

10-Port 1-Gigabit Ethernet Line Card for Cisco 12000 Series Internet Routers

This feature module describes the 10-Port 1-Gigabit Ethernet line card and its use in the Cisco 12000 series Internet Routers.

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Feature Overview

The 10-Port 1-Gigabit Ethernet line card, which is designed for high-density and server-aggregation applications, provides the Cisco 12400 series Internet Routers (Cisco 12416 Internet Router, Cisco 12410 Internet Router, and Cisco 12406 Internet Router) with ten optical 802.3 Gigabit Ethernet interfaces on a single line card. These interfaces provide high-speed interconnects to other network devices, such as other Cisco 12000 series Internet Routers, or to other routers or layer 2 or layer 3 switches that support Gigabit Ethernet interfaces.

Benefits

- Protocol compliance—Ethernet V2.0, IEEE 802.3 with IEEE 802.2, IEEE 802.3 with IEEE 802.2 and SNAP, IEEE 802.3z, ARP, RARP, IP Multicast with Cisco Group Management Protocol (CGMP)
- Field-replaceable SFP transceiver modules (1000Base-SX and 1000Base-LX/LH)
- Auto-negotiation—Respond to received Pause frames for flow control
- Hot Standby Router Protocol (HSRP)
- Media Access Control (MAC) address accounting, source and destination
- IEEE 802.1Q Virtual Local-Area Network (VLAN) trunking, 1500 VLANs per system
- Jumbo frames—9180-byte frame size
- Multiprotocol Label Switching (MPLS/Tag Switching)
 - MPLS switching
 - MPLS CoS
 - MPLS TE (RRR)
 - IP TOS to MPLS CoS mapping—receive direction only
- IP switching
- Layer 3 quality-of-service (QoS)
 - Weighted Random Early Detection (WRED)
 - Modified Deficit Round Robin (MDRR)
 - Committed Access Rate (CAR)—Input only; per port, basic only, based on IP TOS and protocol type
 - ACLs—Input only; per port, per interface, and per VLAN (802.1Q)
 - IP precedence setting
 - Output rate shaping on CoS queues (by IP protocol type and precedence level)
- IP and MPLS accounting—Receive direction; per packet and per byte
- IP load balancing on up to eight paths—Receive direction

Restrictions

The following qualifications apply when you are configuring a 10-Port 1-Gigabit Ethernet line card:

- Because the 10-Port 1-Gigabit Ethernet line card requires a card cage slot that is 1.8 inches (4.5 centimeters) wide, you can use the 10-Port 1-Gigabit Ethernet line card in only the Cisco 12416 Internet Router, Cisco 12410 Internet Router, or Cisco 12406 Internet Router. The system must be configured for full switching fabric capacity, which is one clock and scheduler card (CSC) and three switch fabric cards (SFCs).
- Without EACLs—Line card supports full line rate traffic on all ten ports for frame sizes of 64 bytes or larger when extended access control lists (EACLs) are not used.
- With EACLs—Line card supports full line rate traffic on all ten ports for frame sizes of 80 bytes or larger when EACLs are used.

Related Features and Technologies

- Hot Standby Router Protocol (HSRP)
- Multiprotocol Label Switching (MPLS)
- Layer 3 quality-of-service (QoS)
- Weighted Random Early Detection (WRED)
- Modified Deficient Round Robin (MDRR)
- Committed Access Rate (CAR)

See the [“Related Documents”](#) in the next section for a list of documents that describe these features and technologies.

Related Documents

The following documents provide additional information about installing and configuring 10-Port 1-Gigabit Ethernet line cards:

- *10-Port 1-Gigabit Ethernet Line Card Installation and Configuration*
- *Release Notes for Cisco 7000 Family and Cisco 12000 Series Routers for Cisco IOS Release 12.0 S*
- *Release Notes for Cisco IOS Release 12.0 ST*
- *Weighted Random Early Detection on the Cisco 12000 Series Router*
- *Multiprotocol Label Switching on Cisco Routers*
- *MPLS Virtual Private Networks*

You can also find additional information in the installation and configuration guide for your Cisco 12000 series Internet Router, and in the Cisco IOS Release 12.0 documentation set.

Supported Platforms

- Cisco 12416 Internet Router
- Cisco 12410 Internet Router
- Cisco 12406 Internet Router

The 10-Port 1-Gigabit Ethernet line card is compatible with only Cisco 12416, Cisco 12410, and Cisco 12406 Internet Routers that are operating with the following system software:

- Cisco IOS Release 12.0(19)S or later release of Cisco IOS Release 12.0 S software
- Cisco IOS Release 12.0(19)ST or later release of Cisco IOS Release 12.0 ST software

Supported Standards, MIBs, and RFCs

Standards

- Ethernet V2.0
- IEEE 802.3 with IEEE 802.2
- IEEE 802.3 with IEEE 802.2 and SNAP
- IEEE 802.3z
- ARP
- RARP
- IP Multicast with Cisco Group Management Protocol (CGMP)

MIBs

In addition to industry-standard SNMP and other MIBs supported on the Cisco 12000 series Internet Router, the 10-Port 1-Gigabit Ethernet line card also supports the following:

- RFC 1157 (SNMP)
- RFC 1643 (Ethernet)
- RFC 1213 (MIB II)
- RFC 1573 (MIB II Interface Extensions)
- RFC 1901 through 1907 (SNMP V2c)

To obtain lists of supported MIBs by platform and Cisco IOS software release, and to download MIB modules, go to the Cisco MIB web site on Cisco.com at

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

Configuration Tasks

See the following sections for configuration tasks for the 10-Port 1-Gigabit Ethernet line card. Each task in the list is identified as either optional or required.

- [Configuring Interfaces, page 5](#)
- [Verifying Operation, page 7](#)

Configuring Interfaces

Use the **show running-config** command to display current port configuration information. On power up, the interfaces on a new 10-Port 1-Gigabit Ethernet line card are shut down. To enable the interfaces, you must enter a **no shutdown** command in configuration mode for each interface.

Default or Initial Interface Configuration

When an interface on the 10-Port 1-Gigabit Ethernet line card is enabled (taken out of shutdown) with no additional configuration commands applied, the default interface configuration file parameters are used for the interface. [Table 1](#) lists these default interface parameters:

Table 1 10-Port 1-Gigabit Ethernet Line Card Default Configuration Values

Parameter	Configuration File Entry	Default Value
IP address	no ip address	None
Translation of directed broadcast to physical broadcasts	no ip directed-broadcast	Disabled
Shutdown	shutdown	Interface disabled
Auto-negotiation	negotiation auto	Negotiation auto
Cisco Discovery Protocol (CDP)	no cdp enable	Disabled

To enter a **no shutdown** command for an interface on a 10-Port 1-Gigabit Ethernet line card or to change the configuration of an interface, you must enter configuration mode by using the **configure** privileged EXEC command.

Configuring the Interface

After you verify that the new 10-Port 1-Gigabit Ethernet line card is installed correctly, use the **configure** command to configure the new interface. Be prepared with the information you will need, such as the interface IP address.

The following procedure is for creating a basic configuration—enabling an interface and specifying IP routing. You might also need to enter other configuration subcommands, depending on the requirements for your system configuration.

(For descriptions of configuration subcommands and the configuration options available, see the appropriate software publications in the [“Related Documents” section on page 3](#).)

A Cisco 12000 series Internet Router identifies an interface address by its line card slot number and port number, in the format *slot/port*. There are 10 ports on the 10-Port 1-Gigabit Ethernet line card numbered 0 through 9. For example, the slot/port address of the top port on an interface on a 10-Port 1-Gigabit Ethernet line card installed in line card slot 1 is 1/0.

Before you can use the **configure** command, you must enter the privileged level of the EXEC command interpreter with the **enable** command. The system will prompt you for a password if one is set.

To configure an interface on the 10-Port 1-Gigabit Ethernet line card, perform the following steps:

	Command	Purpose
Step 1	Router# show version	Confirm that the system recognizes the line card.
Step 2	Router# show interfaces	Check the status of each port on the line card.
Step 3	Router# configure terminal	Enter configuration mode and specify that the console terminal will be the source of the configuration subcommands.
Step 4	Router(config)# ip routing	Enable IP routing.
Step 5	Router(config)# interface gigabitethernet slot/port	Specify the new Gigabit Ethernet interface to configure.
Step 6	Router(config-if)# ip address 10.1.2.3 255.255.255.255	Assign an IP address and subnet mask to the interface.
Step 7	Router(config-if)# no shutdown	Change the shutdown state to up and enable the interface.
Step 8	Router(config-if)# keepalive	Set keepalive messages on or off as desired.
Step 9	Router(config-if)# no ip multicast distributed	Turn off IP multicast fast switching.
Step 10	(Use any other configuration subcommands required to enable routing protocols and adjust the interface characteristics.)	Complete the configuration based on the unique and specific requirements of your network.
Step 11	Press Control-Z to exit configuration mode.	Exit configuration mode.
Step 12	Router# copy running-config startup-config	Write the new configuration to memory.

Verifying Operation

To verify the operation of the interfaces configured on the 10-Port 1-Gigabit Ethernet line card, perform the following steps:

	Command	Purpose
Step 1	Router# show version	Displays the configuration of the system hardware, the software release, the names and sources of configuration files, and the boot images. Verify that the list includes the newly configured 10-Port 1-Gigabit Ethernet line card ports and interfaces.
Step 2	Router# show interfaces gigabitethernet	Displays status and configuration of Gigabit Ethernet interfaces.
Step 3	Router# show protocols	Displays information about the protocols configured for the system as a whole, and for specific interfaces.

Monitoring and Maintaining Operations

Use the following commands to perform monitoring and maintenance tasks on the 10-Port 1-Gigabit Ethernet line card.

Command	Purpose
Router# execute-on show access-lists eng4ge	Displays information about access control lists (ACLs) applied on the Cisco 10-Port 1-Gigabit Ethernet line card.
Router# execute-on show controllers gigabitethernet	Displays an exhaustive list of information for the Gigabit Ethernet interface controllers of the Cisco 10-Port 1-Gigabit Ethernet line card.
Router# execute-on show tcam-mgr	Displays ternary content addressable memory (TCAM) manager information for the Cisco 10-Port 1-Gigabit Ethernet line card.

Configuration Examples

This section provides interface configuration examples.

Configuring IP Routing

In the following example, port 9 of a 10-port 1-GigabitEthernet line card in slot 3 of a Cisco 12000 series Internet Router is configured for IP routing.

```
interface gigabitethernet 3/9
 ip address 172.1.1.1 255.255.255.0
```

(Additional display text is not shown.)

Configuring for VLANs

In the following example, port 1 of a 10-port 1-GigabitEthernet line card in slot 3 of a Cisco 12000 series Internet Router is configured for a VLAN.

```
interface gigabitethernet 3/1.1
 encapsulation dot1q 10
 ip address 172.1.1.1 255.255.255.0
```

(Additional display text is not shown.)

Configuring for IP with Source/Destination MAC Accounting

In the following example, port 9 of a 10-port 1-GigabitEthernet line card in slot 3 of a Cisco 12000 series Internet Router is configured for IP with source/destination MAC accounting.

```
interface gigabitethernet 3/9
 ip address 172.1.1.1 255.255.255.0
 ip accounting mac-address input
 ip accounting mac-address output
```

(Additional display text is not shown.)

Configuring for IP with Input ACLs

In the following example, port 9 of a 10-port 1-GigabitEthernet line card in slot 3 of a Cisco 12000 series Internet Router is configured for IP with input ACLs.

```
access-list 100 permit ip any any
interface gigabitethernet 3/9
 ip address 172.1.1.1 255.255.255.0
 ip access-group 100 in
```

(Additional display text is not shown.)

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.0 command reference publications.

- [rate-limit](#), page 11
- [show access-lists eng4ge](#), page 14
- [show controllers gigabitethernet \(line card image\)](#), page 20
- [show tcam-mgr](#), page 25



rate-limit



To configure committed access rate (CAR) and distributed CAR (DCAR) policies on the on the Cisco 10-Port 1-Gigabit Ethernet line card, use the **rate-limit** interface configuration command. To remove the rate limit from the configuration, use the **no** form of this command.

```
rate-limit {input | output} [access-group [rate-limit] acl-index] bps burst-normal burst-max
conform-action action exceed-action action
```

```
no rate-limit {input | output} [access-group [rate-limit] acl-index] bps burst-normal burst-max
conform-action action exceed-action action
```

Syntax Description

input	Applies this CAR traffic policy to packets received on this interface.
output	Applies this CAR traffic policy to packets sent on this interface.
	 Note The 10-Port 1-Gigabit Ethernet line card does not support this keyword.
access-group	(Optional) Applies this CAR traffic policy to the specified access control list.
rate-limit	(Optional) The access list is a rate-limit access list.
<i>acl-index</i>	(Optional) Access control list index number.
<i>bps</i>	Average rate in bits per second. The value must be in increments of 8 kbps.
<i>burst-normal</i>	Normal burst size in bytes. The minimum value is bps divided by 2000.
<i>burst-max</i>	Excess burst size in bytes.
	 Note The 10-Port 1-Gigabit Ethernet line card ignores this parameter because the hardware cannot provide rate-limit on the max-burst-count using a token bucket implementation.
conform-action	Action to take on packets that conform to the rate limit.

<i>action</i>	<p>Action to take on packets. Specify one of the following keywords:</p> <ul style="list-style-type: none"> continue—Evaluate the next rate-limit command. <p> Note The 10-Port 1-Gigabit Ethernet line card does not support the continue action.</p> <ul style="list-style-type: none"> drop—Drop the packet. set-prec-continue <i>new-prec</i>—Set the IP precedence and evaluate the next rate-limit command. <p> Note The 10-Port 1-Gigabit Ethernet line card does not support the set-prec-continue <i>new-prec</i> action.</p> <ul style="list-style-type: none"> set-prec-transmit <i>new-prec</i>—Set the IP precedence and transmit the packet. transmit—Transmit the packet.
exceed-action	Action to take on packets that exceed the rate limit.

Defaults

CAR and DCAR are disabled on the interface.

Command Modes

Interface configuration

Command History

Release	Modification
11.1 CC	This command was introduced.
12.0(19)S	This command was modified to support the Cisco 10-Port 1-Gigabit Ethernet line card on the Cisco 12400 series Internet Routers.

Usage Guidelines

The Cisco 10-Port 1-Gigabit Ethernet line card does not support the **output** keyword because the line card only supports input CAR.

The Cisco 10-Port 1-Gigabit Ethernet line card ignores the existing parameter *burst-max* because the hardware implementation cannot provide **rate-limit** on the *burst-max* count using a token bucket implementation.

The Cisco 10-Port 1-Gigabit Ethernet line card does not support the existing actions **continue** and **set-prec-continue** *new-prec*.

To support selecting an alternate WRED/MDRR policy, the **rate-limit** command action can be augmented to support **set-cos-queue-group-transmit** [**input** | **output**] *cos-group-name*, where *cos-group-name* selects a previously created CoS group that was created by the **cos-queue-group** command. In this command, the **input** and **output** keywords determine whether the WRED/MDRR CoS group is to be applied to the input or output line card. If you do not specify either **input** or **output**, the CoS is applied to both sides.

Examples

In the following example, input traffic is limited to 50 Mbps, with a normal burst size of 100 kilobytes and a maximum burst size of 200 kilobytes. Traffic that conforms to the rate limit is transmitted. Traffic that does not conform is dropped:

```
Router(config-if)# rate-limit input 50m 100k 200k conform-action transmit  
                   exceed-action drop
```

Related Commands

Command	Description
access-list rate-limit	Configures an access list for use with CAR polices.
show access-lists rate-limit	Displays information about rate-limit access lists.
show interfaces rate-limit	Displays information about CAR for an interface.
show ip rsvp installed	Displays RSVP-related installed filters and corresponding bandwidth information.

show access-lists eng4ge

To display information about access control lists (ACLs) applied on the Cisco 10-Port 1-Gigabit Ethernet line card, use the **attach** privileged EXEC command to connect to the line card and then use the **show access-lists eng4ge** privileged EXEC command, or use the **execute-on** privileged EXEC command as a prefix to the **show access-lists eng4ge** privileged EXEC command from the GRP image.

```
show access-lists eng4ge l4sram { hardware | shadow } [rule-number]
```

```
show access-lists eng4ge label { hw | table [detailed | vlan [detailed]] }
```

```
show access-lists eng4ge summary
```

Syntax Description		
l4sram		Displays the SRAM-related ACL Layer4 rules governing port logical operations. The logical operations supported by the SRAM are gt (greater than, lt (less than), neq (not equal to), and range (inclusive).
hardware		Reads all of the logical operation selections from the hardware and then displays information about each section.
shadow		Displays the software shadow copy of the logical operations sections currently in use.
<i>rule-number</i>		(Optional) Displays hardware or shadow information about only the specified rule (1 to 138).
label		Displays label commands for port-label table. Each ACL is labeled with a software label structure. All of the required information about the ACL applied at a line card port can be extracted using this label. Main interface and VLAN subinterface labels are maintained in two different tables.
hw		Displays entries programmed in the hardware port-label register. There is a hardware port-label table that enables ACLs to be shared among different ports. The hw keyword displays information about the labels against each port programmed in this port-label table.
table		Displays information about each main-interface ACL label against each port.
vlan		Displays brief information about all the subinterface VLAN ACL labels.
detailed		(Optional) For the table or vlan keywords, displays the brief information about each label and information about each ACE in each ACL label in the specified table (for example, the main-interface or VLAN label table). The information is displayed in the value/mask/result format. For long ACLs, the command can generate a very long output stream.
summary		Displays a summary of the main interface ACLs, as well as VLAN subinterface ACLs, applied on all ports of this line card.

Command Modes	
	Privileged EXEC

Command History	Release	Modification
	12.0(19)S	This command was introduced.

Examples

Because you are executing this command on the line card, you must connect to the line card using the **attach** command, or use the **execute-on** command as a prefix to the **show access-lists eng4ge** command. All of the examples in this section assume that the **attach** command has been used to connect to the line card.

The following example shows output from the **show access-lists eng4ge summary** privileged EXEC command:

```
LC-Slot2# show access-lists eng4ge summary
```

```
Port      Label      HwLabel  ACL#      Merge      Hit Counter
-----
0         0          0        145       no         0
1         None       14       None      None       0
2         None       2        None      None       0
3         1          1        131       no         0
4         1          1        131       no         0
5         1          1        131       no         0
6         1          1        131       no         0
7         1          1        131       no         0
8         1          1        131       no         0
9         1          1        131       no         0
```

```
Subinterface ACL summary:
```

```
-----
There are 2 entries in subint acl label table
Port.subif:vlanid  Label      HwLabel  ACL#      Merge      Hit Counter
-----
0.1:5              16         0        101       yes        0
2.3:6              17         2        102       yes        0
```

```
Packets punted to CPU for logging = 0
Non-IP packets permitted          = 0
TCP FragOffset = 1 packets dropped= 0
```

```
LC-Slot2#
```

Table 2 *show access-lists eng4ge summary* Field Descriptions

Field	Description
Port	Port number on the line card.
Label	Software label used by the ACL to insert ACL entries in TCAM.
HwLabel	Label value of the port programmed in the hardware port-label table. This table enables ACL sharing among ports.
ACL#	Number of the ACL.
Merge	ACL code uses “Merge” algorithm to condense the number of entries. “Yes” means condensed entries are programmed in TCAM; “no” means uncondensed original entries are programmed in TCAM.
Hit Counter	Aggregate hit counter of all the ACEs in the given ACL. If counter resources are not available for an ACL, “no count” is displayed in this column against the entry. It is important to note that if an ACL is shared among the ports, its counters are also shared.

Table 2 *show access-lists eng4ge summary Field Descriptions (continued)*

Field	Description
Port.subif:vlanid	Port/subinterface number and VLAN ID information (for VLAN ACLs only).
“Packets punted to CPU for logging”	Total number of packets across all ACLs that are punted to the CPU for logging because of a hit with “log” keyword ACEs.
“Non-IP packets permitted”	Total number of non-IP packets permitted.
“TCP FragOffset = 1 packets dropped”	Total number of dropped TCP fragment packets whose fragment offset equals 1 (RFC 1858 test).

The following example shows output from the **show access-lists eng4ge label table** privileged EXEC command:

```
LC-Slot2# show access-lists eng4ge label table
```

```
Allocated label table contents :
```

```
Port#: 0
Label value           = 0
Hw label value        = 0
Label status          = programmed
Reference count       = 1
Using acl merge       = no
VMRs freed flag       = no
Counters available    = yes
ACL list number       = 145
```

```
Port#: 1
Default label         = 1
```

```
Port#: 2
Default label         = 2
```

```
Port#: 3
Label value           = 1
Hw label value        = 1
Label status          = programmed
Reference count       = 7
Using acl merge       = no
VMRs freed flag       = no
Counters available    = yes
ACL list number       = 131
```

(Additional display text is not shown.)

The following example shows output from the **show access-lists eng4ge label table detailed** privileged EXEC command:

```
LC-Slot2# show access-lists eng4ge label table detailed
```

```
Allocated label table contents :
```

```
Port#: 0
Label value           = 0
Hw label value        = 0
Label status          = programmed
Reference count       = 1
Using acl merge       = no
VMRs freed flag       = no
```



```
Counters available          = yes
ACL list number            = 145
```

```
Merge format (pre-merge) ACL VMR contents:
-----
```

```
Contents of VMR ACL:
Number of ACEs in the VMR ACL = 5954
```

```
Value:
```

```
IP DA                      = 0.0.0.0
IP SA                      = 0.0.0.0
L4 DPORT                   = 111
L4 SPORT                   = 0
L4 Protocol                 = 0x6
TCPFLAGS                   = 0x0
TCP Established            = 0x0
IP TOS                     = 0x0
IP Fragment Offset0       = 0x0
IP Fragment Offset1       = 0x0
TCPPD[0]                   = 0x0
TCPPD[1]                   = 0x0
TCPPD[2]                   = 0x0
TCPPD[3]                   = 0x0
```

```
Mask:
```

```
IP DA                      = 0.0.0.0
IP SA                      = 0.0.0.0
L4 DPORT                   = 65535
L4 SPORT                   = 0
L4 Protocol                 = 0xFF
TCPFLAGS                   = 0x0
TCP Established            = 0x0
IP TOS                     = 0x0
IP Fragment Offset0       = 0x1
IP Fragment Offset1       = 0x0
TCPPD[0]                   = 0x0
TCPPD[1]                   = 0x0
TCPPD[2]                   = 0x0
TCPPD[3]                   = 0x0
```

```
Result                     = 0x0
```

```
Value:
```

(Additional display text is not shown.)

The following example shows output from the **show access-lists eng4ge l4sram hardware** privileged EXEC command:

```
LC-Slot2# show access-lists eng4ge l4sram hardware
```

```
TCP Port SRAM Values:
```

Rule#	Port	GT	D
0	0	N	N
1	0	N	N
2	0	N	N
3	0	N	N
4	0	N	N
5	0	N	N

```
show access-lists eng4ge
```

```

6          0          N      N
7          0          N      N
8          0          N      N
9          0          N      N
10         12344       Y      Y
11         12347       N      Y
12         1023        Y      Y
13         5430        Y      Y
14         5433        N      Y
15         29299       Y      Y
16         29302       N      Y
17         143         Y      Y
18         146         N      Y

```

```
LC-Slot2#
```

Table 3 *show access-lists eng4ge l4sram hardware Field Descriptions*

Field	Description
Rule#	L4 logical operation rule number. There are 138 rules, but software uses only 128.
Port	L4 TCP/UDP port number of the rule.
GT	If this value is “Y,” this rule is used for “greater than” operations. If this value is “N,” this rule is used for “less than” operations.
D	Destination bit. If this value is “Y,” this rule is applied on a destination port; if this value is “N,” this rule is applied on a source port.

The following example shows output from the **show access-lists eng4ge l4sram shadow** privileged EXEC command:

```
LC-Slot2# show access-lists eng4ge l4sram shadow
```

```

There are 94 L4PORT SRAM sections in use
L4 Port SRAM Allocated Sections Shadow Information:

```

```

Rule#          Port          GT      D      Refcount
-----
10             12344       Y      Y      1
11             12347       N      Y      1
12             1023        Y      Y      372
13             5430        Y      Y      1
14             5433        N      Y      1
15             29299       Y      Y      6
16             29302       N      Y      6
17             143         Y      Y      1
18             146         N      Y      2
19             142         Y      Y      1
20             8059        Y      Y      1

```

```
LC-Slot2#
```

Table 4 *show access-lists eng4ge l4sram shadow Field Descriptions*

Field	Description
Rule#	L4 logical operation rule number. There are 138 rules, but software uses only 128.
Port	L4 TCP/UDP port number of the rule.

Table 4 *show access-lists eng4ge l4sram shadow Field Descriptions (continued)*

Field	Description
GT	If this value is “Y,” this rule is used for “greater than” operations. If this value is “N,” this rule is used for “less than” operations.
D	Destination bit. If this value is “Y,” this rule is applied on a destination port; if this value is “N,” this rule is applied on a source port.
RefCount	Reference count. This value gives an indication of the number of ACES sharing this rule.

show controllers gigabitethernet (line card image)

To display information for the Gigabit Ethernet interface controllers of the Cisco 10-Port 1-Gigabit Ethernet line card, use the **attach** privileged EXEC command to connect to the line card and then use the **show controllers gigabitethernet** privileged EXEC command, or use the **execute-on** privileged EXEC command as a prefix to the **show controllers gigabitethernet** privileged EXEC command from the GRP image.

```
show controllers gigabitethernet [port [gbic | mac | rxfifo [start-block] [number]] |
counter-sram [start-block] [number] | port-map-index-table | registers | rewrite |
tcp-port-sram | vlan vlan-id]
```

Syntax Description		
<i>port</i>		The physical port on the 10-Port 1-Gigabit Ethernet line card (0 to 9).
gbic		(Optional) For a port number specified as <i>port</i> , the gbic keyword displays information about the small form-factor pluggable (SFP) optical transceiver module.
mac		(Optional) For a port number specified as <i>port</i> , the mac keyword displays MAC chip information.
rxfifo		(Optional) For a port number specified as <i>port</i> , the rxfifo keyword displays information about the receive (RX) FIFO buffer.
<i>start-block</i>		(Optional) For the rxfifo keyword, <i>start-block</i> specifies the RX FIFO block number (0 to 191) to use as the starting point.
<i>number</i>		(Optional) For the rxfifo keyword, <i>number</i> specifies the number of RX FIFO blocks (0 to 192) to display.
counter-sram		Display counter SRAM information.
<i>start-block</i>		(Optional) For the counter-sram keyword, <i>start-block</i> specifies the counter SRAM block number (0 to 1023) to use as the starting point.
<i>number</i>		(Optional) For the counter-sram keyword, <i>number</i> specifies the number of counter SRAM blocks (0 to 1024) to display.
port-map-index-table		Display port map index table information.
registers		Display general register information.
rewrite		Display local MAC rewrite table information.
tcp-port-sram		Display TCP port SRAM information.
vlan		Display line card VLAN ID table information as maintained in software.
<i>vlan-id</i>		(Optional) For the vlan keyword, <i>vlan-id</i> specifies the IEEE 802.1Q VLAN ID (1 to 4095).

Command Modes Privileged EXEC

Command History	Release	Modification
	12.0(19)S	This command was introduced.

Examples

Because you are executing this command on the line card, you must connect to the line card using the **attach** command, or use the **execute-on** command as a prefix to the **show controllers gigabitethernet** privileged EXEC command. All of the examples in this section assume that the **attach** command has been used to connect to the line card.

The following example shows output from the **show controllers gigabitethernet port gbic** privileged EXEC command:

```
LC-Slot2# show controllers gigabitethernet 0 gbic

** GBIC serial EEPROM
  identifier          0x03 (Reserved)
  connector           0x07 (Reserved)
  gbic_transceiver_code 0x01 (1000BASE-SX)
  encoding            0x01 (8B10B)
  br_nominal (units of 100MHz)
                    12
  length_9u (units of 100m)
                    32
  length_50u (units of 100m)
                    55
  length_62_5u (units of 100m)
                    27
  length_cu (unit of 10m)
                    32
  vendor_name        IBM          ZIBM42P12SNY  AA10  r ^Z^E^E21P46990AL10D  00102001
  yIBM SFPS ARE CLASS 1 LASER SAFE
  vendor_oui         0x08 20 5A
  vendor_pn          0x49424D34 32503132 534E5920 20202020
  vendor_rev         0x41413130 AA10  r ^Z^E^E21P46990AL10D  00102001
  yIBM SFPS ARE CLASS 1 LASER SAFE
  cc_base            0xF2
  options[0]        0x20
  br_max (upper baud rate margin, units of %)
                    5
  br_min (upper baud rate margin, units of %)
                    5
  vendor_sn          0x32315034 36393930 414C3130 44202020
  date_code          00102001 yIBM SFPS ARE CLASS 1 LASER SAFE (yyymmddvv,
  v=vendor specific)
  cc_ext             0x79
```

```
LC-Slot2#
```

The following example shows output from the **show controllers gigabitethernet port mac** privileged EXEC command:

```
LC-Slot2# show controllers gigabitethernet 0 mac

*** Port 0

GigMac, port 0:
GMAC_Control          0x1CFE  autoneg-enable enable-rx-dpath
                       enable-tx-dpath suppress-rx flush-tx
                       pad-enable add-crc ucast-enable
                       mcast-enable bcast-enable

TxLinkCfg             0x0000
RcvLinkCfg             0x0000
RcvLnkCfgAutoneg      0x0000
RmacRcvStatus         0x0840  rx-sync rx-sync-timer-dly
IPGTxTime              0x0000
PktMaxLen              0x2800
```

show controllers gigabitethernet (line card image)

```
TxFIFO, port 0: BPStartLvl 0x0100, BPStopLvl 0x0140, XmitWaterLvl 0x0080,
  Error 0x0000, DataErrorAddr 0x0000, CmdErrorAddr 0x0000
```

```
RxFIFO, port 0: ParityErrStatus 0x0000, ParityErrAddr 0x0000
```

GigMac TX Statistics Counters:

```
  0 defab, 0 defer, 0 abt_lcol, 0 colte, 0 colex
  0 coll, 0 colm, 0 colt, 0 abt_len, 0 undrn
  0 tcrc, 0 ttot, 0 toct, 0 t64, 0 t127
  0 t255, 0 t511, 0 t1023, 0 t1518, 0 t1548
  0 tgiant, 0 mcast, 0 bcast, 0 tpause, 0 tisl, 0 tiq
```

GigMac RX Statistics Counters:

```
  0 rtot, 0 roct, 0 rcrc, 0 jbbbr, 0 runt
  0 short_len, 0 r64, 0 r127, 0 r255, 0 r511
  0 r1023, 0 r1518, 0 r1548, 0 rgiant, 0 rcode
  0 totrm, 0 totrb, 0 totrg, 0 rpause, 0 rcntl
  0 risl, 0 rig, 0 rdrop, 0 rsupp, 0 rinvalid_encap, 0 rfifo_full
```

```
LC-Slot2#
```

The following example shows output from the **show controllers gigabitethernet port rxfifo** privileged EXEC command:

```
LC-Slot2# show controllers gigabitethernet 0 rxfifo 0 1
```

```
RxFIFO Dump, port 0 :
```

```
RxFIFO Block 0 :
```

```
003C0000 FFFFFFFF FFFF0002 FC0D1C80
08060001 08000604 00020002 FC0D1C80
01010101 FFFFFFFF FFFF0101 01010000
00000000 00000000 00000000 00000000
003C0000 FFFFFFFF FFFF0002 FC0D1C80
08060001 08000604 00020002 FC0D1C80
01010101 FFFFFFFF FFFF0101 01010000
00000000 00000000 00000000 00000000
```

```
LC-Slot2#
```

The following example shows output from the **show controllers gigabitethernet counter-sram** privileged EXEC command:

```
LC-Slot2# show controllers gigabitethernet counter-sram 0 10
```

```
Block 0   = 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 ....
Block 1   = 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 ....
Block 2   = 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 ....
Block 3   = 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 ....
Block 4   = 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 ....
Block 5   = 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 ....
Block 6   = 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 ....
Block 7   = 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 ....
Block 8   = 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 ....
Block 9   = 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 ....
```

```
LC-Slot2#
```

The following example shows output from the **show controllers gigabitethernet port-map-index-table** privileged EXEC command:

```
LC-Slot2# show controllers gigabitethernet port-map-index-table
```

```
Port Map Index Table (Port = Mapped Port Index):
0=0, 1=14, 2=14, 3=14, 4=14, 5=14, 6=14, 7=14, 8=14, 9=14,
```

```
LC-Slot2#
```

The following example shows output from the **show controllers gigabitethernet registers** privileged EXEC command:

```
LC-Slot2# show controllers gigabitethernet registers
```

```
Global Registers :
MasterConfig          0x73FF    HW-assist-ICMP-reply NonIP-Padding Enable
                        IP-Padding-Enable Port9-TCAM-enabled
                        Port8-TCAM-enabled Port7-TCAM-enabled
                        Port6-TCAM-enabled Port5-TCAM-enabled
                        Port4-TCAM-enabled Port3-TCAM-enabled
                        Port2-TCAM-enabled Port1-TCAM-enabled
                        Port0-TCAM-enabled
```

```
IntStatus1           0x0000
IntMask1              0x0000
TransmitPathErr      0x0000
IndirectUpperAddr    0x0120
IndirectLowerAddr    0x0000
ASIC ID               0x21CC
IOFIFOErr            0x0000
MemBistCtrl           0x0000
MemBistResultsLow    0x0000
MemBistResultsHi     0x0000
IMBusTimeout         0x03FF
IntStatus2           0x0000
IntMask2             0x0000
```

```
JumboFrameType 0x8870
```

```
TCAM Config Registers: DropType0 0x0, DropType1 0x0, DropType2 0x0
```

```
FrameAlignModule Registers: FrameAlignRxFIFOWatermark 0x204,
                             FrameAlignErr 0x85785EEB, ProtVals 0x0F524310
```

```
TxDemux Registers: TXDemuxTxIFError 0x0, TXDemuxTXChannelActive 0x2
```

```
TxFIFO, port 0: BPStartLvl 0x0100, BPStopLvl 0x0140, XmitWaterLvl 0x0080,
                Error 0x0000, DataErrorAddr 0x0000, CmdErrorAddr 0x0000
```

```
.
.
.
```

```
TxFIFO, port 9: BPStartLvl 0x0100, BPStopLvl 0x0140, XmitWaterLvl 0x0080,
                Error 0x0000, DataErrorAddr 0x0000, CmdErrorAddr 0x0000
```

```
RxFIFO, port 0: ParityErrStatus 0x0000, ParityErrAddr 0x0000
```

```
.
.
.
```

```
RxFIFO, port 9: ParityErrStatus 0x0000, ParityErrAddr 0x0000
```

show controllers gigabitethernet (line card image)

```
GxMac :
  R_SymbolVal 0xF700, RB_SymbolVal 0x1C00,
  K_SymbolVal 0xBC00, KB_SymbolVal 0x3C00,
  S_SymbolVal 0xFB00, T_SymbolVal 0xFD00,
  E_SymbolVal 0xFE00, V_SymbolVal 0xFC00,
  T1_SyncCount 8191 , T2_SyncCount 8191 ,
  PauseFrameDA 0x0180, PauseFrameSA 0x0000,
  PauseFramePauseType 0x8808, PauseFrameOpCode 0x0001,
  PauseFrameHdr 0xFB00 PauseFrameXonCrc 0xFB00,
  PauseFrameOffTmr1 0xFFFF, PauseFrameOffTmr2 0xFFE7,
  ClkCompTimerVal 0x7FFF, ClkCompCyclesVal 0x7000,
  512bitTimeVal 0x0700, PauseFrameMCastAddr 0x0700,
  PauseFrameUcastAddr 0x0700, SendFlowCtrlFrames 0x0000,
  ExpectedRcvPreamble 0x0000, ExpectedRcvPreambleMask 0x0000,
  ExpRcvPreambleCapture 0x0000, XmitPreamble 0x0000,
  XmitPopFifoWaterLvl 0x000A, BorderFifoWaterLvl 0x000F,
  ConfigRegister 0x6900, MinPktSize 64 ,
  IntCause 0x0000, IntMask 0xFF00,
  RcvSuppressFrames 0x0000, FlushXmitFrames 0x0000,
  SyncStatus 0x2000, MaxPktLen 10240
```

```
LC-Slot2#
```

The following example shows output from the **show controllers gigabitethernet tcp-port-sram** privileged EXEC command:

```
LC-Slot2# show controllers gigabitethernet tcp-port-sram
```

```
TCP Port SRAM Rules :
```

```
Rule 000=x00000 001=x00000 002=x00000 003=x00000 004=x00000 005=x00000
Rule 006=x00000 007=x00000 008=x00000 009=x00000 010=x00000 011=x00000
Rule 012=x00000 013=x00000 014=x00000 015=x00000 016=x00000 017=x00000
Rule 018=x00000 019=x00000 020=x00000 021=x00000 022=x00000 023=x00000
Rule 024=x00000 025=x00000 026=x00000 027=x00000 028=x00000 029=x00000
Rule 030=x00000 031=x00000 032=x00000 033=x00000 034=x00000 035=x00000
Rule 036=x00000 037=x00000 038=x00000 039=x00000 040=x00000 041=x00000
Rule 042=x00000 043=x00000 044=x00000 045=x00000 046=x00000 047=x00000
Rule 048=x00000 049=x00000 050=x00000 051=x00000 052=x00000 053=x00000
Rule 054=x00000 055=x00000 056=x00000 057=x00000 058=x00000 059=x00000
Rule 060=x00000 061=x00000 062=x00000 063=x00000 064=x00000 065=x00000
Rule 066=x00000 067=x00000 068=x00000 069=x00000 070=x00000 071=x00000
Rule 072=x00000 073=x00000 074=x00000 075=x00000 076=x00000 077=x00000
Rule 078=x00000 079=x00000 080=x00000 081=x00000 082=x00000 083=x00000
Rule 084=x00000 085=x00000 086=x00000 087=x00000 088=x00000 089=x00000
Rule 090=x00000 091=x00000 092=x00000 093=x00000 094=x00000 095=x00000
Rule 096=x00000 097=x00000 098=x00000 099=x00000 100=x00000 101=x00000
Rule 102=x00000 103=x00000 104=x00000 105=x00000 106=x00000 107=x00000
Rule 108=x00000 109=x00000 110=x00000 111=x00000 112=x00000 113=x00000
Rule 114=x00000 115=x00000 116=x00000 117=x00000 118=x00000 119=x00000
Rule 120=x00000 121=x00000 122=x00000 123=x00000 124=x00000 125=x00000
Rule 126=x00000 127=x00000 128=x00000 129=x00000 130=x00000 131=x00000
Rule 132=x00000 133=x00000 134=x00000 135=x00000 136=x00000
```

```
LC-Slot2#
```


show tcam-mgr

To display ternary content addressable memory (TCAM) manager information for the Cisco 10-Port 1-Gigabit Ethernet line card, use the **attach** privileged EXEC command to connect to the line card and then use the **show tcam-mgr** privileged EXEC command, or use the **execute-on** privileged EXEC command as a prefix to the **show tcam-mgr** privileged EXEC command from the GRP image.

show tcam-mgr

show tcam-mgr appl [**accounting** [**label** *label* | **table**] | **acl** [**label** *label* | **table**] | **mac** [**label** *label* | **table**] | **vlan** [**label** *label* | **table**]]

show tcam-mgr platform

show tcam-mgr region {*region-ID* | **config** | **statistics**}

show tcam-mgr statistics

Syntax Description		
appl		Displays platform-specific application extension TCAM information.
accounting		(Optional) VLAN/MAC source MAC accounting region.
label <i>label</i>		(Optional) Application entries associated with a label specified as <i>label</i> (0 to 2009).
table		(Optional) Application table entries.
acl		(Optional) Access control list (ACL) region.
mac		(Optional) MAC region.
vlan		(Optional) VLAN region.
platform		Displays platform-related TCAM information.
region		Displays region-related TCAM information.
<i>region-ID</i>		(Optional) For the region keyword, displays TCAM manager information for the specified region (0 to 32). If you do not specify a region ID, the command displays information about all of the regions.
config		(Optional) For the region keyword, displays TCAM manager region configuration information.
statistics		(Optional) For the region keyword, displays TCAM manager region statistical information.
statistics		Displays global TCAM manager statistics.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.0(19)S	This command was introduced.

Usage Guidelines

This command is useful for displaying information about the TCAM manager software module, which manages the TCAM for the various applications that use it. The TCAM manager allocates memory among the applications in the form of regions. The TCAM manager configures the regions as specified by the applications. You can use this command to view the applications, their configured regions, entries in those regions, statistics, and other information.

The TCAM manager is not restricted to a specific platform or CAM implementation. It can be used on a variety of different platforms, line cards, and CAM types.

The applications supported depend on the platform. For example, the Cisco 10-Port 1-Gigabit Ethernet line card supports four applications: MAC, VLAN, source MAC accounting, and ACLs.

Some regions—such as the ACL region—support a list of entries that can be inserted into TCAM by the TCAM manager. These entries are identified by a label. If the label is known, it can be used to display all of the entries corresponding to this label.

Examples

Because you are executing this command on the line card, you must connect to the line card using the **attach** command, or use the **execute-on** command as a prefix to the **show tcam-mgr** command. All of the examples in this section assume that the **attach** command has been used to connect to the line card.

The following example shows partial output from the **show tcam-mgr appl table** privileged EXEC command:

```
LC-Slot2# show tcam-mgr appl table

ACL Table
-----
There are 3 entries in the table

Entry# 1:
Application ID      = 4
Value              =
                   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                   0 0 0 0

Mask               =
                   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                   0 0 1 0

Result            =
                   1 0 0 0

Mask index         = 6552
Mask Physical Address = 52416
Value cell index   = 0
Value cell Physical address = 52416
Allocation direction = top
```

(Additional display text is not shown.)

The following example shows output from the **show tcam-mgr platform** privileged EXEC command:

```
LC-Slot2# show tcam-mgr platform

Platform Control Block Information :

CAM name                = CAM2
Maximum key length      = 288 bits
TBU (TCAM Base Unit) length = 72 bits
V2M Ratio               = 8
TCAM Size               = 262144 TBUs
SRAM Size               = 262144 words
Start index of first VC = 32
Label table size       = 2010

LC-Slot2#
```

The following example shows output from the **show tcam-mgr region config** privileged EXEC command:

```
LC-Slot2# show tcam-mgr region 0 config

Region Configuration :

Region ID                = 0
Region name              = VLAN_SRC_MAC_ACCOUNTING
Fixed size               = no
Region type              = Order_Independent
Application VMR V/M size = 20
Application VMR result size = 4
Vc region size (percentage) = 5

LC-Slot2#
```

The following example shows output from the **show tcam-mgr region statistics** privileged EXEC command:

```
LC-Slot2# show tcam-mgr region 0 statistics

Region ID                = 0
Region expansion count   = 0
Region expansion failures = 0
Invalid direction hits   = 0
Invalid parameter hits   = 0
No free entry failures   = 0

LC-Slot2#
```

Glossary

ACL—Access Control List. Access lists filter network traffic by controlling whether routed packets are forwarded or blocked at the router's interfaces. The router examines each packet to determine whether to forward or drop the packet, based on the criteria specified within the access lists. See also EACL.

CAR—Committed Access Rate. A Cisco IOS software feature that allows a stream of traffic to be rate limited and given a user-specified priority.

CoS—Class of Service. The indication of how an upper-layer protocol requires a lower-layer protocol to treat its messages. For example, the CoS feature for Multiprotocol Label Switching (MPLS) enables network administrators to provide differentiated types of service across an MPLS network. Differentiated service satisfies a range of requirements by supplying for each packet transmitted the particular kind of service specified for that packet by its CoS. Service can be specified in different ways, such as using the IP precedence bit settings in IP packets.

CRC—Cyclic Redundancy Check. A technique for using overhead bits to detect transmission errors.

DRR—Deficit Round Robin. A queuing policy that provides the capability to provide expeditious handling for high priority traffic without starving lower priority traffic.

EACL—Extended Access Lists. Extended form of ACLs; more criteria are available for classifying traffic.

LOS—Loss of Signal.

MPLS—Multiprotocol Label Switching.

Precedence—A 3-bit field within the TOS bits.

QoS—Quality of Service.

RED—Random Early Discard. A congestion management scheme.

SNMP—Simple Network Management Protocol. Internet standard for remote management of network devices.

TCAM—Ternary content addressable memory.

ToS—Type of Service. 8 bits in the IP header governing Quality of Service.

WRED—Weighted RED. A variation of RED.