Configuring CEF Consistency Checkers

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This module contains information about and instructions for configuring Cisco Express Forwarding consistency checkers for route processors and line cards. Cisco Express Forwarding consistency checkers help you find any database inconsistencies, such as an IP prefix missing from a line card or a Route Processor (RP). You can investigate and resolve the inconsistency by examining the associated Cisco Express Forwarding system error messages that occur and by issuing Cisco Express Forwarding **debug** and **show** commands.

Cisco Express Forwarding is an advanced Layer 3 IP switching technology. It optimizes network performance and scalability for all kinds of networks: those that carry small amounts of traffic and those that carry large amounts of traffic in complex patterns, such as the Internet and networks characterized by intensive web-based applications or interactive sessions.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for CEF Consistency Checkers

Cisco Express Forwarding must be up and running on the networking device before you can configure Cisco Express Forwarding consistency checkers.

Restrictions for CEF Consistency Checkers

The Cisco Express Forwarding consistency checkers lc-detect and scan-lc apply only to devices that have distributed Cisco Express Forwarding enabled.

Information About CEF Consistency Checkers

Cisco Platform Support for CEF and dCEF

Cisco Express Forwarding is enabled by default on most Cisco platforms running Cisco IOS software Release12.0 or later. When Cisco Express Forwarding is enabled on a router, the RP performs the express forwarding.

To find out if Cisco Express Forwarding is enabled on your platform, enter the **show ip cef**command. If Cisco Express Forwarding is enabled, you receive output that looks like this:

```
Router# show ip cef
Prefix              Next Hop            Interface
[...]
10.2.61.8/24        192.168.100.1       FastEthernet1/0/0
                    192.168.101.1       FastEthernet6/1
[...]
```

If Cisco Express Forwarding is not enabled on your platform, the output for the **show ip cef**command looks like this:

```
Router# show ip cef
%CEF not running
```

Distributed Cisco Express Forwarding is enabled by default on the Catalyst 6500 series switch, the Cisco 7500 series router, and the Cisco 12000 Series Internet Router. When distributed Cisco Express Forwarding is enabled on your platform, the line cards perform the express forwarding.

If Cisco Express Forwarding is not enabled on your platform, use the **ip cef**command to enable Cisco Express Forwarding or the **ip cef distributed** command to enable distributed Cisco Express Forwarding.

CEF Consistency Checker Types

Cisco Express Forwarding uses routing information that is retrieved from the Routing Information Base (RIB), the RP, and the line card databases to perform express forwarding. As these databases are updated, inconsistencies might result, due to the asynchronous nature of the distribution mechanism for these databases. Inconsistencies caused by asynchronous database distribution are of the following types:

- Missing information, such as a particular prefix, on a line card

- Different information, such as different next hop IP addresses, on the line card

Cisco Express Forwarding supports passive and active consistency checkers that run independently to uncover these forwarding inconsistencies. The table below describes the consistency checkers and indicates whether the checker operates on the RP or the line card.

Table 1   Types of Cisco Express Forwarding Consistency Checkers

Checker Type	Operates On	Description
Lc-detect	Line card	(Distributed Cisco Express Forwarding only) Retrieves IP prefixes found missing from the line card FIB table. If IP prefixes are missing, the line card cannot forward packets for the corresponding addresses. Lc-detect then sends IP prefixes to the RP for confirmation. If the RP finds that it has the relevant entry, an inconsistency is detected, and an error message is displayed. Also, the RP sends a signal back to the line card confirming that the IP prefix contributes to the creation of an inconsistency.
Scan-lc	Line card	(Distributed Cisco Express Forwarding only) Looks through the FIB table for a configurable time period and sends the next n prefixes to the RP. The RP does an exact lookup in its FIB table. If the RP finds that the prefix is missing, the RP reports an inconsistency. The RP sends a signal back to the line card for confirmation. The time period and number of prefixes sent are configured with the **ip cef table consistency-check** command.

Checker Type	Operates On	Description
Scan-rp	Route Processor	Looks through the RP FIB table for a configurable time period and sends the next *n* prefixes to the line card. (This action is opposite to the one that the scan-lc checker performs.) The line card does an exact lookup in the FIB table. If the line card finds the prefix missing, the line card reports an inconsistency and signals the RP for confirmation. The time period and number of prefixes sent are configured with the **ip cef table consistency-check** command.
Scan-rib	Route Processor	Operates on all (even nondistributed) RPs, and scans the RIB to ensure that prefix entries are present in the RP FIB table.

Cisco Express Forwarding consistency checkers are enabled by default for Cisco IOS Releases 12.0(20)S and later. Console errors are disabled by default.

If you find a database inconsistency, such as an IP prefix missing from a line card or an RP, you can investigate and resolve it by examining the Cisco Express Forwarding system error messages and by issuing Cisco Express Forwarding **debug** and **show** commands.

For Cisco Express Forwarding consistency checker system error messages, see the *System Message Guide* for your Cisco IOS Release.

How to Configure CEF Consistency Checkers

Enabling CEF Consistency Checkers

Perform the following task to enable Cisco Express Forwarding consistency checkers.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip cef table consistency-check** [**type** {**lc-detect** | **scan-lc** | **scan-rib** | **scan-rp** }] [**count** *count-number*] [**period** *seconds*]
4. **ip cef table consistency-check** [**settle-time** *seconds*]
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Router# configure terminal	Enters global configuration mode.
Step 3	**ip cef table consistency-check** [**type** {**lc-detect**	**scan-lc**	**scan-rib**	**scan-rp** }] [**count** *count-number*] [**period** *seconds*] **Example:** Router(config)# ip cef table consistency-check scan-rib count 100 period 60	Enables Cisco Express Forwarding table consistency checker types and parameters. • The **type** keyword indicates the type of consistency check to enable. • The **lc-detect** keyword enables the line card to detect a missing prefix, which is confirmed by the RP. • The **scan-lc** keyword enables a passive scan check of tables on the line card. • The **scan-rib** keyword enables a passive scan check of tables on the RP and a comparison with the RIB. • The **scan-rp** keyword enables a passive scan check of tables on the RP. • The **count** *-number* keyword-argument pair is the maximum number of prefixes to check per scan. The range is from 1 to 225. • The **period** *seconds* keyword-argument pair is the time during which updates for a candidate prefix are ignored as inconsistencies. The range is from 1 to 3600 seconds.

	Command or Action	Purpose
Step 4	**ip cef table consistency-check** [**settle-time** *seconds*] **Example:** Router(config)# ip cef table consistency-check settle-time 65	Suppresses inconsistency errors during route updates. • The **settle-time** *seconds* keyword-argument pair is the time elapsed during which updates for a candidate prefix are ignored as inconsistencies. The range is from 1 to 3600 seconds.
Step 5	**end** **Example:** Router(config)# end	Exits to privileged EXEC mode.

Displaying and Clearing Table Inconsistencies

Perform the following task to display and clear Cisco Express Forwarding table inconsistency records found by the lc-detect, scan-rp, scan-rib, and scan-lc detection mechanisms.

SUMMARY STEPS

1. **enable**
2. **show ip cef inconsistency**
3. **clear ip cef inconsistency**
4. **clear cef linecard** [*slot-number*] [**adjacency** | **interface** | **prefix**]
5. **show ip cef inconsistency**
6. **exit**

DETAILED STEPS

Step 1   **enable**
Use this command to enable privileged EXEC mode. For example:

Example:

Router> **enable**

Enter your password if prompted.

Step 2   **show ip cef inconsistency**
Use this command to display Cisco Express Forwarding IP inconsistencies. For example:

Example:

```
Router# show ip cef inconsistency
Table consistency checkers (settle time 65s)
```

```
lc-detect:running
0/0/0 queries sent/ignored/received
scan-lc:running [100 prefixes checked every 60s]
0/0/0 queries sent/ignored/received
scan-rp:running [100 prefixes checked every 60s]
0/0/0 queries sent/ignored/received
scan-rib:running [100 prefixes checked every 60s]
 0/0/0 queries sent/ignored/received
Inconsistencies:0 confirmed, 0/16 recorded
```

For each checker type, the output shows the number of prefixes that Cisco Express Forwarding must check and the number of seconds (the settle time) during which an inconsistency between RP and line card tables is ignored. The preceding output shows that 0 inconsistencies existed between these tables at the time the command was entered on the router.

Step 3 **clear ip cef inconsistency**
Use this command to clear the Cisco Express Forwarding inconsistency statistics and records found by the Cisco Express Forwarding consistency checkers. For example:

Example:

```
Router# clear ip cef inconsistency
```

Step 4 **clear cef linecard** [*slot-number*] [**adjacency** | **interface** | **prefix**]
Use this command to clear Cisco Express Forwarding information from line cards. For example:

```
Router# clear cef linecard
```

Example:

Step 5 **show ip cef inconsistency**
Use this command to verify that Cisco Express Forwarding statistics on inconsistencies are removed from the RP and the line cards. For example:

Example:

```
Router# show ip cef inconsistency
Table consistency checkers (settle time 65s)
 lc-detect:running
  0/0/0 queries sent/ignored/received
 scan-lc:running [100 prefixes checked every 60s]
  0/0/0 queries sent/ignored/received
 scan-rp:running [100 prefixes checked every 60s]
  0/0/0 queries sent/ignored/received
 scan-rib:running [1000 prefixes checked every 60s]
  0/0/0 queries sent/ignored/received
Inconsistencies:0 confirmed, 0/16 recorded
```

This sample output shows that four consistency checkers are enabled, that each checker sends 100 prefixes to be checked every 60 seconds, and that the time during which inconsistencies are ignored is 65 seconds. In this example, no inconsistencies were found.

Example:

Step 6 **exit**
Use this command to exit to user EXEC mode. For example:

Example:

```
Router# exit
Router>
```

Configuration Examples for CEF Consistency Checkers

Example Enabling CEF Consistency Checkers

The following example shows how to enable the scan-rp Cisco Express Forwarding consistency checker.

```
configure terminal
!
ip cef table consistency-check scan-rp count 225 period 3600
ip cef table consistency-check settle-time 2500
end
```

The RP is configured to send 3600 prefixes to the line cards every 225 seconds. After the prefixes are sent, the line cards are to wait 2500 seconds before signaling the RP to report an inconsistency (if there is one).

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
IP switching commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples.	*Cisco IOS IP Switching Command Reference*
Troubleshooting tips for incomplete adjacencies	Troubleshooting Incomplete Adjacencies with CEF
Description of and troubleshooting information for the consistency checker available for the Cisco 7500 series and Cisco 12000 Series Internet routers	Troubleshooting Prefix Inconsistencies with Cisco Express Forwarding
Overview of the Cisco Express Forwarding feature	Cisco Express Forwarding Overview
Tasks for verifying basic Cisco Express Forwarding and distributed Cisco Express Forwarding operation	Configuring Basic Cisco Express Forwarding for Improved Performance, Scalability, and Resiliency in Dynamic Networks

Related Topic	Document Title
Tasks for enabling or disabling Cisco Express Forwarding or distributed Cisco Express Forwarding	Enabling or Disabling Cisco Express Forwarding or Distributed Cisco Express Forwarding to Customize Switching and Forwarding for Dynamic Networks"
Tasks for configuring a load-balancing scheme for Cisco Express Forwarding	Configuring a Load-Balancing Scheme for Cisco Express Forwarding Traffic
Tasks for configuring epochs for Cisco Express Forwarding tables	Configuring Epochs to Clear and Rebuild Cisco Express Forwarding and Adjacency Tables
Tasks for configuring and verifying Cisco Express Forwarding network accounting	Configuring Cisco Express Forwarding Network Accounting
Tasks for customizing the display of recorded Cisco Express Forwarding events	Customizing the Display of Recorded Cisco Express Forwarding Events
Causes of common Cisco Express Forwarding-related error messages on platforms running distributed Cisco Express Forwarding switching (Cisco 7500 series routers and Cisco 12000 Series Internet routers) and how to troubleshoot them	Troubleshooting Cisco Express Forwarding-Related Error Messages

Standards

Standard	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	--

MIBs

MIB	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

RFCs

RFC	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 Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for CEF Consistency Checkers

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 2   Feature Information for Configuring Basic Cisco Express Forwarding Consistency Checkers for Route Processors and Line Cards

Feature Name	Releases	Feature Configuration Information
This table is intentionally left blank because no features were introduced or modified in Cisco IOS Release 12.2(1) or later. This table will be updated when feature information is added to this module.	--	--

Glossary

adjacency --A relationship formed between selected neighboring routers and end nodes for the purpose of exchanging routing information. Adjacency is based upon the use of a common media segment by the routers and nodes involved.

Cisco Express Forwarding --A Layer 3 switching technology. Cisco Express Forwarding can also refer to central Cisco Express Forwarding mode, one of two modes of Cisco Express Forwarding operation. Cisco Express Forwarding enables a Route Processor to perform express forwarding. Distributed Cisco Express Forwarding is the other mode of Cisco Express Forwarding operation.

distributed Cisco Express Forwarding --A mode of Cisco Express Forwarding switching in which line cards (such as Versatile Interface Processor (VIP) line cards) maintain identical copies of the forwarding

information base (FIB) and adjacency tables. The line cards perform the express forwarding between port adapters; this relieves the Route Switch Processor of involvement in the switching operation.

FIB --forwarding information base. A component of Cisco Express Forwarding that is conceptually similar to a routing table or information base. The router uses the FIB lookup table to make destination-based switching decisions during Cisco Express Forwarding operation. The router maintains a mirror image of the forwarding information in an IP routing table.

IPC --interprocess communication. The mechanism that enables the distribution of Cisco Express Forwarding tables from the Route Switch Processor (RSP) to the line card when the router is operating in distributed Cisco Express Forwarding mode.

LIB --label information base. A database used by a label switch router (LSR) to store labels learned from other LSRs, as well as labels assigned by the local LSR.

line card --A general term for an interface processor that can be used in various Cisco products. For example, a Versatile Interface Processor (VIP) is a line card for the Cisco 7500 series router.

MPLS --Multiprotocol Label Switching. An emerging industry standard for the forwarding of packets along the normal routing paths (sometimes called MPLS hop-by-hop forwarding).

prefix --The network address portion of an IP address. A prefix is specified by a network and mask and is generally represented in the format network/mask. The mask indicates which bits are the network bits. For example, 1.0.0.0/16 means that the first 16 bits of the IP address are masked, making them the network bits. The remaining bits are the host bits. In this example, the network number is 10.0.

RIB --Routing Information Base. A central repository of routes that contains Layer 3 reachability information and destination IP addresses or prefixes. The RIB is also known as the routing table.

RP --Route Processor. The processor module in the Cisco 7000 series routers that contains the CPU, system software, and most of the memory components that are used in the router. It is sometimes called a supervisory processor.

VPN --Virtual Private Network. The result of a router configuration that enables IP traffic to use tunneling to travel securely over a public TCP/IP network.

VRF --A Virtual Private Network (VPN) routing/forwarding instance. A VRF consists of an IP routing table, a derived forwarding table, a set of interfaces that use the forwarding table, and a set of rules and routing protocols that determine what goes into the forwarding table. In general, a VRF includes the routing information that defines a customer VPN site that is attached to a PE router.