IS-IS Support for Priority-Driven IP Prefix RIB Installation

The IS-IS Support for Priority-Driven IP Prefix RIB Installation feature allows customers to designate a subset of IP prefixes advertised by Integrated Intermediate System-to-Intermediate System (IS-IS) for faster processing and installation in the global routing table as one way to achieve faster convergence. For example, Voice over IP (VoIP) gateway addresses may need to be processed first to help VoIP traffic get updated faster than other types of packets.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the "Feature Information for IS-IS Support for Priority-Driven IP Prefix RIB Installation" section on page 16.

Finding Support Information for Platforms and Cisco IOS Software Images

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

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Prerequisites for IS-IS Support for Priority-Driven IP Prefix RIB Installation

Before you can configure the IS-IS Support for Priority-Driven IP Prefix RIB Installation feature, the integrated IS-IS routing protocol must be configured.

Restrictions for IS-IS Support for Priority-Driven IP Prefix RIB Installation

- The IS-IS Support for Priority-Driven IP Prefix RIB Installation feature is available only for IP Version 4 networks.
- Cisco IOS software still supports only one IS-IS process in IP routing.

Information About IS-IS Support for Priority-Driven IP Prefix RIB Installation

To set high priority for IS-IS IP prefixes, you should understand the following concepts:

- Convergence, page 2
- How IS-IS Priority-Driven IP Prefix RIB Installation Improves Convergence, page 2
- Benefit of Assigning a High Priority Tag to an IS-IS IP Prefix, page 3

Convergence

Convergence is the process of all routers coming to agreement on optimal routes in a network. In a network where routers run the IS-IS protocol, convergence is achieved by distributing a consistent view of the topology to all routers in the network. When a network event causes a topology change, a number of steps must occur in order for convergence to occur. The router which initially detects the topology change (for example, an interface state change) must inform other routers of the topology change by flooding updated routing information (in the form of Link State PDUs or LSPs) to other routers. All routers, including the router which detected the topology change, must utilize the updated topology information to recompute shortest paths (run an SPF), providing the updated output of the SPF calculation to the router's Routing Information Database (RIB) which will eventually cause the updated routing information to be used to forward packets. Until all routers have performed these basic steps, some destinations may be temporarily unreachable. Faster convergence benefits the network performance by minimizing the period of time during which stale topology information is used to forward packets.

How IS-IS Priority-Driven IP Prefix RIB Installation Improves Convergence

After performing an SPF, IS-IS must install updated routes in the RIB. If the number of prefixes advertised by IS-IS is large, then the time between the installation of the first prefix and the last prefix is significant. Priority driven IP prefix RIB installation allows a subset of the prefixes advertised by IS-IS

to be designated as having a higher priority. Updates to the paths to these prefixes will be installed before updates to prefixes which do not have this designation. This reduces the convergence time for the important IS-IS IP prefixes and results in faster update for routes which are dependent on these prefixes. This in turn shortens the time during which stale information is used for forwarding packets to these destinations.

Prefixes are characterized as being in one of three levels of importance:

1. High priority prefixes—Prefixes which have been tagged with a tag designated for fast convergence.
2. Medium priority prefixes—Any /32 prefixes which have not been designated as high priority prefixes fall into this category.
3. Low priority prefixes—All other prefixes.

When IS-IS updates the RIB, prefixes will be updated in order based on the associated level of importance.

Benefit of Assigning a High Priority Tag to an IS-IS IP Prefix

When you assign high priority tag to some IS-IS IP prefixes, those prefixes with the higher priority will get updated in the routing tables before prefixes with lower priority. The convergence time is reduced for the important IS-IS IP prefixes and results in reduced convergence time for the update processes that occur in the global RIB and Cisco Express Forwarding (CEF).

How to Configure IS-IS Support for Priority-Driven IP Prefix RIB Installation

This section contains the following procedures:

- Setting a High Priority Tag for an IS-IS IP Prefix, page 3 (required)
- Configuring the Router to Give Priority to Prefixes Associated with an IS-IS Tag Value, page 5 (required)
- Verifying the IS-IS Support for Priority-Driven IP Prefix RIB Installation Feature, page 6 (optional)

Setting a High Priority Tag for an IS-IS IP Prefix

This section provides the steps necessary to set a high priority tag for an IS-IS IP prefix.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip router isis** [*area-tag*]
5. **isis tag** *tag-number*
6. **exit**

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	**interface** *type number* **Example:** `Router(config-if)# interface Ethernet 0`	Configures an interface type and enters interface configuration mode.
Step 4	**ip router isis** [*area-tag*] **Example:** `Router(config-if)# ip router isis`	Configures an IS-IS routing process on an interface and attaches an area designator to the routing process. **Note** If the *area-tag* argument is not specified, a null tag is assumed and the process is referenced with a null tag. This name must be unique among all IP or Connectionless Network Service (CLNS) router processes for a given router.
Step 5	**isis tag** *tag-number* **Example:** `Router(config-if)# isis tag 17`	Sets a tag on the IP address configured for an interface when this IP prefix is put into an IS-IS LSP.
Step 6	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.

Configuring the Router to Give Priority to Prefixes Associated with an IS-IS Tag Value

This section provides the steps necessary to configure the router to assign a high priority to prefixes associated with a specified tag value.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router isis** [*area-tag*]
4. **ip route priority high tag** *tag-value*
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	**router isis** [*area-tag*] **Example:** `Router(config)# router isis`	Enables the IS-IS routing protocol and specifies an IS-IS process. **Note** If the *area-tag* argument is not specified, a null tag is assumed and the process is referenced with a null tag. This name must be unique among all IP or Connectionless Network Service (CLNS) router processes for a given router.
Step 4	**ip route priority high tag** *tag-value* **Example:** `Router(config)# ip route priority high tag 200`	Assigns a high priority to prefixes associated the specified tag value.
Step 5	**end** **Example:** `Router(config)# end`	(Optional) Saves configuration commands to the running configuration file, exits configuration mode, and returns the router to privileged EXEC mode.

Troubleshooting Tips

You can enter the **debug isis rib local** command to verify if the IP prefixes that are advertised by IS-IS link-state packets (LSPs) are being updated correctly in the IS-IS local RIB.

Verifying the IS-IS Support for Priority-Driven IP Prefix RIB Installation Feature

IS-IS maintains a local database for all IS-IS routing information. This local database is referred to as the IS-IS local RIB. It contains additional attributes which are not maintained in the global IP routing table. Access to the contents of the local RIB is used to support the **show isis rib** command which is used below to verify routing information related to the Priority Driven IP Prefix RIB Installation feature.

SUMMARY STEPS

1. **enable**
2. **show isis rib** [*ip-address* | *ip-address-mask*]
3. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show isis rib** [*ip-address* | *ip-address-mask*] **Example:** `Router# show isis rib 255.255.255.0`	Displays paths for a specific route in the IP Version 4 IS-IS local RIB.
Step 3	**exit** **Example:** `Router# exit`	Exits privileged EXEC mode.

Configuration Examples for IS-IS Support for Priority-Driven IP Prefix RIB Installation

This section contains the following example:

• Assigning a High Priority Tag Value to an IS-IS IP Prefix: Example, page 6

Assigning a High Priority Tag Value to an IS-IS IP Prefix: Example

The following example uses the **ip route priority high** command to assign a tag value of 200 to the IS-IS IP prefix:

```
interface Ethernet 0
 ip router isis
 isis tag 200
!
router isis
ip route priority high tag 200
```

Additional References

The following sections provide references related to the IS-IS Support for Priority-Driven IP Prefix RIB Installation feature.

Related Documents

Related Topic	Document Title
IS-IS commands	"Integrated IS-IS Commands" chapter in the *Cisco IOS IP Routing Protocols*, Release 12.2(33)SRA
IS-IS configuration tasks	"Configuring Integrated IS-IS" chapter in the *Cisco IOS IP Configuration Guide*, Release 12.4

Standards

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

MIBs

MIBs	MIBs Link
None	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

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 modified commands only.

- **debug isis rib**
- **ip route priority high**
- **show isis rib**

debug isis rib

To display debugging information for Integrated Intermediate System-to-Intermediate System (IS-IS) IP Version 4 routes in the global or local Routing Information Base (RIB), use the **debug isis rib** command in privileged EXEC mode. To disable the debugging of IS-IS IP Version 4 routes, use the **no** form of this command.

debug isis rib [**global** | [**local** [*access-list-number* | **terse**]]

no debug isis rib [**global** | **local**]

Syntax Description

global	(Optional) Displays debugging information for IS-IS IP Version 4 routes in the global RIB.
local	(Optional) Displays debugging information for IS-IS IP Version 4 routes in the IS-IS local RIB.
access-list-number	(Optional) Number of an access list. This is a decimal number from 100 to 199 or from 2000 to 2699.
terse	(Optional) Will not display debug information if the IS-IS IP Version 4 IS-IS local RIB has not changed.

Command Default

Debugging of IS-IS IP Version 4 routes is disabled.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(26)S	This command was introduced.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(18)SXE	This command was integrated into Cisco IOS Release 12.2(18)SXE.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

Use the **debug isis rib** command to verify if an IP prefix has been installed or removed. To monitor updates from the IS-IS database to the IS-IS local RIB, use the **local** keyword, and to monitor updates from the IS-IS database to the global RIB, use the **global** keyword.

It is highly recommended that you limit the debugging output to information specific to the IP prefix that is associated with a specific access list by entering the *accest-list-number* argument.

Examples

The following is sample output from the **debug isis rib** command after the **ip route priority high** command was used to give high priority to IS-IS IP prefixes for the configured access list access-list1. The debug output shows that the route 10.1.1.0/24 has been removed from the IS-IS local RIB.

```
Router# show running-config | include access-list 1

accest-list 1 permit 10.1.1.0 0.0.0.255

! access-list 1 is configured.

Router# debug isis rib local terse 1

00:07:07: ISIS-LR: 10.1.1.0/24 aged out in LSP[10/(7->8)]

! The route 10.1.1.0/24 is removed from the IS-IS local RIB LSP[10/(7->8)].
00:07:07: ISIS-LR: rem path: [115/80/20] via 10.2.2.2(Et2) from 10.22.22.22 tg 0 LSP[10/7]
from active chain (add to deleted chain)

!The remote path [115/80/20] is removed from the active chain.

00:07:07: ISIS-LR: Enqueued to updateQ[2] for 10.1.1.0/24

!Q[2] is marked to be the update.

00:07:07: ISIS-LR: rem path: [115/80/20] via 10.2.2.2(Et2) from 10.22.22.22 tg 0 LSP[10/7]
from deleted chain
00:07:07: ISIS-LR: Rem RT 10.1.1.0/24

!The remote route [115/80/20] is removed from the deleted chain
```

Table 1 describes the significant fields shown in the display.

Table 1 debug isis rib Field Descriptions

Field	Description
ISIS-LR	IS-IS local route debugger.
10.1.1.0/24	IP prefix.
rem path:	Indicates the removal or insertion of a routing path—in this instance, it is a removal.
[115/80/20]	Administrative instance/type/metric for the routing path that has been removed or inserted.
via 10.2.2.2(Et2)	IP address of the next hop of the router, in this instance, Ethernet2.
from 10.22.22.22	IP address to advertise the route path.
tg 0	Priority of the IP prefix. All prefixes have a tag 0 priority unless otherwise configured.

Related Commands

Command	Description
ip route priority high	Assigns a high priority to an IS-IS IP prefix.
show isis rib	Displays paths for routes in the IP Version 4 IS-IS local RIB.

ip route priority high

To assign a high priority to an Integrated Intermediate System-to-Intermediate System (IS-IS) IP prefix, use the **ip route priority high** command in router configuration mode. To remove the IP prefix priority, use the **no** form of this command.

ip route priority high tag *tag-value*

no ip route priority high tag *tag-value*

Syntax Description

tag *tag-value*	Assigns a high priority to IS-IS IP prefixes with a specific route tag in a range from 1 to 4294967295.

Command Default

No IP prefix priority is set.

Command Modes

Router configuration

Command History

Release	Modification
12.0(26)S	This command was introduced.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(18)SXE	This command was integrated into Cisco IOS Release 12.2(18)SXE.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

When you use the **ip route priority high** command to tag higher priority IS-IS IP prefixes for faster processing and installation in the global routing table, you can achieve faster convergence. For example, you can help Voice over IP (VoIP) gateway addresses get processed first to help VoIP traffic get updated faster than other types of packets.

Examples

The following example uses the **ip route priority high** command to assign a tag value of 100 to the IS-IS IP prefix:

```
Router> enable
Router# configure terminal
Router(config)# interface Ethernet 0
Router(config-if)# ip router isis
Router(config-if)# isis tag 100
Router(config-if)# exit
Router(config)# router isis
Router(config-router)# ip route priority high tag 100
!
```

Related Commands

Command	Description
debug isis rib	Displays debug information for IP Version 4 routes within the global or IS-IS local RIB.
show isis rib	Displays paths for routes in the IP Version 4 IS-IS local RIB.

show isis rib

To display paths for a specific route or for all routes under a major network that are stored in the IP local Routing Information Base (RIB), use the **show isis rib** command in privileged EXEC mode.

show isis rib [*ip-address* | *ip-address-mask*]

Syntax Description

ip-address	(Optional) Displays paths for a specific route.
ip-address-mask	(Optional) Displays paths for all routes under a major network.

Command Default

If no *ip-address* or *ip-address-mask* argument is specified, all routes in the Integrated Intermediate System-to-Intermediate System (IS-IS) local RIB are displayed.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(26)S	This command was introduced.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S
12.2(18)SXE	This command was integrated into Cisco IOS Release 12.2(18)SXE.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

To verify that an IP prefix update that exists in the IP global RIB also has been updated in the IS-IS local RIB, enter the **show isis rib** command.

Examples

The following is sample output from the **show isis rib** command to show all routes under the major network with the IP address mask 10.2.2.0 255.255.255.0 that are stored within the IS-IS local RIB:

```
Router# show isis rib 10.2.2.0 255.255.255.0

IPv4 local RIB for IS-IS process
10.2.2.0/24
 [115/L2/20} via 10.2.2.2(Ethernet2), from 10.22.22.22, tag 0, LSP[10/10]
```

Table 2 describes the significant fields shown in the display.

Table 2 show isis rib Field Descriptions

Field	Description
10.2.2.0/24	IP prefix that is stored within the IS-IS local RIB.
[115/L2/20]	Administrative instance/type/metric for the routing path to reach the next hop of the router.
via 10.2.2.2(Ethernet2)	IP address of the next hop—in this instance, Ethernet2.
tag 0	Priority of the IP prefix. All prefixes have a tag 0 priority unless otherwise configured.

Related Commands

Command	Description
debug isis rib	Displays debug information for IP Version 4 routes within the global or IS-IS local RIB.
ip route priority high	Assigns a high priority to an IS-IS IP prefix.

Feature Information for IS-IS Support for Priority-Driven IP Prefix RIB Installation

Table 3 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Cisco IOS software images are specific to a Cisco IOS software release, a feature set, and a platform. Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Note Table 3 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 3 Feature Information for the IS-IS Support for Priority-Driven IP Prefix RIB Installation Feature

Feature Name	Releases	Feature Information
IS-IS Support for Priority-Driven IP Prefix RIB Installation	12.0(26)S 12.3(4)T 12.2(25)S 12.2(18)SXE 12.2(27)SBC 12.2(33)SRA	The IS-IS Support for Priority-Driven IP Prefix RIB Installation feature allows customers to designate a subset of IP prefixes advertised by Integrated Intermediate System-to-Intermediate System (IS-IS) for faster processing and installation in the global routing table as one way to achieve faster convergence. For example, Voice over IP (VoIP) gateway addresses may need to be processed first to help VoIP traffic get updated faster than other types of packets.