



Multi-Processor Forwarding (MPF) for Broadband LAC

The Multi-Processor Forwarding (MPF) for Broadband L2TP Access Concentrator (LAC) feature enables a second CPU on the Cisco 7301 router to use a fast forwarding method of switching data packets in order to improve broadband feature performance.

Feature History for MPF for Broadband LAC Feature

Release	Modification
12.3(7)XI1	This feature was introduced.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Contents

- [Prerequisites for MPF for Broadband LAC, page 2](#)
- [Restrictions for MPF for Broadband LAC, page 2](#)
- [Information About MPF for Broadband LAC, page 2](#)
- [How to Configure MPF for Broadband LAC, page 3](#)
- [Configuration Examples for MPF for Broadband LAC, page 5](#)
- [Additional References, page 7](#)
- [Command Reference, page 8](#)
- [Glossary, page 38](#)



Corporate Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

Copyright © 2004 Cisco Systems, Inc. All rights reserved.

Prerequisites for MPF for Broadband LAC

- You must have an upgraded ROM monitor 2.0 (ROMmon) image before you can download the software to enable use of the second CPU.
 - Minimum required ROMmon version for the Cisco 7301 is ROMmon version 12.3(4r)T2.
 - The upgraded ROMmon 2.0 image is available by default for newly purchased Cisco 7301 routers.
 - If you have a ROMmon version earlier than 2.0 and you would like to use the MPF capability, a Cisco-qualified support engineer (SE) can perform the ROMmon 2.0 upgrade on site.
- Cisco Express Forwarding (CEF) is enabled.
- You should have a preferred 512 MB memory for the second CPU.

Restrictions for MPF for Broadband LAC

- MPF for Broadband LAC is only supported on a Cisco 7301 router.
- MPF for Broadband LAC only supports native Gigabit Ethernet (GE) interfaces.
- L2TP access concentrator (LAC) is the only supported broadband feature.

Information About MPF for Broadband LAC

To configure MPF for Broadband LAC, you should read the [MPF for Broadband LAC Overview, page 2](#).

MPF for Broadband LAC Overview

MPF for Broadband LAC is a method of improving the performance of broadband features, specifically the Layer 2 Tunneling Protocol (L2TP) access concentrator (LAC), by enabling forwarding on a second CPU on the Cisco 7301 router. The need to improve performance is important due to the rapid increase in broadband users. MPF for Broadband LAC significantly improves performance by three times that of a regular Cisco 7301, without adding a new chassis.

MPF for Broadband LAC is accomplished by the second CPU running Fast Forwarding (FF) software to switch data packets. The FF software is bundled together with the Cisco IOS software image. When the Cisco IOS image is loaded, the second CPU is enabled by default. To disable fast forwarding on the second CPU, use the **no ip mpf** command. In addition, **show ip mpf** commands and a **debug ip mpf** command monitor forwarding on the second CPU and provide statistics.

The MPF for Broadband LAC feature requires the purchase of enabling software for the second CPU. You may purchase the enabling software when you purchase a new Cisco 7301 router, or you may purchase the enabling software as an upgrade. In both cases, the second CPU software is bundled in the Cisco IOS image and turned on by default. Contact your Cisco field representative or sales support team for more information.

Certain Broadband LAC features are handed off to the second CPU to be processed. They include the following supported IP features:

- Longest prefix match forwarding. Note that load balancing and IP Version 6 (IPv6) are not supported.
- Fragmentation. Note that reassembly is not supported.

- Point-to-Point Protocol over Ethernet (PPPoE) tunneling to and from L2TP
- Per PPPoE session accounting
- Per L2TP session accounting
- Per IP Version 4 (IPv4) adjacency accounting
- Per interface accounting

MPF for Broadband LAC supports the following protocols and encapsulations:

Protocols

- L2TP

Encapsulations

- ARPA
- 802.1Q
- PPPoE

Features not supported on the second CPU will be redirected and continue to be processed by way of Cisco Express Forwarding (CEF) in the same manner as they are today. Two unsupported features are CEF Accounting and Virtual Private Network (VPN) routing/forwarding (VRF).

The following CEF Accounting and VRF commands will disable the fast forwarding function on a global level:

- **ip cef accounting per-prefix**
- **ip cef accounting prefix-length**
- **ip cef accounting non-recursive**
- **ip vrf vrf-name**

How to Configure MPF for Broadband LAC

This section contains the following tasks:

- [Disabling and Enabling MPF for Broadband LAC, page 3](#) (optional)
- [Verifying MPF for Broadband LAC Is Enabled, page 5](#) (optional)

Disabling and Enabling MPF for Broadband LAC

This section contains the procedure to disable or enable forwarding on the second CPU on a Cisco 7301 router for MPF for Broadband LAC.

Prerequisites

- You have installed the enabling software.
- You must have IP routing turned on before enabling forwarding on the second CPU.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **no ip mpf**
4. **end**
5. **configure terminal**
6. **ip mpf**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	<code>configure terminal</code> Example: Router# configure terminal	Enters global configuration mode.
Step 3	<code>no ip mpf</code> Example: Router(config)# no ip mpf	To disable forwarding on the second CPU. The second CPU is enabled by default.
Step 4	<code>end</code> Example: Router(config)# end	Exits global configuration mode and returns to privileged EXEC mode.
Step 5	<code>configure terminal</code> Example: Router# configure terminal	Enters global configuration mode.
Step 6	<code>ip mpf</code> Example: Router(config)# ip mpf	If you have disabled forwarding on the second CPU for MPF for Broadband LAC, this command re-enables forwarding on the second CPU.

Verifying MPF for Broadband LAC Is Enabled

Perform this optional task to verify that MPF for Broadband LAC is enabled or turned on for the second CPU.

SUMMARY STEPS

1. **enable**
2. **show version**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	Router# show version Example: Router# show version	Displays information about the currently loaded software version along with hardware and device information, including information about whether the second CPU (CPU 1) is enabled for MPF for Broadband LAC.

Configuration Examples for MPF for Broadband LAC

This section contains the following examples:

- [Example of show version Command](#)
- [Example of show ip mpf Command](#)

Example of show version Command

The following **show version** command example displays the second CPU (CPU 1) enabled for MPF for Broadband LAC.

```
Router# show version
```

```
Cisco IOS Software, 7301 Software (C7301-I12S-M), Experimental Version
12.3(20040524:050554) [REL-v123_7_xi_throttle.ios-weekly 114]
Copyright (c) 1986-2004 by Cisco Systems, Inc.
Compiled Mon 24-May-04 06:26 by userid
```

```
ROM:System Bootstrap, Version 12.3(4r)T2, RELEASE SOFTWARE (fc1)
BOOTLDR:Cisco IOS Software, 7301 Software (C7301-BOOT-M), Experimental Version
12.3(20040514:051116) [userid-v123_7_xi_throttle-ios-nightly-task 117]
```

```
Router uptime is 1 hour, 50 minutes
System returned to ROM by reload at 18:05:37 UTC Wed Mar 22 2004
System image file is "disk0:c7301-i12s-mz"
```

```
Cisco 7301 (NPE) processor (revision C) with 229376K/32768K bytes of memory.
```

```

Processor board ID 74806813
SB-1 CPU at 700MHz, Implementation 1, Rev 0.2, 512KB L2 Cache
1 slot midplane, Version 3.0

Last reset from watchdog nmi
CPU 1 Multi-Processor Forwarding, Fri May 21 14:21:57 2004 [dailybuil 119]
1 FastEthernet interface
3 GigabitEthernet interfaces
509K bytes of NVRAM.

62976K bytes of ATA PCMCIA card at slot 0 (Sector size 512 bytes).
32768K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0

```

Example of show ip mpf Command

The following examples display MPF for Broadband LAC information using the **show ip mpf** command. For more information on the examples, refer to the commands in the [Command Reference, page 8](#).

```
Router# show ip mpf ?
```

```

adjacency  Adjacency information
fib        Forwarding information base
interface  Interface related information
lac        LAC information
statistics Protocol statistics
vcci      VCCI allocation

```

```
Router# show ip mpf interface ?
```

```

GigabitEthernet GigabitEthernet IEEE 802.3z
statistics      Interface counters
subblock        Interface subblock information

```

```
Router# show ip mpf interface subblock
```

```
MPF is enabled
CPU 1 is running
```

Interface	Up	MPF	Un	Index	VCCI	Encap	Size	Mactable	If	Info	Info	Map
Gi0/1	Y	Y	--	0	2	ARPA	4096	646FC928	64368908	649BB290		
Gi0/2	Y	Y	--	1	3	ARPA	4096	646FE928	64368898	649C0438		
Gi0/3	Y	Y	--	2	4	ARPA	4096	64700928	64368828	5005F4AC		

```
Router# show ip mpf interface GigabitEthernet 0/0 subblock
```

```
MPF is enabled
CPU 1 is running
```

Interface	Up	MPF	Un	Index	VCCI	Encap	Size	Mactable	If	Info	Info	Map
Gi0/0	Y	Y	--	0	2	ARPA	4096	641089A4	63D72D94	6442F78C		

```
Router# configure t
```

```
Router(config)# ip cef accounting per-prefix
```

```
Router(config)# end
```

```
Router# show ip mpf interface GigabitEthernet 0/0 subblock
```

```

MPF is configured
IP MPF is not currently supported
  CEF accounting is enabled
CPU 1 is running

```

```

Interface    Up MPF Un Index VCCI  Encap  Size Mactable If Info  Info Map
Gi0/0       Y  Y  -- 0    2    ARPA   4096 641089A4 63D72D94 6442F78C

```

```
Router# show ip mpf interface GigabitEthernet 0/0 subblock detailed
```

```
MPF is enabled
CPU 1 is running
```

```

Interface    Up MPF Un Index VCCI  Encap  Size Mactable If Info  Info Map
Gi0/0       Y  Y  -- 0    2    ARPA   4096 641089A4 63D72D94 6442F78C

```

```

Receive      :Packets 122                Bytes 40603
              :Punts 2071                Drops 0
              :Bcast 0
Transmit     :Packets 0                Bytes 0
              :Punts 124                Drops 0
              :Bcast 0
Response    :Negated 0                Disc 0
              Last 00:00:07
Errors      :Input error 0 crc 0, frame 0, runts 0
              :          overrun 0, resource 0, drops 0
              :Output collision 0, underrun 0, drops 0
              :Message negated 0, discards 0, last 00:00:00

```

Additional References

The following sections provide references related to MPF for Broadband LAC.

Related Documents

Related Topic	Document Title
Cisco 7300: Upgrading and Troubleshooting Tasks, using the show version command.	Cisco 7300 Network Processing Engine Installation and Configuration , “Troubleshooting and Upgrading Tasks chapter.”
Cisco Express Forwarding (CEF)	Cisco IOS Switching Services Command Reference , Release 12.3 T
IP commands: command syntax, command mode, defaults, usage guidelines, and examples	Cisco IOS IP Command Reference, Volume 1 of 4: Addressing and Services , Release 12.3

Standards

Standards	Title
Gigabit Ethernet IEEE 802.3z	—
IEEE 802.1q	—

MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

IRFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport

Command Reference

This section documents only new and modified commands.

New commands:

- [debug ip mpf](#)
- [ip mpf](#)
- [show ip mpf adjacency](#)
- [show ip mpf fib](#)
- [show ip mpf interface](#)
- [show ip mpf lac](#)
- [show ip mpf statistics](#)
- [show ip mpf vcci](#)

Modified command:

- [show version](#)

debug ip mpf

To enable debugging on a Cisco 7301 router that has the second CPU enabled for Multi-Processor Forwarding (MPF) for Broadband LAC, use the **debug ip mpf** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug ip mpf [**adjacency** | **eolog** | **error** | **fib** [**events** [*access-list*]] | **interface** [**control**] | **l2tp** | **statistics**]

no debug ip mpf [**adjacency** | **eolog** | **error** | **fib** [**events** [*access-list*]] | **interface** [**control**] | **l2tp** | **statistics**]

Syntax Description		
adjacency	(Optional)	Information about adjacent node events.
eolog	(Optional)	Event logging. Enables or disables logging information about significant internal MPF events.
error	(Optional)	Interface and session setup errors.
fib	(Optional)	Information about routing events (in the forwarding information base (FIB)).
events	(Optional)	Table events.
<i>access-list</i>	(Optional)	Limits debugging collection to packets that match the access list number. This is a standard IP access list number, 1-99.
interface	(Optional)	Information on interfaces.
control	(Optional)	MPF for Broadband LAC control information pertaining to interfaces
l2tp	(Optional)	PPPoE session and L2TP session/tunnel setup information.
statistics	(Optional)	MPF for Broadband LAC statistics.

Defaults No default behavior or values

Command Modes Privileged EXEC

Command History	Release	Modification
	12.3(7)XI1	This command was introduced.

Usage Guidelines Using the **debug ip mpf** command without any keywords only displays general MPF events. We recommend you use the debug condition commands in conjunction with the MPF **debug ip mpf** command in order to limit the amount of debugging output especially in those cases where a large number of sessions will produce verbose output. When debug conditions are entered, the router generates debugging messages for packets entering or leaving the router on a specified interface or subinterface or for a session that meet specified conditions.

The conditions which are applicable to MPF include interface, username, and MAC address. The username and MAC address conditions pertain to a session and are applicable only to the **debug ip mpf l2tp** command. The **debug ip mpf l2tp** command requires the username and MAC address conditions.

For example, the **debug condition username** <username> command generates debugging output only for interfaces with packets that specify the value of that <username>.

The router monitors interfaces to learn if any packets contain the specified value for certain conditions. If the condition is met on an interface or subinterface or for a session, debug command output will be displayed for that interface or session.

Refer to the “[Conditionally Triggered Debugging](#)” chapter of the *Cisco IOS Debug Command Reference* for more information on the **debug condition** commands.



Note

When more than one debug command is enabled, it's possible that if one command meets its conditions, the other debug command's output may not be visible. For example, if you use the **debug ip mpf l2tp** command with a username condition and a second **debug ip mpf interface control** command was enabled, the latter command might not display any output. Add a pertinent interface condition for the second **debug ip mpf interface control** command to enable displaying the output after the interface condition is met.

Examples

The following examples display debugging turned on to collect various debugging information:

```
Router# debug ip mpf
MPF general debugging is on
```

```
Router# debug ip mpf adjacency
MPF adjacency debugging is on
```

```
00:39:19:Gi0/3 MPF:Deleting adjacency 0x6497BFDC for 200.1.1.1 id 0x6497BFDC
00:39:19:Gi0/3 MPF:Allocated adjacency 0x6497BFDC for 200.1.1.1 VCCI 1 flags 0 len 0 id
0x6497BFDC
00:39:19:Gi0/3 MPF:Sent adjacency 0x6497BFDC add for 200.1.1.1 VCCI 1 flags 0 len 0 id
0x6497BFDC
00:39:19:Gi0/3 MPF:Updating adj 0x6497BFDC for 200.1.1.1 VCCI 4 flags 0 len 14 id
0x6497BFDC
00:39:19:Gi0/3 MPF:Sent adjacency 0x6497BFDC update for 200.1.1.1 VCCI 4 flags 0 len 14 id
0x6497BFDC
```

```
Router# debug ip mpf error
MPF error debugging is on
```

```
Router# debug ip mpf fib events
MPF forwarding event debugging is on
```

```
00:40:18:MPF:Found table 0 200.0.0.0/24 leaf 0x64680A48 id null
00:40:18:MPF:Deleting leaf 0x64680A48 200.0.0.0/24 adj null
00:40:18:MPF:Sent upon delete leaf 0x64680A48 200.0.0.0/24 adj null
00:40:18:MPF:Freeing leaf 0x64680A48 for table 0 200.0.0.0/24
00:40:18:MPF:Allocated leaf 0x64680A48 for table 0 0.0.0.0/0
00:40:18:MPF:Updating attached leaf 0x64680A48 table 0 200.0.0.0/24 flags 9 adj punt
00:40:18:MPF:Sent attached leaf 0x64680A48 table 0 200.0.0.0/24 flags 9 adj punt
00:40:18:MPF:Found table 0 200.0.0.0/24 leaf 0x64680A48 id punt
00:40:18:MPF:Adding attached leaf 0x64680A48 table 0 200.0.0.0/24 flags 9 adj punt
00:40:18:MPF:Sent attached leaf 0x64680A48 table 0 200.0.0.0/24 flags 9 adj punt
```

```
Router(config)# access-list 1 permit 200.1.1.1
Router(config)# end
Router# debug ip mpf fib events 1
```

```

MPF forwarding event debugging is on for access list 1
Router# clear ip route *

00:43:04:MPF:Found table 0 200.1.1.1/32 leaf 0x64681390 id null
00:43:04:MPF:Deleting leaf 0x64681390 200.1.1.1/32 adj null
00:43:04:MPF:Sent upon delete leaf 0x64681390 200.1.1.1/32 adj null
00:43:04:MPF:Unlocking leaf 0x64681390 table 0 200.1.1.1/32 flags 0 from adj null
00:43:04:MPF:Sent update for leaf 0x64681390 table 0 200.1.1.1/32 flags 0 adj punt
00:43:04:MPF:Freeing leaf 0x64681390 for table 0 200.1.1.1/32
00:43:04:MPF:Leaf 0x64681324 table 0 0.0.0.0/0 flags 0 adj punt changed 200.1.1.1/32
00:43:04:MPF:Updating host route leaf 0x64681324 table 0 200.1.1.1/32 flags 10 adj punt
00:43:04:MPF:Sent host route leaf 0x64681324 table 0 200.1.1.1/32 flags 10 adj punt
00:43:04:MPF:Locking leaf 0x64681324 table 0 200.1.1.1/32 flags 10 with adj 0x6497BFDC
00:43:04:MPF:Sent update for leaf 0x64681324 table 0 200.1.1.1/32 flags 10 adj 0x6497BFDC
00:43:04:MPF:Found table 0 200.1.1.1/32 leaf 0x64681324 id 0x6497BFDC
00:43:04:MPF:Adding attached leaf 0x64681324 table 0 200.1.1.1/32 flags 10 adj 0x6497BFDC
00:43:04:MPF:Sent attached leaf 0x64681324 table 0 200.1.1.1/32 flags 10 adj 0x6497BFDC
00:43:04:MPF:Found table 0 200.1.1.1/32 leaf 0x64681324 id 0x6497BFDC
00:43:04:MPF:Adding host route leaf 0x64681324 table 0 200.1.1.1/32 flags 10 adj
0x6497BFDC
00:43:04:MPF:Sent host route leaf 0x64681324 table 0 200.1.1.1/32 flags 10 adj 0x6497BFDC

Router# debug ip mpf interface control
MPF interface control debugging is on

Router(config)# interface gi0/2
Router(config-if)# shutdown
Router(config-if)# end
Router#
00:44:38:Gi0/2 MPF:State changed to DOWN
00:44:38:Gi0/2 MPF:Updating ICB 1 VCCI 3 with encap drop, MTU max 1528 min 18

Router# debug ip mpf l2tp
MPF L2TP debugging is on

Router# debug ip mpf statistics
MPF statistics debugging is on

```

Related Commands

Command	Description
show ip mpf adjacency	Shows information about MPF adjacency nodes.
show ip mpf fib	Shows forwarding information base (FIB) information used to fast forward IP traffic.
show ip mpf interface	Shows interface-related information for all MPF interfaces.
show ip mpf lac	Shows MPF L2TP Access Concentrator (LAC) information.
show ip mpf statistics	Shows MPF data packet statistics.
show ip mpf vcci	Displays the Virtual Channel Common Index (VCCI) mapping to interfaces.

ip mpf

To enable Multi-Processor Forwarding (MPF) for Broadband LAC on the second CPU of a Cisco 7301 router, use the **ip mpf** command in global configuration mode. To disable MPF for Broadband LAC forwarding, use the **no** form of this command.

ip mpf

no ip mpf

Syntax Description This command has no arguments or keywords.

Defaults MPF for Broadband LAC forwarding is enabled by default on the second CPU.

Command Modes Global configuration

Command History	Release	Modification
	12.3(7)XI1	This command was introduced.

Usage Guidelines MPF for Broadband LAC forwarding is enabled by default on the second CPU (CPU 1). The MPF-enabling software image is bundled together with the Cisco IOS image. Cisco IOS images that contain the special MPF images must be purchased.

Examples The following example disables MPF for Broadband LAC forwarding on the second CPU:

```
Router(config)# no ip mpf
```

Related Commands	Command	Description
	debug ip mpf	Enables MPF debugging.
	show ip mpf adjacency	Shows information about MPF adjacency nodes.
	show ip mpf fib	Shows forwarding information base (FIB) information used to fast forward IP traffic.
	show ip mpf interface	Shows interface-related information for all MPF interfaces.
	show ip mpf lac	Shows MPF L2TP Access Concentrator (LAC) information.
	show ip mpf statistics	Shows MPF data packet statistics.
	show ip mpf vcci	Displays the Virtual Channel Common Index (VCCI) mapping to interfaces.

show ip mpf adjacency

To show information about adjacency nodes when Multi-Processor Forwarding (MPF) for Broadband LAC is enabled on the second CPU on a Cisco 7301 router, use the **show ip mpf adjacency** command in privileged EXEC mode.

```
show ip mpf adjacency [GigabitEthernet slot/port / id number / vcci number]
```

Syntax Description	GigabitEthernet	(Optional) Displays the specified Gigabit Ethernet interface
	slot/port	Displays the slot number and port number for the Gigabit Ethernet interface
	id number	(Optional) Displays information for a specific adjacency identifier. number is the adjacency identifier number.
	vcci number	(Optional) Displays all adjacencies on a particular Virtual Channel Common Index (VCCI). VCCI is associated with an interface. number is the VCCI number.

Defaults No default behavior or values

Command Modes Privileged EXEC

Command History	Release	Modification
	12.3(7)XI1	This command was introduced.

Usage Guidelines Use this command to display MPF for Broadband LAC adjacency table information and to verify that an adjacency exists for a connected device, particularly the IP address of the interface representing the next hop for packet routing.

Examples The following example displays information (all adjacencies on VCCI number 3, the next hop IP address) adjacent to the Gigabit Ethernet 0/1 interface:

```
Router# show ip mpf adjacency GigabitEthernet 0/1
```

```
-----
Protocol Interface ID      VCCI Address
IP        Gi0/1    63BB9040 3    12.1.1.1
IP        Gi0/1    63BB9170 3    12.1.1.4
IP        Gi0/1    63BB9208 3    12.1.1.3
IP        Gi0/1    63BB90D8 3    12.1.1.2
IP        Gi0/1    63BB8DE0 3    12.1.1.100
```

Table 1 describes the fields shown in the display.

Table 1 *show ip mpf adjacency Field Descriptions*

Field	Description
Protocol	Routed protocol to which the adjacency is related.
Interface	Outgoing interface associated with the adjacency.
ID	The adjacency identifier
VCCI	The Virtual Channel Common Index (VCCI) number.
Address	The next-hop IP address reachable via Gi0/1.

The following example displays all adjacencies on VCCI ID number 3:

```
Router# show ip mpf adjacency vcci 3
-----
Protocol Interface ID      VCCI  Address
IP       Gi0/1    63BB9040 3    12.1.1.1
IP       Gi0/1    63BB9170 3    12.1.1.4
IP       Gi0/1    63BB9208 3    12.1.1.3
IP       Gi0/1    63BB90D8 3    12.1.1.2
IP       Gi0/1    63BB8DE0 3    12.1.1.100
```

The following example displays adjacency information for adjacency ID number 63BB9040:

```
Router# show ip mpf adjacency id 63BB9040
-----
Protocol Interface ID      VCCI  Address
IP       Gi0/1    63BB9040 3    12.1.1.1
```

Related Commands

Command	Description
show ip mpf fib	Shows forwarding information base (FIB) information used to fast forward IP traffic.
show ip mpf interface	Shows interface-related information for all MPF interfaces.
show ip mpf lac	Shows MPF L2TP Access Concentrator (LAC) information.
show ip mpf statistics	Shows MPF data packet statistics.
show ip mpf vcci	Displays the Virtual Channel Common Index (VCCI) mapping to interfaces.

show ip mpf fib

To show information about the forwarding information base (FIB) on a Cisco 7301 router enabled for Multi-Processor Forwarding (MPF) for Broadband LAC, use the **show ip mpf fib** command in privileged EXEC mode.

show ip mpf fib [*A.B.C.D E.F.G.H*]

Syntax Description	<i>A.B.C.D E.F.G.H</i> (Optional) Destination prefix (IP address, A.B.C.D) and mask (E.F.G.H) in dotted decimal format.
---------------------------	---

Defaults	No default behavior or values
-----------------	-------------------------------

Command Modes	Privileged EXEC
----------------------	-----------------

Command History	Release	Modification
	12.3(7)XI1	This command was introduced.

Usage Guidelines	Use this command to show forwarding information used to fast forward IP traffic for a destination prefix (IP address and mask). Multiple hops can be required to reach the destination prefix; each hop is via a connected adjacency that has its own address.
-------------------------	--

Examples	The following example displays the forwarding information for IP address 12.1.1.1 with subnet mask 255.255.255.255. The output shows the IP address and mask (Prefix), the adjacency ID number (Next Hop), and the output interface (Interface Gi 0/1).
-----------------	---

```
Router# show ip mpf fib 12.1.1.1 255.255.255.255
```

```
Prefix           Next Hop Interface
12.1.1.1/32      63BB9040 Gi0/1
```

The following example displays the forwarding information based upon all IP addresses and subnets:

```
Router# show ip mpf fib
```

```
Prefix           Next Hop Interface
0.0.0.0/32      receive
0.0.0.0/0       drop    Null0 (default route handler entry)
10.0.0.0/32     receive
10.0.0.0/24     punt
10.0.0.121/32   63BB8AE8
10.0.0.201/32   receive
10.0.0.255/32   receive
12.1.1.0/32     receive
12.1.1.0/24     punt
12.1.1.1/32     63BB9040 Gi0/1
12.1.1.2/32     63BB90D8 Gi0/1
```

■ show ip mpf fib

```

12.1.1.3/32      63BB9208 Gi0/1
12.1.1.4/32      63BB9170 Gi0/1
12.1.1.100/32    63BB8DE0 Gi0/1
12.1.1.101/32    receive
12.1.1.255/32    receive
13.1.1.0/32      receive
13.1.1.0/24      punt
13.1.1.1/32      receive
13.1.1.255/32    receive

```

The following example displays the forwarding information used to forward via MPF for Broadband LAC to the prefix representing the 200.1.1.0/24 subnet. The output highlights all prefixes within this subnet.

```
Router# show ip mpf fib 200.1.1.0 255.255.255.0
```

```

Prefix          Next Hop Interface
200.1.1.0/32    receive
200.1.1.0/24    punt
200.1.1.1/32    64B2F7DC Gi0/3
200.1.1.12/32   receive
200.1.1.255/32  receive

```

Table 2 describes the significant fields and output text shown in the output example.

Table 2 *show ip mpf fib Field Descriptions*

Field	Description
Prefix	Specifies the network prefix (IP address and mask).
Next Hop	Specifies the adjacency ID number, drop, receive, or punt status.
Interface	Output or next hop interface.
receive	Packets forwarded to this adjacency are received.
drop	Packets forwarded to this adjacency are dropped.
punt	Represents destinations that cannot be switched in the normal path and that are punted to the next fastest switching vector.

Related Commands

Command	Description
show ip mpf adjacency	Shows information about MPF adjacency nodes.
show ip mpf interface	Shows interface-related information for all MPF interfaces.
show ip mpf lac	Shows MPF L2TP Access Concentrator (LAC) information.
show ip mpf statistics	Shows MPF data packet statistics.
show ip mpf vcci	Displays the Virtual Channel Common Index (VCCI) mapping to interfaces.

show ip mpf interface

To show interface-related information for all interfaces that support MPF for Broadband LAC on a Cisco 7301 router, use the **show ip mpf interface** command in privileged EXEC mode.

```
show ip mpf interface [GigabitEthernet slot/port [statistics | subblock [detailed]] | statistics | subblock]
```

Syntax Description	GigabitEthernet	(Optional) Displays interface-related information for a specified Gigabit Ethernet interface.
	<i>slot/port</i>	Displays the slot number and port number for the Gigabit Ethernet interface.
	statistics	(Optional) Displays interface counters.
	subblock	(Optional) Displays interface subblock information.
	detailed	(Optional) Displays detailed information on all MPF-supported Gigabit Ethernet interfaces.

Defaults No default behavior or values

Command Modes Privileged EXEC

Command History	Release	Modification
	12.3(7)XI1	This command was introduced.

Usage Guidelines Each interface has an associated VCCI number. When Cisco Express Forwarding (CEF) accounting or Virtual Private Network (VPN) routing/forwarding (VRF) is configured, fast forwarding of IP traffic is disabled.

Examples The following example displays interface counters for all MPF-supported interfaces (Gi0/0, Gi0/1, Gi0/2):

```
Router# show ip mpf interface statistics

Gi0/0, VCCI 2
  Receive  :Packets 5          Bytes 1630
            :Punts 73         Drops 0
            :Bcast 0
  Transmit :Packets 0          Bytes 0
            :Punts 6          Drops 0
            :Bcast 0
  Response :Negated 0         Disc 0
            Last 00:00:07
  Errors   :Input error 0 crc 0, frame 0, runts 0
            :          overrun 0, resource 0, drops 0
            :Output collision 0, underrun 0, drops 0
            :Message negated 0, discards 0, last 00:00:00
```

show ip mpf interface

```

Gi0/1, VCCI 3
Receive  :Packets 18956          Bytes 7438945
          :Punts   6            Drops  0
          :Bcast   0
Transmit :Packets 18847          Bytes 7270512
          :Punts  119           Drops  0
          :Bcast   0
Response :Negated 0             Disc  0
          Last    00:00:08
Errors   :Input  error 0 crc 0, frame 0, runts 0
          :      overrun 0, resource 0, drops 0
          :Output collision 0, underrun 0, drops 0
          :Message negated 0, discards 0, last 00:00:00

Gi0/2, VCCI 4
Receive  :Packets 25706          Bytes 10679484
          :Punts  13878         Drops  0
          :Bcast   0
Transmit :Packets 39575          Bytes 21512973
          :Punts   6            Drops  0
          :Bcast   0
Response :Negated 0             Disc  0
          Last    00:00:01
Errors   :Input  error 0 crc 0, frame 0, runts 0
          :      overrun 0, resource 0, drops 0
          :Output collision 0, underrun 0, drops 0
          :Message negated 0, discards 0, last 00:00:00

```

The following example displays information about each interface (Gi0/1, Gi0/2, Gi0/3) by subblock:

```
Router# show ip mpf interface subblock
```

```
MPF is enabled
CPU 1 is running
```

Interface	Up	MPF	Un	Index	VCCI	Encap	Size	Mactable	If	Info	Info	Map
Gi0/1	Y	Y	--	0	2	ARPA	4096	646FC928	64368908	649BB290		
Gi0/2	Y	Y	--	1	3	ARPA	4096	646FE928	64368898	649C0438		
Gi0/3	Y	Y	--	2	4	ARPA	4096	64700928	64368828	5005F4AC		

The following example displays information for the Gigabit Ethernet 0/0 interface when Cisco Express Forwarding (CEF) Accounting, an unsupported feature, is enabled. The output text regarding whether IP MPF is supported and CEF accounting is enabled is displayed depending on the CEF Accounting settings selected:

```
Router# show ip mpf interface GigabitEthernet 0/0 subblock
```

```
MPF is enabled
CPU 1 is running
```

Interface	Up	MPF	Un	Index	VCCI	Encap	Size	Mactable	If	Info	Info	Map
Gi0/0	Y	Y	--	0	2	ARPA	4096	64228024	63E92274	64556ECC		

```
Router# configure t
```

```
Router(config)# ip cef accounting per-prefix
```

```
Router(config)# end
```

```
Router# show ip mpf interface GigabitEthernet 0/0 subblock
```

```
MPF is configured
IP MPF is not currently supported
  CEF accounting is enabled
CPU 1 is running
```

```

Interface    Up MPF Un Index VCCI  Encap  Size Mappable If Info  Info Map
Gi0/0       Y  Y  -- 0    2    ARPA   4096 641089A4 63D72D94 6442F78C

```

The following example shows that a configuration for Virtual Private Network (VPN) routing/forwarding (VRF), an unsupported feature, is enabled. The output text regarding whether IP MPF is supported and IP VRF is enabled is displayed depending on the VRF settings selected:

```

Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# ip vrf vpn1
Router(config-vrf)# end
Router# show ip mpf interface subblock

```

```

MPF is configured
IP MPF is not currently supported
  IP VRF is enabled
CPU 1 is running

```

```

Interface    Up MPF Un Index VCCI  Encap  Size Mappable If Info  Info Map
Gi0/0       Y  Y  -- 0    2    ARPA   4096 64228024 63E92274 64556ECC
Gi0/1       Y  Y  -- 1    3    ARPA   4096 6422A024 63E92204 6458CC2C
Gi0/2       Y  Y  -- 2    4    ARPA   4096 6422C024 63E92194 645A4F70

```

The following example displays all detailed information for the Gigabit Ethernet 0/0 interface by subblock:

```

Router# show ip mpf interface GigabitEthernet 0/0 subblock detailed

```

```

MPF is enabled
CPU 1 is running

```

```

Interface    Up MPF Un Index VCCI  Encap  Size Mappable If Info  Info Map
Gi0/0       Y  Y  -- 0    2    ARPA   4096 641089A4 63D72D94 6442F78C

```

```

Receive  :Packets 122          Bytes 40603
          :Punts  2071         Drops 0
          :Bcast  0
Transmit :Packets 0          Bytes 0
          :Punts  124         Drops 0
          :Bcast  0
Response :Negated 0          Disc 0
          Last    00:00:07
Errors   :Input  error 0 crc 0, frame 0, runts 0
          :      overrun 0, resource 0, drops 0
          :Output collision 0, underrun 0, drops 0
          :Message negated 0, discards 0, last 00:00:00

```

Table 3 describes significant fields shown in the output examples.

Table 3 *show ip mpf interface Field Descriptions*

Field	Description
Up	The interface is up (Y) or down (N).
MPF	MPF is enabled (Y) or disabled (N) on the interface.

Table 3 *show ip mpf interface Field Descriptions (continued)*

Field	Description
Un	Unsupported features. All traffic received on this interface is punted (and fast forwarding disabled) if I- (input) or IO is present. All traffic destined towards this interface is punted if -O (output) or IO is present. The I- condition can be set by input features such as access lists, unicast RPF, or policing; the -O condition is set by any QoS or features such as access lists.
Index	Internal enumeration of the interface.
VCCI	Allocated identifier for the interface.
Encap	Encapsulation. This can be one of the following: <ul style="list-style-type: none"> • Actual data encapsulation type • punt (if interface is I-/IO) • drop (if the interface is down)
Size/Mactable/If Info/Info Map	Internal interface information.
Negated	Number of counters received from the module which was determined to have decreased in value and which upon detection was corrected.
Disc(ard)	Number of messages received from the module in which the set of counters was deemed not to have advanced.

Related Commands

Command	Description
show ip mpf adjacency	Shows information about MPF adjacency nodes.
show ip mpf fib	Shows forwarding information base (FIB) information used to fast forward IP traffic.
show ip mpf lac	Shows MPF L2TP Access Concentrator (LAC) information.
show ip mpf statistics	Shows MPF data packet statistics.
show ip mpf vcci	Displays the Virtual Channel Common Index (VCCI) mapping to interfaces.

show ip mpf lac

To show L2TP Access Concentrator (LAC) information on a Cisco 7301 router enabled for Multi-Processor Forwarding (MPF) for Broadband LAC, use the **show ip mpf lac** command in privileged EXEC mode.

```
show ip mpf lac [detail | interface {interface-type interface-number} | session [l2tp [id id] | pppoe [id id] | tunnel id]
```

Syntax Description		
detail	(Optional)	Displays Media Access Control (MAC) rewrite information.
interface	(Optional)	Displays information for a physical interface.
<i>interface-type</i>		Gigabit Ethernet interface.
<i>interface-number</i>		Gigabit Ethernet slot/port number.
session	(Optional)	Displays LAC information by session.
l2tp	(Optional)	Displays LAC information for all L2TP sessions.
pppoe	(Optional)	Displays LAC information for all PPPoE sessions
id	(Optional)	Displays LAC information for an individual L2TP session or PPPoE session with a specific session ID number.
tunnel	(Optional)	Displays the number of L2TP tunnels and associated tunnel information.
<i>id</i>		L2TP session number or PPPoE session number or tunnel number, as designated by the “Local” output field.

Defaults No default behavior or values

Command Modes Privileged EXEC

Command History	Release	Modification
	12.3(7)XI1	This command was introduced.

Usage Guidelines The **show ip mpf lac** command without any arguments is the primary command for displaying session information. The command displays the complete set of connections and their segments with the associated binding between PPPoE sessions and L2TP session/tunnels.

Examples The following example without any arguments displays all the PPPoE session and L2TP session/tunnel information on the router:

```
Router# show ip mpf lac
```

```
Connection Segment 1 Type Local Len IP MTU Segment 2 Type Local Len IP MTU
641A94EC 641872F8 PPPoE 201 24 1500 64187280 L2TP 202 38 65497
641A9510 64187348 PPPoE 200 24 1500 641872A8 L2TP 201 38 65497
```

```
show ip mpf lac
```

```
641A9534 64187370 PPPoE 199 24 1500 641872D0 L2TP 200 38 65497
641A9558 64187398 PPPoE 198 24 1500 64187320 L2TP 199 38 65497
641A957C 64187460 PPPoE 197 24 1500 641873C0 L2TP 198 38 65497
641A95A0 64187488 PPPoE 196 24 1500 641873E8 L2TP 197 38 65497
641A95C4 641874B0 PPPoE 195 24 1500 64187410 L2TP 196 38 65497
641A95E8 641874D8 PPPoE 194 24 1500 64187438 L2TP 195 38 65497
641A960C 641875A0 PPPoE 193 24 1500 64187500 L2TP 194 38 65497
641A9630 641875C8 PPPoE 192 24 1500 64187528 L2TP 193 38 65497
641A9654 641875F0 PPPoE 191 24 1500 64187550 L2TP 192 38 65497
641A9678 64187618 PPPoE 190 24 1500 64187578 L2TP 191 38 65497
641A969C 641876E0 PPPoE 189 24 1500 64187640 L2TP 190 38 65497
641A96C0 64187708 PPPoE 188 24 1500 64187668 L2TP 189 38 65497
641A96E4 64187730 PPPoE 187 24 1500 64187690 L2TP 188 38 65497
641A9708 64187758 PPPoE 186 24 1500 641876B8 L2TP 187 38 65497
641A972C 64187820 PPPoE 185 24 1500 64187780 L2TP 186 38 65497
641A9750 64187848 PPPoE 184 24 1500 641877A8 L2TP 185 38 65497
641A9774 64187870 PPPoE 183 24 1500 641877D0 L2TP 184 38 65497
```

The following example shows additional MAC rewrite information for each connection:

```
Router# show ip mpf lac detail
```

```
Connection Segment 1 Type Local Len IP MTU Segment 2 Type Local Len IP MTU
641A94EC 641872F8 PPPoE 201 24 1500 64187280 L2TP 202 38 65497
VCCI 208, VCD 0 Tunnel 19855, Mode L2L2, Seq N
000E3975C01A000E3975BC1A81000070 4500000000000000FF1129DDC801010C
8864110000C963C9 C801010106A506A500080000020216D0
0DDC0000FF03
641A9510 64187348 PPPoE 200 24 1500 641872A8 L2TP 201 38 65497
VCCI 207, VCD 0 Tunnel 19855, Mode L2L2, Seq N
000E3975C01A000E3975BC1A81000070 4500000000000000FF1129DDC801010C
8864110000C863C9 C801010106A506A500080000020216D0
0DDB0000FF03
641A9534 64187370 PPPoE 199 24 1500 641872D0 L2TP 200 38 65497
VCCI 206, VCD 0 Tunnel 19855, Mode L2L2, Seq N
000E3975C01A000E3975BC1A81000070 4500000000000000FF1129DDC801010C
8864110000C763C9 C801010106A506A500080000020216D0
0DDA0000FF03
641A9558 64187398 PPPoE 198 24 1500 64187320 L2TP 199 38 65497
VCCI 205, VCD 0 Tunnel 19855, Mode L2L2, Seq N
000E3975C01A000E3975BC1A81000070 4500000000000000FF1129DDC801010C
8864110000C663C9 C801010106A506A500080000020216D0
0DD90000FF03
```

The following example displays MAC rewrite information for each connection when an idle timer is added to the configuration:

```
Router# show running-config interface virtual-Template 1
Building configuration...
```

```
Current configuration :156 bytes
!
interface Virtual-Template1
 ip unnumbered Loopback0
 no peer default ip address
 ppp authentication chap
 ppp timeout idle 120 either
end
```

```
Router# show ip mpf lac detail
```

```
Connection Segment 1 Type Local Len IP MTU Segment 2 Type Local Len IP MTU
641A94EC 641872F8 PPPoE 201 24 1500 64187280 L2TP 202 38 65497
VCCI 208, VCD 0 Tunnel 19855, Mode L2L2, Seq N
```

```

000E3975C01A000E3975BC1A81000070 4500000000000000FF1129DDC801010C
8864110000C963C9                      C801010106A506A500080000020216D0
                                         0DDC0000FF03

Idle direction either,
last in 00:01:36 out 00:01:36
641A9510 64187348 PPPoE 200 24 1500 641872A8 L2TP 201 38 65497
VCCI 207, VCD 0                      Tunnel 19855, Mode L2L2, Seq N
000E3975C01A000E3975BC1A81000070 4500000000000000FF1129DDC801010C
8864110000C863C9                      C801010106A506A500080000020216D0
                                         0DDB0000FF03

Idle direction either,
last in 00:01:36 out 00:01:36
641A9534 64187370 PPPoE 199 24 1500 641872D0 L2TP 200 38 65497
VCCI 206, VCD 0                      Tunnel 19855, Mode L2L2, Seq N
000E3975C01A000E3975BC1A81000070 4500000000000000FF1129DDC801010C
8864110000C763C9                      C801010106A506A500080000020216D0
                                         0DDA0000FF03

Idle direction either,
last in 00:01:36 out 00:01:36
641A9558 64187398 PPPoE 198 24 1500 64187320 L2TP 199 38 65497
VCCI 205, VCD 0                      Tunnel 19855, Mode L2L2, Seq N
000E3975C01A000E3975BC1A81000070 4500000000000000FF1129DDC801010C
8864110000C663C9                      C801010106A506A500080000020216D0
                                         0DD90000FF03

Idle direction either,
last in 00:01:37 out 00:01:37

```

The following example displays the LAC information for the Gigabit Ethernet interface 0/2.112:

```

Router# show ip mpf lac interface gi0/2.112
VCCI Interface
8      Gi0/2.112
135    Gi0/2.112
134    Gi0/2.112
133    Gi0/2.112
132    Gi0/2.112

```

The following example displays information about the different types of LAC sessions, which are listed by local session ID:

```
Router# show ip mpf lac session
```

Total number of L2TP sessions:169

Local	Remote	If	Context	Tunnel	DF	Seq	IP	MTU	Len
798	174	0	67B21120	35457/47563	N	N	65497	38	
797	173	0	67B23860	35457/47563	N	N	65497	38	
796	172	0	67B235A0	35457/47563	N	N	65497	38	
795	171	0	67B247E0	35457/47563	N	N	65497	38	
794	170	0	67B22DC0	35457/47563	N	N	65497	38	
793	169	0	67B22B00	35457/47563	N	N	65497	38	
792	168	0	67B22840	35457/47563	N	N	65497	38	
791	167	0	67B24E80	35457/47563	N	N	65497	38	
790	166	0	67B24AE0	35457/47563	N	N	65497	38	
789	165	0	67B230C0	35457/47563	N	N	65497	38	
788	164	0	67B21E00	35457/47563	N	N	65497	38	
787	163	0	67B1C200	35457/47563	N	N	65497	38	
786	162	0	67B1CB00	35457/47563	N	N	65497	38	
785	161	0	67B1BF40	35457/47563	N	N	65497	38	
784	160	0	67B1BC80	35457/47563	N	N	65497	38	
783	159	0	67B1D0A0	35457/47563	N	N	65497	38	
782	158	0	67B1CDE0	35457/47563	N	N	65497	38	
781	157	0	67B1D500	35457/47563	N	N	65497	38	
780	156	0	67A11C00	35457/47563	N	N	65497	38	

■ show ip mpf lac

```
779 155 0 67A11940 35457/47563 N N 65497 38
```

```
Total number of PPPoE sessions:167
```

Local If	Context	VCCI	VCD	IP	MTU	Len
829 Gi0/1.112	64AC60E0	804	0	1500	24	
828 Gi0/1.112	64AC5FEC	803	0	1500	24	
827 Gi0/1.112	64AC5EF8	802	0	1500	24	
826 Gi0/1.112	64AC5B28	801	0	1500	24	
821 Gi0/1.112	64AC61D4	798	0	1500	24	
820 Gi0/1.112	64AC5D10	797	0	1500	24	
815 Gi0/1.112	64AC51A0	796	0	1500	24	
814 Gi0/1.112	64AC547C	795	0	1500	24	
812 Gi0/1.112	64AC4448	794	0	1500	24	
811 Gi0/1.112	64AC4630	793	0	1500	24	
810 Gi0/1.112	64AC4724	792	0	1500	24	
809 Gi0/1.112	64AC5388	791	0	1500	24	
808 Gi0/1.112	64AC5294	790	0	1500	24	
807 Gi0/1.112	64AC4DD0	789	0	1500	24	
806 Gi0/1.112	64AC4FB8	788	0	1500	24	
813 Gi0/1.112	64AC37E4	787	0	1500	24	
805 Gi0/1.112	64AC4EC4	786	0	1500	24	
804 Gi0/1.112	64AC5570	785	0	1500	24	
803 Gi0/1.112	64AC4CDC	784	0	1500	24	
802 Gi0/1.112	64AC4BE8	783	0	1500	24	

The following example displays LAC information for all L2TP sessions:

```
Router# show ip mpf lac session l2tp
```

```
Total number of L2TP sessions:1
```

Local Remote If	Context	Tunnel	DF	Seq	IP	MTU	Len
801 177 0	67A14C60	18574/61698	N	N	65497	38	

The following example displays LAC information for an individual L2TP session with the session ID number 801:

```
Router# show ip mpf lac session l2tp id 801
```

Local Remote If	Context	Tunnel	DF	Seq	IP	MTU	Len
801 177 0	67A14C60	18574/61698	N	N	65497	38	

The following example displays LAC information for all PPPoE sessions:

```
Router# show ip mpf lac session pppoe
```

```
Total number of PPPoE sessions:1
```

Local If	Context	VCCI	VCD	IP	MTU	Len
832 Gi0/1.112	64AC50AC	807	0	1500	24	

The following example displays LAC information for an individual PPPoE session with the session ID number 832:

```
Router# show ip mpf lac session pppoe id 832
```

Local If	Context	VCCI	VCD	IP	MTU	Len
832 Gi0/1.112	64AC50AC	807	0	1500	24	

The following example displays the number of L2TP tunnels and associated tunnel information:

```
Router# show ip mpf lac tunnel
```

```
Total number of tunnels:1

Local Remote Mode Remote Address  Port  Tport Count DF    ToS  UDP MTU
35457 47563  L2L2 200.1.1.1    1701  IP    167  clr  clr  N/N 65497
```

The following example displays information for an individual L2TP tunnel with the tunnel ID number 18574:

```
Router# show ip mpf lac tunnel 18574
```

```
Local Remote Mode Remote Address  Port  Tport Count DF    ToS  UDP MTU
18574 61698  L2L2 200.1.1.1    1701  IP     1    clr  clr  N/N 65497
```

Table 4 describes significant fields shown in the output examples.

Table 4 show ip mpf lac Field Descriptions

Field	Description
Context	Internal reference.
Count	Number of sessions in tunnel.
DF	DF bit setting. Always displays “N” for L2TP session keyword; not supported for LAC.
If	Interface number or Interface name for a PPPoE session. Not applicable for LAC L2TP.
Len	Length of protocol/encapsulation.
Local	Local session ID.
Mode	Layer two to layer two switch.
Port	User Datagram Protocol (UDP) port number for the L2TP traffic.
Remote	Remote session ID.
Remote address	IP address of the remote end of the tunnel (that is the L2TP network server (LNS) endpoint).
Seq	L2TP sequencing, always displays “N,” not supported by MPF.
ToS	Type of Service setting, not supported for LAC.
Tport	Transport for L2TP is IP.
Tunnel	Local/Remote ID.
UDP	User Datagram Protocol (UDP) checksums. Always displays “N,” not supported by MPF.
VCCI	Allocated virtual common channel index. Provides mapping of LAC sessions to interface via the VCCI.
VCD	Reserved for future use.

■ show ip mpf lac

Related Commands	Command	Description
	show ip mpf adjacency	Shows information about MPF adjacency nodes.
	show ip mpf fib	Shows forwarding information base (FIB) information used to fast forward IP traffic.
	show ip mpf interface	Shows interface-related information for all MPF interfaces.
	show ip mpf statistics	Shows MPF data packet statistics.
	show ip mpf vcci	Displays the Virtual Channel Common Index (VCCI) mapping to interfaces.

show ip mpf statistics

To show Multi-Processor Forwarding (MPF) for Broadband LAC data packet statistics on a Cisco 7301 router enabled for MPF, use the **show ip mpf statistics** command in privileged EXEC mode.

show ip mpf statistics [**dot1q** [**GigabitEthernet** *slot/port* | **id** *vlan-id*] | **traffic**]

Syntax Description		
dot1q	(Optional) Displays data packet statistics for all IEEE 802.1Q VLANs for an interface or for a specific IEEE 802.1Q VLAN across all interfaces or subinterfaces.	
GigabitEthernet	(Optional) Displays data packet statistics for all IEEE 802.1Q VLANs for a specified Gigabit Ethernet interface.	
<i>slot/port</i>	Displays the slot number and port number for the Gigabit Ethernet interface.	
id	(Optional) Individual Virtual LAN identifier. Displays data packet statistics for an individual IEEE 802.1Q VLAN across all interfaces or subinterfaces.	
<i>vlan-id</i>	Virtual LAN identifier. The allowed range is from 1 to 4094.	
traffic	(Optional) Displays received and sent data packet traffic counters.	

Defaults No default behavior or values

Command Modes Privileged EXEC

Command History	Release	Modification
	12.3(7)XI1	This command was introduced.

Usage Guidelines The traffic output is similar to the traffic counters in the **show ip traffic** command.

Examples The following example displays traffic counter statistics:

```
Router# show ip mpf statistics traffic

Rcvd:  0 checksum errors
        0 fragments, 0 total reassembled
        0 reassembly timeouts, 0 failed reassembly
Sent:   0 fragmented into 0 fragments, 0 failed
```

The following example displays data packet statistics for all VLANs on the Gigabit Ethernet 0/1 interface:

```
Router# show ip mpf statistics dot1q gi0/1

VLAN      Packets          Bytes
1         in 0             in 0
1         out 0            out 0
100      in 0             in 0
```


show ip mpf vcci

To display the Virtual Channel Common Index (VCCI) mapping to interfaces on a Cisco 7301 router, enabled for Multi-Processor Forwarding (MPF) for Broadband LAC, use the **show ip mpf vcci** command in privileged EXEC mode.

```
show ip mpf vcci number [interface [GigabitEthernet slot/port] | summary]
```

Syntax Description		
	<i>number</i>	The VCCI number.
	interface	(Optional) Displays MPF-supported Gigabit Ethernet interfaces for a VCCI. VCCI is associated with an interface.
	GigabitEthernet	(Optional) Displays the specified Gigabit Ethernet interface for a VCCI.
	<i>slot/port</i>	The slot number and port number for the Gigabit Ethernet interface.
	summary	(Optional) Displays summary information on MPF-supported Gigabit Ethernet interfaces by VCCI.

Defaults No default behavior or values

Command Modes Privileged EXEC

Command History	Release	Modification
	12.3(7)XI1	This command was introduced.

Usage Guidelines VCCI is associated with an interface.

Examples The following example displays the MPF-supported interface (Gigabit Ethernet 0/1) for VCCI 3:

```
Router# show ip mpf vcci 3
```

```
VCCI  Interface
3      Gi0/1
```

The following example displays MPF-supported Gigabit Ethernet interface (Gi0/1) information by VCCI:

```
Router# show ip mpf vcci interface gi0/1.112
```

```
VCCI  Interface  Context
7      Gi0/1.112  I 64C0F428
Receive :Packets 1177815          Bytes 910700653
         :Punts   1300           Drops 0
Transmit :Packets 770578          Bytes 296721860
         :Punts   0             Drops 0
Response :Negated 0             Disc 1
         Last    00:00:04
```

Table 5 describes significant fields shown in the **show ip mpf vcci interface** output example.

Table 5 *show ip mpf vcci interface Field Descriptions*

Field	Description
Negated	Number of counters received from the module which was determined to have decreased in value and which upon detection was corrected.
Disc(ard)	Number of messages received from the module in which the set of counters was deemed not to have advanced.

The following example displays summary MPF-supported interface information by VCCI:

Router# **show ip mpf vcci summary**

Type	Base	Max	Used	Avail	Num	Size	Allocated	Array
Basic queue	63B45300	16384	0	16384	1	2	0	63B45300
VLAN queue	63B3F2D4	3	3	0	4096	2	3	638E305C
VCCI queue	63B4D32C	65531	9	65522	1	0	3188	63B4D32C

Related Commands

Command	Description
show ip mpf adjacency	Shows information about MPF adjacency nodes.
show ip mpf fib	Shows forwarding information base (FIB) information used to fast forward IP traffic.
show ip mpf interface	Shows interface-related information for all MPF interfaces.
show ip mpf lac	Shows MPF L2TP Access Concentrator (LAC) information.
show ip mpf statistics	Shows MPF data packet statistics.

show version

To display information about the currently loaded software version along with hardware and device information, use the **show version** command in EXEC mode.

show version

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes User EXEC
Privileged EXEC

Command History	Release	Modification
	9.0	This command was introduced.
	12.3(4)T, 12.2(20)S	The output format of this command was updated.
	12.3(7)XI1	This command was modified to show the second CPU information with Multi-Processor Forwarding (MPF) for Broadband LAC enabled on the Cisco 7301 only.

Usage Guidelines This command displays information about the Cisco IOS software version currently running on your routing device, the ROM Monitor and Bootflash or boot loader software versions, and information about the hardware configuration, including the amount of system memory. Because this command displays both software and hardware information, the output of this command is the same as the output of the **show hardware** command. (The **show hardware** command is a command alias for the **show version** command.)

Specifically, the **show version** command provides the following information:

- Software information
 - Main Cisco IOS image version
 - Main Cisco IOS image capabilities (feature set)
 - Location and name of bootfile in ROM
 - Bootflash or boot loader image version (depending on platform)
 - Second CPU information with Multi-Processor Forwarding (MPF) for Broadband LAC enabled on the Cisco 7301
- Device-specific information
 - Device name
 - System uptime
 - System reload reason

- Config-register setting
- Config-register settings for after the next reload (depending on platform)
- Hardware information
 - Platform type
 - Processor type
 - Processor hardware revision
 - Amount of main (processor) memory installed
 - Amount I/O memory installed
 - Amount of Flash memory installed on different types (depending on platform)
 - Processor board ID

The output of this command will vary by platform image, but generally uses the following format:

```
Cisco IOS Software, <platform> Software (<image-id>), Version <software-version>,
<software-type>
Technical Support: http://www.cisco.com/techsupport
Copyright (c) <date-range> by Cisco Systems, Inc.
Compiled <day> <date> <time> by <compiler-id>

ROM: System Bootstrap, Version <software-version>, <software-type>
BOOTLDR: <platform> Software (image-id), Version <software-version>, <software-type>

<router-name> uptime is <w> weeks, <d> days, <h> hours, <m> minutes
System returned to ROM by reload at <time> <day> <date>
System image file is "<filesystem-location>/<software-image-name>"
Last reload reason: <reload-reason>

Cisco <platform-processor-type> processor (revision <processor-revision-id>) with
<free-DRAM-memory>K/<packet-memory>K bytes of memory.
Processor board ID <ID-number>
<CPU-type> CPU at <clock-speed>Mhz, Implementation <number>, Rev <Revision-number>,
<kilobytes-Processor-Cache-Memory>KB <cache-Level> Cache
```

See the Examples section for descriptions of the fields in this output.

Examples

The following is sample output from the **show version** command from Cisco IOS Release 12.3(7)XI1, showing the second CPU (CPU 1) software with Multi-Processing Forwarding enabled on a Cisco 7301 router:

```
Router# show version

Cisco IOS Software, 7301 Software (C7301-I12S-M), Experimental Version
12.3(20040524:050554) [REL-v123_7_xi_throttle.ios-weekly 114]
Copyright (c) 1986-2004 by Cisco Systems, Inc.
Compiled Mon 24-May-04 06:26 by userid

ROM: System Bootstrap, Version 12.3(4r)T2, RELEASE SOFTWARE (fc1)
BOOTLDR: Cisco IOS Software, 7301 Software (C7301-BOOT-M), Experimental Version
12.3(20040514:051116) [userid-v123_7_xi_throttle-ios-nightly-task 117]

Router uptime is 1 hour, 50 minutes
System returned to ROM by reload at 18:05:37 UTC Wed Mar 22 2004
System image file is "disk0:c7301-i12s-mz"
```

```
Cisco 7301 (NPE) processor (revision C) with 229376K/32768K bytes of memory.  
Processor board ID 74806813  
SB-1 CPU at 700MHz, Implementation 1, Rev 0.2, 512KB L2 Cache  
1 slot midplane, Version 3.0
```

```
Last reset from watchdog nmi  
CPU 1 Multi-Processor Forwarding, Fri May 21 14:21:57 2004 [dailybuil 119]  
1 FastEthernet interface  
3 GigabitEthernet interfaces  
509K bytes of NVRAM.
```

```
62976K bytes of ATA PCMCIA card at slot 0 (Sector size 512 bytes).  
32768K bytes of Flash internal SIMM (Sector size 256K).  
Configuration register is 0x0
```

The following is sample output from the **show version** command from Cisco IOS Release 12.3(7)T1:

```
C7301# show version  
Cisco IOS Software, 7301 Software (C7301-IS-M), Version 12.3(7)T1, RELEASE SOFTWARE (fc2)  
Technical Support: http://www.cisco.com/techsupport  
Copyright (c) 1986-2004 by Cisco Systems, Inc.  
Compiled Wed 21-Apr-04 21:52 by userid
```

```
ROM: System Bootstrap, Version 12.3(4r)T2, RELEASE SOFTWARE (fc1)  
BOOTLDR: Cisco IOS Software, 7301 Software (C7301-BOOT-M), Experimental Version  
12.3(20040514:051116) [userid-v123_7_xi_throttle-ios-nightly-task 117]
```

```
Router uptime is 50 minutes  
System returned to ROM by reload at 22:22:08 UTC Thu Apr 13 2004  
System image file is "disk0:c7301-is-mz.123-7.T1"  
Last reload reason: Reload command
```

```
Cisco 7301 (NPE) processor (revision C) with 229376K/32768K bytes of memory.  
Processor board ID 74806813  
SB-1 CPU at 700MHz, Implementation 1, Rev 0.2, 512KB L2 Cache  
1 slot midplane, Version 3.0
```

```
Last reset from watchdog nmi  
1 FastEthernet interface  
3 Gigabit Ethernet interfaces  
509K bytes of NVRAM.
```

```
62976K bytes of ATA PCMCIA card at slot 0 (Sector size 512 bytes).  
32768K bytes of Flash internal SIMM (Sector size 256K).  
Configuration register is 0x0
```

Table 6 describes significant fields for the **show version** command.

Table 6 *show version Field Descriptions*

Field	Description
<p>Cisco IOS Software, <platform> Software (<image-id>), Version <software-version>, <release-type></p> <p>Example: Cisco IOS Software, 7301 Software (C7301-IS-M), Version 12.3(7)T</p>	<p><i>platform</i>—Cisco hardware device name.</p> <p><i>image-id</i>—The coded software image identifier, in the format <i>platform-features-format</i> (for example, “c7301-is-m”).</p> <p><i>software-version</i>—The Cisco IOS software release number, in the format <i>x.y(z)A</i>, where <i>x.y</i> is the main release identifier, <i>z</i> is the maintenance release number, and <i>A</i>, where applicable, is the special release train identifier. For example, 12.3(7)T indicates the seventh maintenance release of the 12.3T special technology release train.</p> <p>Note In the full software image filename, 12.3(7)T appears as 123-7.T. In the IOS Upgrade Planner, 12.3(7)T appears as 12.3.7T (ED).</p> <p><i>release-type</i>—The description of the release type. Possible values include MAINTENANCE (for example, 12.3(3)), INTERIM (for example, 12.3(3.2)), and EARLY DEPLOYMENT (for example 12.2(20)S).</p> <p>Tip Refer to “The ABC’s of Cisco IOS Networking” (available on Cisco.com) for more information on Cisco IOS software release numbering and software versions.</p> <p>Cisco IOS is a registered trademark (R) of Cisco Systems, Inc.</p>
<p>Technical Support: http://www.cisco.com/techsupport Copyright (c) <date-range> by Cisco Systems, Inc.</p>	<p>The Cisco Technical Assistance Center (TAC) contains more than 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.</p> <p>Cisco IOS software, including the source code, user-help, and documentation, is copyrighted by Cisco Systems, Inc. It is Cisco’s policy to enforce its copyrights against any third party who infringes on its copyright.</p>
<p>ROM: System Bootstrap, Version 12.3(4r)T2, RELEASE SOFTWARE (fc1)</p>	<p>The system “bootstrap” software, stored in ROM memory.</p>
<p>BOOTLDR:</p>	<p>The system “boot loader” software, stored in Flash memory (if applicable).</p>
<p><device> uptime is ...</p> <p>Example: C7301 uptime is 1 week, 3 days, 6 hours, 41 minutes</p>	<p>The amount of time the system has been up and running.</p>

Table 6 *show version Field Descriptions (continued)*

Field	Description
System returned to ROM by <reload-reason> at <time> <day> <date> Example: System returned to ROM by reload at 22:22:08 UTC Thu Apr 13 2004	Shows the last recorded reason for a system reload, and time of last reload.
Last reload reason: <reload-reason> Example: Last reload reason: Reload command	Shows the last recorded reason for a system reload.
Last reset from <reset-reason> Example: Last reset from power-on	Shows the last recorded reason for a system reset. Possible <i>reset-reason</i> values include: <ul style="list-style-type: none"> • power-on—System was reset with the initial power on or a power cycling of the device. • s/w peripheral—System was reset due to a software peripheral. • s/w nmi—System was reset by a nonmaskable interrupt (NMI) originating in the system software. For example, on some systems, you can configure the device to reset automatically if two or more fans fail. • push-button—System was reset by manual activation of a RESET push-button (also called a hardware NMI). • watchdog—System was reset due to a watchdog process. • unexpected value—May indicate a bus error, such as for an attempt to access a nonexistent address (for example, “System restarted by bus error at PC 0xC4CA, address 0x210C0C0”). (This field was formerly labeled as the “System restarted by” field.)
System image file is "<file-location/file-name>" Example: System image file is "disk0:c7301-is-mz.123-7.T1"	Displays the file location (local or remote filesystem) and the system image name.

Table 6 show version Field Descriptions (continued)

Field	Description
<pre>Cisco <platform> (<processor-type>) processor (revision <processor-revision-id>) with <free-DRAM-memory>K/<packet-memo- ry>K bytes of memory.</pre>	<p>This line can be used to determine how much Dynamic RAM (DRAM) is installed on your system, in order to determine if you meet the “Min. Memory” requirement for a software image. DRAM (including SDRAM) is used for system processing memory and for packet memory.</p> <p>Two values, separated by a slash, are given for DRAM: The first value tells you how DRAM is available for system processing, and the second value tells you how much DRAM is being used for Packet memory.</p>
<p>Example: Separate DRAM and Packet Memory</p> <pre>Cisco RSP4 (R5000) processor with 65536K/2072K bytes of memory</pre>	<p>The first value, Main Processor memory, is either:</p> <ul style="list-style-type: none"> • The amount of DRAM available for the processor, or • The total amount of DRAM installed on the system.
<p>Example: Combined DRAM and Packet Memory</p> <pre>Cisco 3660 (R527x) processor (revision 1.0) with 57344K/8192K bytes of memory.</pre>	<p>The second value, Packet memory, is either:</p> <ul style="list-style-type: none"> • The total physical input/output (I/O) memory (or “Fast memory”) installed on the router (Cisco 4000, 4500, 4700, and 7500 series), or • The amount of “shared memory” used for packet buffering. In the shared memory scheme (Cisco 2500, 2600, 3600, and 7200 series), a percentage of DRAM is used for packet buffering by the router's network interfaces. <p>Note The terms “I/O memory” or “iomem”; “shared memory”; “Fast memory” and “PCI memory” all refer to “Packet Memory.” Packet memory is either separate physical RAM or shared DRAM.</p> <p>Separate DRAM and Packet Memory</p> <p>The Cisco 4000, 4500, 4700, and 7500 series routers have separate DRAM and Packet memory, so you only need to look at the first number to determine total DRAM. In the example to the left for the Cisco RSP4, the first value shows that the router has 65536K (65,536 kilobytes, or 64 megabytes) of DRAM. The second value, 2072K, is the Packet memory.</p> <p>Combined DRAM and Packet Memory</p> <p>The Cisco 2500, 2600, 3600, 7301, and 7200 series routers require a minimum amount of I/O memory to support certain interface processors.</p> <p>The Cisco 1600, 2500, 2600, 3600, 7301, and 7200 series routers use a fraction of DRAM as Packet memory, so you need to add both numbers to find out the real amount of DRAM. In the example to the left for the Cisco 3660, the router has 57,344 kilobytes (KB) of free DRAM and 8,192 KB dedicated to Packet memory. Adding the two numbers together gives you $57,344K + 8,192K = 65,536K$, or 64 megabytes (MB) of DRAM.</p>

Table 6 show version Field Descriptions (continued)

Field	Description
	For more details on memory requirements, see the document “How to Choose a Cisco IOS® Software Release” on Cisco.com.
<pre>Configuration register is <value></pre> <p>Example: <pre>Configuration register is 0x2142 (will be 0x2102 at next reload)</pre></p>	<p>Shows the current configured hex value of the software configuration register. If the value has been changed with the config-register command, the register value that will be used at the next reload is displayed in parentheses.</p> <p>The boot field (final digit) of the software configuration register dictates what the system will do after a reset.</p> <p>For example, when the boot field of the software configuration register is set to 00 (for example, 0x0), and you press the NMI button on a Performance Route Processor (PRP), the user-interface remains at the ROM monitor prompt (rommon>) and waits for a user command to boot the system manually. But if the boot field is set to 01 (for example, 0x1), the system automatically boots the first Cisco IOS image found in the onboard Flash memory SIMM on the PRP.</p> <p>The factory-default setting for the configuration register is 0x2102. This value indicates that the router will attempt to load a Cisco IOS software image from Flash memory and load the startup configuration file.</p>
<pre>CPU 1 Multi-Processor Forwarding, <day> <date> <time> <year> [daily build number]</pre> <p>Example: <pre>CPU 1 Multi-Processor Forwarding, Thu Feb 5 23:26:14 2004 [dailybuil 100]</pre></p>	<p>Indicates the second CPU (CPU 1) is enabled for Multi-Processor Forwarding on day, date, time, and year.</p> <p>[daily build number] is the user id of whoever built the image. In the example it was the daily build that built the image.</p>

Related Commands

Command	Description
show inventory	Displays the Cisco Unique Device Identifier information, including the product ID, the version ID, and the serial number, for the hardware device and hardware components.

Glossary

adjacency—Information about adjacent node events.

broadband—Transmission methodology that multiplexes multiple independent signals onto one cable. In telecommunications, broadband is classified as any channel with bandwidth greater than 4kHz (typical voice grade). In LAN terminology, broadband is classified as a coaxial cable on which analog signaling is employed.

FF—Fast Forwarding. Accelerates broadband features by enabling the second CPU on the Cisco 7301 router.

FIB—Forwarding information base. Information used to fast forward IP traffic.

MPF for Broadband LAC—Multi-Processor Forwarding for broadband L2TP access concentrator. Enables a second CPU on the Cisco 7301 router to use a fast forwarding method of forwarding data packets in order to improve broadband feature performance.

ROMmon—ROM monitor. ROMmon is the initializing software that is executed when the router is powered up.

VCCI—Virtual Channel Common Index. The VCCI is used as an identifier for the interface. It supports a variety of interfaces that can be mapped to a single VCCI value or to multiple VCCI values.



Note

Refer to [Internetworking Terms and Acronyms](#) for terms not included in this glossary.

CCVP, the Cisco logo, and Welcome to the Human Network are trademarks of Cisco Systems, Inc.; Changing the Way We Work, Live, Play, and Learn is a service mark of Cisco Systems, Inc.; and Access Registrar, Aironet, Catalyst, CCDA, CCDP, CCIE, CCIP, CCNA, CCNP, CCSF, Cisco, the Cisco Certified Internetwork Expert logo, Cisco IOS, Cisco Press, Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Cisco Unity, Enterprise/Solver, EtherChannel, EtherFast, EtherSwitch, Fast Step, Follow Me Browsing, FormShare, GigaDrive, HomeLink, Internet Quotient, IOS, iPhone, IP/TV, iQ Expertise, the iQ logo, iQ Net Readiness Scorecard, iQuick Study, LightStream, Linksys, MeetingPlace, MGX, Networkers, Networking Academy, Network Registrar, PIX, ProConnect, ScriptShare, SMARTnet, StackWise, The Fastest Way to Increase Your Internet Quotient, and TransPath are registered trademarks of Cisco Systems, Inc. and/or its affiliates in the United States and certain other countries.

All other trademarks mentioned in this document or Website are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (0711R)

Copyright © 2004 Cisco Systems, Inc. All rights reserved.