IPv6 Routing: Route Redistribution

IPv6 route redistribution supports redistributing routes into an IPv6 IS-IS routing process and redistributing IPv6 IS-IS routes between IS-IS levels.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and 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.

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.

Information About IPv6 Routing: Route Redistribution

IS-IS Enhancements for IPv6

IS-IS in IPv6 functions the same and offers many of the same benefits as IS-IS in IPv4. IPv6 enhancements to IS-IS allow IS-IS to advertise IPv6 prefixes in addition to IPv4 and OSI routes. Extensions to the IS-IS command-line interface (CLI) allow configuration of IPv6-specific parameters. IPv6 IS-IS extends the address families supported by IS-IS to include IPv6, in addition to OSI and IPv4.

IS-IS in IPv6 supports either single-topology mode or multiple topology mode.

IPv6 IS-IS Route Redistribution

IS-IS for IPv6 supports redistributing routes into an IPv6 IS-IS routing process and redistributing IPv6 IS-IS routes between IS-IS levels.

Preserving Metrics During Redistribution

When ISIS redistributes a route, the prefix can be preserved as the original route installed in the routing information base (RIB) by using the options **rib-metric-as-external** or **rib-metric-as-internal** for the **metric-type** keyword in the **redistribute** command. The options are allowed when ISIS redistributes routes from any routing process, including another ISIS process.

How to Configure IPv6 Routing: Route Redistribution

Redistributing Routes into an IPv6 IS-IS Routing Process

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router isis** *area-tag*
4. **address-family ipv6** [**unicast**]
5. **redistribute** *source-protocol* [*process-id*] [**metric** *metric-value*] [**metric-type** *type-value*] [**route-map** *map-tag*]
6. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**router isis** *area-tag* **Example:** `Device(config)# router isis area2`	Enables IS-IS for the specified IS-IS routing process, and enters router configuration mode.

	Command or Action	Purpose
Step 4	**address-family ipv6** [**unicast**] **Example:** `Device(config-router)# address-family ipv6`	Specifies the IPv6 address family, and enters address family configuration mode. • **unicast—**(Optional) Specifies the unicast IPv6 unicast address family. This is the default option.
Step 5	**redistribute** *source-protocol* [*process-id*] [**metric** *metric-value*] [**metric-type** *type-value*] [**route-map** *map-tag*] **Example:** `Device(config-router-af)# redistribute bgp 64500 metric 100 route-map isismap`	Redistributes routes from the specified protocol into the IS-IS process. • *source-protocol***—**Can be one of the following: **bgp**, **connected**, **isis**, **rip** or **static**. • *process-id***—**(Optional) Routing process name. • **metric** *metric-value***—**Redistributes routes based on the metric value. • **metric-type** *type-value***—**Specifies the link type, which can be the following: **external** to set an external ISIS metric type, **internal** to set an internal ISIS metric type, **rib-metric-as-external** to set metric type to external and use the RIB metric, and **rib-metric-as-internal** to set metric type to internal and use the RIB metric.
Step 6	**end** **Example:** `Device(config-router-af)# end`	Exits address family configuration mode and returns to privileged EXEC mode.

Redistributing IPv6 IS-IS Routes Between IS-IS Levels

Perform this task to redistribute IPv6 routes learned at one IS-IS level into a different level.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router isis** *area-tag*
4. **address-family ipv6** [**unicast**]
5. **redistribute isis** [*process-id*] {**level-1** | **level-2**} **into** {**level-1** | **level-2**} **distribute-list** *list-name*
6. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**router isis** *area-tag* **Example:** `Device(config)# router isis area2`	Enables IS-IS for the specified IS-IS routing process, and enters router configuration mode.
Step 4	**address-family ipv6** [**unicast**] **Example:** `Device(config-router)# address-family ipv6`	Specifies the IPv6 address family, and enters address family configuration mode. • **unicast—**(Optional) Specifies the unicast IPv6 unicast address family. This is the default option.
Step 5	**redistribute isis** [*process-id*] {**level-1** | **level-2**} **into** {**level-1** | **level-2**} **distribute-list** *list-name* **Example:** `Device(config-router-af)# redistribute isis level-1 into level-2`	Redistributes IPv6 routes from one IS-IS level into another IS-IS level. • By default, the routes learned by Level 1 instances are redistributed by the Level 2 instance. **Note** The *protocol* argument must be **isis** in this configuration of the **redistribute** command. Only the arguments and keywords relevant to this task are specified here.
Step 6	**end** **Example:** `Device(config-router-af)# end`	Exits address family configuration mode and returns to privileged EXEC mode.

Verifying IPv6 IS-IS Configuration and Operation

SUMMARY STEPS

1. **enable**
2. **show ipv6 protocols** [**summary**]
3. **show isis** [*process-tag*] [**ipv6** | *****] **topology**
4. **show clns** [*process-tag*] **neighbors** *interface-type interface-number*] [**area**] [**detail**]
5. **show clns** *area-tag* **is-neighbors** [*type number*] [**detail**]
6. **show isis** [*process-tag*] **database** [**level-1**] [**level-2**] [**l1**] [**l2**] [**detail**] [**lspid**]
7. **show isis ipv6 rib** [*ipv6-prefix*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show ipv6 protocols** [**summary**] **Example:** `Device# show ipv6 protocols`	Displays the parameters and current state of the active IPv6 routing processes.
Step 3	**show isis** [*process-tag*] [**ipv6**	*****] **topology** **Example:** `Device# show isis topology`	Displays a list of all connected routers running IS-IS in all areas.
Step 4	**show clns** [*process-tag*] **neighbors** *interface-type interface-number*] [**area**] [**detail**] **Example:** `Device# show clns neighbors detail`	Displays end system (ES), intermediate system (IS), and multitopology IS-IS (M-ISIS) neighbors.
Step 5	**show clns** *area-tag* **is-neighbors** [*type number*] [**detail**] **Example:** `Device# show clns is-neighbors detail`	Displays IS-IS adjacency information for IS-IS neighbors. • Use the **detail** keyword to display the IPv6 link-local addresses of the neighbors.
Step 6	**show isis** [*process-tag*] **database** [**level-1**] [**level-2**] [**l1**] [**l2**] [**detail**] [**lspid**]	Displays the IS-IS link-state database.

	Command or Action	Purpose
	Example: `Device# show isis database detail`	• In this example, the contents of each LSP are displayed using the **detail** keyword.
Step 7	**show isis ipv6 rib** [*ipv6-prefix*] **Example:** `Device# show isis ipv6 rib`	Displays the IPv6 local RIB.

Configuration Examples for IPv6 Routing: Route Redistribution

Example: Redistributing Routes into an IPv6 IS-IS Routing Process

The following example redistributes IPv6 BGP routes into the IPv6 IS-IS Level 2 routing process:

```
router isis
 address-family ipv6
 redistribute bgp 64500 metric 100 route-map isismap
 exit
```

Example: Redistributing IPv6 IS-IS Routes Between IS-IS Levels

The following example redistributes IPv6 IS-IS Level 1 routes into the IPv6 IS-IS Level 2 routing process:

```
router isis
 address-family ipv6
 redistribute isis level-1 into level-2
```

Example: Configuring IS-IS for IPv6

In the following example, output information about the parameters and current state of that active IPv6 routing processes is displayed using the **show ipv6 protocols**command:

```
Device# show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "static"
IPv6 Routing Protocol is "isis"
  Interfaces:
    GigabitEthernet0/0/3
    GigabitEthernet0/0/1
    Serial1/0/1
    Loopback1 (Passive)
    Loopback2 (Passive)
    Loopback3 (Passive)
    Loopback4 (Passive)
```

```
    Loopback5 (Passive)
  Redistribution:
    Redistributing protocol static at level 1
  Address Summarization:
    L2: 2001:DB8:33::/16  advertised with metric 0
    L2: 2001:DB8:44::/16  advertised with metric 20
    L2: 2001:DB8:66::/16  advertised with metric 10
    L2: 2001:DB8:77::/16  advertised with metric 10
```

In the following example, output information about all connected routers running IS-IS in all areas is displayed using the **show isis topology**command:

```
Device# show isis topology
IS-IS paths to level-1 routers
System Id       Metric  Next-Hop        Interface       SNPA
0000.0000.000C
0000.0000.000D  20      0000.0000.00AA  Se1/0/1         *HDLC*
0000.0000.000F  10      0000.0000.000F  GE0/0/1         0050.e2e5.d01d
0000.0000.00AA  10      0000.0000.00AA  Se1/0/1         *HDLC*
IS-IS paths to level-2 routers
System Id       Metric  Next-Hop        Interface       SNPA
0000.0000.000A  10      0000.0000.000A  GE0/0/3         0010.f68d.f063
0000.0000.000B  20      0000.0000.000A  GE0/0/3         0010.f68d.f063
0000.0000.000C  --
0000.0000.000D  30      0000.0000.000A  GE0/0/3         0010.f68d.f063
0000.0000.000E  30      0000.0000.000A  GE0/0/3         0010.f68d.f063
```

In the following example, output information to confirm that the local router has formed all the necessary IS-IS adjacencies with other IS-IS neighbors is displayed using the **show clns is-neighbors**command. To display the IPv6 link-local addresses of the neighbors, specify the **detail** keyword.

```
Device# show clns is-neighbors detail
System Id      Interface   State  Type Priority  Circuit Id         Format
0000.0000.00AA Se1/0/1     Up     L1   0         00                 Phase V
  Area Address(es): 49.0001
  IPv6 Address(es): FE80::YYYY:D37C:C854:5
  Uptime: 17:21:38
0000.0000.000F Et0/0/1     Up     L1   64        0000.0000.000C.02  Phase V
  Area Address(es): 49.0001
  IPv6 Address(es): FE80::XXXX:E2FF:FEE5:D01D
  Uptime: 17:21:41
0000.0000.000A Et0/0/3     Up     L2   64        0000.0000.000C.01  Phase V
  Area Address(es): 49.000b
  IPv6 Address(es): FE80::ZZZZ:F6FF:FE8D:F063
  Uptime: 17:22:06
```

In the following example, detailed output information that displays both end system (ES) and intermediate system (IS) neighbors is displayed using the **show clns neighbors** command with the **detail** keyword.

```
Device# show clns neighbors detail
System Id          Interface    SNPA            State  Holdtime  Type Protocol
0000.0000.0007     GE3/3        aa00.0400.6408  UP     26        L1   IS-IS
Area Address(es): 20
IP Address(es): 172.16.0.42*
Uptime: 00:21:49
0000.0C00.0C35     GE3/2        0000.0c00.0c36  Up     91        L1   IS-IS
Area Address(es): 20
IP Address(es): 192.168.0.42*
Uptime: 00:21:52
0800.2B16.24EA     GE3/3        aa00.0400.2d05  Up     27        L1   M-ISIS
Area Address(es): 20
IP Address(es): 192.168.0.42*
IPv6 Address(es): FE80::2B0:8EFF:FE31:EC57
Uptime: 00:00:27
0800.2B14.060E     GE3/2        aa00.0400.9205  Up     8         L1   IS-IS
Area Address(es): 20
IP Address(es): 192.168.0.30*
Uptime: 00:21:52
```

In the following example, detailed output information about LSPs received from other routers and the IPv6 prefixes they are advertising is displayed using the **show isis database**command with the **detail** keyword specified:

```
Device# show isis database detail
IS-IS Level-1 Link State Database
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
0000.0C00.0C35.00-00  0x0000000C   0x5696        325           0/0/0
  Area Address: 47.0004.004D.0001
  Area Address: 39.0001
  Metric: 10   IS 0000.0C00.62E6.03
  Metric: 0    ES 0000.0C00.0C35
 --More--
0000.0C00.40AF.00-00* 0x00000009   0x8452        608           1/0/0
  Area Address: 47.0004.004D.0001
  Topology: IPv4 (0x0) IPv6 (0x2)
  NLPID: 0xCC 0x8E
  IP Address: 172.16.21.49
  Metric: 10   IS 0800.2B16.24EA.01
  Metric: 10   IS 0000.0C00.62E6.03
  Metric: 0    ES 0000.0C00.40AF
  IPv6 Address: 2001:DB8::/32
  Metric: 10   IPv6 (MT-IPv6) 2001:DB8::/64
  Metric: 5    IS-Extended cisco.03
  Metric: 10   IS-Extended cisco1.03
  Metric: 10    IS (MT-IPv6) cisco.03
IS-IS Level-2 Link State Database:
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime      ATT/P/OL
0000.0000.000A.00-00  0x00000059   0x378A        949               0/0/0
  Area Address: 49.000b
  NLPID:        0x8E
  IPv6 Address: 2001:DB8:1:1:1:1:1:1
  Metric: 10         IPv6 2001:DB8:2:YYYY::/64
  Metric: 10         IPv6 2001:DB8:3:YYYY::/64
  Metric: 10         IPv6 2001:DB8:2:YYYY::/64
  Metric: 10         IS-Extended 0000.0000.000A.01
  Metric: 10         IS-Extended 0000.0000.000B.00
  Metric: 10         IS-Extended 0000.0000.000C.01
  Metric: 0          IPv6 11:1:YYYY:1:1:1:1:1/128
  Metric: 0          IPv6 11:2:YYYY:1:1:1:1:1/128
  Metric: 0          IPv6 11:3:YYYY:1:1:1:1:1/128
  Metric: 0          IPv6 11:4:YYYY:1:1:1:1:1/128
  Metric: 0          IPv6 11:5:YYYY:1:1:1:1:1/128
0000.0000.000A.01-00  0x00000050   0xB0AF        491               0/0/0
  Metric: 0          IS-Extended 0000.0000.000A.00
  Metric: 0          IS-Extended 0000.0000.000B.00
```

The following example shows output from the **show isis ipv6 rib** command. An asterisk (*) indicates prefixes that have been installed in the master IPv6 RIB as IS-IS routes. Following each prefix is a list of all paths in order of preference, with optimal paths listed first and suboptimal paths listed after optimal paths.

```
Device# show isis ipv6 rib

IS-IS IPv6 process "", local RIB
  2001:DB8:88:1::/64
    via FE80::210:7BFF:FEC2:ACC9/GigabitEthernet2/0/0, type L2  metric 20 LSP [3/7]
    via FE80::210:7BFF:FEC2:ACCC/GigabitEthernet2/1/0, type L2  metric 20 LSP [3/7]
* 2001:DB8:1357:1::/64
    via FE80::202:7DFF:FE1A:9471/GigabitEthernet2/1/0, type L2  metric 10 LSP [4/9]
* 2001:DB8:45A::/64
    via FE80::210:7BFF:FEC2:ACC9/GigabitEthernet2/0/0, type L1  metric 20 LSP [C/6]
    via FE80::210:7BFF:FEC2:ACCC/GigabitEthernet2/1/0, type L1  metric 20 LSP [C/6]
    via FE80::210:7BFF:FEC2:ACC9/GigabitEthernet2/0/0, type L2  metric 20 LSP [3/7]
    via FE80::210:7BFF:FEC2:ACCC/GigabitEthernet2/1/0, type L2  metric 20 LSP [3/7]
```

Additional References for IPv6 Routing: Route Redistribution

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
IPv6 commands	Cisco IOS IPv6 Command Reference
IP Routing ISIS commands	Cisco IOS IP Routing: ISIS Command Reference
Cisco IOS IPv6 features	Cisco IOS IPv6 Feature Mapping
IPv6 addressing and connectivity	*IPv6 Configuration Guide*
ISIS overview	*IS-IS Overview and Basic Configuration*

Standards and RFCs

Standard/RFC	Title
RFCs for IPv6	*IPv6 RFCs*

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 IPv6 Routing: Route Redistribution

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 1: Feature Information for IPv6 Routing: Route Redistribution

Feature Name	Releases	Feature Information
IPv6 Routing: Route Redistribution	Cisco IOS XE Release 2.4	IS-IS for IPv6 supports redistributing routes into an IPv6 IS-IS routing process and redistributing IPv6 IS-IS routes between IS-IS levels. The following commands were introduced or modified: **address-family ipv6**, **redistribute isis (IPv6)**.
Preserve ISIS metrics when redistributing routes between ISIS instances	Cisco IOS XE Release 3.15S	This feature preserves the prefix as the original route installed in the routing information base (RIB). The following command was modified: **redistribute isis (IPv6)**.