays the NSSA (type 7) LSAs with detailed information of each field of the LSAs. **Command mode:** All
show ip ospf database router Displays the router (type 1) LSAs with detailed information of each field of the LSAs. **Command mode:** All
show ip ospf database self Displays all the self-advertised LSAs. No parameters are required. **Command mode:** All
show ip ospf database summary [advertising-router *<router ID>***|link-state-id** *<A.B.C.D>***|self]** Displays the network summary (type 3) LSAs with detailed information of each field of the LSAs. **Command mode:** All
show ip ospf database Displays all the LSAs. **Command mode:** All

OSPF Information Route Codes

The following command displays OSPF route information:

`show ip ospf routes`

Command mode: All

```
Codes: IA - OSPF inter area,
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
 IA 10.10.0.0/16 via 200.1.1.2
 IA 40.1.1.0/28 via 20.1.1.2
 IA 80.1.1.0/24 via 200.1.1.2
 IA 100.1.1.0/24 via 20.1.1.2
 IA 140.1.1.0/27 via 20.1.1.2
 IA 150.1.1.0/28 via 200.1.1.2
 E2 172.18.1.1/32 via 30.1.1.2
 E2 172.18.1.2/32 via 30.1.1.2
 E2 172.18.1.3/32 via 30.1.1.2
 E2 172.18.1.4/32 via 30.1.1.2
 E2 172.18.1.5/32 via 30.1.1.2
 E2 172.18.1.6/32 via 30.1.1.2
 E2 172.18.1.7/32 via 30.1.1.2
 E2 172.18.1.8/32 via 30.1.1.2
```

Routing Information Protocol

Table 2-31 Routing Information Protocol Commands

Command Syntax and Usage
show ip rip routes Displays RIP routes. **Command mode:** All For more information, see page 76.
show ip rip interface [*<1-128>***]** Displays RIP user's configuration. **Command mode:** All For more information, see page 77.

RIP Routes Information

The following command displays Routing Information Protocol (RIP) route information:

show ip rip routes

Command mode: All

```
30.1.1.0/24 directly connected
3.0.0.0/8 via 30.1.1.11 metric 4
4.0.0.0/16 via 30.1.1.11 metric 16
10.0.0.0/8 via 30.1.1.2 metric 3
20.0.0.0/8 via 30.1.1.2 metric 2
```

This table contains all dynamic routes learned through RIP, including the routes that are undergoing garbage collection with metric = 16. This table does not contain locally configured static routes.

RIP User Configuration

The following command displays RIP user information:

`show ip rip interface [`*<1-128>***`]`**

Command mode: All

```
RIP USER CONFIGURATION :
       RIP on updat 30
       RIP Interface 2 : 102.1.1.1,       enabled
        version 2, listen enabled, supply enabled, default none
        poison disabled, trigg enabled, mcast enabled, metric 1
       auth none,key none
       RIP Interface 3 : 103.1.1.1,       enabled
        version 2, listen enabled, supply enabled, default none
       poison disabled, trigg enabled, mcast enabled, metric 1
```

IP Information

The following command displays Layer 3 information:

`show layer3 information`

Command mode: All

```
IP information:
  AS number 0

Interface information:
  1: 10.200.30.3    255.255.0.0     10.200.255.255, vlan 1, up
128: 10.90.90.97     255.255.255.0   10.90.90.255,    vlan 4095, up

Default gateway information: metric strict
  1: 10.200.1.1,     vlan any,  up

Current BOOTP relay settings: OFF
  0.0.0.0, 0.0.0.0

Current IP forwarding settings: ON, dirbr disabled, noicmprd dis-
abled

Current network filter settings:
  none

Current route map settings:
```

IP information includes:

- IP interface information: Interface number, IP address, subnet mask, broadcast address, VLAN number, and operational status.
- Default gateway information: Metric for selecting which configured gateway to use, gateway number, IP address, and health status
- BootP relay settings
- IP forwarding settings, including the forwarding status of directed broadcasts, and the status of ICMP re-directs
- Network filter settings
- Route map settings

IGMP Multicast Group Information

Table 2-32 IGMP Multicast Group Information Commands

Command Syntax and Usage
`show ip igmp snoop` Displays IGMP Snooping information. **Command mode:** All
`show ip igmp relay` Displays IGMP Relay information. **Command mode:** All
`show ip igmp mrouter information` Displays IGMP Multicast Router information. **Command mode:** All
`show ip igmp mrouter vlan` *<1-4094>* Displays IGMP Multicast Router information for the specified VLAN. **Command mode:** All
`show ip igmp filtering` Displays current IGMP Filtering parameters. **Command mode:** All
`show ip igmp profile` *<1-16>* Displays information about the current IGMP filter. **Command mode:** All

Table 2-32 IGMP Multicast Group Information Commands

Command Syntax and Usage
show ip igmp groups address *<IP address>* Displays a single IGMP multicast group by its IP address. **Command mode:** All
show ip igmp groups vlan *<1-4094>* Displays all IGMP multicast groups on a single VLAN. **Command mode:** All
show ip igmp groups interface *<port alias or number>* Displays all IGMP multicast groups on a single port. **Command mode:** All
show ip igmp groups portchannel *<1-22>* Displays all IGMP multicast groups on a single trunk group. **Command mode:** All
show ip igmp groups detail *<IP address>* Displays details about an IGMP multicast group, including source and timer information. **Command mode:** All
show ip igmp groups Displays information for all multicast groups. **Command mode:** All

IGMP Group Information

The following command displays IGMP Group information:

`show ip igmp groups`

Command mode: All

```
Note: Local groups (224.0.0.x) are not snooped/relayed and will not appear.
     Source          Group        VLAN    Port   Version   Mode  Expires  Fwd
 -------------- --------------- ------- ------ --------  ----- -------  ---
 10.1.1.1       232.1.1.1         2      EXT4    V3       INC    4:16    Yes
 10.1.1.5       232.1.1.1         2      EXT4    V3       INC    4:16    Yes
    *           232.1.1.1         2      EXT4    V3       INC     -      No
 10.10.10.43    235.0.0.1         9      EXT1    V3       INC    2:26    Yes
    *           236.0.0.1         9      EXT1    V3       EXC     -      Yes
```

IGMP Group information includes:

- IGMP source address
- IGMP Group address
- VLAN and port
- IGMP version
- IGMPv3 filter mode
- Expiration timer value
- IGMP multicast forwarding state

IGMP Multicast Router Information

The following command displays Mrouter information:

`show ip igmp mrouter information`

Command mode: All

```
VLAN     Port       Version    Expires    Max Query Resp. Time     QRV    QQIC

-------  -------    ---------  --------   ----------------------- ----    ---
1        EXT1       V3         4:09       128                      2      125
2        EXT3       V2         4:09       125                      -       -
3        EXT4       V2         static     unknown                  -       -
```

IGMP Mrouter information includes:

- VLAN and port where the Mrouter is connected
- IGMP version
- Mrouter expiration
- Maximum query response time
- Querier's Robustness Variable (QRV)
- Querier's Query Interval Code (QQIC)

VRRP Information

Virtual Router Redundancy Protocol (VRRP) support on GbE Switch Module provides redundancy between routers in a LAN. This is accomplished by configuring the same virtual router IP address and ID number on each participating VRRP-capable routing device. One of the virtual routers is then elected as the master, based on a number of priority criteria, and assumes control of the shared virtual router IP address. If the master fails, one of the backup virtual routers will assume routing authority and take control of the virtual router IP address.

The following command displays VRRP information:

`show ip vrrp information`

Command mode: All

```
VRRP information:
  1: vrid 2, 205.178.18.210, if  1, renter, prio 100, master, server
  2: vrid 1, 205.178.18.202, if  1, renter, prio 100, backup
  3: vrid 3, 205.178.18.204, if  1, renter, prio 100, master, proxy
```

When virtual routers are configured, you can view the status of each virtual router using this command. VRRP information includes:

- Virtual router number
- Virtual router ID and IP address
- Interface number
- Ownership status
  - `owner` identifies the preferred master virtual router. A virtual router is the owner when the IP address of the virtual router and its IP interface are the same.
  - `renter` identifies virtual routers which are not owned by this device.
- Priority value. During the election process, the virtual router with the highest priority becomes master.
- Activity status
  - `master` identifies the elected master virtual router.
  - `backup` identifies that the virtual router is in backup mode.
  - `init` identifies that the virtual router is waiting for a startup event.
    For example, once it receives a startup event, it transitions to master if its priority is 255, (the IP address owner), or transitions to backup if it is not the IP address owner.
- Server status. The `server` state identifies virtual routers.
- Proxy status. The proxy state identifies virtual proxy routers, where the virtual router shares the same IP address as a proxy IP address. The use of virtual proxy routers enables redundant switches to share the same IP address, minimizing the number of unique IP addresses that must be configured.

802.1p Information

The following command displays 802.1p information:

`show qos transmit-queue information`

Command mode: All

```
Current priority to COS queue information:
Priority  COSq  Weight
--------  ----  ------
    0       0      1
    1       0      1
    2       0      1
    3       0      1
    4       1      2
    5       1      2
    6       1      2
    7       1      2

Current port priority information:
Port   Priority  COSq  Weight
-----  --------  ----  ------
INT1        0       0      1
INT2        0       0      1
...

MGT         0       0      1
EXT1        0       0      1
EXT2        0       0      1
EXT3        0       0      1
EXT4        0       0      1
```

The following table describes the IEEE 802.1p priority-to-COS queue information.

Table 2-33 802.1p Priority-to-COS Queue Parameter Descriptions

Parameter	Description
Priority	Displays the 802.1p Priority level.
COSq	Displays the Class of Service queue.
Weight	Displays the scheduling weight of the COS queue.

The following table describes the IEEE 802.1p port priority information.

Table 2-34 802.1p Port Priority Parameter Descriptions

Parameter	Description
Port	Displays the port alias.
`Priority`	Displays the 802.1p Priority level.
`COSq`	Displays the Class of Service queue.
`Weight`	Displays the scheduling weight.

Access Control List Information

The following command displays Access Control List (ACL) information:

`show access-control`

Command mode: All

```
Current ACL information:
------------------------
  Filter 2 profile:
   Ethernet
     - VID        : 2/0xfff
   Meter
     - Set to disabled
     - Set committed rate : 64
     - Set max burst size : 32
   Re-Mark
     - Set use of TOS precedence to disabled
   Actions        : Permit
  No ACL groups configured.
```

Access Control List (ACL) information includes configuration settings for each ACL and ACL Group.

Table 2-35 ACL Parameter Descriptions

Parameter	Description
Filter x profile	Indicates the ACL number.
`Meter`	Displays the ACL meter parameters.
`Re-Mark`	Displays the ACL re-mark parameters.
`Actions`	Displays the configured action for the ACL.

Link Status Information

The following command displays link information:

`show interface link`

Command mode: All except User EXEC

```
Alias   Port   Speed    Duplex     Flow Ctrl      Link
----   -----   -----   --------  --TX-----RX--   ------
 INT1    1      1000     full     yes    yes       up
 INT2    2      1000     full     yes    yes       up
 INT3    3      1000     full     yes    yes       up
 INT4    4      1000     full     yes    yes       up
 INT5    5      1000     full     yes    yes      down
 INT6    6      1000     full     yes    yes       up
 INT7    7      1000     full     yes    yes       up
 INT8    8      1000     full     yes    yes       up
 INT9    9      1000     full     yes    yes       up
 INT10  10      1000     full     yes    yes       up
 INT11  11      1000     full     yes    yes       up
 INT12  12      1000     full     yes    yes       up
 INT13  13      1000     full     yes    yes       up
 INT14  14      1000     full     yes    yes       up
 MGT    15       100     full     yes    yes       up
 EXT1   17      10000     any     yes    yes       up
 EXT2   18      10000     any     yes    yes       up
 EXT3   19      10000     any     yes    yes       up
 EXT4   20       any      any     yes    yes       up
```

NOTE – The sample screens that appear in this document might differ slightly from the screens displayed by your system. Screen content varies based on the type of BladeCenter unit that you are using and the firmware versions and options that are installed.

Use this command to display link status information about each port on an GbE Switch Module slot, including:

- Port alias and number
- Port speed (10, 100, 1000, 10000)
- Duplex mode (half, full, or any)
- Flow control for transmit and receive (no or yes)
- Link status (up, down, or disabled)

Port Information

The following command displays port information:

`show interface information`

Command mode: All except User EXEC

```
Alias Port Tag Fast Lrn Fld PVID      NAME                 VLAN(s)
----- ---- --- ---- --- --- ---- -------------- --------------------
INT1    1   y   n    e   e     1 INT1           1 4095
INT2    2   y   n    e   e     1 INT2           1 4095
INT3    3   y   n    e   e     1 INT3           1 4095
INT4    4   y   n    e   e     1 INT4           1 4095
INT5    5   y   n    e   e     1 INT5           1 4095
INT6    6   y   n    e   e     1 INT6           1 4095
INT7    7   y   n    e   e     1 INT7           1 4095
INT8    8   y   n    e   e     1 INT8           1 4095
INT9    9   y   n    e   e     1 INT9           1 4095
INT10  10   y   n    e   e     1 INT10          1 4095
INT11  11   y   n    e   e     1 INT11          1 4095
INT12  12   y   n    e   e     1 INT12          1 4095
INT13  13   y   n    e   e     1 INT13          1 4095
INT14  14   y   n    e   e     1 INT14          1 4095
MGT    15   y   n    e   e  4095*MGT            4095
EXT1   17   n   n    e   e     1 EXT1           1
EXT2   18   n   n    e   e     1 EXT2           1
EXT3   19   y   n    e   e     1 EXT3           1 ^10
EXT4   20   y   n    e   e     1 EXT4           1 ^30

^ = Dynamic port in this VLAN
* = PVID is tagged.
```

NOTE – The sample screens that appear in this document might differ slightly from the screens displayed by your system. Screen content varies based on the type of BladeCenter unit that you are using and the firmware versions and options that are installed.

Port information includes:

- Port alias and number
- Whether the port uses VLAN tagging or not (`y` or `n`)
- Whether the port is configured for Port Fast Fowarding (**`Fast`**)
- Whether the port is enabled for FDB Learning (**`Lrn`**)
- Whether the port is enabled for flooding of unknown destination MACs (**`Fld`**)
- Port VLAN ID (**`PVID`**)

- Port name
- VLAN membership

Logical Port to GEA Port Mapping

The following command displays information about GEA ports:

`show geaport`

Command mode: All

```
Alias  Logical Port  GEA Port(0-based)  GEA Unit
-----  ------------  -----------------  ---------
INT1         1               15               0
INT2         2               19               0
INT3         3               18               0
INT4         4               17               0
INT5         5               13               0
INT6         6               11               0
INT7         7               10               0
INT8         8                8               0
INT9         9                2               0
INT10       10                1               0
INT11       11                5               0
INT12       12                4               0
INT13       13               20               0
INT14       14                6               0
MGT         15               22               0
EXT1        17               25               0
EXT2        18               26               0
EXT3        19               27               0
EXT4        20                0               0
```

NOTE – The sample screens that appear in this document might differ slightly from the screens displayed by your system. Screen content varies based on the type of BladeCenter unit that you are using and the firmware versions and options that are installed.

This display correlates the port alias to logical port number, and shows the GEA unit on which each port resides.

Fiber Port Transceiver Status

The following command displays port transceiver information:

`show transceiver`

Command mode: All

```
Port       Device TX-Enable RX-Signal TX-Fault
---------- ------ --------- --------- --------
19 - EXT3  SR-XFP  enabled     LOST      N/A     <= XFP NOT APPROVED
20 - EXT4  CU-SFP  enabled     N/A      none
```

This command displays the status of the Small Form Pluggable (SFP) transceiver module on each Fiber External Port.

Information Dump

The following command dumps switch information:

`show information-dump`

Command mode: All

Use the dump command to dump all switch information available (10K or more, depending on your configuration). This data is useful for tuning and debugging switch performance.

If you want to capture dump data to a file, set your communication software on your workstation to capture session data prior to issuing the dump commands.

CHAPTER 3

Statistics Commands

You can use the Statistics Commands to view switch performance statistics in both the user and administrator command modes. This chapter discusses how to use the command line interface to display switch statistics.

Table 3-1 Statistics Commands

Command Syntax and Usage
`show layer3 counters` **Command mode:** All Displays Layer 3 statistics.
`show snmp-server counters` **Command mode:** All Displays SNMP statistics. See page 130 for sample output.
`show ntp counters` Displays Network Time Protocol (NTP) Statistics. **Command mode:** All See page 133 for a sample output and a description of NTP Statistics.
`show counters` Dumps all switch statistics. Use this command to gather data for tuning and debugging switch performance. If you want to capture dump data to a file, set your communication software on your workstation to capture session data prior to issuing the dump command. **Command mode:** All For details, see page 134.

Port Statistics

These commands display traffic statistics on a port-by-port basis. Traffic statistics include SNMP Management Information Base (MIB) objects.

Table 3-2 Port Statistics Commands

Command Syntax and Usage
show interface port {<*port alias or number*>**} dot1x counters** Displays IEEE 802.1x statistics for the port. **Command mode:** All See page 91 for sample output.
show interface port {<*port alias or number*>**} bridging-counters** Displays bridging (“dot1”) statistics for the port. **Command mode:** All See page 96 for sample output.
show interface port {<*port alias or number*>**} ethernet-counters** Displays Ethernet (“dot3”) statistics for the port. **Command mode:** All See page 97 for sample output.
show interface port {<*port alias or number*>**} interface-counters** Displays interface statistics for the port. **Command mode:** All See page 99 for sample output.
show interface port {<*port alias or number*>**} ip-counters** Displays IP statistics for the port. **Command mode:** All See page 101 for sample output.
show interface port {<*port alias or number*>**} link-counters** Displays link statistics for the port. **Command mode:** All See page 101 for sample output.
show interface port {<*port alias or number*>**} counters** Displays statistics for the port. **Command mode:** All

Table 3-2 Port Statistics Commands

Command Syntax and Usage
clear interface port {<*port alias or number*>**} counters** Clears all statistics for the port. **Command mode:** All except User EXEC
clear interfaces Clears statistics for all ports. **Command mode:** All except User EXEC

802.1x Authenticator Statistics

Use the following command to display the 802.1x authenticator statistics of the selected port:

show interface port {<*port alias or number*>**} dot1x counters**

Command mode: All

```
Authenticator Statistics:
  eapolFramesRx          = 925
  eapolFramesTx          = 3201
  eapolStartFramesRx     = 2
  eapolLogoffFramesRx    = 0
  eapolRespIdFramesRx    = 463
  eapolRespFramesRx      = 460
  eapolReqIdFramesTx     = 1820
  eapolReqFramesTx       = 1381
  invalidEapolFramesRx   = 0
  eapLengthErrorFramesRx = 0
  lastEapolFrameVersion  = 1
  lastEapolFrameSource   = 00:01:02:45:ac:51
```

Table 3-3 802.1x Authenticator Statistics of a Port

Statistics	Description
eapolFramesRx	Total number of EAPOL frames received
eapolFramesTx	Total number of EAPOL frames transmitted
eapolStartFramesRx	Total number of EAPOL Start frames received
eapolLogoff-FramesRx	Total number of EAPOL Logoff frames received

Table 3-3 802.1x Authenticator Statistics of a Port

Statistics	Description
`eapolRespId-FramesRx`	Total number of EAPOL Response Identity frames received
`eapolRespFramesRx`	Total number of Response frames received
`eapolReqIdFramesTx`	Total number of Request Identity frames transmitted
`eapolReqFramesTx`	Total number of Request frames transmitted
`invalidEapol-FramesRx`	Total number of invalid EAPOL frames received
`eapLengthError-FramesRx`	Total number of EAP length error frames received
`lastEapolFrameVer-sion`	The protocol version number carried in the most recently received EAPOL frame.
`lastEapolFrame-Source`	The source MAC address carried in the most recently received EAPOL frame.

802.1x Authenticator Diagnostics

Use the following command to display the 802.1x authenticator diagnostics of the selected port:

`show interface port {`*<port alias or number>***`} dot1x`**

Command mode: All

```
Authenticator Diagnostics:
  authEntersConnecting                = 1820
  authEapLogoffsWhileConnecting       = 0
  authEntersAuthenticating            = 463
  authSuccessesWhileAuthenticating    = 5
  authTimeoutsWhileAuthenticating     = 0
  authFailWhileAuthenticating         = 458
  authReauthsWhileAuthenticating      = 0
  authEapStartsWhileAuthenticating    = 0
  authEapLogoffWhileAuthenticating    = 0
  authReauthsWhileAuthenticated       = 3
  authEapStartsWhileAuthenticated     = 0
  authEapLogoffWhileAuthenticated     = 0
  backendResponses                    = 923
  backendAccessChallenges             = 460
  backendOtherRequestsToSupplicant    = 460
  backendNonNakResponsesFromSupplicant = 460
  backendAuthSuccesses                = 5
  backendAuthFails                    = 458
```

Table 3-4 802.1x Authenticator Diagnostics of a Port

Statistics	Description
`authEntersConnecting`	Total number of times that the state machine transitions to the CONNECTING state from any other state.
`authEapLogoffsWhileConnecting`	Total number of times that the state machine transitions from CONNECTING to DISCONNECTED as a result of receiving an EAPOL-Logoff message.
`authEntersAuthenticating`	Total number of times that the state machine transitions from CONNECTING to AUTHENTICATING, as a result of an EAP-Response/Identity message being received from the Supplicant.
`authSuccessesWhileAuthenticating`	Total number of times that the state machine transitions from AUTHENTICATING to AUTHENTICATED, as a result of the Backend Authentication state machine indicating successful authentication of the Supplicant.

Table 3-4 802.1x Authenticator Diagnostics of a Port

Statistics	Description
`authTimeoutsWhile-Authenticating`	Total number of times that the state machine transitions from AUTHENTICATING to ABORTING, as a result of the Backend Authentication state machine indicating authentication timeout.
`authFailWhileAu-thenticating`	Total number of times that the state machine transitions from AUTHENTICATING to HELD, as a result of the Backend Authentication state machine indicating authentication failure.
`authReauthsWhile-Authenticating`	Total number of times that the state machine transitions from AUTHENTICATING to ABORTING, as a result of a re-authentication request
`authEapStartsWhi-leAuthenticating`	Total number of times that the state machine transitions from AUTHENTICATING to ABORTING, as a result of an EAPOL-Start message being received from the Supplicant.
`authEapLogoffWhi-leAuthenticating`	Total number of times that the state machine transitions from AUTHENTICATING to ABORTING, as a result of an EAPOL-Logoff message being received from the Supplicant.
`authReauthsWhile-Authenticated`	Total number of times that the state machine transitions from AUTHENTICATED to CONNECTING, as a result of a re-authentication request.
`authEapStartsWhi-leAuthenticated`	Total number of times that the state machine transitions from AUTHENTICATED to CONNECTING, as a result of an EAPOL-Start message being received from the Supplicant.
`authEapLogoffWhi-leAuthenticated`	Total number of times that the state machine transitions from AUTHENTICATED to DISCONNECTED, as a result of an EAPOL-Logoff message being received from the Supplicant.
`backendResponses`	Total number of times that the state machine sends an initial Access-Request packet to the Authentication server. Indicates that the Authenticator attempted communication with the Authentication Server.
`backendAccessChal-lenges`	Total number of times that the state machine receives an initial Access-Challenge packet from the Authentication server. Indicates that the Authentication Server has communication with the Authenticator.
`backendOtherRe-questsToSupplicant`	Total number of times that the state machine sends an EAP-Request packet (other than an Identity, Notification, Failure, or Success message) to the Supplicant. Indicates that the Authenticator chose an EAP-method.
`backendNonNakRe-sponsesFromSuppli-cant`	Total number of times that the state machine receives a response from the Supplicant to an initial EAP-Request, and the response is something other than EAP-NAK. Indicates that the Supplicant can respond to the Authenticator.s chosen EAP-method.

Table 3-4 802.1x Authenticator Diagnostics of a Port

Statistics	Description
backendAuthSuccesses	Total number of times that the state machine receives an Accept message from the Authentication Server. Indicates that the Supplicant has successfully authenticated to the Authentication Server.
backendAuthFails	Total number of times that the state machine receives a Reject message from the Authentication Server. Indicates that the Supplicant has not authenticated to the Authentication Server.

Bridging Statistics

Use the following command to display the bridging statistics of the selected port:

`show interface port {`*<port alias or number>***`} bridging-counters`**

Command mode: All

```
Bridging statistics for port INT1:
dot1PortInFrames:                    63242584
dot1PortOutFrames:                   63277826
dot1PortInDiscards:                         0
dot1TpLearnedEntryDiscards:                 0
dot1StpPortForwardTransitions:              0
```

Table 3-5 Bridging Statistics of a Port

Statistics	Description
`dot1PortInFrames`	The number of frames that have been received by this port from its segment. A frame received on the interface corresponding to this port is only counted by this object if and only if it is for a protocol being processed by the local bridging function, including bridge management frames.
`dot1PortOutFrames`	The number of frames that have been transmitted by this port to its segment. Note that a frame transmitted on the interface corresponding to this port is only counted by this object if and only if it is for a protocol being processed by the local bridging function, including bridge management frames.
`dot1PortInDiscards`	Count of valid frames received which were discarded (that is, filtered) by the Forwarding Process.
`dot1TpLearnedEntry Discards`	The total number of Forwarding Database entries, which have been or would have been learnt, but have been discarded due to a lack of space to store them in the Forwarding Database. If this counter is increasing, it indicates that the Forwarding Database is regularly becoming full (a condition which has unpleasant performance effects on the subnetwork). If this counter has a significant value but is not presently increasing, it indicates that the problem has been occurring but is not persistent.
`dot1StpPortForward Transitions`	The number of times this port has transitioned from the Learning state to the Forwarding state.

Ethernet Statistics

Use the following command to display the ethernet statistics of the selected port:

`show interface port {`*<port alias or number>***`} ethernet-counters`**

Command mode: All

```
Ethernet statistics for port INT1:
dot3StatsAlignmentErrors:                 0
dot3StatsFCSErrors:                       0
dot3StatsSingleCollisionFrames:           0
dot3StatsMultipleCollisionFrames:         0
dot3StatsLateCollisions:                  0
dot3StatsExcessiveCollisions:             0
dot3StatsInternalMacTransmitErrors:      NA
dot3StatsFrameTooLongs:                   0
dot3StatsInternalMacReceiveErrors:        0
```

Table 3-6 Ethernet Statistics for Port

Statistics	Description
`dot3StatsAlignment Errors`	A count of frames received on a particular interface that are not an integral number of octets in length and do not pass the Frame Check Sequence (FCS) check. The count represented by an instance of this object is incremented when the `alignmentError` status is returned by the MAC service to the Logical Link Control (LLC) (or other MAC user). Received frames for which multiple error conditions obtained are, according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.
`dot3StatsFCSErrors`	A count of frames received on a particular interface that are an integral number of octets in length but do not pass the Frame Check Sequence (FCS) check. The count represented by an instance of this object is incremented when the `frameCheckError` status is returned by the MAC service to the LLC (or other MAC user). Received frames for which multiple error conditions obtained are, according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

Table 3-6 Ethernet Statistics for Port

Statistics	Description
dot3StatsSingle-CollisionFrames	A count of successfully transmitted frames on a particular interface for which transmission is inhibited by exactly one collision. A frame that is counted by an instance of this object is also counted by the corresponding instance of either the ifOutUcastPkts, ifOutMul-ticastPkts, or ifOutBroadcastPkts, and is not counted by the corresponding instance of the dot3StatsMultipleCollision-Frame object.
dot3StatsMultiple-CollisionFrames	A count of successfully transmitted frames on a particular interface for which transmission is inhibited by more than one collision. A frame that is counted by an instance of this object is also counted by the corresponding instance of either the ifOutUcastPkts, ifOutMul-ticastPkts, or ifOutBroadcastPkts, and is not counted by the corresponding instance of the dot3StatsSingleCollision-Frames object.
dot3StatsLate-Collisions	The number of times that a collision is detected on a particular interface later than 512 bit-times into the transmission of a packet. Five hundred and twelve bit-times corresponds to 51.2 microseconds on a 10 Mbit/s system. A (late) collision included in a count represented by an instance of this object is also considered as a (generic) collision for pur-poses of other collision-related statistics.
dot3StatsExcessive Collisions	A count of frames for which transmission on a particular interface fails due to excessive collisions.
dot3StatsInternal-MacTransmitErrors	A count of frames for which transmission on a particular interface fails due to an internal MAC sub layer transmit error. A frame is only counted by an instance of this object if it is not counted by the corresponding instance of either the dot3StatsLateCollisions object, the dot3StatsExcessiveCollisions object, or the dot3Stats-CarrierSenseErrors object. The precise meaning of the count represented by an instance of this object is implementation-specific. In particular, an instance of this object may represent a count of transmission errors on a particular interface that are not otherwise counted.
dot3StatsFrameToo-Longs	A count of frames received on a particular interface that exceed the maxi-mum permitted frame size. The count represented by an instance of this object is incremented when the frameTooLong status is returned by the MAC service to the LLC (or other MAC user). Received frames for which multiple error condi-tions obtained are, according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

Table 3-6 Ethernet Statistics for Port

Statistics	Description
`dot3StatsInternal-MacReceiveErrors`	A count of frames for which reception on a particular interface fails due to an internal MAC sub layer receive error. A frame is only counted by an instance of this object if it is not counted by the corresponding instance of either the `dot3StatsFrameTooLongs` object, the `dot3Stats-AlignmentErrors` object, or the `dot3StatsFCSErrors` object. The precise meaning of the count represented by an instance of this object is implementation-specific. In particular, an instance of this object may represent a count of received errors on a particular interface that are not otherwise counted.

Interface Statistics

Use the following command to display the interface statistics of the selected port:

`show interface port {`*<port alias or number>***`} interface-counters`**

Command mode: All

```
Interface statistics for port EXT1:
                    ifHCIn Counters       ifHCOut Counters
Octets:                 51697080313            51721056808
UcastPkts:                 65356399               65385714
BroadcastPkts:                    0                   6516
MulticastPkts:                    0                      0
Discards:                         0                      0
Errors:                           0                  21187
```

Table 3-7 Interface Statistics for Port

Statistics	Description
`ifInOctets`	The total number of octets received on the interface, including framing characters.
`ifInUcastPkts`	The number of packets, delivered by this sub-layer to a higher sub- layer, which were not addressed to a multicast or broadcast address at this sub-layer.
`ifInBroadcastPkts`	The number of packets, delivered by this sub-layer to a higher sub- layer, which were addressed to a broadcast address at this sub-layer.
`ifInMulticastPkts`	The total number of packets that higher-level protocols requested to be transmitted, and which were addressed to a multicast address at this sub-layer, including those that were discarded or not sent. For a MAC layer protocol, this includes both Group and Functional addresses.

Table 3-7 Interface Statistics for Port

Statistics	Description
`ifInDiscards`	The number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being delivered to a higher-layer protocol. One possible reason for discarding such a packet could be to free up buffer space.
`ifInErrors`	For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being delivered to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.
`ifInUnknownProtos`	For packet-oriented interfaces, the number of packets received via the interface which were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces which support protocol multiplexing, the number of transmission units received via the interface which were discarded because of an unknown or unsupported protocol. For any interface which does not support protocol multiplexing, this counter will always be 0.
`ifOutOctets`	The total number of octets transmitted out of the interface, including framing characters.
`ifOutUcastPkts`	The total number of packets that higher-level protocols requested to be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
`ifOutBroadcastPkts`	The total number of packets that higher-level protocols requested to be transmitted, and which were addressed to a broadcast address at this sub-layer, including those that were discarded or not sent. This object is a 64-bit version of `ifOutBroadcastPkts`.
`ifOutMulticastPkts`	The total number of packets that higher-level protocols requested to be transmitted, and which were addressed to a multicast address at this sub-layer, including those that were discarded or not sent. For a MAC layer protocol, this includes both Group and Functional addresses. This object is a 64-bit version of `ifOutMulticastPkts`.
`ifOutDiscards`	The number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being transmitted. One possible reason for discarding such a packet could be to free up buffer space.
`ifOutErrors`	For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.

Interface Protocol Statistics

Use the following command to display the interface protocol statistics of the selected port:

`show interface port {`*<port alias or number>***`} ip-counters`**

Command mode: All

```
GEA IP statistics for port INT1:
ipInReceives   :         0
ipInHeaderError:         0
ipInDiscards   :         0
```

Table 3-8 Interface Protocol Statistics

Statistics	Description
`ipInReceives`	The total number of input datagrams received from interfaces, including those received in error.
`ipInHeaderErrors`	The number of input datagrams discarded because the IP address in their IP header's destination field was not a valid address to be received at this entity (the switch).
`ipInDiscards`	The number of input IP datagrams for which no problems were encountered to prevent their continued processing, but which were discarded (for example, for lack of buffer space). Note that this counter does not include any datagrams discarded while awaiting re-assembly.

Link Statistics

Use the following command to display the link statistics of the selected port:

`show interface port {`*<port alias or number>***`} link-counters`**

Command mode: All

```
Link statistics for port INT1:
linkStateChange:             1
```

Table 3-9 Link Statistics

Statistics	Description
`linkStateChange`	The total number of link state changes.

Layer 2 Statistics

Table 3-10 Layer 2 Statistics Commands

Command Syntax and Usage
`show mac-address-table counters` Displays FDB statistics. **Command mode:** All See page 103 for sample output.
`clear mac-address-table counters` Clears FDB statistics. **Command mode:** All except User EXEC
`show interface port {`*<port alias or number>***`} lacp counters`** Displays Link Aggregation Control Protocol (LACP) statistics. **Command mode:** All See page 103 for sample output.
`clear interface port {`*<port alias or number>***`} lacp counters`** Clears Link Aggregation Control Protocol (LACP) statistics. **Command mode:** All except User EXEC
`show gvrp counters` Displays Generic VLAN Registration Protocol (GVRP) statistics. **Command mode:** All See page 105 for sample output.

FDB Statistics

Use the following command to display statistics regarding the use of the forwarding database, including the number of new entries, finds, and unsuccessful searches:

`show mac-address-table counters`

Command mode: All

```
FDB statistics:
 current:            83   hiwat:              855
```

FDB statistics are described in the following table:

Table 3-11 Forwarding Database Statistics

Statistic	Description
`current`	Current number of entries in the Forwarding Database.
`hiwat`	Highest number of entries recorded at any given time in the Forwarding Database.

LACP Statistics

Use the following command to display Link Aggregation Control Protocol (LACP) statistics:

`show interface port {`*<port alias or number>***`} lacp counters`**

Command mode: All

```
Port EXT1:
 -------------------------------------
 Valid LACPDUs received:          - 870
 Valid Marker PDUs received:      - 0
 Valid Marker Rsp PDUs received:  - 0
 Unknown version/TLV type:        - 0
 Illegal subtype received:        - 0
 LACPDUs transmitted:             - 6031
 Marker PDUs transmitted:         - 0
 Marker Rsp PDUs transmitted:     - 0
```

Link Aggregation Control Protocol (LACP) statistics are described in the following table:

Table 3-12 LACP Statistics

Statistic	Description
`Valid LACPDUs received`	Total number of valid LACP data units received.
`Valid Marker PDUs received`	Total number of valid LACP marker data units received.
`Valid Marker Rsp PDUs received`	Total number of valid LACP marker response data units received.
`Unknown version/TLV type`	Total number of LACP data units with an unknown version or type, length, and value (TLV) received.
`Illegal subtype received`	Total number of LACP data units with an illegal subtype received.
`LACPDUs transmitted`	Total number of LACP data units transmitted.
`Marker PDUs trans-mitted`	Total number of LACP marker data units transmitted.
`Marker Rsp PDUs transmitted`	Total number of LACP marker response data units transmitted.

GVRP Statistics

Use the following command to display statistics for Generic VLAN Registration Protocol (GVRP):

`show gvrp counters`

Command mode: All

```
GARP/GVRP statistics
====================
Join Empty received:     3194
Join In received:        492
Empty received:          482
Leave In received:       0
Leave Empty received:    0
Leave All received:      138
Join Empty transmitted:  1461
Join In transmitted:     586
Empty transmitted:       1175
Leave In transmitted:    0
Leave Empty transmitted: 0
Leave All transmitted:   143
Malformed Attributes:    0
Malformed GPDU:          0
Failure in registration: 0
```

Generic VLAN Registration Protocol (GVRP) statistics are described in the following table:

Table 3-13 GVRP Statistics

Statistic	Description
`Join Empty received`	The total number of Join Empty messages received.
`Join In received`	The total number of Join In messages received.
`Empty received`	The total number of Empty messages received.
`Leave In received`	The total number of Leave In messages received.
`Leave Empty received`	The total number of Leave Empty messages received.
`Leave All received`	The total number of Leave All messages received.
`Join Empty transmitted`	The total number of Join Empty messages sent.
`Join In transmitted`	The total number of Join In messages sent.

Table 3-13 GVRP Statistics

Statistic	Description
`Empty transmitted`	The total number of Empty messages sent.
`Leave In transmitted`	The total number of Leave In messages sent.
`Leave Empty transmitted`	The total number of Leave Empty messages sent.
`Leave All transmitted`	The total number of LeaveAll messages sent.
`Unaccepted Attribute Value`	The total number of GPDUs received that had an unacceptable attribute value.
`Invalid Message/ Attributes`	The total number of invalid messages or attributes received, such as the following: Invalid **Protocol ID** Invalid **Attribute Type** Invalid **Attribute Length** Invalid **Attribute Event**
`Failure in registration`	The total number of GVRP registrations that failed. To see more detail about failed registrations, check the syslog.

Layer 3 Statistics

Table 3-14 Layer 3 Statistics Commands

Command Syntax and Usage
show ip counters Displays IP statistics. **Command mode:** All See page 110 for sample output.
show ip route counters Displays route statistics. **Command mode:** All See page 112 for sample output.
show ip arp counters Displays Address Resolution Protocol (ARP) statistics. **Command mode:** All See page 113 for sample output.
show ip dns counters Displays Domain Name System (DNS) statistics. **Command mode:** All
show ip icmp counters Displays Internet Control Message Protocol (ICMP) statistics. **Command mode:** All See page 113 for sample output.
show ip tcp counters Displays Transmission Control Protocol (TCP) statistics. **Command mode:** All See page 115 for sample output.
show ip udp counters Displays User Datagram Protocol (UDP) statistics. **Command mode:** All See page 117 for sample output.
show ip ospf counters Displays OSPF statistics. **Command mode:** All See page 118 for sample output.

Table 3-14 Layer 3 Statistics Commands

Command Syntax and Usage
`show ip igmp counters` Displays IGMP statistics. **Command mode:** All See page 122 for sample output.
`show layer3 igmp-groups` Displays the total number of IGMP groups that are registered on the switch. **Command mode:** All
`show layer3 ipmc-groups` Displays the total number of current IP multicast groups that are registered on the switch. **Command mode:** All
`show ip vrrp counters` When virtual routers are configured, you can display protocol statistics for VRRP: **Command mode:** All See page 123 for sample output.
`show ip rip counters` Displays Routing Information Protocol (RIP) statistics. **Command mode:** All See page 124 for sample output.
`clear ip arp counters` Clears Address Resolution Protocol (ARP) statistics. **Command mode:** All except User EXEC
`clear ip dns counters` Clears Domain Name System (DNS) statistics. **Command mode:** All except User EXEC
`clear ip icmp counters` Clears Internet Control Message Protocol (ICMP) statistics. **Command mode:** All except User EXEC
`clear ip tcp counters` Clears Transmission Control Protocol (TCP) statistics. **Command mode:** All except User EXEC
`clear ip udp counters` Clears User Datagram Protocol (UDP) statistics. **Command mode:** All except User EXEC

Table 3-14 Layer 3 Statistics Commands

Command Syntax and Usage
clear ip igmp [<*1-4094*>**] counters** Clears IGMP statistics. **Command mode:** All except User EXEC
clear ip vrrp counters Clears VRRP statistics. **Command mode:** All except User EXEC
clear ip counters Clears IP statistics. Use this command with caution as it will delete all the IP statistics. **Command mode:** All except User EXEC
clear ip rip counters Clears Routing Information Protocol (RIP) statistics. **Command mode:** All except User EXEC
clear ip ospf counters Clears Open Shortest Path First (OSPF) statistics. **Command mode:** All except User EXEC
show layer3 counters Dumps all Layer 3 statistics. Use this command to gather data for tuning and debugging switch performance. If you want to capture dump data to a file, set your communication software on your workstation to capture session data prior to issuing the dump command. **Command mode:** All

IP Statistics

The following command displays IP statistics:

`show ip counters`

Command mode: All

Use the following command to clear IP statistics:

`clear ip counters`

```
IP statistics:
ipInReceives:        3115873   ipInHdrErrors:           1
ipInAddrErrors:        35447   ipForwDatagrams:         0
ipInUnknownProtos:    500504   ipInDiscards:            0
ipInDelivers:        2334166   ipOutRequests:     1010542
ipOutDiscards:             4   ipOutNoRoutes:           4
ipReasmReqds:              0   ipReasmOKs:              0
ipReasmFails:              0   ipFragOKs:               0
ipFragFails:               0   ipFragCreates:           0
ipRoutingDiscards:         0   ipDefaultTTL:          255
ipReasmTimeout:            5
```

Table 3-15 IP Statistics

Statistics	Description
`ipInReceives`	The total number of input datagrams received from interfaces, including those received in error.
`ipInHdrErrors`	The number of input datagrams discarded due to errors in their IP headers, including bad `checksums`, version number mismatch, other format errors, time-to-live exceeded, errors discovered in processing their IP options, and so forth.
`ipInAddrErrors`	The number of input datagrams discarded because the IP address in their IP header's destination field was not a valid address to be received at this entity (the switch). This count includes invalid addresses (for example, 0.0.0.0) and addresses of unsupported Classes (for example, Class E). For entities which are not IP Gateways and therefore do not forward datagrams, this counter includes datagrams discarded because the destination address was not a local address.

Table 3-15 IP Statistics

Statistics	Description
`ipForwDatagrams`	The number of input datagrams for which this entity (the switch) was not their final IP destination, as a result of which an attempt was made to find a route to forward them to that final destination. In entities which do not act as IP Gateways, this counter will include only those packets, which were Source-Routed via this entity (the switch), and the Source- Route option processing was successful.
`ipInUnknownProtos`	The number of locally addressed datagrams received successfully but discarded because of an unknown or unsupported protocol.
`ipInDiscards`	The number of input IP datagrams for which no problems were encountered to prevent their continued processing, but which were discarded (for example, for lack of buffer space). Note that this counter does not include any datagrams discarded while awaiting re-assembly.
`ipInDelivers`	The total number of input datagrams successfully delivered to IP user-protocols (including ICMP).
`ipOutRequests`	The total number of IP datagrams which local IP user-protocols (including ICMP) supplied to IP in requests for transmission. Note that this counter does not include any datagrams counted in `ipForwDatagrams`.
`ipOutDiscards`	The number of output IP datagrams for which no problem was encountered to prevent their transmission to their destination, but which were discarded (for example, for lack of buffer space). Note that this counter would include datagrams counted in `ipForwDatagrams` if any such packets met this (discretionary) discard criterion.
`ipOutNoRoutes`	The number of IP datagrams discarded because no route could be found to transmit them to their destination. Note that this counter includes any packets counted in `ipForwDatagrams`, which meet this *no-route* criterion. Note that this includes any datagrams which a host cannot route because all of its default gateways are down.
`ipReasmReqds`	The number of IP fragments received which needed to be reassembled at this entity (the switch).
`ipReasmOKs`	The number of IP datagrams successfully re- assembled.
`ipReasmFails`	The number of failures detected by the IP re- assembly algorithm (for whatever reason: timed out, errors, and so forth). Note that this is not necessarily a count of discarded IP fragments since some algorithms (notably the algorithm in RFC 815) can lose track of the number of fragments by combining them as they are received.

Table 3-15 IP Statistics

Statistics	Description
ipFragOKs	The number of IP datagrams that have been successfully fragmented at this entity (the switch).
ipFragFails	The number of IP datagrams that have been discarded because they needed to be fragmented at this entity (the switch) but could not be, for example, because their Don't Fragment flag was set.
ipFragCreates	The number of IP datagram fragments that have been generated as a result of fragmentation at this entity (the switch).
ipRoutingDiscards	The number of routing entries, which were chosen to be discarded even though they are valid. One possible reason for discarding such an entry could be to free-up buffer space for other routing entries.
ipDefaultTTL	The default value inserted into the Time-To-Live (TTL) field of the IP header of datagrams originated at this entity (the switch), whenever a TTL value is not supplied by the transport layer protocol.
ipReasmTimeout	The maximum number of seconds, which received fragments are held while they are awaiting reassembly at this entity (the switch).

Route Statistics

The following command displays route statistics:

show ip route counters

Command mode: All

```
Route statistics:
ipRoutesCur:              11  ipRoutesHighWater:        11
ipRoutesMax:            2048
```

Table 3-16 Route Statistics

Statistics	Description
ipRoutesCur	The total number of outstanding routes in the route table.
ipRoutesHighWater	The highest number of routes ever recorded in the route table.
ipRoutesMax	The maximum number of routes that are supported.

ARP statistics

The following command displays Address Resolution Protocol statistics.

show ip arp counters

Command mode: All

```
ARP statistics:
arpEntriesCur:              3  arpEntriesHighWater:          4
```

Table 3-17 ARP Statistics

Statistics	Description
arpEntriesCur	The total number of outstanding ARP entries in the ARP table.
arpEntriesHighWater	The highest number of ARP entries ever recorded in the ARP table.

ICMP Statistics

The following command displays ICMP statistics:

show ip icmp counters

Command mode: All

```
ICMP statistics:
icmpInMsgs:             245802   icmpInErrors:              1393
icmpInDestUnreachs:         41   icmpInTimeExcds:              0
icmpInParmProbs:             0   icmpInSrcQuenchs:             0
icmpInRedirects:             0   icmpInEchos:                 18
icmpInEchoReps:         244350   icmpInTimestamps:             0
icmpInTimestampReps:         0   icmpInAddrMasks:              0
icmpInAddrMaskReps:          0   icmpOutMsgs:             253810
icmpOutErrors:               0   icmpOutDestUnreachs:         15
icmpOutTimeExcds:            0   icmpOutParmProbs:             0
icmpOutSrcQuenchs:           0   icmpOutRedirects:             0
icmpOutEchos:           253777   icmpOutEchoReps:             18
icmpOutTimestamps:           0   icmpOutTimestampReps:         0
icmpOutAddrMasks:            0   icmpOutAddrMaskReps:          0
```

Table 3-18 ICMP Statistics

Statistics	Description
icmpInMsgs	The total number of ICMP messages which the entity (the switch) received. Note that this counter includes all those counted by icmpInErrors.
icmpInErrors	The number of ICMP messages which the entity (the switch) received but determined as having ICMP-specific errors (bad ICMP checksums, bad length, and so forth).
icmpInDestUnreachs	The number of ICMP Destination Unreachable messages received.
icmpInTimeExcds	The number of ICMP Time Exceeded messages received.
icmpInParmProbs	The number of ICMP Parameter Problem messages received.
icmpInSrcQuenchs	The number of ICMP Source Quench (buffer almost full, stop sending data) messages received.
icmpInRedirects	The number of ICMP Redirect messages received.
icmpInEchos	The number of ICMP Echo (request) messages received.
icmpInEchoReps	The number of ICMP Echo Reply messages received.
icmpInTimestamps	The number of ICMP Timestamp (request) messages received.
icmpInTimestampReps	The number of ICMP Timestamp Reply messages received.
icmpInAddrMasks	The number of ICMP Address Mask Request messages received.
icmpInAddrMaskReps	The number of ICMP Address Mask Reply messages received.
icmpOutMsgs	The total number of ICMP messages which this entity (the switch) attempted to send. Note that this counter includes all those counted by icmpOutErrors.
icmpOutErrors	The number of ICMP messages which this entity (the switch) did not send due to problems discovered within ICMP such as a lack of buffer. This value should not include errors discovered outside the ICMP layer such as the inability of IP to route the resultant datagram. In some implementations there may be no types of errors that contribute to this counter's value.
icmpOutDestUnreachs	The number of ICMP Destination Unreachable messages sent.
icmpOutTimeExcds	The number of ICMP Time Exceeded messages sent.
icmpOutParmProbs	The number of ICMP Parameter Problem messages sent.
icmpOutSrcQuenchs	The number of ICMP Source Quench (buffer almost full, stop sending data) messages sent.

Table 3-18 ICMP Statistics

Statistics	Description
icmpOutRedirects	The number of ICMP Redirect messages sent. For a host, this object will always be zero, since hosts do not send redirects.
icmpOutEchos	The number of ICMP Echo (request) messages sent.
icmpOutEchoReps	The number of ICMP Echo Reply messages sent.
icmpOutTimestamps	The number of ICMP Timestamp (request) messages sent.
icmpOutTimestampReps	The number of ICMP Timestamp Reply messages sent.
icmpOutAddrMasks	The number of ICMP Address Mask Request messages sent.
icmpOutAddrMaskReps	The number of ICMP Address Mask Reply messages sent.

TCP Statistics

The following command displays TCP statistics:

show ip tcp counters

Command mode: All

```
TCP statistics:
tcpRtoAlgorithm:         4   tcpRtoMin:               0
tcpRtoMax:          240000   tcpMaxConn:            512
tcpActiveOpens:     252214   tcpPassiveOpens:         7
tcpAttemptFails:       528   tcpEstabResets:          4
tcpInSegs:          756401   tcpOutSegs:         756655
tcpRetransSegs:          0   tcpInErrs:               0
tcpCurBuff:              0   tcpCurConn:              3
tcpOutRsts:            417
```

Table 3-19 TCP Statistics

Statistics	Description
tcpRtoAlgorithm	The algorithm used to determine the timeout value used for retransmitting unacknowledged octets.
tcpRtoMin	The minimum value permitted by a TCP implementation for the retransmission timeout, measured in milliseconds. More refined semantics for objects of this type depend upon the algorithm used to determine the retransmission timeout. In particular, when the timeout algorithm is rsre(3), an object of this type has the semantics of the LBOUND quantity described in RFC 793.

Table 3-19 TCP Statistics

Statistics	Description
tcpRtoMax	The maximum value permitted by a TCP implementation for the retransmission timeout, measured in milliseconds. More refined semantics for objects of this type depend upon the algorithm used to determine the retransmission timeout. In particular, when the timeout algorithm is rsre(3), an object of this type has the semantics of the UBOUND quantity described in RFC 793.
tcpMaxConn	The limit on the total number of TCP connections the entity (the switch) can support. In entities where the maximum number of connections is dynamic, this object should contain the value -1.
tcpActiveOpens	The number of times TCP connections have made a direct transition to the SYN-SENT state from the CLOSED state.
tcpPassiveOpens	The number of times TCP connections have made a direct transition to the SYN-RCVD state from the LISTEN state.
tcpAttemptFails	The number of times TCP connections have made a direct transition to the CLOSED state from either the SYN-SENT state or the SYN-RCVD state, plus the number of times TCP connections have made a direct transition to the LISTEN state from the SYN-RCVD state.
tcpEstabResets	The number of times TCP connections have made a direct transition to the CLOSED state from either the ESTABLISHED state or the CLOSE-WAIT state.
tcpInSegs	The total number of segments received, including those received in error. This count includes segments received on currently established connections.
tcpOutSegs	The total number of segments sent, including those on current connections but excluding those containing only retransmitted octets.
tcpRetransSegs	The total number of segments retransmitted - that is, the number of TCP segments transmitted containing one or more previously transmitted octets.
tcpInErrs	The total number of segments received in error (for example, bad TCP checksums).
tcpCurBuff	The total number of outstanding memory allocations from heap by TCP protocol stack.
tcpCurConn	The total number of outstanding TCP sessions that are currently opened.
tcpOutRsts	The number of TCP segments sent containing the RST flag.

UDP Statistics

The following command displays UDP statistics:

show ip udp counters

Command mode: All

```
UDP statistics:
udpInDatagrams:        54   udpOutDatagrams:        43
udpInErrors:            0   udpNoPorts:        1578077
```

Table 3-20 UDP Statistics

Statistics	Description
udpInDatagrams	The total number of UDP datagrams delivered to the switch.
udpOutDatagrams	The total number of UDP datagrams sent from this entity (the switch).
udpInErrors	The number of received UDP datagrams that could not be delivered for reasons other than the lack of an application at the destination port.
udpNoPorts	The total number of received UDP datagrams for which there was no application at the destination port.

OSPF Statistics

Table 3-21 OSPF Statistics Commands

Command Syntax and Usage
show ip ospf counters Displays OSPF statistics. **Command mode:** All See page 118 for sample output.
show ip ospf area counters Displays OSPF area statistics. **Command mode:** All except User EXEC
show ip ospf interface [<*1-127*>] counters Displays OSPF interface statistics. **Command mode:** All except User EXEC

OSPF Global Statistics

The following command displays statistics about OSPF packets received on all OSPF areas and interfaces:

`show ip ospf counters`

Command mode: All except User EXEC

```
OSPF stats
----------
Rx/Tx Stats:          Rx            Tx
                    --------      --------
  Pkts                   0             0
  hello                 23           518
  database               4            12
  ls requests            3             1
  ls acks                7             7
  ls updates             9             7

Nbr change stats:                Intf change Stats:
  hello                   2            hello              4
  start                   0            down               2
  n2way                   2            loop               0
  adjoint ok              2            unloop             0
  negotiation done        2            wait timer         2
  exchange done           2            backup             0
  bad requests            0            nbr change         5
  bad sequence            0
  loading done            2
  n1way                   0
  rst_ad                  0
  down                    1

Timers kickoff
  hello                 514
  retransmit           1028
  lsa lock                0
  lsa ack                 0
  dbage                   0
  summary                 0
  ase export              0
```

Table 3-22 OSPF General Statistics

Statistics	Description
Rx/Tx Stats:	
Rx Pkts	The sum total of all OSPF packets received on all OSPF areas and interfaces.
Tx Pkts	The sum total of all OSPF packets transmitted on all OSPF areas and interfaces.
Rx Hello	The sum total of all Hello packets received on all OSPF areas and interfaces.
Tx Hello	The sum total of all Hello packets transmitted on all OSPF areas and interfaces.
Rx Database	The sum total of all Database Description packets received on all OSPF areas and interfaces.
Tx Database	The sum total of all Database Description packets transmitted on all OSPF areas and interfaces.
Rx ls Requests	The sum total of all Link State Request packets received on all OSPF areas and interfaces.
Tx ls Requests	The sum total of all Link State Request packets transmitted on all OSPF areas and interfaces.
Rx ls Acks	The sum total of all Link State Acknowledgement packets received on all OSPF areas and interfaces.
Tx ls Acks	The sum total of all Link State Acknowledgement packets transmitted on all OSPF areas and interfaces.
Rx ls Updates	The sum total of all Link State Update packets received on all OSPF areas and interfaces.
Tx ls Updates	The sum total of all Link State Update packets transmitted on all OSPF areas and interfaces.

Table 3-22 OSPF General Statistics

Statistics	Description
Nbr Change Stats:	
hello	The sum total of all Hello packets received from neighbors on all OSPF areas and interfaces.
Start	The sum total number of neighbors in this state (that is, an indication that Hello packets should now be sent to the neighbor at intervals of HelloInterval seconds.) across all OSPF areas and interfaces.
n2way	The sum total number of bidirectional communication establishment between this router and other neighboring routers.
adjoint ok	The sum total number of decisions to be made (again) as to whether an adjacency should be established/maintained with the neighbor across all OSPF areas and interfaces.
negotiation done	The sum total number of neighbors in this state wherein the Master/slave relationship has been negotiated, and sequence numbers have been exchanged, across all OSPF areas and interfaces.
exchange done	The sum total number of neighbors in this state (that is, in an adjacency's final state) having transmitted a full sequence of Database Description packets, across all OSPF areas and interfaces.
bad requests	The sum total number of Link State Requests which have been received for a link state advertisement not contained in the database across all interfaces and OSPF areas.
bad sequence	The sum total number of Database Description packets which have been received that either: a) Has an unexpected DD sequence number b) Unexpectedly has the init bit set c) Has an options field differing from the last Options field received in a Database Description packet. Any of these conditions indicate that some error has occurred during adjacency establishment for all OSPF areas and interfaces.
loading done	The sum total number of link state updates received for all out-of-date portions of the database across all OSPF areas and interfaces.
n1way	The sum total number of Hello packets received from neighbors, in which this router is not mentioned across all OSPF interfaces and areas.
rst_ad	The sum total number of times the Neighbor adjacency has been reset across all OPSF areas and interfaces.
down	The total number of Neighboring routers down (that is, in the initial state of a neighbor conversation.) across all OSPF areas and interfaces.

Table 3-22 OSPF General Statistics

Statistics	Description
Intf Change Stats:	
hello	The sum total number of Hello packets sent on all interfaces and areas.
down	The sum total number of interfaces down in all OSPF areas.
loop	The sum total of interfaces no longer connected to the attached network across all OSPF areas and interfaces.
unloop	The sum total number of interfaces, connected to the attached network in all OSPF areas.
wait timer	The sum total number of times the Wait Timer has been fired, indicating the end of the waiting period that is required before electing a (Backup) Designated Router across all OSPF areas and interfaces.
backup	The sum total number of Backup Designated Routers on the attached network for all OSPF areas and interfaces.
nbr change	The sum total number of changes in the set of bidirectional neighbors associated with any interface across all OSPF areas.
Timers Kickoff:	
hello	The sum total number of times the Hello timer has been fired (which triggers the send of a Hello packet) across all OPSF areas and interfaces.
retransmit	The sum total number of times the Retransmit timer has been fired across all OPSF areas and interfaces.
lsa lock	The sum total number of times the Link State Advertisement (LSA) lock timer has been fired across all OSPF areas and interfaces.
lsa ack	The sum total number of times the LSA Ack timer has been fired across all OSPF areas and interfaces.
dbage	The total number of times the data base age (Dbage) has been fired.
summary	The total number of times the Summary timer has been fired.
ase export	The total number of times the Autonomous System Export (ASE) timer has been fired.

IGMP Statistics

The following command displays statistics about the use of the IGMP Multicast Groups:

`show ip igmp counters`

Command mode: All

```
IGMP Snoop vlan 2 statistics:
-------------------------------------------------------------------------
rxIgmpValidPkts:                0   rxIgmpInvalidPkts:                0
rxIgmpGenQueries:               0   rxIgmpGrpSpecificQueries:         0
rxIgmpGroupSrcSpecificQueries:  0
rxIgmpLeaves:                   0   rxIgmpReports:                    0
txIgmpReports:                  0   txIgmpGrpSpecificQueries:         0
txIgmpLeaves:                   0   rxIgmpV3CurrentStateRecords:      0
rxIgmpV3SourceListChangeRecords:0   rxIgmpV3FilterChangeRecords:      0
```

Table 3-23 IGMP Statistics

Statistic	Description
`rxIgmpValidPkts`	Total number of valid IGMP packets received
`rxIgmpInvalidPkts`	Total number of invalid packets received
`rxIgmpGenQueries`	Total number of General Membership Query packets received
`rxIgmpGrpSpecificQueries`	Total number of Membership Query packets received from specific groups
`rxIgmpGroupSrcSpecificQueries`	Total number of Group Source-Specific Queries (GSSQ) received
`rxIgmpLeaves`	Total number of Leave requests received
`rxIgmpReports`	Total number of Membership Reports received
`txIgmpReports`	Total number of Membership reports transmitted
`txIgmpGrpSpecificQueries`	Total number of Membership Query packets transmitted to specific groups
`txIgmpLeaves`	Total number of Leave messages transmitted
`rxIgmpV3CurrentStateRecords`	Total number of Current State records received
`rxIgmpV3SourceListChangeRecords`	Total number of Source List Change records received.
`rxIgmpV3FilterChangeRecords`	Total number of Filter Change records received.

VRRP Statistics

Virtual Router Redundancy Protocol (VRRP) support on the GbE Switch Module provides redundancy between routers in a LAN. This is accomplished by configuring the same virtual router IP address and ID number on each participating VRRP-capable routing device. One of the virtual routers is then elected as the master, based on a number of priority criteria, and assumes control of the shared virtual router IP address. If the master fails, one of the backup virtual routers will assume routing authority and take control of the virtual router IP address.

When virtual routers are configured, you can display protocol statistics for VRRP:

The following command displays VRRP statistics:

`show ip vrrp counters`

Command mode: All

```
VRRP statistics:
vrrpInAdvers:              0   vrrpBadAdvers:            0
vrrpOutAdvers:             0
vrrpBadVersion:            0   vrrpBadVrid:              0
vrrpBadAddress:            0   vrrpBadData:              0
vrrpBadPassword:           0   vrrpBadInterval:          0
```

Table 3-24 VRRP Statistics

Statistics	Description
`vrrpInAdvers`	The total number of valid VRRP advertisements that have been received.
`vrrpBadAdvers`	The total number of VRRP advertisements received that were dropped.
`vrrpOutAdvers`	The total number of VRRP advertisements that have been sent.
`vrrpBadVersion`	The total number of VRRP advertisements received that had a bad version number.
`vrrpBadVrid`	The total number of VRRP advertisements received that had a bad virtual router ID.
`vrrpBadAddress`	The total number of VRRP advertisements received that had a bad address.
`vrrpBadData`	The total number of VRRP advertisements received that had bad data.
`vrrpBadPassword`	The total number of VRRP advertisements received that had a bad password.
`vrrpBadInterval`	The total number of VRRP advertisements received that had a bad interval.

Routing Information Protocol Statistics

The following command displays RIP statistics:

`show ip rip counters`

Command mode: All

```
RIP ALL STATS INFORMATION:
        RIP packets received  = 12
        RIP packets sent      = 75
        RIP request received  = 0
        RIP response recevied = 12
        RIP request sent      = 3
        RIP reponse sent      = 72
        RIP route timeout     = 0
        RIP bad size packet received = 0
        RIP bad version received       = 0
        RIP bad zeros received         = 0
        RIP bad src port received      = 0
        RIP bad src IP received        = 0
        RIP packets from self received = 0
```

Management Processor Statistics

Table 3-25 Management Processor Statistics Commands

Command Syntax and Usage
`show mp packet` Displays packet statistics, to check for leads and load. **Command mode:** All To view a sample output and a description of the stats, see page 126.
`show mp tcp-block` Displays all TCP control blocks that are in use. **Command mode:** All To view a sample output and a description of the stats, see page 127.
`show mp udp-block` Displays all UDP control blocks that are in use. **Command mode:** All To view a sample output, see page 127.
`show mp cpu` Displays CPU utilization for periods of up to 1, 4, and 64 seconds. **Command mode:** All To view a sample output and a description of the stats, see page 128.

MP Packet Statistics

The following command displays MP packet statistics:

`show mp packet`

Command mode: All except User EXEC

```
Packet counts:
 allocs:       1722684     frees:                    1722684
 mediums:            0     mediums hi-watermark:           4
 jumbos:             0     jumbos hi-watermark:            0
 smalls:             0     smalls hi-watermark:            8
 failures:           0
```

Table 3-26 Packet Statistics

Statistics	Description
`allocs`	Total number of packet allocations from the packet buffer pool by the TCP/IP protocol stack.
`frees`	Total number of times the packet buffers are freed (released) to the packet buffer pool by the TCP/IP protocol stack.
`mediums`	Total number of packet allocations with size between 128 to 1536 bytes from the packet buffer pool by the TCP/IP protocol stack.
`mediums hi-water-mark`	The highest number of packet allocation with size between 128 to 1536 bytes from the packet buffer pool by the TCP/IP protocol stack.
`jumbos`	Total number of packet allocations with more than 1536 bytes from the packet buffer pool by the TCP/IP protocol stack.
`jumbos hi-watermark`	The highest number of packet allocation with more than 1536 bytes from the packet buffer pool by the TCP/IP protocol stack.
`smalls`	Total number of packet allocations with size less than 128 bytes from the packet buffer pool by the TCP/IP protocol stack.
`smalls hi-watermark`	The highest number of packet allocation with size less than 128 bytes from the packet buffer pool by the TCP/IP protocol stack.
`failures`	Total number of packet allocation failures from the packet buffer pool by the TCP/IP protocol stack.

TCP Statistics

The following command displays TCP statistics:

`show mp tcp-block`

Command mode: All except User EXEC

```
All TCP allocated control blocks:
10ad41e8:  0.0.0.0             0 <=> 0.0.0.0            80  listen
10ad5790:  47.81.27.5       1171 <=> 47.80.23.243       23  established
```

Table 3-27 MP Specified TCP Statistics

Statistics	Description
`10ad41e8/10ad5790`	Memory
`0.0.0.0/47.81.27.5`	Destination IP address
`0/1171`	Destination port
`0.0.0.0/47.80.23.243`	Source IP
`80/23`	Source port
`listen/established`	State

UDP Statistics

The following command displays UDP statistics:

`show mp udp-block`

Command mode: All except User EXEC

```
All UDP allocated control blocks:
  161:  listen
```

CPU Statistics

The following command displays the CPU utilization statistics:

`show mp cpu`

Command mode: All except User EXEC.

```
CPU utilization:
cpuUtil1Second:            53%
cpuUtil4Seconds:           54%
cpuUtil64Seconds:          54%
```

Table 3-28 CPU Statistics

Statistics	Description
`cpuUtil1Second`	The utilization of MP CPU over 1 second. It shows the percentage.
`cpuUtil4Seconds`	The utilization of MP CPU over 4 seconds. It shows the percentage.
`cpuUtil64Seconds`	The utilization of MP CPU over 64 seconds. It shows the percentage.

Access Control List Statistics

Table 3-29 ACL Statistics Commands

Command Syntax and Usage
`show access-control list {`*`<1-896>`***`} counters`** Displays the Access Control List Statistics for a specific ACL. **Command mode:** All For details, see page 129.
`show access-control counters` Displays all ACL statistics. **Command mode:** All except User EXEC
`clear access-control list` Clears ACL statistics. **Command mode:** All except User EXEC

ACL Statistics

This option displays ACL statistics.

`show access-control counters`

Command mode: All

```
Hits for ACL 1, port EXT1:              26057515
Hits for ACL 2, port EXT1:              26057497
```

SNMP Statistics

The following command displays SNMP statistics:

`show snmp-server counters`

Command mode: All except User EXEC

```
SNMP statistics:
snmpInPkts:             150097   snmpInBadVersions:              0
snmpInBadC'tyNames:          0   snmpInBadC'tyUses:              0
snmpInASNParseErrs:          0   snmpEnableAuthTraps:            0
snmpOutPkts:            150097   snmpInBadTypes:                 0
snmpInTooBigs:               0   snmpInNoSuchNames:              0
snmpInBadValues:             0   snmpInReadOnlys:                0
snmpInGenErrs:               0   snmpInTotalReqVars:        798464
snmpInTotalSetVars:       2731   snmpInGetRequests:          17593
snmpInGetNexts:         131389   snmpInSetRequests:            615
snmpInGetResponses:          0   snmpInTraps:                    0
snmpOutTooBigs:              0   snmpOutNoSuchNames:             1
snmpOutBadValues:            0   snmpOutReadOnlys:               0
snmpOutGenErrs:              1   snmpOutGetRequests:             0
snmpOutGetNexts:             0   snmpOutSetRequests:             0
snmpOutGetResponses:    150093   snmpOutTraps:                   4
snmpSilentDrops:             0   snmpProxyDrops:                 0
```

Table 3-30 SNMP Statistics

Statistics	Description
`snmpInPkts`	The total number of Messages delivered to the SNMP entity from the transport service.
`snmpInBadVersions`	The total number of SNMP Messages, which were delivered to the SNMP protocol entity and were for an unsupported SNMP version.
`snmpInBadC'tyNames`	The total number of SNMP Messages delivered to the SNMP entity which used an SNMP community name not known to the said entity (the switch).
`snmpInBadC'tyUses`	The total number of SNMP Messages delivered to the SNMP protocol entity which represented an SNMP operation which was not allowed by the SNMP community named in the Message.

Table 3-30 SNMP Statistics

Statistics	Description
snmpInASNParseErrs	The total number of ASN.1 or BER errors encountered by the SNMP protocol entity when decoding SNMP Messages received. **Note:** OSI's method of specifying abstract objects is called ASN.1 (Abstract Syntax Notation One, defined in X.208), and one set of rules for representing such objects as strings of ones and zeros is called the BER (Basic Encoding Rules, defined in X.209). ASN.1 is a flexible notation that allows one to define a variety of data types, from simple types such as integers and bit strings to structured types such as sets and sequences. BER describes how to represent or encode values of each ASN.1 type as a string of eight-bit octets.
snmpEnableAuth Traps	An object to enable or disable the authentication traps generated by this entity (the switch).
snmpOutPkts	The total number of SNMP Messages which were passed from the SNMP protocol entity to the transport service.
snmpInBadTypes	The total number of SNMP Messages which failed ASN parsing.
snmpInTooBigs	The total number of SNMP Protocol Data Units (PDUs) which were delivered to the SNMP protocol entity and for which the value of the error-status field is *too big*.
snmpInNoSuchNames	The total number of SNMP Protocol Data Units (PDUs) which were delivered to the SNMP protocol entity and for which the value of the error-status field is noSuchName.
snmpInBadValues	The total number of SNMP Protocol Data Units (PDUs) which were delivered to the SNMP protocol entity and for which the value of the error-status field is badValue.
snmpInReadOnlys	The total number of valid SNMP Protocol Data Units (PDUs), which were delivered to the SNMP protocol entity and for which the value of the error-status field is `read-Only'. It should be noted that it is a protocol error to generate an SNMP PDU, which contains the value `read-Only' in the error-status field. As such, this object is provided as a means of detecting incorrect implementations of the SNMP.
snmpInGenErrs	The total number of SNMP Protocol Data Units (PDUs), which were delivered to the SNMP protocol entity and for which the value of the error-status field is genErr.
snmpInTotalReqVars	The total number of MIB objects which have been retrieved successfully by the SNMP protocol entity as a result of receiving valid SNMP Get-Request and Get-Next Protocol Data Units (PDUs).

Table 3-30 SNMP Statistics

Statistics	Description
`snmpInTotalSetVars`	The total number of MIB objects, which have been altered successfully by the SNMP protocol entity as a result of receiving valid SNMP Set-Request Protocol Data Units (PDUs).
`snmpInGetRequests`	The total number of SNMP Get-Request Protocol Data Units (PDUs), which have been accepted and processed by the SNMP protocol entity.
`snmpInGetNexts`	The total number of SNMP Get-Next Protocol Data Units (PDUs), which have been accepted and processed by the SNMP protocol entity.
`snmpInSetRequests`	The total number of SNMP Set-Request Protocol Data Units (PDUs), which have been accepted and processed by the SNMP protocol entity.
`snmpInGetResponses`	The total number of SNMP Get-Response Protocol Data Units (PDUs), which have been accepted and processed by the SNMP protocol entity.
`snmpInTraps`	The total number of SNMP Trap Protocol Data Units (PDUs), which have been accepted and processed by the SNMP protocol entity.
`snmpOutTooBigs`	The total number of SNMP Protocol Data Units (PDUs), which were generated by the SNMP protocol entity and for which the value of the error-status field is *too big*.
`snmpOutNoSuchNames`	The total number of SNMP Protocol Data Units (PDUs), which were generated by the SNMP protocol entity and for which the value of the error-status is `noSuchName`.
`snmpOutBadValues`	The total number of SNMP Protocol Data Units (PDUs), which were generated by the SNMP protocol entity and for which the value of the error-status field is `badValue.`
`snmpOutReadOnlys`	Not in use.
`snmpOutGenErrs`	The total number of SNMP Protocol Data Units (PDUs), which were generated by the SNMP protocol entity and for which the value of the error-status field is `genErr`.
`snmpOutGetRequests`	The total number of SNMP Get-Request Protocol Data Units (PDUs), which have been generated by the SNMP protocol entity.
`snmpOutGetNexts`	The total number of SNMP Get-Next Protocol Data Units (PDUs), which have been generated by the SNMP protocol entity.
`snmpOutSetRequests`	The total number of SNMP Set-Request Protocol Data Units (PDUs), which have been generated by the SNMP protocol entity.
`snmpOutGet Responses`	The total number of SNMP Get-Response Protocol Data Units (PDUs), which have been generated by the SNMP protocol entity.

Table 3-30 SNMP Statistics

Statistics	Description
snmpOutTraps	The total number of SNMP Trap Protocol Data Units (PDUs), which have been generated by the SNMP protocol entity.
snmpSilentDrops	The total number of GetRequest-PDUs, GetNextRequest-PDUs, GetBulkRequest-PDUs, SetRequest-PDUs, and InformRequest-PDUs delivered to the SNMPv2 entity which were silently dropped because the size of a reply containing an alternate Response-PDU with an empty variable bindings field was greater than either a local constraint or the maximum message size associated with the originator of the request.
snmpProxyDrops	The total number of GetRequest-PDUs, GetNextRequest-PDUs, GetBulkRequest-PDUs, SetRequest-PDUs, and InformRequest-PDUs delivered to the SNMP entity which were silently dropped because the transmission of the message to a proxy target failed in a manner such that no Response-PDU could be returned.

NTP Statistics

Alteon OS uses NTP (Network Timing Protocol) version 3 to synchronize the switch's internal clock with an atomic time calibrated NTP server. With NTP enabled, the switch can accurately update its internal clock to be consistent with other devices on the network and generates accurate syslogs.

The following command displays NTP statistics:

show ntp counters

Command mode: All

```
NTP statistics:
        Primary Server:
                Requests Sent:                17
                Responses Received:           17
                Updates:                      1
        Secondary Server:
                Requests Sent:                0
                Responses Received:           0
                Updates:                      0
        Last update based on response from primary server.
        Last update time: 18:04:16 Tue Jul 13, 2004
        Current system time: 18:55:49 Tue Jul 13, 2004
```

Table 3-31 NTP Statistics

Field	Description
`Primary Server`	**Requests Sent:** The total number of NTP requests the switch sent to the primary NTP server to synchronize time. **Responses Received:** The total number of NTP responses received from the primary NTP server. **Updates:** The total number of times the switch updated its time based on the NTP responses received from the primary NTP server.
Secondary Server	**Requests Sent:** The total number of NTP requests the switch sent to the secondary NTP server to synchronize time. **Responses Received:** The total number of NTP responses received from the secondary NTP server. **Updates:** The total number of times the switch updated its time based on the NTP responses received from the secondary NTP server.
Last update based on response from primary server	Last update of time on the switch based on either primary or secondary NTP response received.
Last update time	The time stamp showing the time when the switch was last updated.
Current system time	The switch system time when the following command was issued: **`show ntp counters`**

Statistics Dump

The following command dumps switch statistics:

`show counters`

Use the dump command to dump all switch statistics (40K or more, depending on your configuration). This data can be used to tune or debug switch performance.

If you want to capture dump data to a file, set your communication software on your workstation to capture session data prior to issuing the dump command.

CHAPTER 4
Configuration Commands

This chapter discusses how to use the Command Line Interface (CLI) for making, viewing, and saving switch configuration changes. Many of the commands, although not new, display more or different information than in the previous version. Important differences are called out in the text.

Table 4-1 General Configuration Commands

Command Syntax and Usage
`show running-config` Dumps current configuration to a script file. **Command mode:** All For details, see page 255.
`copy running-config {ftp|tftp}` Backs up current configuration to FTP or TFTP server. **Command mode:** All For details, see page 256.
`copy {ftp|tftp} running-config` Restores current configuration from a FTP or TFTP server. **Command mode:** All For details, see page 256.

Viewing and Saving Changes

As you use the configuration commands to set switch parameters, the changes you make take effect immediately. You do not need to apply them. Configuration changes are lost the next time the switch boots, unless you save the changes.

NOTE – Some operations can override the settings of the Configuration commands. Therefore, settings you view using the Configuration commands (for example, port status) might differ from run-time information that you view using the Information commands or the management module. The Information commands display current run-time information of switch parameters.

Saving the Configuration

You must save configuration settings to flash memory, so the GbESM reloads the settings after a reset.

NOTE – If you do not save the changes, they will be lost the next time the system is rebooted.

To save the new configuration, enter the following command:

```
Router# copy running-config startup-config
```

When you save configuration changes, the changes are saved to the *active* configuration block. For instructions on selecting the configuration to run at the next system reset, see “Selecting a Configuration Block” on page 268.

System Configuration

These commands provide configuration of switch management parameters such as user and administrator privilege mode passwords, Web-based management settings, and management access lists.

Table 4-2 System Configuration Commands

Command Syntax and Usage
`system date` *<yyyy> <mm> <dd>* Prompts the user for the system date. The date reverts to its default value when the switch is reset. **Command mode:** Global configuration
`system time` *<hh>:<mm>:<ss>* Configures the system time using a 24-hour clock format. The time reverts to its default value when the switch is reset. **Command mode:** Global configuration
`system timezone` Configures the time zone where the switch resides. You are prompted to select your location (continent, country, region) by the timezone wizard. Once a region is selected, the switch updates the time to reflect local changes to Daylight Savings Time, etc. **Command mode:** Global configuration
`system timezone` *<hh:mm>* Prompts for the NTP time zone offset, in hours and minutes, of the switch you are synchronizing from Greenwich Mean Time (GMT). The offset format is `hh:mm` (hours:minutes). **Command mode:** Global configuration
`[no] system daylight` Disables or enables daylight savings time in the system clock. When enabled, the switch will add an extra hour to the system clock so that it is consistent with the local clock. By default, this option is disabled. **Command mode:** Global configuration
`system idle` *<1-60>* Sets the idle timeout for CLI sessions, from 1 to 60 minutes. The default is 5 minutes. **Command mode:** Global configuration
`system notice` *<1-1024 characters multi-line ('-' to end)>* Displays login notice immediately before the "Enter password:" prompt. This notice can contain up to 1024 characters and new lines. **Command mode:** Global configuration

Table 4-2 System Configuration Commands

Command Syntax and Usage
[no] banner *<1-80 characters>* Configures a login banner of up to 80 characters. When a user or administrator logs into the switch, the login banner is displayed. It is also displayed as part of the output from the **show sys-info** command. **Command mode:** Global configuration
[no] hostname *<string>* Enables or disables displaying of the host name (system administrator's name) in the Command Line Interface (CLI). **Command mode:** Global configuration
show system Displays the current system parameters. **Command mode:** All

System Host Log Configuration

Table 4-3 Host Log Configuration Commands

Command Syntax and Usage
[no] logging host {*<1-2>***} address {***<IP address>***}** Sets the IP address of the first or second syslog host. **Command mode:** Global configuration
logging host {*<1-2>***} severity {***<0-7>***}** This option sets the severity level of the first or second syslog host displayed. The default is 7, which means log all severity levels. **Command mode:** Global configuration
logging host {*<1-2>***} facility {***<0-7>***}** This option sets the facility level of the first or second syslog host displayed. The default is 0. **Command mode:** Global configuration
logging console Enables delivering syslog messages to the console. It is enabled by default. **Command mode:** Global configuration
no logging console Disables delivering syslog messages to the console. When necessary, disabling `console` ensures the switch is not affected by syslog messages. It is enabled by default. **Command mode:** Global configuration

Table 4-3 Host Log Configuration Commands

Command Syntax and Usage
`[no] logging log {`<*feature*>**`}`** Displays a list of features for which syslog messages can be generated. You can choose to enable/disable specific features (such as vlans, stg, or servers), or enable/disable syslog on all available features. **Command mode:** Global configuration
`show logging` Displays the current syslog settings. **Command mode:** All

SSH Server Configuration

For the GbE Switch Module, these commands enable Secure Shell access from any SSH client.

Table 4-4 SSH Server Configuration Commands

Command Syntax and Usage
ssh interval *<0-24>* Set the interval for auto-generation of the RSA server key. **Command mode:** Global configuration
ssh scp-password Set the administration password for SCP access. **Command mode:** Global configuration
ssh generate-host-key Generate the RSA host key. **Command mode:** Global configuration
ssh generate-server-key Generate the RSA server key. **Command mode:** Global configuration
ssh port *<TCP port number>* Sets the SSH server port number. **Command mode:** Global configuration
ssh scp-enable Enables the SCP apply and save. **Command mode:** Global configuration
no ssh scp-enable Disables the SCP apply and save. **Command mode:** Global configuration
ssh enable Enables the SSH server. **Command mode:** Global configuration
no ssh enable Disables the SSH server. **Command mode:** Global configuration
show ssh Displays the current SSH server configuration. **Command mode:** All

RADIUS Server Configuration

Table 4-5 RADIUS Configuration Commands

Command Syntax and Usage
`[no] radius-server primary-host` *<IP address>* Sets the primary or secondary RADIUS server address. **Command mode:** Global configuration
`[no] radius-server secondary-host` *<IP address>* Sets the secondary RADIUS server address. **Command mode:** Global configuration
`radius-server primary-host {`*<IP address>***`} key`** *<1-32 characters>* This is the primary shared secret between the switch and the RADIUS server(s). **Command mode:** Global configuration
`radius-server secondary-host {`*<IP address>***`} key`** *<1-32 characters>* This is the secondary shared secret between the switch and the RADIUS server(s). **Command mode:** Global configuration
`[default] radius-server port [`*<UDP port number>***`]`** Enter the number of the UDP port to be configured, between 1500 - 3000. The default is 1645. **Command mode:** Global configuration
`radius-server retransmit` *<1-3>* Sets the number of failed authentication requests before switching to a different RADIUS server. The default is 3 requests. **Command mode:** Global configuration
`radius-server timeout` *<1-10>* Sets the amount of time, in seconds, before a RADIUS server authentication attempt is considered to have failed. The default is 3 seconds. **Command mode:** Global configuration
`[no] radius-server telnet-backdoor` Enables or disables the RADIUS backdoor for telnet. The `telnet` command also applies to SSH/SCP connections and the Browser-Based Interface (BBI). The default is `disabled`. To obtain the RADIUS backdoor password for your GbESM, contact your IBM Service and Support line. **Command mode:** Global configuration
`radius-server enable` Enables the RADIUS server. **Command mode:** Global configuration

Table 4-5 RADIUS Configuration Commands

Command Syntax and Usage
`no radius-server enable` Disables the RADIUS server. **Command mode:** Global configuration
`show radius-server` Displays the current RADIUS server parameters. **Command mode:** All

TACACS+ Server Configuration

TACACS (Terminal Access Controller Access Control system) is an authentication protocol that allows a remote access server to forward a user's logon password to an authentication server to determine whether access can be allowed to a given system. TACACS is an encryption protocol, and therefore less secure than TACACS+ and Remote Authentication Dial-In User Service (RADIUS) protocols. (Both TACACS and TACACS+ are described in RFC 1492.)

TACACS+ protocol is more reliable than RADIUS, as TACACS+ uses the Transmission Control Protocol (TCP) whereas RADIUS uses the User Datagram Protocol (UDP). Also, RADIUS combines authentication and authorization in a user profile, whereas TACACS+ separates the two operations.

TACACS+ offers the following advantages over RADIUS as the authentication device:

- TACACS+ is TCP-based, so it facilitates connection-oriented traffic.
- It supports full-packet encryption, as opposed to password-only in authentication requests.
- It supports de-coupled authentication, authorization, and accounting.

Table 4-6 TACACS+ Server Commands

Command Syntax and Usage
`[no] tacacs-server host` *<IP address>* Defines the primary or secondary TACACS+ server address. **Command mode:** Global configuration
`[no] tacacs-server host` *<IP address>* **`key`** *<1-32 characters>* This is the primary or secondary shared secret between the switch and the TACACS+ server(s). **Command mode:** Global configuration

Table 4-6 TACACS+ Server Commands

Command Syntax and Usage
`[default] tacacs-server port [`*<TCP port number>***`]`** Enter the number of the TCP port to be configured, between 1 - 65000. The default is 49. **Command mode:** Global configuration
`tacacs-server retransmit` *<1-3>* Sets the number of failed authentication requests before switching to a different TACACS+ server. The default is 3 requests. **Command mode:** Global configuration
`tacacs-server timeout` *<4-15>* Sets the amount of time, in seconds, before a TACACS+ server authentication attempt is considered to have failed. The default is 5 seconds. **Command mode:** Global configuration
`[no] tacacs-server backdoor` Enables or disables the TACACS+ back door for Telnet, SSH/SCP, or HTTP/HTTPS. Enabling this feature allows you to bypass the TACACS+ servers. It is recommended that you use Secure Backdoor to ensure the switch is secured, because Secure Backdoor disallows access through the back door when the TACACS+ servers are responding. The default is `disabled`. To obtain the TACACS+ backdoor password for your GbESM, contact your IBM Service and Support line. **Command mode:** Global configuration
`[no] tacacs-server secure-backdoor` Enables or disables TACACS+ secure back door access through Telnet, SSH/SCP, or HTTP/HTTPS only when the TACACS+ servers are not responding. This feature is recommended to permit access to the switch when the TACACS+ servers become unresponsive. If no back door is enabled, the only way to gain access when TACACS+ servers are unresponsive is to use the back door via the console port. The default is `disabled`. **Command mode:** Global configuration
`[no] tacacs-server privilege-mapping` Enables or disables TACACS+ privilege-level mapping. The default value is `disabled`. **Command mode:** Global configuration
`[no] tacacs-server password-change` Enables or disables TACACS+ password change. The default value is `disabled`. **Command mode:** Global configuration

Table 4-6 TACACS+ Server Commands

Command Syntax and Usage
primary-password Configures the password for the primary TACACS+ server. The CLI will prompt you for input. **Command mode:** Global configuration
secondary-password Configures the password for the secondary TACACS+ server. The CLI will prompt you for input. **Command mode:** Global configuration
[no] tacacs-server command-authorization Enables or disables TACACS+ command authorization. **Command mode:** Global configuration
[no] tacacs-server command-logging Enables or disables TACACS+ command logging. **Command mode:** Global configuration
tacacs-server enable Enables the TACACS+ server. **Command mode:** Global configuration
no tacacs-server enable Disables the TACACS+ server. This is the default setting. **Command mode:** Global configuration
show tacacs-server Displays current TACACS+ configuration parameters. **Command mode:** All

LDAP Server Configuration

LDAP (Lightweight Directory Access Protocol) is an authentication protocol that allows a remote access server to forward a user's logon password to an authentication server to determine whether access can be allowed to a given system.

Table 4-7 LDAP Configuration commands

Command Syntax and Usage
`[no] ldap-server host` *<IP address>* Sets the primary or secondary LDAP server address. **Command mode:** Global configuration
`[default] ldap-server port [`*<UDP port number>***`]`** Enter the number of the UDP port to be configured, between 1-65000. The default is 389. **Command mode:** Global configuration
`ldap-server retransmit` *<1-3>* Sets the number of failed authentication requests before switching to a different LDAP server. The default is 3 requests. **Command mode:** Global configuration
`ldap-server timeout` *<4-15>* Sets the amount of time, in seconds, before a LDAP server authentication attempt is considered to have failed. The default is 5 seconds. **Command mode:** Global configuration
`ldap-server domain [`*<1-128 characters>***`|none]`** Sets the domain name for the LDAP server. Enter the full path for your organization. For example: `ou=people,dc=mydomain,dc=com` **Command mode:** Global configuration
`[no] ldap-server telnet-backdoor` Enables or disables the LDAP backdoor for telnet. The `telnet` command also applies to SSH/SCP connections and the Browser-Based Interface (BBI). The default is `disabled`. To obtain the LDAP backdoor password for your GbESM, contact your IBM Service and Support line. **Command mode:** Global configuration
`ldap-server enable` Enables the LDAP server. **Command mode:** Global configuration
`no ldap-server enable` Disables the LDAP server. **Command mode:** Global configuration

Table 4-7 LDAP Configuration commands

Command Syntax and Usage
`show ldap-server` Displays the current LDAP server parameters. **Command mode:** All

NTP Server Configuration

These commands enable you to synchronize the switch clock to a Network Time Protocol (NTP) server. By default, this option is disabled.

Table 4-8 NTP Configuration Commands

Command Syntax and Usage
`[no] ntp primary-server` *<IP address>* Prompts for the IP addresses of the primary NTP server to which you want to synchronize the switch clock. **Command mode:** Global configuration
`[no] ntp secondary-server` *<IP address>* Prompts for the IP addresses of the secondary NTP server to which you want to synchronize the switch clock. **Command mode:** Global configuration
`ntp interval` *<1-44640>* Specifies the interval, that is, how often, in minutes (1-2880), to re-synchronize the switch clock with the NTP server. **Command mode:** Global configuration
`ntp enable` Enables the NTP synchronization service. **Command mode:** Global configuration
`no ntp enable` Disables the NTP synchronization service. **Command mode:** Global configuration
`show ntp` Displays the current NTP service settings. **Command mode:** All

System SNMP Configuration

Alteon OS supports SNMP-based network management. In SNMP model of network management, a management station (client/manager) accesses a set of variables known as MIBs (Management Information Base) provided by the managed device (agent). If you are running an SNMP network management station on your network, you can manage the switch using the following standard SNMP MIBs:

- MIB II (RFC 1213)
- Ethernet MIB (RFC 1643)
- Bridge MIB (RFC 1493)

An SNMP agent is a software process on the managed device that listens on UDP port 161 for SNMP messages. Each SNMP message sent to the agent contains a list of management objects to retrieve or to modify.

SNMP parameters that can be modified include:

- System name
- System location
- System contact
- Use of the SNMP system authentication trap function
- Read community string
- Write community string
- Trap community strings

Table 4-9 System SNMP Commands

Command Syntax and Usage
`snmp-server name` *<1-64 characters>* Configures the name for the system. The name can have a maximum of 64 characters. **Command mode:** Global configuration
`snmp-server location` *<1-64 characters>* Configures the name of the system location. The location can have a maximum of 64 characters. **Command mode:** Global configuration
`snmp-server contact` *<1-64 characters>* Configures the name of the system contact. The contact can have a maximum of 64 characters. **Command mode:** Global configuration

Table 4-9 System SNMP Commands

Command Syntax and Usage
`snmp-server read-community` *<1-32 characters>* Configures the SNMP read community string. The read community string controls SNMP "get" access to the switch. It can have a maximum of 32 characters. The default read community string is *public*. **Command mode:** Global configuration
`snmp-server write-community` *<1-32 characters>* Configures the SNMP write community string. The write community string controls SNMP "set" and "get" access to the switch. It can have a maximum of 32 characters. The default write community string is *private*. **Command mode:** Global configuration
`snmp-server timeout` *<1-30>* Sets the timeout value for the SNMP state machine, in minutes. **Command mode:** Global configuration
`[no] snmp-server authentication-trap` Enables or disables the use of the system authentication trap facility. The default setting is disabled. **Command mode:** Global configuration
`[no] snmp-server link-trap` Enables or disables the sending of SNMP link up and link down traps. The default setting is enabled. **Command mode:** Global configuration
`snmp-server trap-src-if` *<1-128>* Configures the source interface for SNMP traps. **Command mode:** Global configuration
`show snmp-server` Displays the current SNMP configuration. **Command mode:** All

SNMPv3 Configuration

SNMP version 3 (SNMPv3) is an extensible SNMP Framework that supplements the SNMPv2 Framework by supporting the following:

- a new SNMP message format
- security for messages
- access control
- remote configuration of SNMP parameters

For more details on the SNMPv3 architecture please refer to RFC2271 to RFC2276.

Table 4-10 SNMPv3 Configuration Commands

Command Syntax and Usage
snmp-server user *<1-16>* This command allows you to create a user security model (USM) entry for an authorized user. You can also configure this entry through SNMP. **Command mode:** Global configuration To view command options, see page 151.
snmp-server view *<1-128>* This command allows you to create different MIB views. **Command mode:** Global configuration To view command options, see page 152.
snmp-server access *<1-32>* This command allows you to specify access rights. The View-based Access Control Model defines a set of services that an application can use for checking access rights of the user. You need access control when you have to process retrieval or modification request from an SNMP entity. **Command mode:** Global configuration To view command options, see page 153.
snmp-server group *<1-16>* A group maps the user name to the access group names and their access rights needed to access SNMP management objects. A group defines the access rights assigned to all names that belong to a particular group. **Command mode:** Global configuration To view command options, see page 154.

Table 4-10 SNMPv3 Configuration Commands

`snmp-server community` *<1-16>* The community table contains objects for mapping community strings and version-independent SNMP message parameters. **Command mode:** Global configuration To view command options, see page 154.
`snmp-server target-address` *<1-16>* This command allows you to configure destination information, consisting of a transport domain and a transport address. This is also termed as transport endpoint. The SNMP MIB provides a mechanism for performing source address validation on incoming requests, and for selecting community strings based on target addresses for outgoing notifications. **Command mode:** Global configuration To view command options, see page 155.
`snmp-server target-parameters` *<1-16>* This command allows you to configure SNMP parameters, consisting of message processing model, security model, security level, and security name information. There may be multiple transport endpoints associated with a particular set of SNMP parameters, or a particular transport endpoint may be associated with several sets of SNMP parameters. **Command mode:** Global configuration To view command options, see page 156.
`snmp-server notify` *<1-16>* A notification application typically monitors a system for particular events or conditions, and generates Notification-Class messages based on these events or conditions. **Command mode:** Global configuration To view command options, see page 158.
`snmp-server version {v1v2v3|v3only}` This command allows you to enable or disable the access to SNMP versions 1, 2 or 3. This command is enabled by default. **Command mode:** Global configuration
`show snmp-server v3` Displays the current SNMPv3 configuration. **Command mode:** All

User Security Model Configuration

You can make use of a defined set of user identities using this Security Model. An SNMP engine must have the knowledge of applicable attributes of a user.

These commands help you create a user security model entry for an authorized user. You need to provide a security name to create the USM entry.

Table 4-11 User Security Model Configuration Commands

Command Syntax and Usage
snmp-server user *<1-16>* **name** *<1-32 characters>* This command allows you to configure a string that represents the name of the user. This is the login name that you need in order to access the switch. **Command mode:** Global configuration
snmp-server user {*<1-16>***}** **authentication-protocol {md5|sha|none}** **authentication-password** *<password value>* This command allows you to configure the authentication protocol and password. The authentication protocol can be HMAC-MD5-96 or HMAC-SHA-96, or none. The default algorithm is none. When you configure an authentication algorithm, you must provide a password, otherwise you will get an error message during validation. This command allows you to create or change your password for authentication. **Command mode:** Global configuration
snmp-server user {*<1-16>***} privacy-protocol {des|none}** **privacy-password** *<password value>* This command allows you to configure the type of privacy protocol and the privacy password. The privacy protocol protects messages from disclosure. The options are des (CBC-DES Symmetric Encryption Protocol) or none. If you specify des as the privacy protocol, then make sure that you have selected one of the authentication protocols (MD5 or HMAC-SHA-96). If you select none as the authentication protocol, you will get an error message. You can create or change the privacy password. **Command mode:** Global configuration
no snmp-server user *<1-16>* Deletes the USM user entries. **Command mode:** Global configuration
show snmp-server v3 user *<1-16>* Displays the USM user entries. **Command mode:** All

SNMPv3 View Configuration

Table 4-12 SNMPv3 View Configuration Commands

Command Syntax and Usage
snmp-server view {*<1-128>***} name** *<1-32 characters>* This command defines the name for a family of view subtrees. **Command mode:** Global configuration
snmp-server view {*<1-128>***} tree** *<1-32 characters>* This command defines MIB tree, which when combined with the corresponding mask defines a family of view subtrees. **Command mode:** Global configuration
snmp-server view {*<1-128>***} mask** *<1-32 characters>* This command defines the bit mask, which in combination with the corresponding tree defines a family of view subtrees. **Command mode:** Global configuration
snmp-server view {*<1-128>***} type {included|excluded}** This command indicates whether the corresponding instances of `vacmViewTreeFamilySubtree` and `vacmViewTreeFamilyMask` define a family of view subtrees, which is included in or excluded from the MIB view. **Command mode:** Global configuration
no snmp-server view *<1-128>* Deletes the `vacmViewTreeFamily` group entry. **Command mode:** Global configuration
show snmp-server v3 view *<1-128>* Displays the current `vacmViewTreeFamily` configuration. **Command mode:** All

View-based Access Control Model Configuration

The view-based Access Control Model defines a set of services that an application can use for checking access rights of the user. Access control is needed when the user has to process SNMP retrieval or modification request from an SNMP entity.

Table 4-13 View-based Access Control Model Commands

Command Syntax and Usage
snmp-server access {*<1-32>***} name** *<1-32 characters>* Defines the name of the group. **Command mode:** Global configuration
snmp-server access {*<1-32>***} security {usm|snmpv1|snmpv2}** Allows you to select the security model to be used. **Command mode:** Global configuration
snmp-server access {*<1-32>***} level {noAuthNoPriv|authNoPriv|authPriv}** Defines the minimum level of security required to gain access rights. The level `noAuthNoPriv` means that the SNMP message will be sent without authentication and without using a privacy protocol. The level `authNoPriv` means that the SNMP message will be sent with authentication but without using a privacy protocol. The `authPriv` means that the SNMP message will be sent both with authentication and using a privacy protocol. **Command mode:** Global configuration
snmp-server access {*<1-32>***} read-view** *<1-32 characters>* Defines a read view name that allows you read access to a particular MIB view. If the value is empty or if there is no active MIB view having this value then no access is granted. **Command mode:** Global configuration
snmp-server access {*<1-32>***} write-view** *<1-32 characters>* Defines a write view name that allows you write access to the MIB view. If the value is empty or if there is no active MIB view having this value then no access is granted. **Command mode:** Global configuration
snmp-server access {*<1-32>***} notify-view** *<1-32 characters>* Defines a notify view name that allows you notify access to the MIB view. **Command mode:** Global configuration
no snmp-server access {*<1-32>***}** Deletes the View-based Access Control entry. **Command mode:** Global configuration
show snmp-server v3 access {*<1-32>***}** Displays the View-based Access Control configuration. **Command mode:** All

SNMPv3 Group Configuration

Table 4-14 SNMPv3 Group Configuration Commands

Command Syntax and Usage
snmp-server group {*<1-16>***} security {usm|snmpv1|snmpv2}** Defines the security model. **Command mode:** Global configuration
snmp-server group {*<1-16>***} user-name** *<1-32 characters>* Sets the user name as defined in the following command: `snmp-server user <1-16> name` *<1-32 characters>* on page 151. **Command mode:** Global configuration
snmp-server group {*<1-16>***} group-name** *<1-32 characters>* The name for the access group. **Command mode:** Global configuration
no snmp-server group {*<1-16>***}** Deletes the `vacmSecurityToGroup` entry. **Command mode:** Global configuration
show snmp-server v3 group {*<1-16>***}** Displays the current `vacmSecurityToGroup` configuration. **Command mode:** All

SNMPv3 Community Table Configuration

These commands are used for configuring the community table entry. The configured entry is stored in the community table list in the SNMP engine. This table is used to configure community strings in the Local Configuration Datastore (LCD) of SNMP engine.

Table 4-15 SNMPv3 Community Table Configuration Commands

Command Syntax and Usage
snmp-server community {*<1-16>***} index** *<1-32 characters>* Allows you to configure the unique index value of a row in this table. **Command string:** Global configuration
snmp-server community {*<1-16>***} name** *<1-32 characters>* Defines a readable string that represents the corresponding value of an SNMP community name in a security model. **Command string:** Global configuration

Table 4-15 SNMPv3 Community Table Configuration Commands

Command Syntax and Usage
snmp-server community {*<1-16>***} user-name** *<1-32 characters>* Defines the user name as defined in the following command: **snmp-server user {***<1-16>***} name** *<1-32 characters>* **Command mode:** Global configuration
snmp-server community {*<1-16>***} tag** *<1-255 characters>* Allows you to configure a tag. This tag specifies a set of transport endpoints to which a command responder application sends an SNMP trap. **Command mode:** Global configuration
no snmp-server community {*<1-16>***}** Deletes the community table entry. **Command mode:** Global configuration
show snmp-server v3 community {*<1-16>***}** Displays the community table configuration. **Command mode:** All

SNMPv3 Target Address Table Configuration

These commands are used to configure the target transport entry. The configured entry is stored in the target address table list in the SNMP engine. This table of transport addresses is used in the generation of SNMP messages.

Table 4-16 Target Address Table Configuration Commands

Command Syntax and Usage
snmp-server target-address {*<1-16>***} address {***<IP address>***} name** *<1-32 characters>* Allows you to configure the locally arbitrary, but unique identifier, target address name associated with this entry. **Command mode:** Global configuration
snmp-server target-address {*<1-16>***} name {***<1-32 characters>***} address** *<transport IP address>* Allows you to configure a transport address IP that can be used in the generation of SNMP traps. **Command mode:** Global configuration
snmp-server target-address {*<1-16>***} port** *<port number>* Allows you to configure a transport address port that can be used in the generation of SNMP traps. **Command mode:** Global configuration

Table 4-16 Target Address Table Configuration Commands

Command Syntax and Usage
snmp-server target-address {<*1-16*>**} taglist** <*1-255 characters*> Allows you to configure a list of tags that are used to select target addresses for a particular operation. **Command mode:** Global configuration
snmp-server target-address {<*1-16*>**} parameters-name** <*1-32 characters*> Defines the name as defined in the following command: `snmp-server target-parameters {`<*1-16*>`} name` <*1-32 characters*> on page 156. **Command mode:** Global configuration
no snmp-server target-address {<*1-16*>**}** Deletes the Target Address Table entry. **Command mode:** Global configuration
show snmp-server v3 target-address {<*1-16*>**}** Displays the current Target Address Table configuration. **Command mode:** All

SNMPv3 Target Parameters Table Configuration

You can configure the target parameters entry and store it in the target parameters table in the SNMP engine. This table contains parameters that are used to generate a message. The parameters include the message processing model (for example: SNMPv3, SNMPv2c, SNMPv1), the security model (for example: USM), the security name, and the security level (`noAuthnoPriv`, `authNoPriv`, or `authPriv`).

Table 4-17 Target Parameters Table Configuration Commands

Command Syntax and Usage
snmp-server target-parameters {<*1-16*>**} name** <*1-32 characters*> Allows you to configure the locally arbitrary, but unique, identifier that is associated with this entry. **Command mode:** Global configuration
snmp-server target-parameters {<*1-16*>**} message {snmpv1|snmpv2c|snmpv3}** Allows you to configure the message processing model that is used to generate SNMP messages. **Command mode:** Global configuration
snmp-server target-parameters {<*1-16*>**} security {usm|snmpv1|snmpv2}** Allows you to select the security model to be used when generating the SNMP messages. **Command mode:** Global configuration

Table 4-17 Target Parameters Table Configuration Commands

Command Syntax and Usage
`snmp-server target-parameters {`*<1-16>***`} user-name`** *<1-32 characters>* Defines the name that identifies the user in the USM table (page 151) on whose behalf the SNMP messages are generated using this entry. **Command mode:** Global configuration
`snmp-server target-parameters {`*<1-16>***`} level {noAuthNoPriv|authNo-Priv|authPriv}`** Allows you to select the level of security to be used when generating the SNMP messages using this entry. The level `noAuthNoPriv` means that the SNMP message will be sent without authentication and without using a privacy protocol. The level `authNoPriv` means that the SNMP message will be sent with authentication but without using a privacy protocol. The `authPriv` means that the SNMP message will be sent both with authentication and using a privacy protocol. **Command mode:** Global configuration
`no snmp-server target-parameters {`*<1-16>***`}`** Deletes the `targetParamsTable` entry. **Command mode:** Global configuration
`show snmp-server v3 target-parameters {`*<1-16>***`}`** Displays the current `targetParamsTable` configuration. Command mode: All

SNMPv3 Notify Table Configuration

SNMPv3 uses Notification Originator to send out traps. A notification typically monitors a system for particular events or conditions, and generates Notification-Class messages based on these events or conditions.

Table 4-18 Notify Table Commands

Command Syntax and Usage
snmp-server notify {<*1-16*>**} name** <*1-32 characters*> Defines a locally arbitrary, but unique, identifier associated with this SNMP notify entry. **Command mode:** Global configuration
snmp-server notify {<*1-16*>**} tag** <*1-255 characters*> Allows you to configure a tag that contains a tag value which is used to select entries in the Target Address Table. Any entry in the `snmpTargetAddrTable`, that matches the value of this tag, is selected. **Command mode:** Global configuration
no snmp-server notify {<*1-16*>**}** Deletes the notify table entry. **Command mode:** Global configuration
show snmp-server v3 notify {<*1-16*>**}** Displays the current notify table configuration. **Command mode:** All

System Access Configuration

Table 4-19 System Access Configuration Commands

Command Syntax and Usage

access user administrator-password
access user operator-password
access user user-password

Allows you to change the password. You must enter the current password in use for validation.

Command Mode: Global configuration

[no] access http enable

Enables or disables HTTP (Web) access to the Browser-Based Interface. It is enabled by default.

Command mode: Global configuration

[default] access http port [<*port number*>**]**

Sets the switch port used for serving switch Web content. The default is HTTP port 80.

Command mode: Global configuration

[no] access snmp {read-only|read-write}

Disables or provides read-only/write-read SNMP access.

Command mode: Global configuration

[no] access userbbi

Enables or disables user configuration access through the Browser-Based Interface (BBI).

Command mode: Global configuration

[no] access telnet enable

Enables or disables Telnet access. This command is enabled by default.

Command mode: Global configuration

[default] access telnet port [<*1-65535*>**]**

Sets an optional Telnet server port number for cases where the server listens for Telnet sessions on a non-standard port.

Command mode: Global configuration

[default] access tftp-port [<*1-65535*>**]**

Sets the TFTP port for the switch. The default is port 69.

Command mode: Global configuration

show access

Displays the current system access parameters.

Command mode: All

Management Network Configuration

These commands are used to define IP address ranges which are allowed to access the switch for management purposes.

Table 4-20 Management Network Configuration Commands

Command Syntax and Usage
access management-network *<IP address> <IP mask>* Adds a defined network through which switch access is allowed through Telnet, SNMP, RIP, or the Alteon OS browser-based interface. A range of IP addresses is produced when used with a network mask address. Specify an IP address and mask address in dotted-decimal notation. **Command mode:** Global configuration
no access management-network *<IP address> <IP mask>* Removes a defined network, which consists of a management network address and a management network mask address. **Command mode:** Global configuration
show access management-network Displays the current configuration. **Command mode:** All except User EXEC
clear access management-network *<IP address> <IP mask>* Removes a defined network, which consists of a management network address and a management network mask address. **Command mode:** Global configuration

User Access Control Configuration

The following table describes user-access control commands.

NOTE – User passwords can be a maximum of 15 characters.

Table 4-21 User Access Control Configuration Commands

Command Syntax and Usage
access user *<1-10>* Configures the User ID. **Command mode:** Global configuration
access user eject *<user name>* Ejects the specified user from the GbESM. **Command mode:** Global configuration
access user user-password *<1-15 characters>* Sets the user (`user`) password. The user has no direct responsibility for switch management. He or she can view switch status information and statistics, but cannot make any configuration changes. **Command mode:** Global configuration
access user operator-password *<1-15 characters>* Sets the operator (`oper`) password. The operator password can have a maximum of 15 characters. The operator has no direct responsibility for switch management. He or she can view switch status information and statistics, but cannot make any configuration changes. **Command mode:** Global configuration
access user administrator-password *<character string>* Sets the administrator (`admin`) password. The super user administrator has complete access to all information and configuration commands on the GbE Switch Module, including the ability to change both the user and administrator passwords. Access includes "`oper`" functions. **Command mode:** Global configuration
show access user Displays the current user status. **Command mode:** All except User EXEC

System User ID Configuration

Table 4-22 User ID Configuration Commands

Command Syntax and Usage
access user {*<1-10>***} level {user|operator|administrator}** Sets the Class-of-Service to define the user's authority level. Alteon OS defines these levels as: User, Operator, and Administrator, with User being the most restricted level. **Command mode:** Global configuration
access user {*<1-10>***} name** *<1-8 characters>* Defines the user name of maximum eight characters. **Command mode:** Global configuration
access user {*<1-10>***} password** Sets the user password of up to 15 characters maximum. **Command mode:** Global configuration
access user {*<1-10>***} enable** Enables the user ID. **Command mode:** Global configuration
no access user {*<1-10>***} enable** Disables the user ID. **Command mode:** Global configuration
no access user {*<1-10>***}** Deletes the user ID. **Command mode:** Global configuration
show access user Displays the current user ID configuration. **Command mode:** All except User EXEC

Strong Password Configuration

Table 4-23 Strong Password Configuration Commands

Command Syntax and Usage
access user strong-password enable Enables Strong Password requirement. **Command mode:** Global configuration
no access user strong-password enable Disables Strong Password requirement. **Command mode:** Global configuration
access user strong-password expiry *<1-365>* Configures the number of days allowed before the password must be changed. **Command mode:** Global configuration
access user strong-password warning *<1-365>* Configures the number of days before password expiration, that a warning is issued to users. **Command mode:** Global configuration
access user strong-password faillog *<1-255>* Configures the number of failed login attempts allowed before a security notification is logged. **Command mode:** Global configuration
show access user strong-password Displays the current Strong Password configuration. **Command mode:** All except User EXEC

HTTPS Access Configuration

Table 4-24 HTTPS Access Configuration Commands

Command Syntax and Usage
`[no] access https enable` Enables or disables BBI access (Web access) using HTTPS. **Command mode:** Global configuration
`[default] access https port [`*<TCP port number>***`]`** Defines the HTTPS Web server port number. **Command mode:** Global configuration
`access https generate-certificate` Allows you to generate a certificate to connect to the SSL to be used during the key exchange. A default certificate is created when HTTPS is enabled for the first time. The user can create a new certificate defining the information that they want to be used in the various fields. For example: ■ Country Name (2 letter code) [ ]: CA ■ State or Province Name (full name) []: Ontario ■ Locality Name (for example, city) []: Ottawa ■ Organization Name (for example, company) []: Blade ■ Organizational Unit Name (for example, section) []: Alteon ■ Common Name (for example, user's name) []: Mr Smith ■ Email (for example, email address) []: info@bladenetworks.net You will be asked to confirm if you want to generate the certificate. It will take approximately 30 seconds to generate the certificate. Then the switch will restart SSL agent. **Command mode:** Global configuration
`access https save-certificate` Allows the client, or the Web browser, to accept the certificate and save the certificate to Flash to be used when the switch is rebooted. **Command mode:** Global configuration
`show access` Displays the current SSL Web Access configuration. **Command mode:** All except User EXEC

Port Configuration

These commands enable you to configure settings for individual switch ports (except MGT). This command is enabled by default.

Table 4-25 Port Configuration Commands

Command Syntax and Usage
`interface port` *<port alias or number>* Enter Interface port mode. **Command mode:** Global configuration
`dot1p` *<0-7>* Configures the port's 802.1p priority level. **Command mode:** Interface port
`pvid` *<1-4095>* Sets the default VLAN number which will be used to forward frames which are not VLAN tagged. The default number is 1 for non-management ports. **Command mode:** Interface port
`name` *<1-64 characters>* Sets a name for the port. The assigned port name appears next to the port number on some information and statistics screens. The default is set to None. **Command mode:** Interface port
`[no] dscp-marking` Enables or disables DSCP re-marking on a port. **Command mode:** Interface port
`[no] learning` Enables or disables FDB learning on a port. **Command mode:** Interface port
`[no] tagging` Disables or enables VLAN tagging for this port. It is disabled by default. **Command mode:** Interface port
`[no] tag-pvid` Disables or enables VLAN tag persistence. When disabled, the VLAN tag is removed from packets whose VLAN tag matches the port PVID. The default value is disabled for INT and EXT ports, and enabled for the MGT port. **Command mode:** Interface port

Table 4-25 Port Configuration Commands

Command Syntax and Usage
`[no] fastforward` Disables or enables Port Fast Forwarding, which permits a port that participates in Spanning Tree to bypass the Listening and Learning states and enter directly into the Forwarding state. While in the Forwarding state, the port listens to the BPDUs to learn if there is a loop and, if dictated by normal STG behavior (following priorities, etc.), the port transitions into the Blocking state. This feature permits the GbESM to interoperate well within Rapid Spanning Tree networks. **Command mode:** Interface port
`[no] flood-blocking` Enables or disables port Flood Blocking. When enabled, unicast and multicast packets with unknown destination MAC addresses are blocked from the port. **Command mode:** Interface port
`no shutdown` Enables the port. **Command mode:** Interface port
`shutdown` Disables the port. (To temporarily disable a port without changing its configuration attributes, refer to "Temporarily Disabling a Port" on page 168.) **Command mode:** Interface port
`show interface port` *<port alias or number>* Displays current port parameters. **Command mode:** All

Port Link Configuration

You can use these commands to set port parameters for the port link.

NOTE – The `speed` and `mode` parameters are fixed for Gigabit Ethernet ports, and cannot be configured.

Table 4-26 Port Link Configuration Commands

Command Syntax and Usage
`speed {10|100|1000|auto}` Sets the link speed. Not all options are valid on all ports. The choices include: ■ 10 Mbps ■ 100 Mbps ■ 1000 Mbps ■ "Auto," for auto negotiation **Command mode:** Interface port
`duplex {full|half|any}` Sets the operating mode. The choices include: ■ Full-duplex ■ Half-duplex ■ "Any," for auto negotiation (default) **Command mode:** Interface port
`flowcontrol {receive|send|both}` **`no flowcontrol`** Sets the flow control. The choices include: ■ Receive flow control ■ Transmit flow control ■ Both receive and transmit flow control (default) ■ No flow control **Command mode:** Interface port
`show interface port` *<port alias or number>* Displays current port parameters. **Command mode:** All

Temporarily Disabling a Port

To temporarily disable a port without changing its stored configuration attributes, enter the following command at any prompt:

```
Router# interface port <port alias or number> shutdown
```

Because this configuration sets a temporary state for the port, you do not need to use a save operation. The port state will revert to its original configuration when the GbE Switch Module is reset. See the "Operations Commands" on page 257 for other operations-level commands.

ACL Port Configuration

Table 4-27 ACL/QoS Configuration Commands

Command Syntax and Usage
access-control list *<1-896>* Adds the specified ACL list to the port. You can add multiple ACL lists to a port. **Command mode:** Interface port
no access-control list *<1-896>* Deletes the specified ACL list from the port. **Command mode:** Interface port
access-control group *<1-896>* Adds the specified ACL Group to the port. You can add multiple ACL Groups to a port. **Command mode:** Interface port
no access-control group *<1-896>* Removes the specified ACL from the port. **Command mode:** Interface port
show interface port {*<port alias or number>***} access-control** Displays current ACL QoS parameters. **Command mode:** All

Layer 2 Configuration

The following table describes basic Layer 2 Configuration commands. The following sections provide more detailed information and commands.

Table 4-28 Layer 2 Configuration Commands

Command Syntax and Usage
vlan *<1-4095>* Enter VLAN configuration mode. **Command mode:** Global configuration To view command options, see page 192.
[no] spanning-tree pvst-compatibility Enables or disables VLAN tagging of spanning tree BPDUs. The default value is **enabled**. **Command mode:** Global configuration
[no] spanning-tree uplinkfast Enables or disables Fast Uplink Convergence, which provides rapid Spanning Tree convergence to an upstream switch during failover. **Note**: When enabled, this feature increases bridge priorities to 65500 for all STGs (except the management STG 128) and path cost by 3000 for all external STP ports. **Command mode:** Global configuration
spanning-tree uplinkfast max-update-rate *<10-200>* Configures the station update rate. The default value is 40. **Command mode:** Global configuration
[no] spanning-tree bpdu-guard Enables or disables BPDU guard, to avoid spanning-tree loops on ports with Port Fast Forwarding enabled **Command mode:** Global configuration
[no] mac-address-table mac-notification Enables or disables MAC Address Notification. With MAC Address Notification enabled, the switch generates a syslog message when a MAC address is added or removed from the MAC address table. ‘ **Command mode:** Global configuration
show layer2 Displays current Layer 2 parameters. **Command mode:** All

802.1x Configuration

These commands allow you to configure the GbESM as an IEEE 802.1x Authenticator, to provide port-based network access control.

Table 4-29 802.1x Configuration Commands

Command Syntax and Usage
dot1x enable Globally enables 802.1x. **Command mode:** Global configuration
no dot1x enable Globally disables 802.1x. **Command mode:** Global configuration
show dot1x Displays current 802.1x parameters. **Command mode:** All

802.1x Global Configuration

The global 802.1x commands allow you to configure parameters that affect all ports in the GbESM.

Table 4-30 802.1x Global Configuration Commands

Command Syntax and Usage
dot1x mode {[force-unauthorized|auto|force-authorized]} Sets the type of access control for all ports: ■ **force-unauthorized** - the port is unauthorized unconditionally. ■ **auto** - the port is unauthorized until it is successfully authorized by the RADIUS server. ■ **force-authorized** - the port is authorized unconditionally, allowing all traffic. The default value is force-authorized. **Command mode:** Global configuration
dot1x quiet-time {*<0-65535>***}** Sets the time, in seconds, the authenticator waits before transmitting an EAP-Request/ Identity frame to the supplicant (client) after an authentication failure in the previous round of authentication. The default value is 60 seconds. **Command mode:** Global configuration

Table 4-30 802.1x Global Configuration Commands

Command Syntax and Usage
dot1x transmit-interval {<*1-65535*>**}** Sets the time, in seconds, the authenticator waits for an EAP-Response/Identity frame from the supplicant (client) before retransmitting an EAP-Request/Identity frame. The default value is 30 seconds. **Command mode:** Global configuration
dot1x supplicant-timeout {<*1-65535*>**}** Sets the time, in seconds, the authenticator waits for an EAP-Response packet from the supplicant (client) before retransmitting the EAP-Request packet from the authentication server. The default value is 30 seconds. **Command mode:** Global configuration
dot1x server-timeout {<*1-65535*>**}** Sets the time, in seconds, the authenticator waits for a response from the RADIUS server before declaring an authentication timeout. The default value is 30 seconds. The time interval between transmissions of the RADIUS Access-Request packet containing the supplicant's (client's) EAP-Response packet is determined by the current setting of `radius-server timeout <timeout-value>` (default is 3 seconds). **Command mode:** Global configuration
dot1x max-request {<*1-10*>**}** Sets the maximum number of times the authenticator retransmits an EAP-Request packet to the supplicant (client). The default value is 2. **Command mode:** Global configuration
dot1x re-authentication-interval {<*1-604800*>**}** Sets the time, in seconds, the authenticator waits before re-authenticating a supplicant (client) when periodic re-authentication is enabled. The default value is 3600 seconds. **Command mode:** Global configuration
dot1x re-authenticate Sets the re-authentication status to `on`. The default value is `off`. **Command mode:** Global configuration
[no] dot1x re-authenticate Sets the re-authentication status to `off`. The default value is `off`. **Command mode:** Global configuration

Table 4-30 802.1x Global Configuration Commands

Command Syntax and Usage
default dot1x Resets the global 802.1x parameters to their default values. **Command mode:** Global configuration
show dot1x Displays current global 802.1x parameters. **Command mode:** All

802.1x Guest VLAN Configuration

The 802.1x Guest VLAN menu allows you to configure a Guest VLAN for unauthenticated ports. The Guest VLAN provides limited access to switch functions.

Table 4-31 802.1x Guest VLAN Configuration Commands

Command Syntax and Usage
[no] dot1x guest-vlan vlan {*<1-4094>***}** Configures the Guest VLAN number. **Command mode:** Global configuration
dot1x guest-vlan enable Enables the 802.1x Guest VLAN. **Command mode:** Global configuration
no dot1x guest-vlan enable Disables the 802.1x Guest VLAN. **Command mode:** Global configuration
show dot1x Displays current 802.1x parameters. **Command mode:** All

802.1x Port Configuration

The 802.1x port commands allows you to configure parameters that affect the selected port in the GbESM. These settings override the global 802.1x parameters.

Table 4-32 802.1x Port Commands

Command Syntax and Usage
dot1x mode force-unauthorized|auto|force-authorized Sets the type of access control for the port: ■ **force-unauthorized** - the port is unauthorized unconditionally. ■ **auto** - the port is unauthorized until it is successfully authorized by the RADIUS server. ■ **force-authorized** - the port is authorized unconditionally, allowing all traffic. The default value is `force-authorized`. **Command mode:** Interface port
dot1x quiet-time {*<0-65535>***}** Sets the time, in seconds, the authenticator waits before transmitting an EAP-Request/ Identity frame to the supplicant (client) after an authentication failure in the previous round of authentication. The default value is 60 seconds. **Command mode:** Interface port
dot1x transmit-interval {*<1-65535>***}** Sets the time, in seconds, the authenticator waits for an EAP-Response/Identity frame from the supplicant (client) before retransmitting an EAP-Request/Identity frame. The default value is 30 seconds. **Command mode:** Interface port
dot1x supplicant-timeout {*<1-65535>***}** Sets the time, in seconds, the authenticator waits for an EAP-Response packet from the supplicant (client) before retransmitting the EAP-Request packet from the authentication server. The default value is 30 seconds. **Command mode:** Interface port
dot1x server-timeout {*<1-65535>***}** Sets the time, in seconds, the authenticator waits for a response from the RADIUS server before declaring an authentication timeout. The default value is 30 seconds. The time interval between transmissions of the RADIUS Access-Request packet containing the supplicant's (client's) EAP-Response packet is determined by the current setting of the following command: `radius-server timeout` **Command mode:** Interface port

Table 4-32 802.1x Port Commands

Command Syntax and Usage
dot1x max-request {<*1-10*>**}** Sets the maximum number of times the authenticator retransmits an EAP-Request packet to the supplicant (client). The default value is 2. **Command mode:** Interface port
dot1x re-authentication-interval {<*1-604800*>**}** Sets the time, in seconds, the authenticator waits before re-authenticating a supplicant (client) when periodic re-authentication is enabled. The default value is 3600 seconds. **Command mode:** Interface port
dot1x re-authenticate Sets the re-authentication status to `on`. The default value is `off`. **Command mode:** Interface port
[no] dot1x re-authenticate Sets the re-authentication status `off`. The default value is `off`. **Command mode:** Interface port
default dot1x Resets the 802.1x port parameters to their default values. **Command mode:** Interface port
dot1x apply-global Applies current global 802.1x configuration parameters to the port. **Command mode:** Interface port
show interface port {<*port alias or number*>**} dot1x** Displays current 802.1x port parameters. **Command mode:** All

Rapid Spanning Tree Protocol/Multiple Spanning Tree Protocol Configuration

Alteon OS supports the IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) and IEEE 802.1s Multiple Spanning Tree Protocol (MSTP). MSTP allows you to map many VLANs to a small number of spanning tree groups, each with its own topology.

Up to 32 Spanning Tree Groups can be configured in **`mstp`** mode. MRST is turned off by default.

NOTE – When Multiple Spanning Tree is turned on, VLAN 4095 is moved from Spanning Tree Group 128 to the Common Internal Spanning Tree (CIST). When Multiple Spanning Tree is turned off, VLAN 4095 is moved back to Spanning Tree Group 128.

Table 4-33 Multiple Spanning Tree Configuration Commands

Command Syntax and Usage
`spanning-tree mstp name` *<1-32 characters>* Configures a name for the MSTP region. All devices within a MSTP region must have the same region name. **Command mode:** Global configuration
`spanning-tree mstp version` *<0-65535>* Configures a version number for the MSTP region. The version is used as a numerical identifier for the region. All devices within a MSTP region must have the same version number. **Command mode:** Global configuration
`spanning-tree mstp maximum-hop` *<4-60>* Configures the maximum number of bridge hops a packet may traverse before it is dropped. The default is 20. **Command mode:** Global configuration
`spanning-tree mode {pvst|rstp|mst}` Selects the Spanning Tree mode, as follows: Per VLAN Spanning Tree (`pvst`), Rapid Spanning Tree (`rstp`) or Multiple Spanning Tree (`mst`). The default mode is `pvst`. **Command mode:** Global configuration
`show spanning-tree mstp mrst` Displays the current RSTP/MSTP configuration. **Command mode:** All

Common Internal Spanning Tree Configuration

Table 4-34 describes the commands used to configure Common Internal Spanning Tree (CIST) parameters. The CIST provides compatibility with different MSTP regions and with devices running different Spanning Tree instances. It is equivalent to Spanning Tree Group 0.

Table 4-34 CIST Configuration Commands

Command Syntax and Usage
`default spanning-tree mstp cist` Resets all CIST parameters to their default values. **Command mode:** Global configuration
`show spanning-tree mstp cist` Displays the current CIST configuration. **Command mode:** All

CIST Bridge Configuration

CIST bridge parameters are used only when the switch is in MSTP or RSTP mode. CIST parameters do not affect operation of STP/PVST+.

Table 4-35 CIST Bridge Configuration Commands

Command Syntax and Usage
`spanning-tree mstp cist-bridge priority` *<0-65535>* Configures the CIST bridge priority. The bridge priority parameter controls which bridge on the network is the MSTP root bridge. To make this switch the root bridge, configure the bridge priority lower than all other switches and bridges on your network. The lower the value, the higher the bridge priority. The range is 0 to 65535, and the default is 32768. **Command mode:** Global configuration
`spanning-tree mstp cist-bridge maximum-age` *<6-40>* Configures the CIST bridge maximum age. The maximum age parameter specifies the maximum time the bridge waits without receiving a configuration bridge protocol data unit before it reconfigures the MSTP network. The range is 6 to 40 seconds, and the default is 20 seconds. **Command mode:** Global configuration

Table 4-35 CIST Bridge Configuration Commands

Command Syntax and Usage
spanning-tree mstp cist-bridge forward-delay *<4-30>* Configures the CIST bridge forward delay parameter. The forward delay parameter specifies the amount of time that a bridge port has to wait before it changes from the listening state to the learning state and from the learning state to the forwarding state. The range is 4 to 30 seconds, and the default is 15 seconds. **Command mode:** Global configuration
show spanning-tree mstp cist Displays the current CIST bridge configuration. **Command mode:** All Except User EXEC

CIST Port Configuration

CIST port parameters are used to modify MRST operation on an individual port basis. CIST parameters do not affect operation of STP/PVST+. For each port, RSTP/MSTP is turned on by default.

Table 4-36 CIST Port Configuration Commands

Command Syntax and Usage
spanning-tree mstp cist interface-priority {*<0-240>***}** Configures the CIST port priority. The port priority helps determine which bridge port becomes the designated port. In a network topology that has multiple bridge ports connected to a single segment, the port with the lowest port priority becomes the designated port for the segment. The range is 0 to 240, in steps of 16 (0, 16, 32...), and the default is 128. **Command mode:** Interface port
spanning-tree mstp cist path-cost {*<0-200000000>***}** Configures the CIST port path cost. The port path cost is used to help determine the designated port for a segment. Generally speaking, the faster the port, the lower the path cost. The default is 2000 for 10 Gigabit ports, 20000 for Gigabit ports. **Command mode:** Interface port
spanning-tree mstp cist hello {*<1-10>***}** Configures the CIST port Hello time.The Hello time specifies how often the root bridge transmits a configuration bridge protocol data unit (BPDU). Any bridge that is not the root bridge uses the root bridge Hello value. The range is 1 to 10 seconds, and the default is 2 seconds. **Command mode:** Interface port

Table 4-36 CIST Port Configuration Commands

Command Syntax and Usage
spanning-tree mstp cist link-type {auto|p2p|shared} Defines the type of link connected to the port, as follows: **auto**: Configures the port to detect the link type, and automatically match its settings. **p2p**: Configures the port for Point-To-Point protocol. **shared**: Configures the port to connect to a shared medium (usually a hub). The default link type is **auto**. **Command mode:** Interface port
[no] spanning-tree mstp cist edge Enables or disables this port as an edge port. An edge port is not connected to a bridge, and can begin forwarding traffic as soon as the link is up. Configure server ports as edge ports (enabled). This command is disabled by default. **Command mode:** Interface port
spanning-tree mstp cist enable Enables MRST on the port. **Command mode:** Interface port
no spanning-tree mstp cist enable Disables MRST on the port. **Command mode:** Interface port
show interface port {<*port alias or number*>**} spanning-tree mstp cist** Displays the current CIST port configuration. **Command mode:** All Except User EXEC

Spanning Tree Configuration

Alteon OS supports the IEEE 802.1d Spanning Tree Protocol (STP). STP is used to prevent loops in the network topology. Up to 128 Spanning Tree Groups can be configured on the switch (STG 128 is reserved for management).

NOTE – When VRRP is used for active/active redundancy, STG must be enabled.

Table 4-37 Spanning Tree Configuration Commands

Command Syntax and Usage
spanning-tree stp {*<1-128>***} vlan {***<1-4094>***}** Associates a VLAN with a spanning tree and requires an external VLAN ID as a parameter. **Command mode:** Global configuration
no spanning-tree stp {*<1-128>***} vlan {***<1-4094>***}** Breaks the association between a VLAN and a spanning tree and requires an external VLAN ID as a parameter. **Command mode:** Global configuration
no spanning-tree stp {*<1-128>***} vlan all** Removes all VLANs from a spanning tree. **Command mode:** Global configuration
spanning-tree stp {*<1-128>***} enable** Globally enables Spanning Tree Protocol. STG is turned on by default. **Command mode:** Global configuration
no spanning-tree stp {*<1-128>***} enable** Globally disables Spanning Tree Protocol. **Command mode:** Global configuration
default spanning-tree {*<1-128>***}** Restores a spanning tree instance to its default configuration. **Command mode:** Global configuration
show spanning-tree stp {*<1-128>***}** Displays current Spanning Tree Protocol parameters. **Command mode:** All

Bridge Spanning Tree Configuration

Spanning Tree bridge parameters affect the global STG operation of the switch. STG bridge parameters include:

- Bridge priority
- Bridge hello time
- Bridge maximum age
- Forwarding delay
- Bridge aging time

Table 4-38 Bridge Spanning Tree Configuration Commands

Command Syntax and Usage
spanning-tree stp {*<1-128>***} bridge priority {***<0-65535>***}** Configures the bridge priority. The bridge priority parameter controls which bridge on the network is the STG root bridge. To make this switch the root bridge, configure the bridge priority lower than all other switches and bridges on your network. The lower the value, the higher the bridge priority. The range is 0 to 65535, and the default is 32768. **RSTP/MSTP**: The range is 0 to 61440, in steps of 4096 (0, 4096, 8192...), and the default is 32768. **Command mode:** Global configuration
spanning-tree stp {*<1-128>***} bridge hello-time {***<1-10>***}** Configures the bridge Hello time.The Hello time specifies how often the root bridge transmits a configuration bridge protocol data unit (BPDU). Any bridge that is not the root bridge uses the root bridge Hello value. The range is 1 to 10 seconds, and the default is 2 seconds. This command does not apply to MSTP. **Command mode:** Global configuration
spanning-tree stp {*<1-128>***} bridge maximum-age {***<6-40>***}** Configures the bridge maximum age. The maximum age parameter specifies the maximum time the bridge waits without receiving a configuration bridge protocol data unit before it re configures the STG network. The range is 6 to 40 seconds, and the default is 20 seconds. This command does not apply to MSTP. **Command mode:** Global configuration
spanning-tree stp {*<1-128>***} bridge forward-delay {***<4-30>***}** Configures the bridge forward delay parameter. The forward delay parameter specifies the amount of time that a bridge port has to wait before it changes from the listening state to the learning state and from the learning state to the forwarding state. The range is 4 to 30 seconds, and the default is 15 seconds. This command does not apply to MSTP. **Command mode:** Global configuration

Table 4-38 Bridge Spanning Tree Configuration Commands

Command Syntax and Usage
spanning-tree stp {<*1-128*>**} bridge aging {**<*1-65535*>**}** Configures the forwarding database aging time. The aging time specifies the amount of time the bridge waits without receiving a packet from a station before removing the station from the forwarding database. The range is 1 to 65535 seconds, and the default is 300 seconds. To disable aging, set this parameter to 0. **Command mode:** Global configuration
show spanning-tree stp {<*1-128*>**} bridge** Displays the current bridge STG parameters. **Command mode:** All

When configuring STG bridge parameters, the following formulas must be used:

- 2*(*fwd*-1) $\leq$ *mxage*
- 2*(*hello*+1) $\leq$ *mxage*

Spanning Tree Port Configuration

By default for STP/PVST+, Spanning Tree is turned off for internal ports and management ports, and turned on for external ports. By default for RSTP/MSTP, Spanning Tree is turned off for internal ports and management ports, and turned on for external ports, with internal ports configured as Edge ports. STG port parameters include:

- Port priority
- Port path cost

The **port** option of STG is turned on by default.

Table 4-39 Spanning Tree Port Commands

Command Syntax and Usage
spanning-tree stp {*<1-128>***} priority {***<0-255>***}** Configures the port priority. The port priority helps determine which bridge port becomes the designated port. In a network topology that has multiple bridge ports connected to a single segment, the port with the lowest port priority becomes the designated port for the segment. The default value is 128. **RSTP/MSTP**: The range is 0 to 240, in steps of 16 (0, 16, 32...) and the default is 128. **Command mode:** Interface port
spanning-tree stp {*<1-128>***} path-cost {***<1-65535>***}** Configures the port path cost. The port path cost is used to help determine the designated port for a segment. Generally speaking, the faster the port, the lower the path cost. The default is 19 for 100Mbps ports, 20000 for 1Gb ports and 2 for 10 Gb ports. A value of 0 (zero) indicates that the default cost will be computed for an auto negotiated link speed. **Command mode:** Interface port
spanning-tree stp {*<1-128>***} link {auto|p2p|shared}** Defines the type of link connected to the port, as follows: **auto**: Configures the port to detect the link type, and automatically match its settings. **p2p**: Configures the port for Point-To-Point protocol. **shared**: Configures the port to connect to a shared medium (usually a hub). **Command mode:** Interface port
[no] spanning-tree stp {*<1-128>***} edge** Enables or disables this port as an edge port. An edge port is not connected to a bridge, and can begin forwarding traffic as soon as the link is up. Configure server ports as edge ports (enabled). **Command mode:** Interface port
spanning-tree stp {*<1-128>***} enable** Enables STG on the port. **Command mode:** Interface port

Table 4-39 Spanning Tree Port Commands

Command Syntax and Usage
no spanning-tree stp {*<1-128>***} enable** Disables STG on the port. **Command mode:** Interface port
show interface port {*<port alias or number>***} spanning-tree stp {***<1-128>***}** Displays the current STG port parameters. **Command mode:** All

Static FDB Configuration

Use the following commands to configure static entries in the Forwarding Database (FDB).

Table 4-40 FDB configuration commands

Command Syntax and Usage
mac-address-table static *<MAC address> <VLAN number> <port number>* Adds a permanent FDB entry. **Command mode**: Global configuration
no mac-address-table static *<MAC address> <VLAN number>* Deletes a permanent FDB entry. **Command mode**: Global configuration
clear mac-address-table static all Clears all static FDB entries. **Command mode**: Global configuration
show mac-address-table Display current FDB configuration. **Command mode**: All except User EXEC

GVRP Configuration

Use the following commands to configure Generic VLAN Registration Protocol (GVRP).

Table 4-41 GVRP commands

Command Syntax and Usage
`gvrp timer join {`*<100-65535>*`}`** Configures the time interval between GARP Join messages, in milliseconds. The default value is 200. **Command mode:** Global configuration
`gvrp timer leave {`*<100-65535>*`}`** Configures the GARP Leave time value, in milliseconds. The Leave time is the interval the switch waits before removing the port from a VLAN on which it received the Leave message. The default value is 600. **Command mode:** Global configuration
`gvrp timer leaveall {`*<100-65535>*`}`** Configures the time interval for GARP Leave-All messages, in milliseconds. The default value is 10000. **Command mode:** Global configuration
`[no] gvrp dynamic-vlan-creation` Enables or disables dynamic VLAN creation. If you disable dynamic VLAN creation, existing dynamic VLANs persist in the switch, but no new dynamic VLANs are created. To remove all existing dynamic VLANs, turn GVRP **`off`**. **Command mode:** Global configuration
`gvrp enable` Globally turns GVRP `on`. With GVRP on, the GbESM processes GPDUs. **Command mode:** Global configuration
`no gvrp enable` Globally turns GVRP `off`. With GVRP off, the switch does not process GPDUs. When you turn GVRP `off`, existing dynamic VLANs are deleted. **Command mode:** Global configuration
`show gvrp` Display current GVRP configuration. **Command mode:** All except User EXEC

GVRP Port Configuration

Use the following commands to configure GVRP settings for the port.

Table 4-42 GVRP Port commands

Command Syntax and Usage
gvrp registrar-state {normal|block} Configures GPDU learning for the port's GVRP registrar, as follows: ■ **Normal**: The registrar listens for GPDUs, and learns GVRP attributes from other devices on the network. ■ **Block**: The registrar does not listen for GPDUs from other devices. **Command mode:** Interface port
gvrp applicant-state {normal|block} Configures GPDU sending for the port's GVRP applicant, as follows: ■ **Normal**: The applicant sends GPDUs to other devices on the network. ■ **Block**: The applicant does not send GPDUs to other devices. **Command mode:** Interface port
gvrp port-state enable Enables GVRP on the port. **Command mode:** Interface port
no gvrp port-state Disables GVRP on the port. **Command mode:** Interface port
show interface port {<*port alias or number*>**} gvrp** Display current GVRP port configuration. **Command mode:** All except User EXEC

Trunk Configuration

Trunk groups can provide super-bandwidth connections between GbE Switch Modules or other trunk capable devices. A *trunk* is a group of ports that act together, combining their bandwidth to create a single, larger port. Up to 11 trunk groups can be configured on the GbE Switch Module, with the following restrictions:

- Any physical switch port can belong to no more than one trunk group.
- Up to 4 ports/trunks can belong to the same trunk group.
- Configure all ports in a trunk group with the same link configuration (speed, duplex, flow control).
- Trunking from non-Alteon devices must comply with Cisco® EtherChannel® technology.

By default, each trunk group is empty and disabled.

Table 4-43 Trunk Configuration Commands

Command Syntax and Usage
`portchannel {`*<1-11>***`} port {`***<port alias or number>***`}`** Adds a physical port to the current trunk group. You can add several ports, with each port separated by a comma (,). **Command mode:** Global configuration
`no portchannel {`*<1-11>***`} port {`***<port alias or number>***`}`** Removes a physical port from the current trunk group. **Command mode:** Global configuration
`portchannel {`*<1-11>***`} enable`** Enables the current trunk group. **Command mode:** Global configuration
`no portchannel {`*<1-11>***`} enable`** Disables the current trunk group. **Command mode:** Global configuration
`no portchannel {`*<1-11>***`}`** Removes the current trunk group configuration. **Command mode:** Global configuration
`show portchannel {`*<1-11>***`}`** Displays current trunk group parameters. **Command mode:** All

IP Trunk Hash Configuration

Use the following commands to configure IP trunk hash settings for the GbESM. The trunk hash settings affect both static trunks and LACP trunks.

Table 4-44 IP Trunk Hash commands

Command Syntax and Usage
`show portchannel hash` Display current trunk hash configuration. **Command mode**: All

Layer 2 IP Trunk Hash Configuration

Trunk hash parameters are set globally for the GbE Switch Module. You can enable one or two parameters, to configure any of the following valid combinations:

- SMAC (source MAC only)
- DMAC (destination MAC only)
- SIP (source IP only)
- DIP (destination IP only)
- SIP + DIP (source IP and destination IP)
- SMAC + DMAC (source MAC and destination MAC)

Use the following commands to configure layer 2 IP trunk hash parameters for the GbESM.

Table 4-45 Layer 2 IP Trunk Hash commands

Command Syntax and Usage
portchannel hash source-mac-address Enable trunk hashing on the source MAC. **Command mode:** Global configuration
portchannel hash destination-mac-address Enable trunk hashing on the destination MAC. **Command mode:** Global configuration
portchannel hash source-ip-address Enable trunk hashing on the source IP. **Command mode:** Global configuration
portchannel hash destination-ip-address Enable trunk hashing on the destination IP. **Command mode:** Global configuration
portchannel hash source-destination-ip Enable trunk hashing on the source and destination IP. **Command mode:** Global configuration
portchannel hash source-destination-mac Enable trunk hashing on the source and destination MAC address. **Command mode:** Global configuration
show portchannel hash Display current layer 2 trunk hash setting. **Command mode:** All

Link Aggregation Control Protocol Configuration

Use the following commands to configure Link Aggregation Control Protocol (LACP) for the GbESM.

Table 4-46 Link Aggregation Control Protocol Commands

Command Syntax and Usage
`lacp system-priority {`*<1-65535>***`}`** Defines the priority value for the GbESM. Lower numbers provide higher priority. The default value is 32768. **Command mode:** Global configuration
`lacp timeout {short|long}` Defines the timeout period before invalidating LACP data from a remote partner. Choose **`short`** (3 seconds) or **`long`** (90 seconds). The default value is **`long`**. **Note**: It is recommended that you use a timeout value of **`long`**, to reduce LACPDU processing. If your GbESM's CPU utilization rate remains at 100% for periods of 90 seconds or more, consider using static trunks instead of LACP. **Command mode:** Global configuration
`show lacp` Display current LACP configuration. **Command mode:** All

LACP Port Configuration

Use the following commands to configure Link Aggregation Control Protocol (LACP) for the selected port.

Table 4-47 Link Aggregation Control Protocol Commands

Command Syntax and Usage
lacp mode {off|active|passive} Set the LACP mode for this port, as follows: ■ **off** Turn LACP off for this port. You can use this port to manually configure a static trunk. The default value is **off**. ■ **active** Turn LACP on and set this port to active. Active ports initiate LACPDUs. ■ **passive** Turn LACP on and set this port to passive. Passive ports do not initiate LACPDUs, but respond to LACPDUs from active ports. **Command mode:** Interface port
lacp priority {*<1-65535>***}** Sets the priority value for the selected port. Lower numbers provide higher priority. Default is 32768. **Command mode:** Interface port
lacp key {*<1-65535>***}** Set the admin key for this port. Only ports with the same *admin key* and *oper key* (operational state generated internally) can form a LACP trunk group. **Command mode:** Interface port
show interface port {*<port alias or number>***} lacp** Displays the current LACP configuration for this port. **Command mode:** All

Failover Configuration

Use these commands to configure Layer 2 Failover. For more information about Layer 2 Failover, see "High Availability" in the *Alteon OS Application Guide*.

Table 4-48 Layer 2 Failover Configuration Commands

Command Syntax and Usage
`failover vlan` Globally turns VLAN monitor `on`. When the VLAN Monitor is `on`, the switch automatically disables only internal ports that belong to the same VLAN as ports in the failover trigger. The default value is `off`. **Command mode:** Global configuration
`[no] failover vlan` Globally turns VLAN monitor `off`. When the VLAN Monitor is `on`, the switch automatically disables only internal ports that belong to the same VLAN as ports in the failover trigger. The default value is `off`. **Command mode:** Global configuration
`failover enable` Globally turns L2 failover `on`. **Command mode:** Global configuration
`no failover enable` Globally turns L2 failover `off`. **Command mode:** Global configuration
`show failover` Displays current L2 failover parameters. **Command mode:** All

Failover Trigger Configuration

Table 4-49 Failover Trigger Configuration Commands

Command Syntax and Usage
[no] failover trigger {*<1-8>***} enable** Enables or disables the Failover trigger. **Command mode:** Global configuration
failover trigger {*<1-8>***} limit** *<0-2>* Configures the minimum number of operational links allowed within each trigger before the trigger initiates a failover event. If you enter a value of zero (0), the switch triggers a failover event only when no links in the trigger are operational. **Command mode:** Global configuration
show failover trigger {*<1-8>***}** Displays the current failover trigger settings. **Command mode:** All except User EXEC

Auto Monitor Configuration

Table 4-50 Auto Monitor Configuration Commands

Command Syntax and Usage
failover trigger {*<1-8>***} amon trunk** *<1-11>* Adds a trunk group to the Auto Monitor. **Command mode:** Global configuration
no failover trigger {*<1-8>***} amon trunk** *<1-11>* Removes a trunk group from the Auto Monitor. **Command mode:** Global configuration
failover trigger {*<1-8>***} amon admin-key** *<1-65535>* Adds a LACP admin key to the Auto Monitor. LACP trunks formed with this admin key will be included in the Auto Monitor. **Command mode:** Global configuration
no failover trigger {*<1-8>***} amon admin-key** *<1-65535>* Removes a LACP admin key from the Auto Monitor. **Command mode:** Global configuration

VLAN Configuration

These commands configure VLAN attributes, change the status of each VLAN, change the port membership of each VLAN, and delete VLANs.

By default, the VLAN commands are disabled, except VLAN 1, which is enabled all the time. Internal server ports (INTx) and external ports (EXTx) are in VLAN 1 by default. Up to 1024 VLANs can be configured on the GbESM.

Table 4-51 VLAN Configuration Commands

Command Syntax and Usage
`vlan {`*<1-4095>***`}`** Enter VLAN configuration mode. **Command mode:** Global configuration
`protocol-vlan {`*<1-8>***`}`** Configures the Protocol-based VLAN (PVLAN). **Command mode:** VLAN
`name {`*<1-32 characters>***`}`** Assigns a name to the VLAN or changes the existing name. The default VLAN name is the first one. **Command mode:** VLAN
`stg {`*<1-128>***`}`** Assigns a VLAN to a Spanning Tree Group. **Command mode:** VLAN
`member {`*<port alias or number>***`}`** Adds port(s) to the VLAN membership. **Command mode:** VLAN
`no member {`*<port alias or number>***`}`** Removes port(s) from this VLAN. **Command mode:** VLAN
`enable` Enables this VLAN. **Command mode:** VLAN
`no enable` Disables this VLAN without removing it from the configuration. **Command mode:** VLAN

Table 4-51 VLAN Configuration Commands

Command Syntax and Usage
no vlan {<*1-4095*>**}** Deletes this VLAN. **Command mode:** VLAN
show vlan information Displays the current VLAN configuration. **Command mode:** All

NOTE – All ports must belong to at least one VLAN. Any port which is removed from a VLAN and which is not a member of any other VLAN is automatically added to default VLAN 1. You cannot remove a port from VLAN 1 if the port has no membership in any other VLAN. Also, you cannot add a port to more than one VLAN unless the port has VLAN tagging turned on.

Protocol-based VLAN Configuration

Use the following commands to configure Protocol-based VLAN for the selected VLAN.

Table 4-52 Protocol VLAN commands

Command Syntax and Usage
protocol-vlan {<*1-8*>**} frame-type {ether2|llc|snap}{**<*Ethernet type*>**}** Configures the frame type and the Ethernet type for the selected protocol. Ethernet type consists of a 4-digit (16 bit) hex code, such as `0080` (IPv4). **Command mode:** VLAN
protocol-vlan {<*1-8*>**} priority {**<*0-7*>**}** Configures the priority value for this PVLAN. **Command mode:** VLAN
protocol-vlan {<*1-8*>**} member {**<*port alias or number*>**}** Adds a port to the selected PVLAN. **Command mode:** VLAN
no protocol-vlan {<*1-8*>**} member {**<*port alias or number*>**}** Removes a port from the selected PVLAN. **Command mode:** VLAN
no protocol-vlan {<*1-8*>**}** Deletes the selected protocol configuration from the VLAN. **Command mode:** VLAN

Table 4-52 Protocol VLAN commands

Command Syntax and Usage
protocol-vlan {<*1-8*>**} enable** Enables the selected protocol on the VLAN. **Command mode:** VLAN
no protocol-vlan {<*1-8*>**} enable** Disables the selected protocol on the VLAN. **Command mode:** VLAN
[no] protocol-vlan {<*1-8*>**} tag-pvlan {**<*port alias or number*>**}** Defines a port that will be tagged by the selected protocol on this VLAN. **Command mode:** VLAN
show protocol-vlan {<*1-8*>**}** Displays current parameters for the selected PVLAN. **Command mode:** All

Private VLAN Configuration

Use the following commands to configure Private VLAN.

Table 4-53 Private VLAN commands

Command Syntax and Usage
private-vlan type primary Configures the VLAN type as a Primary VLAN. A Private VLAN must have only one primary VLAN. The primary VLAN carries unidirectional traffic to ports on the isolated VLAN or to community VLAN. **Command mode:** VLAN
private-vlan type community Configures the VLAN type as a community VLAN. Community VLANs carry upstream traffic from host ports. A Private VLAN may have multiple community VLANs. **Command mode:** VLAN
private-vlan type isolated Configures the VLAN type as an isolated VLAN. The isolated VLAN carries unidirectional traffic from host ports. A Private VLAN may have only one isolated VLAN. **Command mode:** VLAN

Table 4-53 Private VLAN commands

Command Syntax and Usage
`no private-vlan type` Clears the private-VLAN type. **Command mode:** VLAN
`[no] private-vlan map [`*<2-4094>***`]`** Configures Private VLAN mapping between a secondary VLAN and a primary VLAN. Enter the primary VLAN ID. Secondary VLANs have the `type` defined as `isolated` or `community`. Use the **no** form to remove the mapping between the secondary VLAN and the primary VLAN. **Command mode:** VLAN
`private-vlan enable` Enables the private VLAN. **Command mode:** VLAN
`no private-vlan enable` Disables the Private VLAN. **Command mode:** VLAN
`show private-vlan [`*<2-4094>***`]`** Displays current parameters for the selected Private VLAN(s). **Command mode:** VLAN

Layer 3 Configuration

The following table describes basic Layer 3 Configuration commands. The following sections provide more detailed information and commands.

Table 4-54 Layer 3 Configuration Commands

Command Syntax and Usage
`interface ip {`*<1-128>***`}`** Configures the IP Interface. **Command mode:** Global configuration To view command options, see page 197.
`router rip` Configures the Routing Interface Protocol. **Command mode:** Global configuration To view command options, see page 208.
`router ospf` Configures OSPF. **Command mode:** Global configuration To view command options, see page 211.
`router bgp` Configures Border Gateway Protocol. **Command mode:** Global configuration To view command options, see page 219.
`router vrrp` Configures Virtual Router Redundancy. **Command mode:** Global configuration To view command options, see page 234.
`ip router-id` *<IP address>* Sets the router ID. **Command mode:** Global configuration
`show layer3` Displays the current IP configuration. **Command mode:** All

IP Interface Configuration

You can configure up to 128 IP interfaces on the GbE Switch Module. Each IP interface represents the GbE Switch Module on an IP subnet on your network. The Interface option is disabled by default.

NOTE – To maintain connectivity between the management module and the GbE Switch Module, use the management module interface to change the IP address of the switch.

Table 4-55 IP Interface Configuration Commands

Command Syntax and Usage
`interface ip {`*<1-128>***`}`** Enter IP interface mode. **Command mode:** Global configuration
`ip address {`*<IP address>***`}{`***<IP netmask>***`}`** Configures the IP address of the switch interface, using dotted decimal notation. **Command mode:** Interface IP
`ip netmask {`*<IP netmask>***`}`** Configures the IP subnet address mask for the interface, using dotted decimal notation. **Command mode:** Interface IP
`vlan {`*<1-4095>***`}`** Configures the VLAN number for this interface. Each interface can belong to one VLAN, though any VLAN can have multiple IP interfaces in it. **Command mode:** Interface IP
`[no] relay` Enables or disables the BOOTP relay on this interface. It is enabled by default. **Command mode:** Interface IP
`enable` Enables this IP interface. **Command mode:** Interface IP
`no enable` Disables this IP interface. **Command mode:** Interface IP

Table 4-55 IP Interface Configuration Commands

Command Syntax and Usage
`no interface ip {`*<1-127>***`}`** Removes this IP interface. **Command mode:** Interface IP
`show interface ip {`*<1-128>***`}`** Displays the current interface settings. **Command mode:** All

Default Gateway Configuration

NOTE – The switch can be configured with up to 4 gateways. Gateway 4 is reserved for management.

This option is disabled by default.

Table 4-56 Default Gateway Commands

Command Syntax and Usage
`ip gateway {`*<1-4>***`} address {`***<IP address>***`}`** Configures the IP address of the default IP gateway using dotted decimal notation. **Command mode:** Global configuration
`ip gateway {`*<1-4>***`} interval {`***<0-60>***`}`** The switch pings the default gateway to verify that it's up. This command sets the time between health checks. The range is from 0 to 60 seconds. The default is 2 seconds. **Command mode:** Global configuration
`ip gateway {`*<1-4>***`} retry {`***<1-120>***`}`** Sets the number of failed health check attempts required before declaring this default gateway inoperative. The range is from 1 to 120 attempts. The default is 8 attempts. **Command mode:** Global configuration
`[no] ip gateway {`*<1-4>***`} arp-health-check`** Enables or disables Address Resolution Protocol (ARP) health checks. This command is disabled by default. **Command mode:** Global configuration
`ip gateway {`*<1-4>***`} vlan {`***<1-4095>***`}`** Sets the VLAN to be assigned to this default IP gateway. **Command mode:** Global configuration

Table 4-56 Default Gateway Commands

Command Syntax and Usage
ip gateway {<*1-4*>**} enable** Enables the gateway for use. **Command mode:** Global configuration
no ip gateway {<*1-4*>**} enable** Disables the gateway. **Command mode:** Global configuration
no ip gateway {<*1-4*>**}** Deletes the gateway from the configuration. **Command mode:** Global configuration
show ip gateway {<*1-4*>**}** Displays the current gateway settings. **Command mode:** All

IP Static Route Configuration

Up to 128 static routes can be configured.

Table 4-57 IP Static Route Configuration Commands

Command Syntax and Usage
ip route <*IP subnet*> <*IP netmask*> <*IP nexthop*> **[**<*IP interface value*>**]** Adds a static route. You will be prompted to enter a destination IP address, destination subnet mask, and gateway address. Enter all addresses using dotted decimal notation. **Command mode:** Global configuration
no ip route {<*IP subnet*>**}{**<*IP netmask*>**}** Removes a static route. The destination address of the route to remove must be specified using dotted decimal notation. **Command mode:** Global configuration
show ip route static Displays the current IP static routes. **Command mode:** All except User EXEC

IP Multicast Route Configuration

The following table describes the IP Multicast Route commands.

Table 4-58 IP Multicast Route Configuration Commands

Command Syntax and Usage
ip mroute *<IPMC destination> <vlan number> <port alias or number>* **{primary|backup|host}** *<VR ID>* **|none** Adds a static multicast route. You will be prompted to enter a destination IP address (in dotted decimal notation), VLAN, and member port. Indicate whether the route is used for a primary, backup, or host multicast router. **Command mode:** Global configuration
no ip mroute *<IPMC destination> <vlan number> <port alias or number>* **{primary|backup|host}** *<VR ID>* **|none** Removes a static multicast route. The destination address, VLAN, and member port of the route to remove must be specified. **Command mode:** Global configuration
ip mroute {*<IP address>***} {***<1-4094>***} portchannel {***<1-11>***} {primary|backup|host} [***<1-255>***]** Selects a trunk/VLAN combination on which the static multicast router is connected. **Command mode:** Global configuration
no ip mroute {*<IP address>***} {***<1-4094>***} portchannel {***<1-11>***} {primary|backup|host} [***<1-255>***]** Removes a static multicast router from the selected trunk/VLAN combination. **Command mode:** Global configuration
show ip mroute Displays the current IP multicast routes. **Command mode:** All except User EXEC

ARP Configuration

Address Resolution Protocol (ARP) is the TCP/IP protocol that resides within the Internet layer. ARP resolves a physical address from an IP address. ARP queries machines on the local network for their physical addresses. ARP also maintains IP to physical address pairs in its cache memory. In any IP communication, the ARP cache is consulted to see if the IP address of the computer or the router is present in the ARP cache. Then the corresponding physical address is used to send a packet.

Table 4-59 ARP Configuration Commands

Command Syntax and Usage
ip arp rearp {*<2-120>***}** Defines re-ARP period in minutes. You can set this duration between 2 and 120 minutes. **Command mode:** Global configuration
show ip arp Displays the current ARP configurations. **Command mode:** All except User EXEC

ARP Static Configuration

Static ARP entries are permanent in the ARP cache and do not age out like the ARP entries that are learnt dynamically. Static ARP entries enable the switch to reach the hosts without sending an ARP broadcast request to the network. Static ARPs are also useful to communicate with devices that do not respond to ARP requests. Static ARPs can also be configured on some gateways as a protection against malicious ARP Cache corruption and possible DOS attacks.

Table 4-60 ARP Static Configuration Commands

Command Syntax and Usage
ip arp *<IP address> <MAC address> <vlan number> <port alias or number>* Adds a permanent ARP entry. **Command mode:** Global configuration
no ip arp {*<IP address>***}** Deletes a permanent ARP entry. **Command mode:** Global configuration

Table 4-60 ARP Static Configuration Commands

Command Syntax and Usage
clear ip arp-cache Clears static ARP entries. **Command mode:** Global configuration
show ip arp static Displays current static ARP configuration. **Command mode:** All except User EXEC

IP Forwarding Configuration

Table 4-61 IP Forwarding Configuration Commands

Command Syntax and Usage
`[no] ip routing directed-broadcasts` Enables or disables forwarding directed broadcasts. This command is disabled by default. **Command mode:** Global configuration
`[no] ip routing no-icmp-redirect` Enables or disables ICMP re-directs. This command is disabled by default. **Command mode:** Global configuration
`ip routing` Enables IP forwarding (routing) on the GbE Switch Module. **Command mode:** Global configuration
`no ip routing` Disables IP forwarding (routing) on the GbE Switch Module. Forwarding is turned off by default. **Command mode:** Global configuration
`show ip routing` Displays the current IP forwarding settings. **Command mode:** All except User EXEC

Network Filter Configuration

Table 4-62 IP Network Filter Configuration Commands

Command Syntax and Usage
`ip match-address {`*<1-256>***`}`** *<IP address> <IP netmask>* Sets the starting IP address for this filter. The default address is 0.0.0.0 **Command mode:** Global configuration.
`ip match-address {`*<1-256>***`} mask`** *<IP netmask>* Sets the IP subnet mask that is used with **`ip match-address`** *`<match-id> <IP address>`* to define the range of IP addresses that will be accepted by the peer when the filter is enabled. The default value is 0.0.0.0. For Border Gateway Protocol (BGP), assign the network filter to a route map, then assign the route map to the peer. **Command mode:** Global configuration

Table 4-62 IP Network Filter Configuration Commands

Command Syntax and Usage
`ip match-address {`*<1-256>***`} enable`** Enables the Network Filter configuration. **Command mode:** Global configuration
`no ip match-address {`*<1-256>***`} enable`** Disables the Network Filter configuration. **Command mode:** Global configuration
`no ip match-address {`*<1-256>***`}`** Deletes the Network Filter configuration. **Command mode:** Global configuration
`show ip match-address [`*<1-256>***`]`** Displays the current the Network Filter configuration. **Command mode:** All except User EXEC

Routing Map Configuration

NOTE – The *map number* (1-32) represents the routing map you wish to configure.

Routing maps control and modify routing information.

Table 4-63 Routing Map Configuration Commands

Command Syntax and Usage
`route-map {`*<1-32>***`}`** Enter route map configuration mode. **Command mode:** Route map
`[no] access-list` *<1-8>* Configures the Access List. **Command mode:** Route map For more information, see page 206.
`[no] as-path-list` *<1-8>* Configures the Autonomous System (AS) Filter. **Command mode:** Route map For more information, see page 207.

Table 4-63 Routing Map Configuration Commands

Command Syntax and Usage
`[no] as-path-preference` *<1-65535>* Sets the AS path preference of the matched route. You can configure up to three path preferences. **Command mode:** Route map
`[no] local-preference` *<0-4294967294>* Sets the local preference of the matched route, which affects both inbound and outbound directions. The path with the higher preference is preferred. **Command mode:** Route map
`[no] metric` *<1-4294967294>* Sets the metric of the matched route. **Command mode:** Route map
`[no] metric-type {type1|type2}` Assigns the type of OSPF metric. The default is type 1. ■ **Type 1**—External routes are calculated using both internal and external metrics. ■ **Type 2**—External routes are calculated using only the external metrics. Type 1 routes have more cost than Type 2. ■ **`none`**—Removes the OSPF metric. **Command mode:** Route map
`precedence` *<1-255>* Sets the precedence of the route map. The smaller the value, the higher the precedence. Default value is 10. **Command mode:** Route map
`[no] weight` *<0-65534>* Sets the weight of the route map. **Command mode:** Route map
`enable` Enables the route map. **Command mode:** Route map
`no enable` Disables the route map. **Command mode:** Route map
`no route-map` *<1-32>* Deletes the route map. **Command mode:** Route map

Table 4-63 Routing Map Configuration Commands

Command Syntax and Usage
show route-map [<*1-32*>**]** Displays the current route configuration. **Command mode:** All except User EXEC

IP Access List Configuration

NOTE – The *route map number (*1-32) and the *access list number* (1-8) represent the IP access list you wish to configure.

Table 4-64 IP Access List Configuration Commands

Command Syntax and Usage
[no] access-list {<*1-8*>**} match-address** <*1-256*> Sets the network filter number. **Command mode:** Route map See "Network Filter Configuration" on page 203 for details.
[no] access-list {<*1-8*>**} metric** <*1-4294967294*> Sets the metric value in the AS-External (ASE) LSA. **Command mode:** Route map
access-list {<*1-8*>**} action {permit|deny}** Permits or denies action for the access list. **Command mode:** Route map
access-list {<*1-8*>**} enable** Enables the access list. **Command mode:** Route map
no access-list {<*1-8*>**} enable** Disables the access list. **Command mode:** Route map
no access-list {<*1-8*>**}** Deletes the access list. **Command mode:** Route map
show route-map {<*1-32*>**} access-list {**<*1-8*>**}** Displays the current Access List configuration. **Command mode:** All except User EXEC

Autonomous System Filter Path Configuration

NOTE – The *rmap number* and the *path number* represent the AS path you wish to configure.

Table 4-65 AS Filter Configuration Commands

Command Syntax and Usage
as-path-list {<*1-8*>**}as-path** <*1-65535*> Sets the Autonomous System filter's path number. **Command mode:** Route map
as-path-list {<*1-8*>**} action {permit|deny}** Permits or denies Autonomous System filter action. **Command mode:** Route map
as-path-list {<*1-8*>**} enable** Enables the Autonomous System filter. **Command mode:** Route map
no as-path-list {<*1-8*>**} enable** Disables the Autonomous System filter. **Command mode:** Route map
no as-path-list {<*1-8*>**}** Deletes the Autonomous System filter. **Command mode:** Route map
show route-map {<*1-32*>**} as-path-list {**<*1-8*>**}** Displays the current Autonomous System filter configuration. **Command mode:** All except User EXEC

Routing Information Protocol Configuration

RIP commands are used for configuring Routing Information Protocol parameters. This option is turned off by default.

Table 4-66 Routing Information Protocol Commands

Command Syntax and Usage
`router rip` Enter Router RIP configuration mode. **Command mode:** Router RIP
`timers update {`*<1-120>***`}`** Configures the time interval for sending for RIP table updates, in seconds. The default value is 30 seconds. **Command mode:** Router RIP
`enable` Globally turns RIP **`on`**. **Command mode:** Router RIP
`no enable` Globally turns RIP **`off`**. **Command mode:** Router RIP
`show ip rip` Displays the current RIP configuration. **Command mode:** All except User EXEC

Routing Information Protocol Interface Configuration

RIP Commands are used for configuring Routing Information Protocol parameters. This option is turned off by default.

NOTE – Do not configure RIP1 parameters if your routing equipment uses RIP version 2.

Table 4-67 Routing Information Protocol Commands

Command Syntax and Usage
ip rip version {1|2|both} Configures the RIP version used by this interface. The default value is version 1. **Command mode:** Interface IP
[no] ip rip supply This command is disabled by default. When enabled, the switch supplies routes to other routers. **Command mode:** Interface IP
[no] ip rip listen This command is disabled by default. When enabled, the switch learns routes from other routers. **Command mode:** Interface IP
[no] ip rip poison This command is disabled by default. When enabled, the switch uses split horizon with poisoned reverse. When disabled, the switch uses only split horizon. **Command mode:** Interface IP
[no] ip rip triggered Enables or disables Triggered Updates. Triggered Updates are used to speed convergence. When enabled, Triggered Updates force a router to send update messages immediately, even if it is not yet time for the update message. The default value is disabled. **Command mode:** Interface IP
[no] ip rip multicast-updates Enables or disables multicast updates of the routing table (using address 224.0.0.9). The default value is disabled. **Command mode:** Interface IP
[no] ip rip default-action {both|listen|supply} When enabled, the switch accepts RIP default routes from other routers, but gives them lower priority than configured default gateways. When disabled, the switch rejects RIP default routes. This command is disabled by default. **Command mode:** Interface IP

Table 4-67 Routing Information Protocol Commands

Command Syntax and Usage
[no] ip rip metric {*<1-15>***}** Configures the route metric, which indicates the relative distance to the destination. The default value is 1. **Command mode:** Interface IP
[no] ip rip authentication type {*<password>***}** Configures the authentication type. The default is none. **Command mode:** Interface IP
ip rip authentication key {*<password>***}** Configures the authentication key password. **Command mode:** Interface IP
ip rip enable Enables this RIP interface. **Command mode:** Interface IP
no ip rip enable Disables this RIP interface. **Command mode:** Interface IP
show interface ip {*<1-128>***} rip** Displays the current RIP interface configuration. **Command mode:** All

Open Shortest Path First Configuration

Table 4-68 OSPF Configuration Commands

Command Syntax and Usage
router ospf Enter Router OSPF configuration mode. **Command mode:** Global configuration
area-range *<0-16>* Configures summary routes for up to 16 IP addresses. **Command mode:** Router OSPF See page 213 to view command options.
ip ospf Configures the OSPF interface. **Command mode:** Interface IP See page 214 to view command options.
area-virtual-link *<1-3>* Configures the Virtual Links used to configure OSPF for a Virtual Link. **Command mode:** Router OSPF See page 216 to view command options.
message-digest-key {*<1-255>***} md5-key** *<string>* Assigns a string to MD5 authentication key. **Command mode:** Router OSPF
host *<1-128>* Configures OSPF for the host routes. Up to 128 host routes can be configured. Host routes are used for advertising network device IP addresses to external networks to perform server load balancing within OSPF. It also makes Area Border Route (ABR) load sharing and ABR failover possible. **Command mode:** Router OSPF See page 217 to view command options.
lsdb-limit *<0-2000>* Sets the link state database limit. **Command mode:** Router OSPF
default-information *<1-16777214> <AS value (1-2)>*|none Sets one default route among multiple choices in an area. Use none for no default. **Command mode:** Router OSPF

Table 4-68 OSPF Configuration Commands

Command Syntax and Usage
`enable` Enables OSPF on the GbE Switch Module. **Command mode:** Router OSPF
`no enable` Disables OSPF on the GbE Switch Module. **Command mode:** Router OSPF
`show ip ospf` Displays the current OSPF configuration settings. **Command mode:** All except User EXEC

Area Index Configuration

Table 4-69 Area Index Configuration Commands

Command Syntax and Usage
`area {`*<0-2>***`} area-id`** *<IP address>* Defines the IP address of the OSPF area number. **Command mode:** Router OSPF
`area {`*<0-2>***`} type {transit|stub|nssa}`** Defines the type of area. For example, when a virtual link has to be established with the backbone, the area type must be defined as transit. **Transit area:** allows area summary information to be exchanged between routing devices. Any area that is not a stub area or NSSA is considered to be transit area. **Stub area:** is an area where external routing information is not distributed. Typically, a stub area is connected to only one other area. **NSSA:** Not-So-Stubby Area (NSSA) is similar to stub area with additional capabilities. For example, routes originating from within the NSSA can be propagated to adjacent transit and backbone areas. External routes from outside the Autonomous System (AS) can be advertised within the NSSA but are not distributed into other areas. **Command mode:** Router OSPF
`area {`*<0-2>***`} stub-metric`** *<1-65535>* Configures a stub area to send a numeric metric value. All routes received via that stub area carry the configured metric to potentially influencing routing decisions. Metric value assigns the priority for choosing the switch for default route. Metric type determines the method for influencing routing decisions for external routes. **Command mode:** Router OSPF

Table 4-69 Area Index Configuration Commands

Command Syntax and Usage
[no] area {<*0-2*>**} authentication-type {password|md5}** **None:** No authentication required. **Password:** Authenticates simple passwords so that only trusted routing devices can participate. **MD5:** This parameter is used when MD5 cryptographic authentication is required. **Command mode:** Router OSPF
area {<*0-2*>**} spf-interval** <*1-255*> Sets time interval between two successive SPF (shortest path first) calculations of the shortest path tree using the Dijkstra's algorithm. **Command mode:** Router OSPF
area {<*0-2*>**}enable** Enables the OSPF area. **Command mode:** Router OSPF
no area {<*0-2*>**} enable** Disables the OSPF area. **Command mode:** Router OSPF
no area {<*0-2*>**}** Deletes the OSPF area. **Command mode:** Router OSPF
show ip ospf area <*0-2*> Displays the current OSPF configuration. **Command mode:** All except User EXEC

OSPF Summary Range Configuration

Table 4-70 OSPF Summary Range Configuration Commands

Command Syntax and Usage
area-range {<*1-16*>**} address** <*IP address*> <*IP netmask*> Displays the base IP address or the IP address mask for the range. **Command mode:** Router OSPF
area-range {<*1-16*>**} area** <*0-2*> Displays the area index used by the GbE Switch Module. **Command mode:** Router OSPF

Table 4-70 OSPF Summary Range Configuration Commands

Command Syntax and Usage
`[no] area-range {`*<1-16>***`} hide`** Hides the OSPF summary range. **Command mode:** Router OSPF
`area-range {`*<1-16>***`} enable`** Enables the OSPF summary range. **Command mode:** Router OSPF
`no area-range {`*<1-16>***`} enable`** Disables the OSPF summary range. **Command mode:** Router OSPF
`no area-range {`*<1-16>***`}`** Deletes the OSPF summary range. **Command mode:** Router OSPF
`show ip ospf area-range` *<1-16>* Displays the current OSPF summary range. **Command mode:** Router OSPF

OSPF Interface Configuration

Table 4-71 OSPF Interface Configuration Commands

Command Syntax and Usage
`ip ospf area {`*<0-2>***`}`** Configures the OSPF area index. **Command mode:** Interface IP
`ip ospf priority` *<0-255>* Configures the priority value for the GbE Switch Module's OSPF interfaces. (A priority value of 255 is the highest and 1 is the lowest. A priority value of 0 specifies that the interface cannot be used as Designated Router (DR) or Backup Designated Router (BDR).) **Command mode:** Interface IP
`ip ospf cost` *<1-65535>* Configures cost set for the selected path—preferred or backup. Usually the cost is inversely proportional to the bandwidth of the interface. Low cost indicates high bandwidth. **Command mode:** Interface IP

Table 4-71 OSPF Interface Configuration Commands

Command Syntax and Usage
ip ospf hello-interval *<1-65535>* Configures the interval in seconds between the `hello` packets for the interfaces. **Command mode:** Interface IP
ip ospf dead-interval *<1-65535>* Configures the health parameters of a `hello` packet, which is set for an interval of seconds before declaring a silent router to be down. **Command mode:** Interface IP
ip ospf transit-delay *<1-3600>* Configures the transit delay in seconds. **Command mode:** Interface IP
ip ospf retransmit-interval *<1-3600>* Configures the retransmit interval in seconds. **Command mode:** Interface IP
[no] ip ospf key *<key string>* Sets the authentication key to clear the password. **Command mode:** Interface IP
[no] ip ospf message-digest-key *<1-255>* Assigns an MD5 key to the interface. **Command mode:** Interface IP
ip ospf enable Enables OSPF interface. **Command mode:** Interface IP
no ip ospf enable Disables OSPF interface. **Command mode:** Interface IP
no ip ospf Deletes OSPF interface. **Command mode:** Interface IP
show interface ip {*<1-128>***} ospf** Displays the current settings for OSPF interface. **Command mode:** All except User EXEC

OSPF Virtual Link Configuration

Table 4-72 OSPF Virtual Link Configuration Commands

Command Syntax and Usage
area-virtual-link {*<1-3>***} area** *<0-2>* Configures the OSPF area index for the virtual link. **Command mode:** Router OSPF
area-virtual-link {*<1-3>***} hello-interval** *<1-65535>* Configures the authentication parameters of a hello packet, in seconds. **Command mode:** Router OSPF
area-virtual-link {*<1-3>***} dead-interval** *<1-65535>* Configures the health parameters of a hello packet, in seconds. Default is 60 seconds. **Command mode:** Router OSPF
area-virtual-link {*<1-3>***} transit-delay** *<1-3600>* Configures the delay in transit, in seconds. Default is one second. **Command mode:** Router OSPF
area-virtual-link {*<1-3>***} retransmit-interval** *<1-3600>* Configures the retransmit interval, in seconds. Default is five seconds. **Command mode:** Router OSPF
area-virtual-link {*<1-3>***} neighbor-router** *<IP address>* Configures the router ID of the virtual neighbor. Default is 0.0.0.0. **Command mode:** Router OSPF
[no] area-virtual-link {*<1-3>***} key** *<key string>* Configures the password (up to eight characters) for each virtual link. Default is none. **Command mode:** Router OSPF
area-virtual-link {*<1-3>***} message-digest-key** *<1-255>* Sets MD5 key ID for each virtual link. Default is none. **Command mode:** Router OSPF
area-virtual-link {*<1-3>***} enable** Enables OSPF virtual link. **Command mode:** Router OSPF
no area-virtual-link {*<1-3>***} enable** Disables OSPF virtual link. **Command mode:** Router OSPF

Table 4-72 OSPF Virtual Link Configuration Commands

Command Syntax and Usage
no area-virtual-link {*<1-3>***}** Deletes OSPF virtual link. **Command mode:** Router OSPF
show ip ospf area-virtual-link *<1-3>* Displays the current OSPF virtual link settings. **Command mode:** All except User EXEC

OSPF Host Entry Configuration

Table 4-73 OSPF Host Entry Configuration Commands

Command Syntax and Usage
host {*<1-128>***} address** *<IP address>* Configures the base IP address for the host entry. **Command mode:** Router OSPF
host {*<1-128>***} area** *<0-2>* Configures the area index of the host. **Command mode:** Router OSPF
host {*<1-128>***} cost** *<1-65535>* Configures the cost value of the host. **Command mode:** Router OSPF
host {*<1-128>***} enable** Enables OSPF host entry. **Command mode:** Router OSPF
no host {*<1-128>***} enable** Disables OSPF host entry. **Command mode:** Router OSPF
no host {*<1-128>***}** Deletes OSPF host entry. **Command mode:** Router OSPF
show ip ospf host *<1-128>* Displays the current OSPF host entries. **Command mode:** All except User EXEC

OSPF Route Redistribution Configuration.

Table 4-74 OSPF Route Redistribution Configuration Commands

Command Syntax and Usage
redistribute {fixed|static|rip|ebgp|ibgp} {<*rmap ID (1-32)*>**}** Adds selected routing map to the rmap list. This option adds a route map to the route redistribution list. The routes of the redistribution protocol matched by the route maps in the route redistribution list will be redistributed. **Command mode:** Router OSPF
no redistribute {fixed|static|rip|ebgp|ibgp} {<*rmap ID (1-32)*>**}** Removes the route map from the route redistribution list. Removes routing maps from the `rmap` list. **Command mode:** Router OSPF
[no] redistribute {fixed|static|rip|ebgp|ibgp} export metric {<*1-16777214*>**} metric-type {type1|type2}** Exports the routes of this protocol as external OSPF AS-external LSAs in which the metric and metric type are specified. To remove a previous configuration and stop exporting the routes of the protocol, enter `none`. **Command mode:** Router OSPF
show ip ospf redistribute Displays the current route map settings. **Command mode:** All except User EXEC

OSPF MD5 Key Configuration

Table 4-75 OSPF MD5 Key Configuration Command Options

Command Syntax and Usage
message-digest-key {<*1-255*>**} md5-key** <*key string*> Sets the authentication key for this OSPF packet. **Command mode:** Router OSPF
no message-digest-key <*1-255*> Deletes the authentication key for this OSPF packet. **Command mode:** Router OSPF
show ip ospf message-digest-key <*1-255*> Displays the current MD5 key configuration. **Command mode:** All except User EXEC

Border Gateway Protocol Configuration

Border Gateway Protocol (BGP) is an Internet protocol that enables routers on a network to share routing information with each other and advertise information about the segments of the IP address space they can access within their network with routers on external networks. BGP allows you to decide what is the “best” route for a packet to take from your network to a destination on another network, rather than simply setting a default route from your border router(s) to your upstream provider(s). You can configure BGP either within an autonomous system or between different autonomous systems. When run within an autonomous system, it's called internal BGP (iBGP). When run between different autonomous systems, it's called external BGP (eBGP). BGP is defined in RFC 1771.

BGP commands enable you to configure the switch to receive routes and to advertise static routes, fixed routes and virtual server IP addresses with other internal and external routers. In the current Alteon OS implementation, the GbE Switch Module does not advertise BGP routes that are learned from other BGP “speakers”.

The BGP command option is turned off by default.

NOTE – Fixed routes are subnet routes. There is one fixed route per IP interface.

Table 4-76 Border Gateway Protocol Commands

Command Syntax and Usage
router bgp Enter Router BGP configuration mode. **Command mode:** Global configuration
neighbor *<1-16>* Configures each BGP *peer.* Each border router, within an autonomous system, exchanges routing information with routers on other external networks. **Command mode:** Router BGP To view command options, see page 220.
as *<0-65535>* Set Autonomous System number. **Command mode:** Router BGP

Table 4-76 Border Gateway Protocol Commands

Command Syntax and Usage
`local-preference` *<0-4294967294>* Sets the local preference. The path with the higher value is preferred. When multiple peers advertise the same route, use the route with the shortest AS path as the preferred route if you are using eBGP, or use the local preference if you are using iBGP. **Command mode:** Router BGP
`enable` Globally turns BGP on. **Command mode:** Router BGP
`no enable` Globally turns BGP off. **Command mode:** Router BGP
`show ip bgp` Displays the current BGP configuration. **Command mode:** All except User EXEC

BGP Peer Configuration

These commands are used to configure BGP peers, which are border routers that exchange routing information with routers on internal and external networks. The peer option is disabled by default.

Table 4-77 BGP Peer Configuration Commands

Command Syntax and Usage
`neighbor {`*<1-16>***`} remote-address`** *<IP address>* Defines the IP address for the specified peer (border router), using dotted decimal notation. The default address is 0.0.0.0. **Command mode:** Router BGP
`neighbor {`*<1-16>***`} remote-as`** *<1-65535>* Sets the remote autonomous system number for the specified peer. **Command mode:** Router BGP
`neighbor {`*<1-16>***`} timers hold-time`** *<0, 3-65535>* Sets the period of time, in seconds, that will elapse before the peer session is torn down because the switch hasn't received a "keep alive" message from the peer. The default value is 180 seconds. **Command mode:** Router BGP

Table 4-77 BGP Peer Configuration Commands

Command Syntax and Usage
neighbor {*<1-16>***} timers keep-alive** *<0, 1-21845>* Sets the keep-alive time for the specified peer, in seconds. The default value is 60 seconds. **Command mode:** Router BGP
neighbor {*<1-16>***} advertisement-interval** *<1-65535>* Sets time in seconds between advertisements. **Command mode:** Router BGP
neighbor {*<1-16>***} retry-interval** *<1-65535>* Sets connection retry interval, in seconds. **Command mode:** Router BGP
neighbor {*<1-16>***} route-origination-interval** *<1-65535>* Sets the minimum time between route originations, in seconds. **Command mode:** Router BGP
neighbor {*<1-16>***} time-to-live** *<1-255>* Time-to-live (TTL) is a value in an IP packet that tells a network router whether or not the packet has been in the network too long and should be discarded. TTL specifies a certain time span in seconds that, when exhausted, would cause the packet to be discarded. The TTL is determined by the number of router hops the packet is allowed before it must be discarded. This command specifies the number of router hops that the IP packet can make. This value is used to restrict the number of "hops" the advertisement makes. It is also used to support multi-hops, which allow BGP peers to talk across a routed network. The default number is set at 1. **Command mode:** Router BGP
neighbor {*<1-16>***} route-map in** *<1-32>* Adds route map into in-route map list. **Command mode:** Router BGP
neighbor {*<1-16>***} route-map out** *<1-32>* Adds route map into out-route map list. **Command mode:** Router BGP
no neighbor {*<1-16>***} route-map in** *<1-32>* Removes route map from in-route map list. **Command mode:** Router BGP
no neighbor {*<1-16>***} route-map out** *<1-32>* Removes route map from out-route map list. **Command mode:** Router BGP

Table 4-77 BGP Peer Configuration Commands

Command Syntax and Usage
no neighbor {*<1-16>***} shutdown** Enables this peer configuration. **Command mode:** Router BGP
neighbor {*<1-16>***} shutdown** Disables this peer configuration. **Command mode:** Router BGP
no neighbor *<1-16>* Deletes this peer configuration. **Command mode:** Router BGP
show ip bgp neighbor *<1-16>* Displays the current BGP peer configuration. **Command mode:** All except User EXEC

BGP Redistribution Configuration

Table 4-78 BGP Redistribution Configuration Commands

Command Syntax and Usage
[no] neighbor {*<1-16>***} redistribute default-metric** *<1-4294967294>* Sets default metric of advertised routes. **Command mode:** Router BGP
[no] neighbor {*<1-16>***} redistribute default-action {import|originate|redistribute}** Sets default route action. Defaults routes can be configured as import, originate, redistribute, or none. **None:** No routes are configured **Import:** Import these routes. **Originate:** The switch sends a default route to peers if it does not have any default routes in its routing table. **Redistribute:** Default routes are either configured through default gateway or learned through other protocols and redistributed to peer. If the routes are learned from default gateway configuration, you have to enable static routes since the routes from default gateway are static routes. Similarly, if the routes are learned from a certain routing protocol, you have to enable that protocol. **Command mode:** Router BGP

Table 4-78 BGP Redistribution Configuration Commands

Command Syntax and Usage
[no] neighbor {*<1-16>***} redistribute rip** Enables or disables advertising RIP routes. **Command mode:** Router BGP
[no] neighbor {*<1-16>***}redistribute ospf** Enables or disables advertising OSPF routes. **Command mode:** Router BGP
[no] neighbor {*<1-16>***} redistribute fixed** Enables or disables advertising fixed routes. **Command mode:** Router BGP
[no] neighbor {*<1-16>***} redistribute static** Enables or disables advertising static routes. **Command mode:** Router BGP
show ip bgp neighbor {*<1-16>***} redistribute** Displays current redistribution configuration. **Command mode:** All except User EXEC

BGP Aggregation Configuration

These commands enable you to configure BGP aggregation to specify the routes/range of IP destinations a peer router accepts from other peers. All matched routes are aggregated to one route, to reduce the size of the routing table. By default, the first aggregation number is enabled and the rest are disabled.

Table 4-79 BGP Aggregation Configuration Commands

Command Syntax and Usage
aggregate-address {*<1-16>***}** *<IP address> <IP netmask>* Defines the starting subnet IP address for this aggregation, using dotted decimal notation. The default address is 0.0.0.0. **Command mode:** Router BGP
aggregate-address {*<1-16>***} enable** Enables this BGP aggregation. **Command mode:** Router BGP
no aggregate-address {*<1-16>***} enable** Disables this BGP aggregation. **Command mode:** Router BGP

Table 4-79 BGP Aggregation Configuration Commands

Command Syntax and Usage
no aggregate-address {<*1-16*>**}** Deletes this BGP aggregation. **Command mode:** Router BGP
show ip bgp aggregate-address [<*1-16*>**]** Displays the current BGP aggregation configuration. **Command mode:** All except User EXEC

IGMP Configuration

Table 4-80 describes the commands used to configure basic IGMP parameters.

Table 4-80 IGMP Configuration Commands

Command Syntax and Usage
ip igmp enable Globally turns IGMP on. **Command mode:** Global configuration
no ip igmp Globally turns IGMP off. **Command mode:** Global configuration
[no] ip igmp aggregate Enables or disables IGMP Membership Report aggregation. **Command mode:** Global configuration
show ip igmp Displays the current IGMP configuration parameters. **Command mode:** All

IGMP Snooping Configuration

IGMP Snooping allows the switch to forward multicast traffic only to those ports that request it. IGMP snooping prevents multicast traffic from being flooded to all ports. The switch learns which server hosts are interested in receiving multicast traffic, and forwards it only to ports connected to those servers.

Table 4-81 describes the commands used to configure IGMP Snooping.

Table 4-81 IGMP Snooping Configuration Commands

Command Syntax and Usage
`ip igmp snoop enable` Enables IGMP Snooping. **Command mode:** Global configuration
`no ip igmp snoop enable` Disables IGMP Snooping. **Command mode:** Global configuration
`ip igmp snoop mrouter-timeout` *<1-600>* Configures the timeout value for IGMP Membership Queries (mrouter). Once the timeout value is reached, the switch removes the multicast router from its IGMP table, if the proper conditions are met. The range is from 1 to 600 seconds. The default is 255 seconds. **Command mode:** Global configuration
`ip igmp snoop source-ip` *<IP address>* Configures the source IP address used as a proxy for IGMP Group Specific Queries. **Command mode:** Global configuration
`ip igmp snoop vlan` *<1-4094>* Adds the selected VLAN(s) to IGMP Snooping. **Command mode:** Global configuration
`no ip igmp snoop vlan` *<1-4094>* Removes the selected VLAN(s) from IGMP Snooping. **Command mode:** Global configuration
`no ip igmp snoop vlan all` Removes all VLANs from IGMP Snooping. **Command mode:** Global configuration
`show ip igmp snoop` Displays the current IGMP Snooping parameters. **Command mode:** All

IGMPv3 Configuration

Table 4-85 describes the commands used to configure IGMP version 3.

Table 4-82 IGMP version 3 Configuration Commands

Command Syntax and Usage
ip igmp snoop igmpv3 sources {<*1-64*>**}** Configures the maximum number of IGMP multicast sources to snoop from within the group record. Use this command to limit the number of IGMP sources to provide more refined control. **Command mode:** Global configuration
[no] ip igmp snoop igmpv3 v1v2 Enables or disables snooping on IGMP version 1 and version 2 reports. When disabled, the switch drops IGMPv1 and IGMPv2 reports. The default value is `enabled`. **Command mode:** Global configuration
[no] ip igmp snoop igmpv3 exclude Enables or disables snooping on IGMPv3 Exclude Reports. When disabled, the switch ignores Exclude Reports. The default value is `enabled`. **Command mode:** Global configuration
ip igmp snoop igmpv3 enable Enables IGMP version 3. The default value is **enabled**. **Command mode:** Global configuration
no ip igmp snoop igmpv3 enable Disables IGMP version 3. **Command mode:** Global configuration
show ip igmp snoop igmpv3 Displays the current IGMP v3 Snooping configuration. **Command mode:** All except User EXEC

IGMP Relay Configuration

When you configure IGMP Relay, also configure the IGMP Relay multicast routers.

Table 4-85 describes the commands used to configure IGMP Relay.

Table 4-83 IGMP Relay Configuration Commands

Command Syntax and Usage
`ip igmp relay enable` Enables IGMP Relay. **Command mode:** Global configuration
`no ip igmp relay enable` Disables IGMP Relay. **Command mode:** Global configuration
`ip igmp relay vlan` *<1-4094>* Adds the VLAN to the list of IGMP Relay VLANs. **Command mode:** Global configuration
`no ip igmp relay vlan` *<1-4094>* Removes the VLAN from the list of IGMP Relay VLANs. **Command mode:** Global configuration
`ip igmp relay report` *<0-150>* Configures the interval between unsolicited Join reports sent by the switch, in seconds. The default value is 10. **Command mode:** Global configuration
`show ip igmp relay` Displays the current IGMP Relay configuration. **Command mode:** All

IGMP Relay Multicast Router Configuration

Table 4-85 describes the commands used to configure multicast routers for IGMP Relay.

Table 4-84 IGMP Relay Mrouter Configuration Commands

Command Syntax and Usage
ip igmp relay mrouter {<*1-2*>**} address** <*IP address (such as 192.4.17.101)*> Configures the IP address of the IGMP multicast router used for IGMP Relay. **Command mode:** Global configuration
ip igmp relay mrouter {<*1-2*>**} interval** <*1-60*> Configures the time interval between ping attempts to the upstream Mrouters, in seconds. The default value is 2. **Command mode:** Global configuration
ip igmp relay mrouter {<*1-2*>**} retry** <*1-120*> Configures the number of failed ping attempts required before the switch declares this Mrouter is down. The default value is 4. **Command mode:** Global configuration
ip igmp relay mrouter {<*1-2*>**} version {**<*1-2*>**}** Configures the IGMP version (1 or 2) of the multicast router. **Command mode:** Global configuration
ip igmp relay mrouter {<*1-2*>**} enable** Enables the multicast router. **Command mode:** Global configuration
no ip igmp relay mrouter {<*1-2*>**} enable** Disables the multicast router. **Command mode:** Global configuration
no ip igmp relay mrouter {<*1-2*>**}** Deletes the multicast router from IGMP Relay. **Command mode:** Global configuration

IGMP Static Multicast Router Configuration

Table 4-85 describes the commands used to configure a static multicast router.

NOTE – When you configure a static multicast router on a VLAN, the process of learning multicast routers is disabled for that VLAN.

Table 4-85 IGMP Static Multicast Router Configuration Commands

Command Syntax and Usage
ip igmp mrouter {<*port alias or number*>**} {**<*VLAN number (1-4094)*>**}** <*version (1-3)*> Selects a port/VLAN combination on which the static multicast router is connected, and configures the IGMP version (1, 2, or 3) of the multicast router. **Command mode:** Global configuration
no ip igmp mrouter {<*port alias or number*>**} {**<*VLAN number (1-4094)*>**}**<*version (1-3)*> Removes a static multicast router from the selected port/VLAN combination. **Command mode:** Global configuration
clear ip igmp mrouter Clears all static multicast routers from the switch. **Command mode:** Global configuration
show ip igmp mrouter Displays the current IGMP Static Multicast Router parameters. **Command mode:** All except User EXEC

IGMP Filtering Configuration

Table 4-86 describes the commands used to configure an IGMP filter.

Table 4-86 IGMP Filtering Configuration Commands

Command Syntax and Usage
ip igmp profile <*1-16*> Configures the IGMP filter. **Command mode:** Global configuration To view command options, see page 230.
ip igmp filtering Enables IGMP filtering globally. **Command mode:** Global configuration

Table 4-86 IGMP Filtering Configuration Commands

Command Syntax and Usage
no ip igmp filtering Disables IGMP filtering globally. **Command mode:** Global configuration
show ip igmp filtering Displays the current IGMP Filtering parameters. **Command mode:** All

IGMP Filter Definition

Table 4-87 describes the commands used to define an IGMP filter.

Table 4-87 IGMP Filter Definition Commands

Command Syntax and Usage
ip igmp profile {*<1-16>***} range** *<IP address 1> <IP address 2>* Configures the range of IP multicast addresses for this filter. **Command mode:** Global configuration
ip igmp profile {*<1-16>***}action {allow|deny}** Allows or denies multicast traffic for the IP multicast addresses specified. **Command mode:** Global configuration
ip igmp profile {*<1-16>***} enable** Enables this IGMP filter. **Command mode:** Global configuration
no ip igmp profile {*<1-16>***} enable** Disables this IGMP filter. **Command mode:** Global configuration
no ip igmp profile {*<1-16>***}** Deletes this filter's parameter definitions. **Command mode:** Global configuration
show ip igmp profile *<1-16>* Displays the current IGMP filter. **Command mode:** All

IGMP Filtering Port Configuration

Table 4-88 describes the commands used to configure a port for IGMP filtering.

Table 4-88 IGMP Filter Port Configuration Commands

Command Syntax and Usage
`[no] ip igmp filtering` Enables or disables IGMP filtering on this port. **Command mode:** Interface port
`ip igmp profile {`*<1-16>***`}`** Adds an IGMP filter to this port. **Command mode:** Interface port
`no ip igmp profile {`*<1-16>***`}`** Removes an IGMP filter from this port. **Command mode:** Interface port
`show interface port {`*<port alias or number>***`} igmp-filtering`** Displays the current IGMP filter parameters for this port. **Command mode:** All except User EXEC

IGMP Advanced Configuration

Table 4-85 describes the commands used to configure advanced IGMP parameters.

Table 4-89 IGMP Advanced Configuration Commands

Command Syntax and Usage
`ip igmp query-interval` *<1-600>* Sets the IGMP router query interval, in seconds. The default value is 125. **Command mode:** Global configuration
`ip igmp robust` *<2-10>* Configures the IGMP Robustness variable, which allows you to tune the switch for expected packet loss on the subnet. If the subnet is expected to be lossy (high rate of packet loss), increase the value. The default value is 2. **Command mode:** Global configuration
`ip igmp timeout` *<1-255>* Configures the timeout value for IGMP Membership Reports (host). Once the timeout value is reached, the switch removes the host from its IGMP table, if the conditions are met. The range is from 1 to 255 seconds. The default is 10 seconds. **Command mode:** Global configuration

Table 4-89 IGMP Advanced Configuration Commands

Command Syntax and Usage
[no] ip igmp fastleave {<*1-4094*>**}** Enables or disables Fastleave processing. Fastleave allows the switch to immediately remove a port from the IGMP port list, if the host sends a Leave message, and the proper conditions are met. This command is disabled by default. **Command mode:** Global configuration
[no] ip igmp flood Configures the switch to flood unregistered IP multicast reports to all ports. The default setting is `enabled`. **Note:** If IGMP hosts reside on different VLANs, you must disable IGMP flooding to ensure that multicast data is forwarded across the VLANs. **Command mode:** Global configuration

Domain Name System Configuration

The Domain Name System (DNS) commands are used for defining the primary and secondary DNS servers on your local network, and for setting the default domain name served by the switch services. DNS parameters must be configured prior to using hostname parameters with the `ping`, `traceroute`, and `tftp` commands.

Table 4-90 Domain Name Service Commands

Command Syntax and Usage
[no] ip dns primary-server *<IP address>* You will be prompted to set the IP address for your primary DNS server. Use dotted decimal notation. **Command mode:** Global configuration
[no] ip dns secondary-server *<IP address>* You will be prompted to set the IP address for your secondary DNS server. If the primary DNS server fails, the configured secondary will be used instead. Enter the IP address using dotted decimal notation. **Command mode:** Global configuration
[no] ip dns domain-name *<string>* Sets the default domain name used by the switch. For example: `mycompany.com` **Command mode:** Global configuration
show ip dns Displays the current Domain Name System settings. **Command mode:** All except User EXEC

Bootstrap Protocol Relay Configuration

The Bootstrap Protocol (BOOTP) Relay commands are used to allow hosts to obtain their configurations from a Dynamic Host Configuration Protocol (DHCP) server. The BOOTP configuration enables the switch to forward a client request for an IP address to two DHCP/BOOTP servers with IP addresses that have been configured on the GbE Switch Module.

BOOTP relay is turned off by default.

Table 4-91 Bootstrap Protocol Relay Configuration Commands

Command Syntax and Usage
`[no] ip bootp-relay server` *<IP address>* Sets the IP address of the first or second BOOTP server. **Command mode:** Global configuration
`ip bootp-relay enable` Globally turns on BOOTP relay. **Command mode:** Global configuration
`no ip bootp-relay enable` Globally turns off BOOTP relay. **Command mode:** Global configuration

VRRP Configuration

Virtual Router Redundancy Protocol (VRRP) support on GbE Switch Modules provides redundancy between routers in a LAN. This is accomplished by configuring the same virtual router IP address and ID number on each participating VRRP-capable routing device. One of the virtual routers is then elected as the master, based on a number of priority criteria, and assumes control of the shared virtual router IP address. If the master fails, one of the backup virtual routers will assume routing authority and take control of the virtual router IP address.

By default, VRRP is disabled. Alteon OS has extended VRRP to include virtual servers as well, allowing for full active/active redundancy between switches. For more information on VRRP, see the "High Availability" chapter in the Alteon OS *Application Guide.*

Table 4-92 Virtual Router Redundancy Protocol Commands

Command Syntax and Usage
`router VRRP` Enter Router VRRP configuration mode. **Command mode:** Global configuration
`[no] hot-standby` Enables or disables hot standby processing, in which two or more switches provide redundancy for each other. By default, this option is disabled. **Command mode:** Router VRRP
`enable` Globally enables VRRP on this switch. **Command mode:** Router VRRP
`no enable` Globally disables VRRP on this switch. **Command mode:** Router VRRP
`show ip vrrp` Displays the current VRRP parameters. **Command mode:** All

Virtual Router Configuration

These commands are used for configuring virtual routers for this switch. A virtual router is defined by its virtual router ID and an IP address. On each VRRP-capable routing device participating in redundancy for this virtual router, a virtual router will be configured to share the same virtual router ID and IP address.

Virtual routers are disabled by default.

Table 4-93 VRRP Virtual Router Configuration Commands

Command Syntax and Usage
virtual-router {<*1-1024*>**} virtual-router-id** <*1-1024*> Defines the virtual router ID. This is used in conjunction with the **[no] virtual-router** <*vr-id*> **address** <*IP address*> command below to define a virtual router on this switch. To create a pool of VRRP-enabled routing devices which can provide redundancy to each other, each participating VRRP device must be configured with the same virtual router. The *vr-id* for standard virtual routers (where the virtual router IP address is not the same as any virtual server) can be any integer between 1 and 1024. The default value is 1. All *vr-id* values must be unique within the VLAN to which the virtual router's IP interface belongs. **Command mode:** Router VRRP
[no] virtual-router {<*1-1024*>**} address** <*IP address*> Defines the IP address for this virtual router using dotted decimal notation. This is used in conjunction with the *vr-id* (above) to configure the same virtual router on each participating VRRP device. The default address is 0.0.0.0. **Command mode:** Router VRRP
virtual-router {<*1-1024*>**} interface** <*1-127*> Selects a switch IP interface. If the IP interface has the same IP address as the `addr` option above, this switch is considered the "owner" of the defined virtual router. An owner has a special priority of 255 (highest) and will always assume the role of master router, even if it must preempt another virtual router which has assumed master routing authority. This preemption occurs even if the `preem` option below is disabled. The default value is 1. **Command mode:** Router VRRP

Table 4-93 VRRP Virtual Router Configuration Commands

Command Syntax and Usage
virtual-router {*<1-1024>***} priority** *<1-254>* Defines the election priority bias for this virtual server. This can be any integer between 1 and 254. The default value is 100. During the master router election process, the routing device with the highest virtual router priority number wins. If there is a tie, the device with the highest IP interface address wins. If this virtual router's IP address is the same as the one used by the IP interface, the priority for this virtual router will automatically be set to 255 (highest). When priority tracking is used, this base priority value can be modified according to a number of performance and operational criteria. **Command mode:** Router VRRP
virtual-router {*<1-1024>***}timers advertise** *<1-255>* Defines the time interval between VRRP master advertisements. This can be any integer between 1 and 255 seconds. The default value is 1. **Command mode:** Router VRRP
[no] virtual-router {*<1-1024>***} preemption** Enables or disables master preemption. When enabled, if this virtual router is in backup mode but has a higher priority than the current master, this virtual router will preempt the lower priority master and assume control. Note that even when `preemption` is disabled, this virtual router will always preempt any other master if this switch is the owner (the IP interface address and virtual router `addr` are the same). By default, this option is enabled. **Command mode:** Router VRRP
virtual-router {*<1-1024>***} enable** Enables this virtual router. **Command mode:** Router VRRP
no virtual-router {*<1-1024>***} enable** Disables this virtual router. **Command mode:** Router VRRP
no virtual-router {*<1-1024>***}** Deletes this virtual router from the switch configuration. **Command mode:** Router VRRP
show ip vrrp virtual-router *<1-1024>* Displays the current configuration information for this virtual router. **Command mode:** All except User EXEC

Virtual Router Priority Tracking Configuration

These commands are used for modifying the priority system used when electing the master router from a pool of virtual routers. Various tracking criteria can be used to bias the election results. Each time one of the tracking criteria is met, the priority level for the virtual router is increased by an amount defined through the VRRP Tracking commands.

Criteria are tracked dynamically, continuously updating virtual router priority levels when enabled. If the virtual router preemption option is enabled, this virtual router can assume master routing authority when its priority level rises above that of the current master.

Some tracking criteria apply to standard virtual routers, otherwise called “virtual interface routers.” A virtual *server* router is defined as any virtual router whose IP address is the same as any configured virtual server IP address.

Table 4-94 VRRP Priority Tracking Configuration Commands

Command Syntax and Usage
[no] virtual-router {<*1-1024*>**} track virtual-routers** When enabled, the priority for this virtual router will be increased for each virtual router in master mode on this switch. This is useful for making sure that traffic for any particular client/server pairing are handled by the same switch, increasing routing and load balancing efficiency. This command is disabled by default. **Command mode:** Router VRRP
[no] virtual-router {<*1-1024*>**} track interfaces** When enabled, the priority for this virtual router will be increased for each other IP interface active on this switch. An IP interface is considered active when there is at least one active port on the same VLAN. This helps elect the virtual routers with the most available routes as the master. This command is disabled by default. **Command mode:** Router VRRP
[no] virtual-router {<*1-1024*>**} track ports** When enabled, the priority for this virtual router will be increased for each active port on the same VLAN. A port is considered “active” if it has a link and is forwarding traffic. This helps elect the virtual routers with the most available ports as the master. This command is disabled by default. **Command mode:** Router VRRP
show ip vrrp virtual-router {<*1-1024*>**} track** Displays the current configuration for priority tracking for this virtual router. **Command mode:** All except User EXEC

Virtual Router Group Configuration

Virtual Router Group commands are used for associating all virtual routers into a single logical virtual router, which forces all virtual routers on the GbE Switch Module to either be master or backup as a group. A virtual router is defined by its virtual router ID and an IP address. On each VRRP-capable routing device participating in redundancy for this virtual router, a virtual router will be configured to share the same virtual router ID and IP address.

NOTE – This option is required to be configured only when using at least two GbE Switch Modules in a hot-standby failover configuration, where only one switch is active at any time.

Table 4-95 VRRP Virtual Router Group Configuration Commands

Command Syntax and Usage
`group virtual-router-id {`*<1-1024>***`}`** Defines the virtual router ID. The `vrid` for standard virtual routers (where the virtual router IP address is not the same as any virtual server) can be any integer between 1 and 1024. All `vrid` values must be unique within the VLAN to which the virtual router's IP interface (see `if` below) belongs. The default virtual router ID is 1. **Command mode:** Router VRRP
`group interface` *<1-127>* Selects a switch IP interface. The default switch IP interface number is 1. **Command mode:** Router VRRP
`group priority` *<1-254>* Defines the election priority bias for this virtual router group. This can be any integer between 1 and 254. The default value is 100. During the master router election process, the routing device with the highest virtual router priority number wins. If there is a tie, the device with the highest IP interface address wins. If this virtual router's IP address (`addr`) is the same as the one used by the IP interface, the priority for this virtual router will automatically be set to 255 (highest). When priority tracking is used, this base priority value can be modified according to a number of performance and operational criteria. **Command mode:** Router VRRP
`group advertisement` *<1-255>* Defines the time interval between VRRP master advertisements. This can be any integer between 1 and 255 seconds. The default is 1. **Command mode:** Router VRRP

Table 4-95 VRRP Virtual Router Group Configuration Commands

Command Syntax and Usage
`[no] group preemption` Enables or disables master preemption. When enabled, if the virtual router group is in backup mode but has a higher priority than the current master, this virtual router will preempt the lower priority master and assume control. Note that even when `preemption` is disabled, this virtual router will always preempt any other master if this switch is the owner (the IP interface address and virtual router address are the same). By default, this option is enabled. **Command mode:** Router VRRP
`group enable` Enables the virtual router group. **Command mode:** Router VRRP
`no group enable` Disables the virtual router group. **Command mode:** Router VRRP
`no group` Deletes the virtual router group from the switch configuration. **Command mode:** Router VRRP
`show ip vrrp group` Displays the current configuration information for the virtual router group. **Command mode:** All except User EXEC

Virtual Router Group Priority Tracking Configuration

NOTE – If *Virtual Router Group Tracking* is enabled, then the tracking option will be available only under *group* option. The tracking setting for the other individual virtual routers will be ignored.

Table 4-96 Virtual Router Group Priority Tracking Configuration Commands

Command Syntax and Usage
`[no] group track interfaces` When enabled, the priority for this virtual router will be increased for each other IP interface active on this switch. An IP interface is considered active when there is at least one active port on the same VLAN. This helps elect the virtual routers with the most available routes as the master. This command is disabled by default. **Command mode:** Router VRRP
`[no] group track ports` When enabled, the priority for this virtual router will be increased for each active port on the same VLAN. A port is considered “active” if it has a link and is forwarding traffic. This helps elect the virtual routers with the most available ports as the master. This command is disabled by default. **Command mode:** Router VRRP
`show ip vrrp group track` Displays the current configuration for priority tracking for this virtual router. **Command mode:** All except User EXEC

VRRP Interface Configuration

NOTE – The *interface* (1 to 127) represents the IP interface on which authentication parameters must be configured.

These commands are used for configuring VRRP authentication parameters for the IP interfaces used with the virtual routers.

Table 4-97 VRRP Interface Commands

Command Syntax and Usage
`interface {`*<1-127>***`} authentication {password|none}`** Defines the type of authentication that will be used: `none` (no authentication) or `password` (password authentication). **Command mode:** Router VRRP
`[no] interface {`*<1-127>***`} password`** *<password>* Defines a plain text password up to eight characters long. This password will be added to each VRRP packet transmitted by this interface when password authentication is chosen (see **`interface authentication`** above). **Command mode:** Router VRRP
`no interface {`*<1-127>***`}`** Clears the authentication configuration parameters for this IP interface. The IP interface itself is not deleted. **Command mode:** Router VRRP
`show ip vrrp interface` *<1-127>* Displays the current configuration for this IP interface's authentication parameters. **Command mode:** All except User EXEC

VRRP Tracking Configuration

These commands are used for setting weights for the various criteria used to modify priority levels during the master router election process. Each time one of the tracking criteria is met (see "VRRP Virtual Router Priority Tracking Commands" on page 237), the priority level for the virtual router is increased by a defined amount.

Table 4-98 VRRP Tracking Configuration Commands

Command Syntax and Usage
`tracking-priority-increment virtual-routers` *<0-254>* Defines the priority increment value (0 through 254) for virtual routers in master mode detected on this switch. The default value is 2. **Command mode:** Router VRRP
`tracking-priority-increment interfaces` *<0-254>* Defines the priority increment value for active IP interfaces detected on this switch. The default value is 2. **Command mode:** Router VRRP
`tracking-priority-increment ports` *<0-254>* Defines the priority increment value for active ports on the virtual router's VLAN. The default value is 2. **Command mode:** Router VRRP
`show ip vrrp tracking-priority-increment` Displays the current configuration of priority tracking increment values. **Command mode:** All except User EXEC

NOTE – These priority tracking options only define increment values. These options do not affect the VRRP master router election process until options under the VRRP Virtual Router Priority Tracking Commands (see page 237) are enabled.

Quality of Service Configuration

Quality of Service (QoS) commands configure the 802.1p priority value and DiffServ Code Point value of incoming packets. This allows you to differentiate between various types of traffic, and provide different priority levels.

802.1p Configuration

This feature provides the GbESM the capability to filter IP packets based on the 802.1p bits in the packet's VLAN header. The 802.1p bits specify the priority that you should give to the packets while forwarding them. The packets with a higher (non-zero) priority bits are given forwarding preference over packets with numerically lower priority bits value.

Table 4-99 802.1p Configuration Commands

Command Syntax and Usage
qos transmit-queue mapping {<*priority (0-7)*>**} {**<*queue (0-1)*>|<*queue (0-7)*>**}** Maps the 802.1p priority of to the Class of Service queue (COSq) priority. Enter the 802.1p priority value (0-7), followed by the Class of Service queue that handles the matching traffic. **Command mode:** Global configuration
qos transmit-queue weight-cos {<*queue (0-1)*>|<*queue (0-7)*>**} {**<*weight (0-15)*>**}** Configures the weight of the selected Class of Service queue (COSq). Enter the queue number, followed by the scheduling weight (0-15). **Command mode:** Global configuration
qos transmit-queue number-cos {2|8} Sets the number of Class of Service queues for switch ports. The default value is 2. **Command mode:** Global configuration
show qos transmit-queue Displays the current 802.1p parameters. **Command mode:** All except User EXEC

DSCP Configuration

These commands map the DiffServ Code Point (DSCP) value of incoming packets to a new value or to an 802.1p priority value.

Table 4-100 DSCP Configuration Commands

Command Syntax and Usage
qos dscp dscp-mapping {<*DSCP value*>**}{**<*new DSCP value*>**}** Maps the initial DiffServ Code Point (DSCP) value to a new value. Enter the DSCP value (0-63) of incoming packets, followed by the new value. **Command mode:** Global configuration
qos dscp dot1p-mapping {<*DSCP value*>**} {**<*priority (0-7)*>**}** Maps the DiffServ Code point value to an 802.1p priority value. Enter the DSCP value, followed by the corresponding 802.1p value. **Command mode:** Global configuration
qos dscp re-marking Turns on DSCP re-marking globally. **Command mode:** Global configuration
no qos dscp re-marking Turns off DSCP re-marking globally. **Command mode:** Global configuration
show qos dscp Displays the current DSCP parameters. **Command mode:** All except User EXEC

Access Control Configuration

Use these commands to create Access Control Lists and ACL Groups. ACLs define matching criteria used for IP filtering and Quality of Service functions.

Table 4-101 General ACL Configuration Commands

Command Syntax and Usage
[no] access-control list *<1-896>* Configures an Access Control List. **Command mode:** Global configuration To view command options, see page 245.
[no] access-control group *<1-896>* Configures an ACL Group. **Command mode:** Global configuration To view command options, see page 251.
show access-control Displays the current ACL parameters. **Command mode:** All except User EXEC

Access Control List Configuration

These commands allow you to define filtering criteria for each Access Control List (ACL).

Table 4-102 ACL Configuration Commands

Command Syntax and Usage
[no] access-control list {*<1-896>***} egress-port** *<port alias or number>* Configures the ACL to function on egress packets. **Command mode:** Global configuration
access-control list {*<1-896>***} action {permit|deny|set-priority** *<0-7>***}** Configures a filter action for packets that match the ACL definitions. You can choose to permit (pass) or deny (drop) packets, or set the 802.1p priority level (0-7). **Command mode:** Global configuration
access-control list {*<1-896>***} statistics** Enables or disables the statistics collection for the Access Control List. **Command mode:** All except User EXEC

Table 4-102 ACL Configuration Commands

Command Syntax and Usage
default access-control list {<*1-896*>**}** Resets the ACL parameters to their default values. **Command mode:** Global configuration
show access-control list <*1-896*> Displays the current ACL parameters. **Command mode:** All except User EXEC

Ethernet Filtering Configuration

These commands allow you to define Ethernet matching criteria for an ACL.

Table 4-103 Ethernet Filtering Configuration Commands

Command Syntax and Usage
[no] access-control list {<*1-896*>**} ethernet source-mac-address {**<*MAC address*>**} {**<*MAC mask*>**}** Defines the source MAC address for this ACL. **Command mode:** Global configuration
[no] access-control list {<*1-896*>**} ethernet destination-mac-address {**<*MAC address*>**} {**<*MAC mask*>**}** Defines the destination MAC address for this ACL. **Command mode:** Global configuration
[no] access-control list {<*1-896*>**} ethernet vlan {**<*VLAN ID*>**} {**<*VLAN mask*>**}** Defines a VLAN number and mask for this ACL. **Command mode:** Global configuration
[no] access-control list {<*1-896*>**} ethernet ethernet-type {arp|ip|ipv6| mpls| rarp|any|0xXXXX}** Defines the Ethernet type for this ACL. **Command mode:** Global configuration
[no] access-control list {<*1-896*>**} ethernet priority** <*0-7*> Defines the Ethernet priority value for the ACL. **Command mode:** Global configuration
default access-control list {<*1-896*>**} ethernet** Resets Ethernet parameters for the ACL to their default values. **Command mode:** Global configuration

Table 4-103 Ethernet Filtering Configuration Commands

Command Syntax and Usage
no access-control list {*<1-896>***} ethernet** Removes Ethernet parameters for the ACL. **Command mode:** Global configuration
show access-control list {*<1-896>***} ethernet** Displays the current Ethernet parameters for the ACL. **Command mode:** All except User EXEC

IP version 4 Filtering Configuration

These commands allow you to define IPv4 matching criteria for an ACL.

Table 4-104 IP version 4 Filtering Configuration Commands

Command Syntax and Usage
[no] access-control list {*<1-896>***} ipv4 source-ip-address** *<IP address> {<IP mask>* Defines a source IP address for the ACL. If defined, traffic with this source IP address will match this ACL. Specify an IP address in dotted decimal notation. **Command mode:** Global configuration
[no] access-control list {*<1-896>***}ipv4 destination-ip-address** *<IP address> <IP mask>* Defines a destination IP address for the ACL. If defined, traffic with this destination IP address will match this ACL. **Command mode:** Global configuration
[no] access-control list {*<1-896>***} ipv4 protocol** *<0-255>* Defines an IP protocol for the ACL. If defined, traffic from the specified protocol matches this filter. Specify the protocol number. Listed below are some of the well-known protocols. **Number** **Name** 1 icmp 2 igmp 6 tcp 17 udp 89 ospf 112 vrrp **Command mode:** Global configuration

Table 4-104 IP version 4 Filtering Configuration Commands

Command Syntax and Usage
[no] access-control list {<*1-896*>**} ipv4 type-of-service** <*0-255*> Defines a Type of Service value for the ACL. For more information on ToS, refer to RFC 1340 and 1349. **Command mode:** Global configuration
default access-control list {<*1-896*>**} ipv4** Resets the IPv4 parameters for the ACL to their default values. **Command mode:** Global configuration
show access-control list {<*1-896*>**} ipv4** Displays the current IPV4 parameters. **Command mode:** All except User EXEC

TCP/UDP Filtering Configuration

These commands allow you to define TCP/UDP matching criteria for an ACL.

Table 4-105 TCP/UDP Filtering Configuration Commands

Command Syntax and Usage
[no] access-control list {*<1-896>***} tcp-udp source-port** *<1-65535> <mask (0xFFFF)>* Defines a source port for the ACL. If defined, traffic with the specified TCP or UDP source port will match this ACL. Specify the port number. Listed below are some of the well-known ports: **Number** **Name** **20** ftp-data **21** ftp **22** ssh **23** telnet **25** smtp **37** time **42** name **43** whois **53** domain **69** tftp **70** gopher **79** finger **80** http **Command mode:** Global configuration
[no] access-control list {*<1-896>***} tcp-udp destination-port** *<1-65535> <mask (0xFFFF)>* Defines a destination port for the ACL. If defined, traffic with the specified TCP or UDP destination port will match this ACL. Specify the port number, just as with `sport` above. **Command mode:** Global configuration
[no] access-control list {*<1-896>***} tcp-udp flags** *<flag (0x0-0x3f)>* Defines a TCP/UDP flag for the ACL. **Command mode:** Global configuration

Table 4-105 TCP/UDP Filtering Configuration Commands

Command Syntax and Usage
default access-control list {<*1-896*>**} tcp-udp** Resets the TCP/UDP parameters for the ACL to their default values. **Command mode:** Global configuration
show access-control list {<*1-896*>**} tcp-udp** Displays the current TCP/UDP Filtering parameters. **Command mode:** All except User EXEC

Packet Format Filtering Configuration

These commands allow you to define Packet Format matching criteria for an ACL.

Table 4-106 Packet Format Filtering Configuration Commands

Command Syntax and Usage
access-control list {<*1-896*>**} packet-format ethernet {ethertype2| snap|llc}** Defines the Ethernet format for the ACL. **Command mode:** Global configuration
[no] access-control list {<*1-896*>**} packet-format tagged** Defines the tagging format for the ACL. **Command mode:** Global configuration
[no] access-control list {<*1-896*>**} packet-format ip {ipv4|ipv6}** Defines the IP format for the ACL. **Command mode:** Global configuration
default access-control list {<*1-896*>**} packet-format** Resets Packet Format parameters for the ACL to their default values. **Command mode:** Global configuration
show access-control list {<*1-896*>**} packet-format** Displays the current Packet Format parameters for the ACL. **Command mode:** All except User EXEC

ACL Group Configuration

These commands allow you to compile one or more ACLs into an ACL Group. Once you create an ACL Group, you can assign the ACL Group to one or more ports.

Table 4-107 ACL Group Configuration Commands

Command Syntax and Usage
access-control group {*<1-896>***} list** *<1-896>* Adds the selected ACL to the ACL Group. **Command mode:** Global configuration
no access-control group {*<1-896>***} list** *<1-896>* Removes the selected ACL from the ACL Group. **Command mode:** Global configuration
show access-control group *<1-896>* Displays the current ACL group parameters. **Command mode:** All except User EXEC

ACL Metering Configuration

These commands define the Access Control profile for the selected ACL or ACL Group.

Table 4-108 ACL Metering Configuration Commands

Command Syntax and Usage
access-control list {*<1-896>***} meter action {permit|deny}** Configures a filter action for packets that match the ACL definitions. You can choose to permit (pass) or deny (drop) packets. **Command mode:** Global configuration
access-control list {*<1-896>***} meter committed-rate** *<1000-1000000>* Configures the committed rate, in Kilobits per second. The committed rate must be a multiple of 64. **Command mode:** Global configuration
access-control list {*<1-896>***} meter maximum-burst-size** *<32-4096>* Configures the maximum burst size, in Kilobits. Enter one of the following values for `mbsize`: 32, 64, 128, 256, 512, 1024, 2048, 4096 **Command mode:** Global configuration
[no] access-control list {*<1-896>***} meter enable** Enables or disables ACL Metering. **Command mode:** Global configuration

Table 4-108 ACL Metering Configuration Commands

Command Syntax and Usage
access-control list {<*1-896*>**} meter action {drop|pass}** Configures the ACL Meter to either drop or pass out-of-profile traffic. **Command mode:** Global configuration
show access-control list {<*1-896*>**} meter** Displays current ACL Metering parameters. **Command mode:** All

ACL Re-Mark Configuration

You can choose to re-mark IP header data for the selected ACL or ACL Group. You can configure different re-mark values, based on whether packets fall within the ACL Metering profile, or out of the ACL Metering profile.

Re-Marking In-Profile Configuration

Table 4-109 Re-Mark Configuration Commands

Command Syntax and Usage
access-control list {<*1-896*>**} re-mark in-profile dscp** <*0-63*> Sets the DiffServ Code Point (DSCP) of In-Profile packets to the selected value. **Command mode:** Global configuration
show access-control list {<*1-896*>**} re-mark** Displays current Re-Mark In-Profile parameters. **Command mode:** All

Update User Priority Configuration

Table 4-110 User Priority Configuration Commands

Command Syntax and Usage
access-control list {<*1-896*>**} re-mark in-profile dot1p** <*0-7*> Defines 802.1p value. The value is the priority bits information in the packet structure. **Command mode:** Global configuration

Table 4-110 User Priority Configuration Commands

Command Syntax and Usage
[no] access-control list {<*1-896*>**} re-mark in-profile use-tos-precedence** Enable or disable mapping of TOS (Type of Service) priority to 802.1p priority for In-Profile packets. When enabled, the TOS value is used to set the 802.1p value. **Command mode:** Global configuration
show access-control list {<*1-896*>**} re-mark** Displays current Re-Mark In-Profile User Priority parameters. **Command mode:** All

Re-Marking Out-of-Profile Configuration

Table 4-111 Out-of-Profile Configuration Commands

Command Syntax and Usage
access-control list {<*1-896*>**} re-mark out-profile dscp** <*0-63*> Sets the DiffServ Code Point (DSCP) of Out-of-Profile packets to the selected value. The switch sets the DSCP value on Out-of-Profile packets. **Command mode:** Global configuration
show access-control list {<*1-896*>**} re-mark** Displays current Re-Mark Out-of-Profile parameters. **Command mode:** All

Port Mirroring Configuration

Port mirroring is disabled by default. For more information about port mirroring on the GbE Switch Module, see "Appendix A: Troubleshooting" in the *Alteon OS Application Guide*.

NOTE – Traffic on VLAN 4095 is not mirrored to the external ports.

Port Mirroring commands are used to configure, enable, and disable the monitored port. When enabled, network packets being sent and/or received on a target port are duplicated and sent to a monitor port. By attaching a network analyzer to the monitor port, you can collect detailed information about your network performance and usage.

Table 4-112 Port Mirroring Configuration Commands

Command Syntax and Usage
`[no] port-mirroring enable` Enables or disables port mirroring. **Command mode:** Global configuration
`show port-mirroring` Displays current settings of the mirrored and monitoring ports. **Command mode:** All except User EXEC

Port-Mirroring Configuration

Table 4-113 Port-Based Port-Mirroring Configuration Commands

Command Syntax and Usage
port-mirroring monitor-port <*port alias or number*> mirroring-port <*port alias or number*> {in|out|both} Adds the port to be mirrored. This command also allows you to enter the direction of the traffic. It is necessary to specify the direction because: If the source port of the frame matches the mirrored port and the mirrored direction is ingress or both (ingress and egress), the frame is sent to the mirrored port. If the destination port of the frame matches the mirrored port and the mirrored direction is egress or both, the frame is sent to the monitoring port. **Command mode:** Global configuration
no port-mirroring monitor-port {<*port alias or number*>**} mirroring-port {**<*port alias or number*>**}** Removes the mirrored port. **Command mode:** Global configuration
show port-mirroring Displays the current settings of the monitoring port. **Command mode:** All except User EXEC

Configuration Dump

The dump program writes the current switch configuration to the terminal screen. To start the dump program, at the prompt, enter:

```
Router(config)# show running-config
```

The configuration is displayed with parameters that have been changed from the default values. The screen display can be captured, edited, and placed in a script file, which can be used to configure other switches through a Telnet connection. When using Telnet to configure a new switch, paste the configuration commands from the script file at the command line prompt of the switch. The active configuration can also be saved or loaded via FTP/TFTP, as described on page 256.

Saving the Active Switch Configuration

When the **copy running-config tftp** command is used, the switch's active configuration commands (as displayed using **show running-config**) will be uploaded to the specified script configuration file on the FTP/TFTP server. To start the switch configuration upload, at the prompt, enter:

```
Router(config)# copy running-config {ftp|tftp}
```

NOTE – The output file is formatted with line-breaks but no carriage returns—the file cannot be viewed with editors that require carriage returns (such as Microsoft Notepad).

NOTE – If the TFTP server is running SunOS or the Solaris operating system, the specified configuration file must exist prior to executing the **copy running-config** command and must be writable (set with proper permission, and not locked by any application). The contents of the specified file will be replaced with the current configuration data.

Restoring the Active Switch Configuration

When the **copy tftp running-config** command is used, the active configuration will be replaced with the commands found in the specified configuration file. The file can contain a full switch configuration or a partial switch configuration.

To start the switch configuration download, at the prompt, enter:

```
Router(config)# copy {ftp|tftp} running-config
```

CHAPTER 5

Operations Commands

Operations commands generally affect switch performance immediately, but do not alter permanent switch configurations. For example, you can use Operations commands to immediately disable a port (without the need to apply or save the change), with the understanding that when the switch is reset, the port returns to its normally configured operation.

These commands enable you to alter switch operational characteristics without affecting switch configuration.

Table 5-1 General Operations Commands

Command Syntax and Usage
`password` *<string>* Allows the user to change the password. You must enter the current password in use for validation. **Command Mode**: `Privileged EXEC`
`clear logging` Clears all Syslog messages. **Command Mode**: `Privileged EXEC`
`ntp send` Allows the user to send requests to the NTP server. **Command Mode**: `Privileged EXEC`

Operations-Level Port Options

Operations-level port options are used for temporarily disabling or enabling a port, and for re-setting the port.

Table 5-2 Port Operations Commands

Command Syntax and Usage
`no interface port` *<port alias or number>* **`shutdown`** Temporarily enables the port. The port will be returned to its configured operation mode when the switch is reset. **Command Mode**: `Privileged EXEC`
`interface port` *<port alias or number>* **`shutdown`** Temporarily disables the port. The port will be returned to its configured operation mode when the switch is reset. **Command Mode**: `Privileged EXEC`
`interface port` *<port alias or number>* **`learning`** Temporarily enables FDB learning on the port. **Command Mode**: `Privileged EXEC`
`no interface port` *<port alias or number>* **`learning`** Temporarily disables FDB learning on the port. **Command Mode**: `Privileged EXEC`
`show interface port` *<port alias or number>* **`operation`** Displays the port interface operational state. **Command Mode**: `Privileged EXEC`

Operations-Level Port 802.1x Options

Operations-level port 802.1x options are used to temporarily set 802.1x parameters for a port.

Table 5-3 802.1x Operations Commands

Command Syntax and Usage
`interface port` *<port alias or number>* **`dot1x init`** Re-initializes the 802.1x access-control parameters for the port. The following actions take place, depending on the 802.1x port configuration: ■ **`force unauth`** - the port is placed in unauthorized state, and traffic is blocked. ■ **`auto`** - the port is placed in unauthorized state, then authentication is initiated. ■ **`force auth`** - the port is placed in authorized state, and authentication is not required. **Command Mode**: `Privileged EXEC`
`interface port` {*<port alias or number>*} **`dot1x re-authenticate`** Re-authenticates the supplicant (client) attached to the port. This command only applies if the port's 802.1x mode is configured as `auto`. **Command Mode**: `Privileged EXEC`

Operations-Level VRRP Options

Table 5-4 Virtual Router Redundancy Operations Commands

Command Syntax and Usage
`router vrrp backup` *<1-1024>* Forces the specified master virtual router on this switch into backup mode. This is generally used for passing master control back to a preferred switch once the preferred switch has been returned to service after a failure. When this command is executed, the current master gives up control and initiates a new election by temporarily advertising its own priority level as 0 (lowest). After the new election, the virtual router forced into backup mode by this command will resume master control in the following cases: ■ This switch owns the virtual router (the IP addresses of the virtual router and its IP interface are the same) ■ This switch's virtual router has a higher priority and preemption is enabled. ■ There are no other virtual routers available to take master control. **Command Mode**: `Privileged EXEC`

Operations-Level BGP Options

Table 5-5 IP BGP Operations Commands

Command Syntax and Usage
`router bgp start` *<1-16>* Starts the peer session. **Command Mode**: `Privileged EXEC`
`router bgp stop` *<1-16>* Stops the peer session. **Command Mode**: `Privileged EXEC`
`show ip bgp state` Displays the current BGP operational state. **Command Mode**: `Privileged EXEC`

Protected Mode Commands

Protected Mode is used to secure certain switch management options, so they cannot be changed by the management module.

Table 5-6 Protected Mode Commands

Command Syntax and Usage
`[no] protected-mode external-management` Enables exclusive local control of switch management. When Protected Mode is set to **on**, the management module cannot be used to disable external management on the switch. The default value is **`enabled`**. **Note**: Due to current management module implementation, this setting cannot be disabled. **Command Mode**: `Global configuration`
`[no] protected-mode external-ports` Enables exclusive local control of external ports. When Protected Mode is set to **on**, the management module cannot be used to disable external ports on the switch. The default value is **`enabled`**. **Note**: Due to current management module implementation, this setting cannot be disabled. **Command Mode**: `Global configuration`

Table 5-6 Protected Mode Commands

Command Syntax and Usage
[no] protected-mode factory-default Enables exclusive local control of factory default resets. When Protected Mode is set to **on**, the management module cannot be used to reset the switch software to factory default values. The default value is **enabled**. **Note**: Due to current management module implementation, this setting cannot be disabled. **Command Mode**: Global configuration
[no] protected-mode management-vlan-interface Enables exclusive local control of the management interface (IF 128). When Protected Mode is set to **on**, the management module cannot be used to configure parameters for the management interface. The default value is **enabled**. **Note**: Due to current management module implementation, this setting cannot be disabled. **Command Mode**: Global configuration
protected-mode enable Turns Protected Mode **on**. When Protected Mode is turned on, the switch takes exclusive local control of all enabled options. **Command Mode**: Global configuration
no protected-mode enable Turns Protected Mode **off**. When Protected Mode is turned off, the switch relinquishes exclusive local control of all enabled options. **Command Mode**: Global configuration
show protected-mode Displays the current Protected Mode configuration. **Command Mode**: Global configuration

CHAPTER 6

Boot Options

To use the Boot Options commands, you must be logged in to the switch as the administrator. The Boot Options commands provide options for:

- Selecting a switch software image to be used when the switch is next reset
- Selecting a configuration block to be used when the switch is next reset
- Downloading or uploading a new software image to the switch via FTP/TFTP

In addition to the Boot commands, you can use a Web browser or SNMP to work with switch image and configuration files. To use SNMP, refer to “Working with Switch Images and Configuration Files” in the *Command Reference*.

The boot options are discussed in the following sections.

Scheduled Reboot of the Switch

This feature allows the switch administrator to schedule a reboot to occur at a particular time in future. This feature is particularly helpful if the user needs to perform switch upgrades during off-peak hours. You can set the reboot time, cancel a previously scheduled reboot, and check the time of the current reboot schedule.

Scheduled Reboot Commands

Table 6-1 Scheduled Reboot commands

Command Syntax and Usage

boot schedule <*day*> <*time (hh:mm)*>
Configures the switch reset time. The following options are valid for the `day` value:
`monday`
`tuesday`
`wednesday`
`thursday`
`friday`
`saturday`
`sunday`
Command Mode: Global configuration

no boot schedule Cancels the switch reset time. **Command Mode**: Global configuration
show boot Displays the current switch reboot schedule. **Command Mode**: `All except User EXEC`

Updating the Switch Software Image

The switch software image is the executable code running on the GbE Switch Module. A version of the image ships with the switch, and comes pre-installed on the device. As new versions of the image are released, you can upgrade the software running on your switch. To get the latest version of software available for your GbE Switch Module, go to:

`http://www-304.ibm.com/jct01004c/systems/support`

Click on software updates. Use the following command to determine the current software version: **`show boot`**

Upgrading the software image on your switch requires the following:

- Loading the new image onto a FTP or TFTP server on your network
- Transferring the new image from the FTP or TFTP server to your switch
- Selecting the new software image to be loaded into switch memory the next time the switch is reset

Loading New Software to Your Switch

The switch can store up to two different software images, called `image1` and `image2`, as well as boot software, called `boot`. When you load new software, you must specify where it should be placed: either into `image1`, `image2`, or `boot`.

For example, if your active image is currently loaded into `image1`, you would probably load the new image software into `image2`. This lets you test the new software and reload the original active image (stored in `image1`), if needed.

To load a new software image to your switch, you need the following:

- The image or boot software loaded on a FTP/TFTP server on your network
- The hostname or IP address of the FTP/TFTP server
- The name of the new software image or boot file

NOTE – The DNS parameters must be configured if specifying hostnames.

When the above requirements are met, use the following procedure to download the new software to your switch.

1. **In Privileged EXEC mode, enter the following command:**

```
Router# copy tftp {<image1|image2|boot-image>}
```

or

```
Router# copy ftp {<image1|image2|boot-image>}
```

2. **Enter the hostname or IP address of the FTP or TFTP server.**

```
Address or name of remote host: <name or IP address>
```

3. **Enter the name of the new software file on the server.**

```
Source file name: <filename>
```

The exact form of the name will vary by server. However, the file location is normally relative to the FTP or TFTP directory (usually `tftpboot`).

4. **Enter your username and password for the server, if applicable.**

```
User name: <username> or <Enter>
```

5. **The system prompts you to confirm your request.**

You should next select a software image to run, as described below.

Selecting a Software Image to Run

You can select which software image (`image1` or `image2`) you want to run in switch memory for the next reboot.

1. **In Global Configuration mode, enter:**

```
Router(config)# boot image {image1|image2}
```

2. **Enter the name of the image you want the switch to use upon the next boot.**

The system informs you of which image set to be loaded at the next reset:

```
Next boot will use switch software image1 instead of image2.
```

Uploading a Software Image from Your Switch

You can upload a software image from the switch to a FTP or TFTP server.

1. **In Privileged EXEC mode, enter:**

```
Router# copy {<image1|image2|boot-image>} tftp
```

or

```
Router# copy {<image1|image2|boot-image>} ftp
```

2. **Enter the name or the IP address of the FTP or TFTP server:**

```
Address or name of remote host: <name or IP address>
```

3. **Enter the name of the file into which the image will be uploaded on the FTP or TFTP server:**

```
Destination file name: <filename>
```

4. **Enter your username and password for the server, if applicable.**

```
User name: <username> or <Enter>
```

5. **The system then requests confirmation of what you have entered. To have the file uploaded, enter Y.**

```
image2 currently contains Software Version 1.1.1
 that was downloaded at  0:23:39 Thu Jan  1, 2007.
Upload will transfer image2 (2788535 bytes) to file "image1"
 on FTP/TFTP server 1.90.90.95.
Confirm upload operation (y/n) ? y
```

Selecting a Configuration Block

When you make configuration changes to the GbE Switch Module, you must save the changes so that they are retained beyond the next time the switch is reset. When you perform a save operation (**`copy running-config startup-config`**), your new configuration changes are placed in the *active* configuration block. The previous configuration is copied into the *backup* configuration block.

There is also a *factory* configuration block. This holds the default configuration set by the factory when your GbE Switch Module was manufactured. Under certain circumstances, it may be desirable to reset the switch configuration to the default. This can be useful when a custom-configured GbE Switch Module is moved to a network environment where it will be re configured for a different purpose.

Use the following procedure to set which configuration block you want the switch to load the next time it is reset:

1. **In Global Configuration mode, enter:**

```
Router (config)# boot configuration-block {active|backup|factory}
```

Resetting the Switch

You can reset the switch to make your software image file and configuration block changes occur.

NOTE – Resetting the switch causes the Spanning Tree Group to restart. This process can be lengthy, depending on the topology of your network.

NOTE – Resetting the switch causes the date and time to revert to default values. Use the following commands and to re-enter the current date and time:

```
>>Router (config)# system date <yyyy><mm><dd>
>>Router (config)# system time <hh><mm><ss>
```

Enter the following command to reset (reload) the switch:

```
>> Router# reload
```

You are prompted to confirm your request.

```
Reset will use software "image2" and the active config block.
>> Note that this will RESTART the Spanning Tree,
>> which will likely cause an interruption in network service.
Confirm reload (y/n) ?
```

Accessing the Alteon OS CLI

To access the Alteon OS CLI, enter the following command from the ISCLI:

```
Router(config)# boot cli-mode aos
```

The default command-line interface for the GbESM is the Alteon OS CLI. To access the ISCLI, enter the following command and reset the GbESM:

```
Main# boot/mode iscli
```

Users can select the CLI mode upon login, if the following command is enabled:

```
boot cli-mode prompt
```

Only an administrator connected through the console port can view and enable the `prompt` command. When `prompt` is enabled, the first user to log in can select the CLI mode. Subsequent users must use the selected CLI mode, until all users have logged out.

CHAPTER 7
Maintenance Commands

The maintenance commands are used to manage dump information and forward database information. They also include debugging commands to help with troubleshooting.

Dump information contains internal switch state data that is written to flash memory on the GbE Switch Module after any one of the following occurs:

- The switch administrator forces a switch *panic*. The **`debug panic`** command causes the switch to dump state information to flash memory, and then causes the switch to reboot.
- The watchdog timer forces a switch reset. The purpose of the watchdog timer is to reboot the switch if the switch software freezes.
- The switch detects a hardware or software problem that requires a reboot.

To use the maintenance commands, you must be logged in to the switch as the administrator.

Table 7-1 General Maintenance Commands

Command Syntax and Usage
`show flash-dump-uuencode` Displays dump information in uuencoded format. **Command mode:** All except User EXEC For details, see page 279.
`copy flash-dump tftp` Saves the system dump information via TFTP. **Command mode:** All except User EXEC For details, see page 280.
`copy flash-dump ftp` Saves the system dump information via FTP. **Command mode:** All except User EXEC
`clear flash-dump` Clears dump information from flash memory. **Command mode:** All except User EXEC

Table 7-1 General Maintenance Commands

Command Syntax and Usage
`debug panic` Dumps MP information to FLASH and reboots. **Command mode:** All except User EXEC For details, see page 281.
`show tech-support` Dumps all GbE Switch Module information, statistics, and configuration.You can log the output (tsdmp) into a file. **Command mode:** All except User EXEC
`copy tech-support tftp` Redirects the technical support dump (tsdmp) to an external TFTP server. **Command mode:** All except User EXEC
`copy tech-support ftp` Redirects the technical support dump (tsdmp) to an external FTP server. **Command mode:** All except User EXEC

System Maintenance

System maintenance commands are reserved for use by IBM Service Support. The options are used to perform system debugging.

Table 7-2 System Maintenance Commands

Command Syntax and Usage
`debug debug-flags` This command sets the flags that are used for debugging purposes by service support group. **Command mode:** All except User EXEC

Forwarding Database Maintenance

The Forwarding Database commands can be used to view information and to delete a MAC address from the forwarding database or to clear the entire forwarding database. This is helpful in identifying problems associated with MAC address learning and packet forwarding decisions.

Table 7-3 FDB Manipulation Commands

Command Syntax and Usage
`show mac-address-table address {`*<MAC address>***`}`** Displays a single database entry by its MAC address. You are prompted to enter the MAC address of the device. Enter the MAC address using the `xx:xx:xx:xx:xx:xx` format (such as `08:00:20:12:34:56`) or `xxxxxxxxxxxx` format (such as `080020123456`). **Command mode:** All except User EXEC
`show mac-address-table interface port {`*<port alias or number>***`}`** Displays all FDB entries for a particular port. **Command mode:** All except User EXEC
`show mac-address-table vlan {`*<VLAN number (1-4095)>***`}`** Displays all FDB entries on a single VLAN. **Command mode:** All except User EXEC
`show mac-address-table` Displays all entries in the Forwarding Database. **Command mode:** All
`no mac-address-table` *<MAC address>***`|all`** Removes static FDB entries. **Command mode:** All except User EXEC
`clear mac-address-table` Clears the entire Forwarding Database from switch memory. **Command mode:** All except User EXEC

Debugging Commands

The Miscellaneous Debug Commands display trace buffer information about events that can be helpful in understanding switch operation. You can view the following information using the debug commands:

- Events traced by the Management Processor (MP)
- Events traced to a buffer area when a reset occurs

If the switch resets for any reason, the MP trace buffer is saved into the snap trace buffer area. The output from these commands can be interpreted by IBM Service Support.

Table 7-4 Miscellaneous Debug Commands

Command Syntax and Usage
`debug mp-trace` Displays the Management Processor trace buffer. Header information similar to the following is shown: `MP trace buffer at 13:28:15 Fri May 25, 2001; mask: 0x2ffdf748` The buffer information is displayed after the header. **Command mode:** All except User EXEC
`debug mp-snap` Displays the Management Processor snap (or post-mortem) trace buffer. This buffer contains information traced at the time that a reset occurred. **Command mode:** All except User EXEC
`clear flash-config` Deletes all flash configuration blocks. **Command mode:** All except User EXEC

ARP Cache Maintenance

Table 7-5 Address Resolution Protocol Maintenance Commands

Command Syntax and Usage
`show ip arp find` *<IP address>* Shows a single ARP entry by IP address. **Command mode:** All except User EXEC
`show ip arp interface port` *<port alias or number>* Shows ARP entries on a single port. **Command mode:** All except User EXEC
`show ip arp vlan` *<1-4095>* Shows ARP entries on a single VLAN. **Command mode:** All except User EXEC
`show ip arp reply` Shows the list of IP addresses which the switch will respond to for ARP requests. **Command mode:** All except User EXEC
`show ip arp` Shows all ARP entries. **Command mode:** All except User EXEC
`clear ip arp-cache` Clears the entire ARP list from switch memory. **Command mode:** All except User EXEC

NOTE – To display all or a portion of ARP entries currently held in the switch, you can also refer to “ARP Information” on page 66.

IP Route Manipulation

Table 7-6 IP Route Manipulation Commands

Command Syntax and Usage
`show ip route address` *<IP address>* Shows a single route by destination IP address. **Command mode:** All except User EXEC
`show ip route gateway` *<IP address>* Shows routes to a default gateway. **Command mode:** All except User EXEC
`show ip route type {indirect|direct|local|broadcast|martian|multicast}` Shows routes of a single type. **Command mode:** All except User EXEC For a description of IP routing types, see Table 2-24 on page 65
`show ip route tag {fixed|static|address|rip|ospf|bgp|broadcast|martian|multicast}` Shows routes of a single tag. **Command mode:** All except User EXEC For a description of IP routing tags, see Table 2-25 on page 66
`show ip route interface` *<1-128>* Shows routes on a single interface. **Command mode:** All except User EXEC
`show ip route` Shows all routes. **Command mode:** All except User EXEC
`clear ip route` Clears the route table from switch memory. **Command mode:** All except User EXEC

NOTE – To display all routes, you can also refer to “IP Routing Information” on page 64.

IGMP Group Information

Table 7-7 describes the IGMP Snooping maintenance commands.

Table 7-7 IGMP Multicast Group Maintenance Commands

Command Syntax and Usage
show ip igmp groups address *<IP address>* Displays a single IGMP multicast group by its IP address. **Command mode:** All
show ip igmp groups vlan *<1-4095>* Displays all IGMP multicast groups on a single VLAN. **Command mode:** All
show ip igmp groups interface *<port alias or number>* Displays all IGMP multicast groups on a single port. **Command mode:** All
show ip igmp groups portchannel *<Trunk Group number>* Displays all IGMP multicast groups on a single trunk group. **Command mode:** All
show ip igmp groups Displays information for all multicast groups. **Command mode:** All
clear ip igmp groups Clears the IGMP group table. **Command mode:** All except User EXEC

IGMP Multicast Routers Maintenance

The following table describes the maintenance commands for IGMP multicast routers.

Table 7-8 IGMP Multicast Router Maintenance Commands

Command Syntax and Usage
`show ip igmp mrouter vlan` *<1-4094>* Displays IGMP mrouter information for a single VLAN. **Command mode:** All
`show ip igmp mrouter` Displays information for all multicast routers. **Command mode:** All
`clear ip igmp mrouter` Clears the IGMP Multicast Router port table. **Command mode:** All except User EXEC

Uuencode Flash Dump

Using this command, dump information is presented in uuencoded format. This format makes it easy to capture the dump information as a file or a string of characters.

If you want to capture dump information to a file, set your communication software on your workstation to capture session data prior to issuing the **show flash-dump uuencode** command. This will ensure that you do not lose any information. Once entered, the **show flash-dump uuencode** command will cause approximately 23,300 lines of data to be displayed on your screen and copied into the file.

Using the **show flash-dump uuencode** command, dump information can be read multiple times. The command does not cause the information to be updated or cleared from flash memory.

NOTE – Dump information is not cleared automatically. In order for any subsequent dump information to be written to flash memory, you must manually clear the dump region. For more information on clearing the dump region, see page 280.

To access dump information, enter:

```
Router# show flash-dump-uuencode
```

The dump information is displayed on your screen and, if you have configured your communication software to do so, captured to a file. If the dump region is empty, the following appears:

```
No FLASH dump available.
```

TFTP or FTP System Dump Put

Use these commands to `put` (save) the system dump to a TFTP or FTP server.

NOTE – If the TFTP/FTP server is running SunOS or the Solaris operating system, the specified **`copy flash-dump tftp`** `(or ftp)` file must exist *prior* to executing the **`copy flash-dump tftp`** command (or **`copy flash-dump tftp`**), and must be writable (set with proper permission, and not locked by any application). The contents of the specified file will be replaced with the current dump data.

To save dump information via TFTP, enter:

```
Router# copy flash-dump tftp <server> <filename>
```

Where *server* is the TFTP server IP address or hostname, and *filename* is the target dump file.

To save dump information via FTP, enter:

```
Router# copy flash-dump ftp <server> <filename>
```

Where *server* is the FTP server IP address or hostname, and *filename* is the target dump file.

Clearing Dump Information

To clear dump information from flash memory, enter:

```
Router# clear flash-dump
```

The switch clears the dump region of flash memory and displays the following message:

```
FLASH dump region cleared.
```

If the flash dump region is already clear, the switch displays the following message:

```
FLASH dump region is already clear.
```

Panic Command

The **debug panic** command causes the switch to immediately dump state information to flash memory and automatically reboot.

To select panic, enter:

```
>> Router# debug panic
A FLASH dump already exists.
Replacing existing dump and reboot [y/n]:
```

Enter **y** to confirm the command:

```
Confirm dump and reboot [y/n]: y
```

The following messages are displayed:

```
Starting system dump...done.

Rebooted because of PANIC command.
Booting complete  0:01:01 Tue Mar  14, 2007:
Version 1.1.0 from FLASH image1, active config block.

No POST errors (0xff).

Production Mode.
```

Unscheduled System Dumps

If there is an unscheduled system dump to flash memory, the following message is displayed when you log on to the switch:

```
Note: A system dump exists in FLASH. The dump was saved
      at 13:43:22 Tuesday March 14, 2007. Use show flash-dump
      uuencode to
      extract the dump for analysis and clear flash-dump to
      clear the FLASH region. The region must be cleared
      before another dump can be saved.
```

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