



Integrated IS-IS Commands

Use the commands in this chapter to configure and monitor Intermediate System-to-Intermediate System (IS-IS) protocol. For IS-IS configuration information and examples, refer to the “Configuring Integrated IS-IS” chapter of the *Cisco IOS IP and IP Routing Configuration Guide*.

area-password

To configure the Intermediate System-to-Intermediate System (IS-IS) area authentication password, use the **area-password** command in router configuration mode. To disable the password, use the **no** form of this command.

area-password *password*

no area-password [*password*]

Syntax Description	<i>password</i>	Password you assign.
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Defaults	No area password is defined and area password authentication is disabled.	
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Command Modes	Router configuration	
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Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines	<p>Using the area-password command on all routers in an area will prevent unauthorized routers from injecting false routing information into the linkstate database.</p> <p>This password is exchanged as plain text and thus this feature provides only limited security.</p> <p>This password is inserted in Level 1 (station router level) link state PDUs (LSPs), complete sequence number PDUs (CSNPs), and partial sequence number PDUs (PSNP).</p>
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Examples	The following example assigns an area authentication password:
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```
router isis
 area-password angel
```

Related Commands	Command	Description
	domain-password	Configures the IS-IS routing domain authentication password.
	isis password	Configures the authentication password for an interface.

default-information originate (IS-IS)

To generate a default route into an Intermediate System-to-Intermediate System (IS-IS) routing domain, use the **default-information originate** command in router configuration mode. To disable this feature, use the **no** form of this command.

default-information originate [*route-map map-name*]

no default-information originate [*route-map map-name*]

Syntax Description	route-map <i>map-name</i> (Optional) Routing process will generate the default route if the route map is satisfied.
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Defaults	This command is disabled by default.
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Command Modes	Router configuration
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Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>10.0</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	10.0	This command was introduced.
Release	Modification				
10.0	This command was introduced.				

Usage Guidelines	<p>If a router configured with this command has a route to 0.0.0.0 in the routing table, IS-IS will originate an advertisement for 0.0.0.0 in its link-state packets (LSPs).</p> <p>Without a route-map, the default is only advertised in L2 LSPs. For L1 routing, there is another mechanism to find the default route, which is to look for the closest L1L2 router. The closest L1L2 router can be found by looking at the attached-bit (ATT) in L1 LSPs.</p> <p>A route-map can be used for two things: 1) make the router generate default in its L1 LSPs. 2) advertise 0/0 conditionally. With a match ip address standard-access-list command, you can specify one or more IP routes that must exist before the router will advertise 0/0.</p>
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Examples	The following example forces the software to generate a default external route into an IS-IS domain:
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```
router isis
! BGP routes will be distributed into IS-IS
redistribute bgp 120
! access list 2 is applied to outgoing routing updates
distribute-list 2 out
default-information originate
! access list 2 defined as giving access to network 10.105.0.0
access-list 2 permit 10.105.0.0 0.0.255.255
```

■ default-information originate (IS-IS)

Related Commands	Command	Description
	redistribute	Redistributes routes from one routing domain into another routing domain.
	show isis database	Displays the IS-IS link state database.

domain-password

To configure the Intermediate System-to-Intermediate System (IS-IS) routing domain authentication password, use the **domain-password** command in router configuration mode. To disable a password, use the **no** form of this command.

domain-password *password*

no domain-password [*password*]

Syntax Description	<i>password</i>	Password you assign.						
Defaults	No password is specified and no authentication is enabled for exchange of L2 routing information.							
Command Modes	Router configuration							
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>10.0</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	10.0	This command was introduced.			
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10.0	This command was introduced.							
Usage Guidelines	<p>This password is exchanged as plain text and thus this feature provides only limited security.</p> <p>This password is inserted in Level 2 (area router level) link state PDUs (LSPs), complete sequence number PDUs (CSNPs), and partial sequence number PDUs (PSNPs).</p>							
Examples	<p>The following example assigns an authentication password to the routing domain:</p> <pre>router isis domain-password flower</pre>							
Related Commands	<table border="1"> <thead> <tr> <th>Command</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>area-password</td> <td>Configures the IS-IS area authentication password.</td> </tr> <tr> <td>isis password</td> <td>Configures the authentication password for an interface.</td> </tr> </tbody> </table>	Command	Description	area-password	Configures the IS-IS area authentication password.	isis password	Configures the authentication password for an interface.	
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area-password	Configures the IS-IS area authentication password.							
isis password	Configures the authentication password for an interface.							

hello padding

To reenable IS-IS hello padding at the router level, enter the **hello padding** command in router configuration mode. To disable IS-IS hello padding, use the **no** form of this command.

hello padding

no hello padding

Syntax Description This command has no arguments or keywords.

Defaults IS-IS hello padding is enabled.

Command Modes Router configuration

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(5)S	This command was integrated into Cisco IOS Release 12.0(5)S.

Usage Guidelines

Intermediate System-to-Intermediate System (IS-IS) hellos are padded to the full maximum transmission unit (MTU) size. The benefit of padding IS-IS hellos to the full MTU is that it allows for early detection of errors that result from transmission problems with large frames or errors that result from mismatched MTUs on adjacent interfaces.

You can disable hello padding in order to avoid wasting network bandwidth in case the MTU of both interfaces is the same or, in case of translational bridging. While hello padding is disabled, Cisco routers still send the first five IS-IS hellos padded to the full MTU size, in order to maintain the benefits of discovering MTU mismatches.

To disable hello padding for all interfaces on a router for the IS-IS routing process, enter the **no hello padding** command in router configuration mode. To selectively disable hello padding for a specific interface, enter the **no isis hello padding** command in interface configuration mode.

Examples

In the following example the **no hello padding** command is used to turn off hello padding at the router level:

```
Router(config)# router isis
Router(config-router)# no hello padding
Router(config-router)# end
```

The **show clns interfaces** command is entered to show that hello padding has been turned off at router level:

```
Router# show clns interface e0/0

Ethernet0/0 is up, line protocol is up
  Checksums enabled, MTU 1497, Encapsulation SAP
```

```

ERPDUs enabled, min. interval 10 msec.
CLNS fast switching enabled
CLNS SSE switching disabled
DEC compatibility mode OFF for this interface
Next ESH/ISH in 4 seconds
Routing Protocol: IS-IS
  Circuit Type: level-1-2
  Interface number 0x0, local circuit ID 0x1
  Level-1 Metric: 10, Priority: 64, Circuit ID: Router_B.01
  Level-1 IPv6 Metric: 10
  Number of active level-1 adjacencies: 1
  Level-2 Metric: 10, Priority: 64, Circuit ID: Router_B.01
  Level-2 IPv6 Metric: 10
  Number of active level-2 adjacencies: 1
  Next IS-IS LAN Level-1 Hello in 6 seconds
! No hello padding
  Next IS-IS LAN Level-2 Hello in 2 seconds
! No hello padding

```

When the **debug isis adj packets** command is entered, the output will show the IS-IS hello protocol data unit (PDU) length when a hello packet has been sent to or received from an IS-IS adjacency. In the following example the IS-IS hello PDU length is 1497:

```

Router# debug isis adj packets e0/0

IS-IS Adjacency related packets debugging is on
Router_A#
*Oct 11 18:04:17.455: ISIS-Adj: Sending L1 LAN IIH on Ethernet0/0, length 55
*Oct 11 18:04:19.075: ISIS-Adj: Rec L2 IIH from aabb.cc00.6600 (Ethernet0/0), cir type
L1L2, cir id 0000.0000.000B.01, length 1497

```

Related Commands

Command	Description
isis hello padding	Reenables IS-IS hello padding at the interface level.
debug isis adj packets	Displays information on all adjacency-related activity such as hello packets sent and received and IS-IS adjacencies going up and down.
show clns interface	Lists the CLNS-specific information about each interface.

ip router isis

To configure an Intermediate System-to-Intermediate System (IS-IS) routing process for IP on an interface and to attach an area designator to the routing process, use the **ip router isis** command in interface configuration mode. Use the **no** form of the command to disable IS-IS for IP.

ip router isis *area-tag*

no ip router isis *area-tag*

Syntax Description

<i>area-tag</i>	Defines a meaningful name for an area routing process. If not specified, a null tag is assumed. It must be unique among all IP router processes for a given router. The <i>area-tag</i> argument is used later as a reference to this area routing process. Each area in a multiarea configuration should have a nonnull area tag to facilitate identification of the area. Note Each area in a multiarea configuration should have a nonnull area tag to facilitate identification of the area.
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Defaults

No routing processes are specified.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command introduced.
12.0(5)T	Multiarea functionality was added, changing the way the <i>tag</i> argument (now <i>area-tag</i>) is used.

Usage Guidelines

Before the IS-IS routing process is useful, a network entity title (NET) must be assigned with the **net** command and some interfaces must have IS-IS enabled.

If you have IS-IS running and at least one ISO-Interior Gateway Routing Protocol (IGRP) process, the IS-IS process and the ISO-IGRP process cannot both be configured without an area tag. The null tag can be used by only one process. If you run ISO-IGRP and IS-IS, a null tag can be used for IS-IS, but not for ISO-IGRP at the same time. However, each area in an IS-IS multiarea configuration should have a nonnull area tag to facilitate identification of the area.

You can configure only one process to perform Level 2 (interarea) routing. If Level 2 routing is configured on any process, all additional processes are automatically configured as Level 1. You can configure this process to perform intra-area (Level 1) routing at the same time. You can configure up to 29 additional processes as Level 1-only processes. Use the **is-type** command to remove Level 2 routing from a router instance. You can then use the **is-type** command to enable Level 2 routing on some other IS-IS router instance.

An interface cannot be part of more than one area, except in the case where the associated routing process is performing both Level 1 and Level 2 routing. On media (such as WAN media, for example) where subinterfaces are supported, different subinterfaces could be configured for different areas.

Examples

The following example specifies IS-IS as an IP routing protocol for a process named Finance, and specifies that the Finance process will be routed on interfaces Ethernet 0 and serial 0:

```
router isis Finance
 net 49.0001.aaaa.aaaa.aaaa.00
interface Ethernet 0
 ip router isis Finance
interface serial 0
 ip router isis Finance
```

The following example shows an IS-IS configuration with two Level 1 areas and one Level 1-2 area:

```
ip routing

...

interface Tunnel529
 ip address 10.0.0.5 255.255.255.0
 ip router isis BB

interface Ethernet1
 ip address 10.1.1.5 255.255.255.0
 ip router isis A3253-01
1
!
interface Ethernet2
 ip address 10.2.2.5 255.255.255.0
 ip router isis A3253-02

...

! Defaults to "is-type level-1-2"
router isis BB
 net 49.2222.0000.0000.0005.00
!
router isis A3253-01
 net 49.0553.0001.0000.0000.0005.00
 is-type level-1
!
router isis A3253-02
 net 49.0553.0002.0000.0000.0005.00
 is-type level-1
```

Related Commands

Command	Description
net	Configures an IS-IS network entity title (NET) for the routing process.
router isis	Enables the IS-IS routing protocol.

isis circuit-type

To configure the type of adjacency, use the **isis circuit-type** command in interface configuration mode. To reset the circuit type to Level 1 and Level 2, use the **no** form of this command.

```
isis circuit-type {level-1 | level-1-2 | level-2-only}
```

```
no isis circuit-type
```

Syntax Description

level-1	A Level 1 adjacency may be established if there is at least one area address in common between this system and its neighbors. Level 2 adjacencies will never be established over this interface.
level-1-2	A Level 1 and Level 2 adjacency is established if the neighbor is also configured as level-1-2 and there is at least one area in common. If there is no area in common, a Level 2 adjacency is established. This is the default.
level-2-only	Level 2 adjacencies are established if the other routers are Level 2 or Level 1-2 routers and their interfaces are configured for Level 1-2 or Level 2. Level 1 adjacencies will never be established over this interface.

Defaults

A Level 1 and Level 2 adjacency is established.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Normally, this command does not need to be configured. The proper way is to configure a router as an Level 1-only, Level 1-2 or Level 2-only system. Only on routers that are between areas (Level 1-2 routers) should you configure some interfaces to be Level 2-only to prevent wasting bandwidth by sending out unused Level 1 hellos. Note that on point-to-point interfaces, the Level 1 and Level 2 hellos are in the same packet.

Examples

In the following example, other routers on Ethernet interface 0 are in the same area. Other routers on Ethernet interface 1 are in other areas, so the router will stop sending Level 1 hellos.

```
interface ethernet 0
ip router isis
interface ethernet 1
isis circuit-type level-2-only
```

isis csnp-interval

To configure the Intermediate System-to-Intermediate System (IS-IS) complete sequence number PDUs (CSNP) interval, use the **isis csnp-interval** command in interface configuration mode. To restore the default value, use the **no** form of this command.

isis csnp-interval *seconds* {**level-1** | **level-2**}

no isis csnp-interval {**level-1** | **level-2**}

Syntax Description	seconds	Interval of time between transmission of CSNPs on multiaccess networks. This interval only applies for the designated router. The default is 10 seconds.
	level-1	Configures the interval of time between transmission of CSNPs for Level 1 independently.
	level-2	Configures the interval of time between transmission of CSNPs for Level 2 independently.

Defaults	10 seconds Level 1 and Level 2
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Command Modes	Interface configuration
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Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines	<p>It is very unlikely you will need to change the default value of this command.</p> <p>This command applies only for the designated router (DR) for a specified interface. Only DRs send CSNP packets in order to maintain database synchronization. The CSNP interval can be configured independently for Level 1 and Level 2. This feature does not apply to serial point-to-point interfaces. It does apply to WAN connections if the WAN is viewed as a multiaccess meshed network.</p> <p>For multi-access WAN interfaces (such as ATM, Frame Relay, and X.25), it is highly recommended you configure the NBMA cloud as multiple point-to-point subinterfaces. Doing so will make routing much more robust if one or more PVCs fail.</p> <p>The isis csnp-interval command on point-to-point subinterfaces only makes sense when using it in combination with the IS-IS mesh-group feature.</p>
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Examples	The following example configures Ethernet interface 0 for sending CSN PDUs every 30 seconds.
----------	--

```
interface ethernet 0
 isis csnp-interval 30 level-1
```

isis display delimiter

To make output from multiarea displays easier to read by specifying the delimiter to use to separate displays of information, use the **isis display delimiter** command in global configuration mode. This command displays the output from different areas as a string or additional white space. Use the **no** form of the command to disable this output format. *cnt*

isis display delimiter [**return** *cnt* | *char cnt*]

no isis display delimiter [**return** *cnt* | *char cnt*]

Syntax Description

return	(Optional) Delimit with carriage returns.
<i>cnt</i>	(Optional) Number of carriage returns or length of string to use for delimiter.
<i>char</i>	(Optional) Character to use for delimiter string.

Defaults

By default the **isis display delimiter** command is disabled.

Command Modes

Global configuration

Command History

Release	Modification
12.0(5)T	This command was introduced.

Usage Guidelines

Use this command to customize display output when the IS-IS multiarea feature is used.

Examples

The following command causes different areas in multiarea displays (such as **show** command output) to be delimited by a string of dashes (-):

```
isis display delimiter - 14
```

With three IS-IS neighbors configured, this command displays the following output from the **show clns neighbors** command:

```
Router# show clns neighbors
-----
Area L2BB:
System Id      Interface  SNPA                State  Holdtime  Type Protocol
0000.0000.0009 Tu529      172.21.39.9         Up     25         L1L2 IS-IS
-----
Area A3253-01:
System Id      Interface  SNPA                State  Holdtime  Type Protocol
0000.0000.0053 Et1        0060.3e58.ccdB     Up     22         L1   IS-IS
0000.0000.0003 Et1        0000.0c03.6944     Up     20         L1   IS-IS
-----
Area A3253-02:
System Id      Interface  SNPA                State  Holdtime  Type Protocol
0000.0000.0002 Et2        0000.0c03.6bc5     Up     27         L1   IS-IS
```

```
0000.0000.0053 Et2          0060.3e58.ccde          Up      24      L1      IS-IS
```

Related Commands

Command	Description
show clns es-neighbors	Lists the ES neighbors that this router knows.
show clns is-neighbors	Displays IS-IS related information for IS-IS router adjacencies.
show clns neighbors	Displays both ES and IS neighbors.
show clns protocol	Lists the protocol-specific information for each ISO IGRP routing process in the router.
show clns traffic	Lists the CLNS packets this router has seen.
show isis database	Displays the IS-IS link-state database.
show isis routes	Displays the IS-IS Level 1 forwarding table for IS-IS learned routes.
show isis spf-log	Displays how often and why the router has run a full SPF calculation.
show isis topology	Displays a list of all connected routers in all areas.

isis hello padding

To reenable IS-IS hello padding at the interface level, enter the **isis hello padding** command in interface configuration mode. To disable IS-IS hello padding, use the **no** form of this command.

isis hello padding

no isis hello padding

Syntax Description This command has no arguments or keywords.

Defaults IS-IS hello padding is enabled.

Command Modes Interface configuration

Command History	Release	Modification
	12.0(5)T	This command was introduced.
	12.0(5)S	This command was integrated into Cisco IOS Release 12.0(5)S.

Usage Guidelines Intermediate System-to-Intermediate System (IS-IS) hellos are padded to the full maximum transmission unit (MTU) size. The benefit of padding IS-IS hellos to the full MTU is that it allows for early detection of errors that result from transmission problems with large frames or errors that result from mismatched MTUs on adjacent interfaces.

You can disable hello padding in order to avoid wasting network bandwidth in case the MTU of both interfaces is the same or, in case of translational bridging. While hello padding is disabled, Cisco routers still send the first five IS-IS hellos padded to the full MTU size, in order to maintain the benefits of discovering MTU mismatches.

To selectively disable hello padding for a specific interface, enter the **no isis hello padding** command in interface configuration mode. To disable hello padding for all interfaces on a router for the IS-IS routing process, enter the **no hello padding** command in router configuration mode.

Examples To turn off hello padding at the interface level for the Ethernet interface 0/0, enter the **no isis hello padding** command in interface configuration mode:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface e0/0
Router(config-if)# no isis hello padding
Router(config-if)# end
```

When the **show clns neighbor** command is entered for Ethernet interface 0/0, the output confirms that hello padding has been turned off for both Level 1 and Level 2 circuit types:

```
Router_A# show clns interface e0/0
```

```

Ethernet0/0 is up, line protocol is up
  Checksums enabled, MTU 1497, Encapsulation SAP
  ERPDUs enabled, min. interval 10 msec.
  CLNS fast switching enabled
  CLNS SSE switching disabled
  DEC compatibility mode OFF for this interface
  Next ESH/ISH in 47 seconds
  Routing Protocol: IS-IS
    Circuit Type: level-1-2
    Interface number 0x0, local circuit ID 0x1
    Level-1 Metric: 10, Priority: 64, Circuit ID: Router_B.01
    Level-1 IPv6 Metric: 10
    Number of active level-1 adjacencies: 1
    Level-2 Metric: 10, Priority: 64, Circuit ID: Router_B.01
    Level-2 IPv6 Metric: 10
    Number of active level-2 adjacencies: 1
    Next IS-IS LAN Level-1 Hello in 2 seconds
!   No hello padding
    Next IS-IS LAN Level-2 Hello in 2 seconds
!   No hello padding

```

When the **debug isis adj packets** command is entered, the output will show the IS-IS hello protocol data unit (PDU) length when a hello packet has been sent to or received from an IS-IS adjacency. In the following example the IS-IS hello PDU length is 1497:

```

Router# debug isis adj packets e0/0

IS-IS Adjacency related packets debugging is on
Router#
*Oct 11 18:04:17.455: ISIS-Adj: Sending L1 LAN IIH on Ethernet0/0, length 55
*Oct 11 18:04:19.075: ISIS-Adj: Rec L2 IIH from aabb.cc00.6600 (Ethernet0/0), cir type
L1L2, cir id 0000.0000.000B.01, length 1497

```

Related Commands

Command	Description
hello padding	Reenables IS-IS hello padding at the router level.
debug isis adj packets	Displays information on all adjacency-related activity such as hello packets sent and received and IS-IS adjacencies going up and down.
show clns interface	Lists the CLNS-specific information about each interface.

isis hello-interval

To specify the length of time between hello packets that the Cisco IOS software sends, use the **isis hello-interval** command in interface configuration mode. To restore the default value, use the **no** form of this command.

isis hello-interval { *seconds* | **minimal** } [**level-1** | **level-2**]

no isis hello-interval { **level-1** | **level-2** }

Syntax Description

<i>seconds</i>	An integer value. By default, a value three times the hello interval <i>seconds</i> is advertised as the <i>holdtime</i> in the hello packets sent. (That multiplier of 3 can be changed by specifying the isis hello-multiplier command.) With smaller hello intervals, topological changes are detected faster, but there is more routing traffic. The default is 10 seconds.
minimal	Causes the system to compute the hello interval based on the hello multiplier (specified by the isis hello-multiplier command) so that the resulting hold time is 1 second.
level-1	Configures the hello interval for Level 1 independently. Use this on X.25, Switched Multimegabit Data Service (SMDS), and Frame Relay multiaccess networks.
level-2	Configures the hello interval for Level 2 independently. Use this on X.25, SMDS, and Frame Relay multiaccess networks.

Defaults

10 seconds
Level 1 and Level 2

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	The minimal keyword was added.

Usage Guidelines

The hello interval multiplied by the hello multiplier equals the hold time. If the **minimal** keyword is specified, the hold time is 1 second and the system computes the hello interval based on the hello multiplier.

The hello interval can be configured independently for Level 1 and Level 2, except on serial point-to-point interfaces. (Because there is only a single type of hello packet sent on serial links, it is independent of Level 1 or Level 2.) The **level-1** and **level-2** keywords are used on X.25, SMDS, and Frame Relay multiaccess networks or LAN interfaces.

A faster hello interval gives faster convergence, but increases bandwidth and CPU usage. It might also add to instability in the network. A slower hello interval saves bandwidth and CPU. Especially when used in combination with a higher hello multiplier, this may increase overall network stability.

It makes more sense to tune the hello interval and hello multiplier on point-to-point interfaces than on LAN interfaces.

Examples

The following example configures serial interface 0 to advertise hello packets every 5 seconds. The router is configured to act as a station router. This will cause more traffic than configuring a longer interval, but topological changes will be detected faster.

```
interface serial 0
 isis hello-interval 5 level-1
```

Related Commands

Command	Description
isis hello-multiplier	Specifies the number of IS-IS hello packets a neighbor must miss before the router should declare the adjacency as down.

isis hello-multiplier

To specify the number of Intermediate System-to-Intermediate System (IS-IS) hello packets a neighbor must miss before the router should declare the adjacency as down, use the **isis hello-multiplier** command in interface configuration mode. To restore the default value, use the **no** form of this command.

isis hello-multiplier *multiplier* {**level-1** | **level-2**}

no isis hello-multiplier {**level-1** | **level-2**}

Syntax Description	<i>multiplier</i>	Integer value from 3 to 1000. The advertised holdtime in IS-IS hellos will be set to the hello-multiplier times the hello-interval. Neighbors will declare an adjacency to this router down after not having received any IS-IS hellos during the advertised holdtime. The holdtime (and thus the hello-multiplier and the hello-interval) can be set on a per interface basis, and can be different between different routers in one area. Using a smaller hello-multiplier will give fast convergence, but can result in more routing instability. Increment the hello-multiplier to a larger value to help network stability when needed. Never configure a hello-multiplier lower than the default value of 3.
	level-1	Configures the hello multiplier independently for Level 1 adjacencies.
	level-2	Configures the hello multiplier independently for Level 2 adjacencies.

Defaults	<i>multiplier</i> : 3 Level 1 and Level 2
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Command Modes	Interface configuration
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Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines	The “holding time” carried in an IS-IS hello packet determines how long a neighbor waits for another hello packet before declaring the neighbor to be down. This time determines how quickly a failed link or neighbor is detected so that routes can be recalculated.
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Use the **isis hello-multiplier** command in circumstances where hello packets are lost frequently and IS-IS adjacencies are failing unnecessarily. You can raise the hello multiplier and lower the hello interval (**isis hello-interval** command) correspondingly to make the hello protocol more reliable without increasing the time required to detect a link failure.

On point-to-point links, there is only one hello for both Level 1 and Level 2, so configuring different hello-multipliers only makes sense for multi-access networks, such as Ethernet, FDDI, etc. Separate Level 1 and Level 2 hellos are also sent over NBMA networks in multipoint mode, such as X.25, Frame Relay and ATM. However, it is recommended to run IS-IS over point-to-point subinterfaces over WAN NBMA media.

Examples

In the following example, the network administrator wants to increase network stability by making sure an adjacency will go down only when many (10) hellos are missed. The total time to detect link failure is 60 seconds. This will ensure that the network remains stable, even when the link is fully congested.

```
interface serial 1
 ip router isis
 isis hello-interval 6 level-1
 isis hello-multiplier 10 level-1
```

Related Commands

Command	Description
isis hello padding	Specifies the length of time between hello packets that the Cisco IOS software sends.

isis lsp-interval

To configure the time delay between successive Intermediate System-to-Intermediate System (IS-IS) link state packet transmissions, use the **isis lsp-interval** command in interface configuration mode. To restore the default value, use the **no** form of this command.

isis lsp-interval *milliseconds*

no isis lsp-interval

Syntax Description	<i>milliseconds</i>	Time delay between successive link state packets, in milliseconds.
---------------------------	---------------------	--

Defaults	The default time delay is 33 milliseconds.
-----------------	--

Command Modes	Interface configuration
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Command History	Release	Modification
	11.1	This command was introduced.

Usage Guidelines	In topologies with a large number of IS-IS neighbors and interfaces, a router may have difficulty with the CPU load imposed by link state packet (LSP) transmission and reception. This command allows the LSP transmission rate (and by implication the reception rate of other systems) to be reduced.
-------------------------	--

Examples	The following example causes the system to send LSPs every 100 milliseconds (10 packets per second) on serial interface 0:
-----------------	--

```
interface serial 0
  isis lsp-interval 100
```

Related Commands	Command	Description
	isis retransmit-interval	Configures the time between retransmission of each LSP (IS-IS link state PDU) over point-to-point links.

isis mesh-group

To optimize link-state packet (LSP) flooding in nonbroadcast multiaccess (NBMA) networks with highly meshed, point-to-point topologies, use the **isis mesh-group** command in interface configuration mode. To remove a (sub)interface from a mesh group, use the **no** form of this command.

isis mesh-group [*num* | **blocked**]

no isis mesh-group [*num* | **blocked**]

Syntax Description	
<i>num</i>	(Optional) A number identifying the mesh group of which this interface is a member.
blocked	(Optional) Specifies that no LSP flooding will take place on this (sub)interface.

Defaults The interface performs normal flooding.

Command Modes Interface configuration

Command History	Release	Modification
	12.0	This command was introduced.

Usage Guidelines LSPs that are first received on (sub)interfaces that are not part of a mesh group are flooded to all other (sub)interfaces in the usual way.

LSPs that are first received on (sub)interfaces that are part of a mesh group are flooded to all interfaces except those in the same mesh-group. If the “blocked” keyword is configured on a (sub)interface, then a newly received LSP is not flooded out over that interface.

To minimize the possibility of incomplete flooding, you should allow unrestricted flooding over at least a minimal set of links in the mesh. Selecting the smallest set of logical links that covers all physical paths results in very low flooding, but less robustness. Ideally you should select only enough links to ensure that LSP flooding is not detrimental to scaling performance, but enough links to ensure that under most failure scenarios no router will be logically disconnected from the rest of the network. In other words, blocking flooding on all links permits the best scaling performance, but there is no flooding. Permitting flooding on all links results in very poor scaling performance.

Examples

In the following example six interfaces are configured in three mesh groups. LSPs received are handled as follows:

- LSPs received first via atm 1/0.1 are flooded to all interfaces except atm 1/0.2 (which is part of the same mesh group) and atm 1/2.1, which is blocked.
- LSPs received first via atm 1/1.2 are flooded to all interfaces except atm 1/1.1 (which is part of the same mesh group) and atm 1/2.1, which is blocked.
- LSPs received first via atm 1/2.1 are not ignored, but flooded as usual to all interfaces. LSPs received first via atm 1/2.2 are flooded to all interfaces, except atm 1/2.1, which is blocked.

```
interface atm 1/0.1
ip router isis
isis mesh-group 10

interface atm 1/0.2
ip router isis
isis mesh-group 10

interface atm 1/1.1
ip router isis
isis mesh-group 11

interface atm 1/1.2
ip router isis
isis mesh-group 11

interface atm 1/2.1
ip router isis
isis mesh-group blocked

interface atm 1/2.2
ip router isis
```

Related Commands

Command	Description
router isis	Enables the IS-IS routing protocol and specifies an IS-IS process.

isis metric

To configure the metric for an interface, use the **isis metric** command in interface configuration mode. To restore the default metric value, use the **no** form of this command.

isis metric *default-metric* {**level-1** | **level-2**}

no isis metric {**level-1** | **level-2**}

Syntax Description		
	<i>default-metric</i>	Metric assigned to the link and used to calculate the cost from each other router via the links in the network to other destinations. You can configure this metric for Level 1 or Level 2 routing. The range is from 0 to 63. The default value is 10.
	level-1	This metric should be used only in the SPF calculation for L1 (intra-area) routing.
	level-2	This metric should be used only in the SPF calculation for L2 (interarea) routing.

Defaults If **level-1** or **level-2** is not specified, **level-1-2** is assumed.

Command Modes Interface configuration

Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines Specifying the **level-1** or **level-2** keywords resets the metric only for Level 1 or Level 2 routing, respectively.

It is highly recommended to configure metrics on all interfaces. If you do not do so, the IS-IS metrics are similar to hop-count metrics.

Examples The following example configures serial interface 0 for a default link-state metric cost of 15 for Level 1:

```
interface serial 0
isis metric 15 level-1
```

isis password

To configure the authentication password for an interface, use the **isis password** command in interface configuration mode. To disable authentication for Intermediate System-to-Intermediate System (IS-IS), use the **no** form of this command.

isis password *password* {**level-1** | **level-2**}

no isis password {**level-1** | **level-2**}

Syntax Description

<i>password</i>	Authentication password you assign for an interface.
level-1	Configures the authentication password for Level 1 independently. For Level 1 routing, the router acts as a station router only.
level-2	Configures the authentication password for Level 2 independently. For Level 2 routing, the router acts as an area router only.

Defaults

This command is disabled by default.
If no keyword is specified, the default is **level-1-2**.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

This command enables you to prevent unauthorized routers from forming adjacencies with this router, and thus protects the network from intruders.

The password is exchanged as plain text and thus provides only limited security.

Different passwords can be assigned for different routing levels using the **level-1** and **level-2** keywords.

Specifying the **level-1** or **level-2** keywords disables the password only for Level 1 or Level 2 routing, respectively.

Examples

The following example configures a password for Ethernet interface 0 at Level 1:

```
interface ethernet 0
 isis password frank level-1
```

isis priority

To configure the priority of designated routers, use the **isis priority** command in interface configuration mode. To reset the default priority, use the **no** form of this command.

isis priority *value* {**level-1** | **level-2**}

no isis priority {**level-1** | **level-2**}

Syntax Description		
	<i>value</i>	Sets the priority of a router and is a number from 0 to 127. The default value is 64.
	level-1	Sets the priority for Level 1 independently.
	level-2	Sets the priority for Level 2 independently.

Defaults
Priority of 64
Level 1 and Level 2

Command Modes
Interface configuration

Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines

Priorities can be configured for Level 1 and Level 2 independently. Specifying the **level-1** or **level-2** keywords resets priority only for Level 1 or Level 2 routing, respectively.

The priority is used to determine which router on a LAN will be the designated router or Designated Intermediate System (DIS). The priorities are advertised in the hellos. The router with the highest priority will become the DIS.

In IS-IS, there is no backup designated router. Setting the priority to 0 lowers the chance of this system becoming the DIS, but does not prevent it. If a router with a higher priority comes on line, it will take over the role from the current DIS. In the case of equal priorities, the highest MAC address breaks the tie.

Examples

The following example shows Level 1 routing given priority by setting the priority level to 80. This router is now more likely to become the DIS.

```
interface ethernet 0
 isis priority 80 level-1
```

isis retransmit-interval

To configure the amount of time between retransmission of each Intermediate System-to-Intermediate System (IS-IS) link-state packet (LSP) on a point-to-point link, use the **isis retransmit-interval** command in interface configuration mode. To restore the default value, use the **no** form of this command.

isis retransmit-interval *seconds*

no isis retransmit-interval *seconds*

Syntax Description	<i>seconds</i>	Time in seconds between retransmission of each LSP. It is an integer that should be greater than the expected round-trip delay between any two routers on the attached network. The default is 5 seconds.
---------------------------	----------------	---

Defaults	5 seconds
-----------------	-----------

Command Modes	Interface configuration
----------------------	-------------------------

Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines	<p>The setting of the <i>seconds</i> argument should be conservative, or needless retransmission will result.</p> <p>This command has no effect on LAN (multipoint) interfaces. On point-to-point links, the value can be increased to enhance network stability.</p> <p>Retransmissions occur only when LSPs are dropped. So setting this to a higher value has little effect on reconvergence. The more neighbors routers have, and the more paths over which LSPs can be flooded, the higher this value can be made.</p> <p>The value should be larger for serial lines.</p>
-------------------------	---

Examples	<p>The following example configures serial interface 0 for retransmission of IS-IS LSP, every 60 seconds for a large serial line:</p>
-----------------	---

```
interface serial 0
 isis retransmit-interval 60
```

Related Commands	Command	Description
	isis lsp-interval	Configures the time delay between successive IS-IS link state packet transmissions.
	isis retransmit-throttle-interval	Configures the amount of time between retransmissions of any IS-IS LSPs on a point-to-point interface.

isis retransmit-throttle-interval

To configure the amount of time between retransmissions on each Intermediate System-to-Intermediate System (IS-IS) link-state packet (LSP) on a point-to-point interface, use the **isis retransmit-throttle-interval** command in interface configuration mode. To restore the default value, use the **no** form of this command.

isis retransmit-throttle-interval *milliseconds*

no isis retransmit-throttle-interval

Syntax Description	<i>milliseconds</i>	Minimum delay (in milliseconds) between LSP retransmissions on the interface.
---------------------------	---------------------	---

Defaults The delay is determined by the **isis lsp-interval** command.

Command Modes Interface configuration

Command History	Release	Modification
	11.1	This command was introduced.

Usage Guidelines This command may be useful in very large networks with many LSPs and many interfaces as a way of controlling LSP retransmission traffic. This command controls the rate at which LSPs can be re-sent on the interface.

The **isis retransmit-throttle-interval** command is distinct from the rate at which LSPs are sent on the interface (controlled by the **isis lsp-interval** command) and the period between retransmissions of a single LSP (controlled by the **isis retransmit-interval** command). These commands may all be used in combination to control the offered load of routing traffic from one router to its neighbors.

Examples The following example configures serial interface 0 to limit the rate of LSP retransmissions to one every 300 milliseconds:

```
interface serial 0
  isis retransmit-throttle-interval 300
```

Related Commands	Command	Description
	isis lsp-interval	Configures the time delay between successive IS-IS link state packet transmissions.
	isis retransmit-interval	Configures the amount of time between retransmission of each IS-IS link-state PDUs (LSPs) over a point-to-point link.

is-type

To configure the routing level for an instance of the Intermediate System-to-Intermediate System (IS-IS) routing process, use the **is-type** command in router configuration mode. To reset the default value, use the **no** form of this command.

is-type { **level-1** | **level-1-2** | **level-2-only** }

no is-type { **level-1** | **level-1-2** | **level-2-only** }

Syntax Description	level-1	level-1-2	level-2-only
	Router performs only Level 1 (intra-area) routing. This router learns only about destinations inside its area. Level 2 (interarea) routing is performed by the closest Level 1-2 router.	Router performs both Level 1 and Level 2 routing. This router runs two instances of the routing process. It has one link-state packet database (LSDB) for destinations inside the area (Level 1 routing) and runs a shortest path first (SPF) calculation to discover the area topology. It also has another link-state packet database (LSDB) with link-state packets (LSPs) of all other backbone (Level 2) routers, and runs another SPF calculation to discover the topology of the backbone, and the existence of all other areas.	Routing process acts as a Level 2 (interarea) router only. This router is part of the backbone, and does not communicate with Level 1-only routers in its own area.

Defaults
In conventional IS-IS configurations, the router acts as both a Level 1 (intra-area) and a Level 2 (interarea) router.
In multiarea IS-IS configurations, the first instance of the IS-IS routing process configured is by default a Level 1-2 (intra-area and interarea) router. The remaining instances of the IS-IS process configured by default are Level 1 routers.

Command Modes
Router configuration

Command History	Release	Modification
	10.3	This command was introduced.
	12.0(5)T	This command was modified to include multiarea IS-IS routing.

Usage Guidelines
It is highly recommended that you configure the type of an IS-IS routing process. If you are configuring multiarea IS-IS, you <i>must</i> configure the type of the router, or allow it to be configured by default. By default, the first instance of the IS-IS routing process that you configure using the router isis command is a Level 1-2 router.

If there is only one area in the network, there is no need to run both Level 1 and Level 2 routing algorithms. If IS-IS is used for Connectionless Network Service (CLNS) routing (and there is only one area), Level 1-only must be used everywhere. If IS-IS is used for IP routing only (and there is only one area), you can run Level 2-only everywhere. Areas you add after the Level 1-2 area exists are by default Level 1 areas.

If the router instance has been configured for Level 1-2 (the default for the first instance of the IS-IS routing process in a Cisco unit), you can remove Level 2 (interarea) routing for the area using the **is-type** command. You can also use the **is-type** command to configure Level 2 routing for an area, but it must be the only instance of the IS-IS routing process configured for Level 2 on the Cisco unit.

Examples

The following example specifies an area router:

```
router isis
 is-type level-2-only
```

Related Commands

Command	Description
router isis	Enables the IS-IS routing protocol and specifies an IS-IS process.
show clns neighbor areas	Displays information about IS-IS neighbors and the areas to which they belong.

lsp-gen-interval

To customize IS-IS throttling of link-state PDU (LSP) generation, use the **lsp-gen-interval** command in router configuration mode. To restore default values, use the **no** form of this command.

lsp-gen-interval [**level-1** | **level-2**] *lsp-max-wait* [*lsp-initial-wait* *lsp-second-wait*]

no lsp-gen-interval

Syntax Description		
level-1	(Optional)	Apply intervals to Level-1 areas only.
level-2	(Optional)	Apply intervals to Level-2 areas only.
<i>lsp-max-wait</i>		Indicates the maximum interval (in seconds) between two consecutive occurrences of an LSP being generated. The range is 1 to 120 seconds. The default is 5 seconds.
<i>lsp-initial-wait</i>	(Optional)	Indicates the initial LSP generation delay (in milliseconds). The range is 1 to 120,000 milliseconds. The default is 50 milliseconds.
<i>lsp-second-wait</i>	(Optional)	Indicates the hold time between the first and second LSP generation (in milliseconds). The range is 1 to 120,000 milliseconds. The default is 5000 milliseconds (5 seconds).

Defaults

lsp-max-wait: 5 seconds
lsp-initial-wait: 50 milliseconds
lsp-second-wait: 5000 milliseconds

Command Modes

Router configuration

Command History

Release	Modification
12.1	This command was introduced.

Usage Guidelines

The following description will help you determine whether to change the default values of this command:

- The *lsp-initial-wait* argument indicates the initial wait time (in milliseconds) before generating the first LSP.
- The third argument indicates the amount of time to wait (in milliseconds) between the first and second LSP generation.
- Each subsequent wait interval is twice as long as the previous one until the wait interval reaches the *lsp-max-wait* interval specified, so this value causes the throttling or slowing down of the LSP generation after the initial and second intervals. Once this interval is reached, the wait interval continues at this interval until the network calms down.
- After the network calms down and there are no triggers for 2 times the *lsp-max-wait* interval, fast behavior is restored (the initial wait time).

Notice that the **lsp-gen-interval** command controls the delay between LSPs being *generated*, as opposed to the following related commands:

- The **isis lsp-interval** command sets the delay (in milliseconds) between successive LSPs being *transmitted* (including LSPs generated by another system and forwarded by the local system).
- The **isis retransmit-interval** command sets the amount of time (in seconds) between retransmissions *of the same LSP* on a point-to-point link.
- The **isis retransmit-throttle-interval** command sets the minimum delay (in milliseconds) between retransmitted LSPs on a point-to-point interface.

These commands can be used in combination to control the rate of LSP packets being generated, transmitted, and retransmitted.

Examples

The following example configures intervals for SPF calculations, PRC, and LSP generation:

```
router isis
  spf-interval 5 10 20
  prc-interval 5 10 20
  lsp-gen-interval 2 50 100
```

Related Commands

Command	Description
isis lsp-interval	Sets the time delay between successive IS-IS LSP transmissions.
isis retransmit-interval	Sets the amount of time between retransmission of each IS-IS LSP on a point-to-point link.
isis retransmit-throttle-interval	Sets the minimum delay between retransmissions on each LSP on a point-to-point interface.

lsp-refresh-interval (IS-IS)

To set the link-state packet (LSP) refresh interval, use the **lsp-refresh-interval** command in router configuration mode. To restore the default refresh interval, use the **no** form of this command.

lsp-refresh-interval *seconds*

no lsp-refresh-interval

Syntax Description	<i>seconds</i>	Interval (in seconds) at which LSPs are refreshed. The range is 1 to 65535 seconds. The default value is 900 seconds (15 minutes).
---------------------------	----------------	--

Defaults	900 seconds (15 minutes)
-----------------	--------------------------

Command Modes	Router configuration
----------------------	----------------------

Command History	Release	Modification
	10.3	This command was introduced.

Usage Guidelines The refresh interval determines the rate at which Cisco IOS software periodically transmits in LSPs the route topology information that it originates. This is done to keep the database information from becoming too old.

LSPs must be periodically refreshed before their lifetimes expire. The value set for the **lsp-refresh-interval** command should be less than the value set for the **max-lsp-lifetime** command; otherwise, LSPs will time out before they are refreshed. If you misconfigure the LSP lifetime to be too low compared to the LSP refresh interval, the software will reduce the LSP refresh interval to prevent the LSPs from timing out.

Reducing the refresh interval reduces the amount of time that undetected link state database corruption can persist at the cost of increased link utilization. (This is an extremely unlikely event, however, because there are other safeguards against corruption.) Increasing the interval reduces the link utilization caused by the flooding of refreshed packets (although this utilization is very small).

Examples The following example configures the IS-IS LSP refresh interval to be 1080 seconds (18 minutes):

```
router isis
 lsp-refresh-interval 1080
```

Related Commands	Command	Description
	max-lsp-lifetime (IS-IS)	Sets the maximum time that link-state packets (LSPs) can remain in a router's database without being refreshed.

max-lsp-lifetime (IS-IS)

To set the maximum time that link-state packets (LSPs) can remain in a router's database without being refreshed, use the **max-lsp-lifetime** command in router configuration mode. To restore the default lifetime, use the **no** form of this command.

max-lsp-lifetime *seconds*

no max-lsp-lifetime

Syntax Description	<i>seconds</i>	Lifetime of the LSP in seconds. The range is 1 to 65535 seconds; the default is 1200 seconds (20 minutes).
---------------------------	----------------	--

Defaults	1200 seconds (20 minutes)
-----------------	---------------------------

Command Modes	Router configuration
----------------------	----------------------

Command History	Release	Modification
	10.3	This command was introduced.

Usage Guidelines	<p>If the lifetime is exceeded before a refresh LSP arrives, the LSP is dropped from the database.</p> <p>You might need to adjust the maximum LSP lifetime if you change the LSP refresh interval with the lsp-refresh-interval (IP) command. The value set for the lsp-refresh-interval command should be less than the value set for the max-lsp-lifetime command; otherwise, LSPs will time out before they are refreshed. If you misconfigure the LSP lifetime to be too low compared to the LSP refresh interval, the software will reduce the LSP refresh interval to prevent the LSPs from timing out.</p> <p>You might prefer higher values for each command in order to reduce control traffic, at the expense of holding stale LSPs from a crashed or unreachable router in the database longer (thus wasting memory) or increasing the risk of undetected bad LSPs staying active (very rare).</p>
-------------------------	---

Examples	The following example configures an LSP lifetime of 40 minutes:
-----------------	---

```
router isis
max-lsp-lifetime 2400
```

Related Commands	Command	Description
	lsp-refresh-interval (IS-IS)	Sets the link-state packet (LSP) refresh interval.

net

To configure an Intermediate System-to-Intermediate System (IS-IS) network entity title (NET) for the routing process, use the **net** command in router configuration mode. To remove a NET, use the **no** form of this command.

net *network-entity-title*

no net *network-entity-title*

Syntax Description	<i>network-entity-title</i>	NET that specifies the area address and the system ID for an IS-IS routing process. This argument can be either an address or a name.
---------------------------	-----------------------------	---

Defaults No NET is configured and the IS-IS process will not start. A NET is mandatory.

Command Modes Router configuration

Command History	Release	Modification
	10.0	This command was introduced.
	12.0(5)T	This command was modified to include multiarea IS-IS routing.

Usage Guidelines

Under most circumstances, one and only one NET must be configured.

A NET is a network service access point (NSAP) where the last byte is always zero. On a Cisco router running IS-IS, a NET can be 8 to 20 bytes. The last byte is always the n-selector and must be zero.

The six bytes directly in front of the n-selector are the system ID. The system ID length is a fixed size and cannot be changed. The system ID must be unique throughout each area (Level 1) and throughout the backbone (Level 2).

All bytes in front of the system ID are the area ID.

Even when IS-IS is used to perform IP routing only (no Connectionless Network Service (CLNS) routing enabled), a NET must still be configured to define the router system ID and area ID.

Multiple NETs per router are allowed, with a maximum of three. In rare circumstances, it is possible to configure two or three NETs. In such a case, the area this router is in will have three area addresses. There will still be only one area, but it will have more area addresses.

Configuring multiple NETs can be temporarily useful in the case of network reconfiguration where multiple areas are merged, or where one area is split into more areas. Multiple area addresses enable you to renumber an area individually as needed.

If you are configuring multiarea IS-IS, the area ID must be unique, but the system ID portion of the NET must be the same for all IS-IS routing process instances.

Examples

The following example configures a router with system ID 0000.0c11.1110 and area ID 47.0004.004d.0001:

```
router isis CHESNUT
 net 47.0004.004d.0001.0001.0c11.1111.00
```

The following example shows three IS-IS routing processes with three areas configured. Each area has a unique identifier, but the system ID is the same for all areas.

```
clns routing

...

interface Tunnel529
 ip address 10.0.0.5 255.255.255.0
 ip router isis BB
 clns router isis BB

interface Ethernet1
 ip address 10.1.1.5 255.255.255.0
 ip router isis A3253-01
 clns router isis A3253-01
!
interface Ethernet2
 ip address 10.2.2.5 255.255.255.0
 ip router isis A3253-02
 clns router isis A3253-02

...

router isis BB                                ! Defaults to "is-type level-1-2"
 net 49.2222.0000.0000.0005.00
!
router isis A3253-01
 net 49.0553.0001.0000.0000.0005.00
 is-type level-1
!
router isis A3253-02
 net 49.0553.0002.0000.0000.0005.00
 is-type level-1
```

Related Commands

Command	Description
is-type	Configures the routing level for an instance of the IS-IS routing process.
router isis	Enables the IS-IS routing protocol and specifies an IS-IS process.

partition avoidance

To cause an Intermediate System-to-Intermediate System (IS-IS) Level 1-2 border router to stop advertising the Level 1 area prefix into the Level 2 backbone when full connectivity is lost between the border router, all adjacent Level 1 routers, and end hosts, use the **partition avoidance** command in router configuration mode. This command displays the output from different areas as a string or additional white space. To disable this output format, use the **no** form of the command .

partition avoidance *area-tag*

no partition avoidance *area-tag*

Syntax Description	<i>area-tag</i>	Required for multiarea IS-IS configuration. Optional for conventional IS-IS configuration. Required for multiarea IS-IS configuration. Meaningful name for a routing process. If it 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 Protocol (CLNS) router processes for a given router.
---------------------------	-----------------	--

Defaults By default the **partition avoidance** command is disabled.

Command Modes Router configuration

Command History	Release	Modification
	12.0(5)T	This command was introduced.

Usage Guidelines When the **partition avoidance** command is enabled, a multiarea router withdraws a Level 1 area prefix from the Level 2 backbone when it no longer has any active adjacencies to that Level 1 area. This withdrawal prevents the Level 1 area from appearing to be partitioned within the Level 2 backbone.

In International Standards Organization (ISO) CLNS networks using a redundant topology, it is possible for an area to become “partitioned” when full connectivity is lost between a Level 1-2 border router, all adjacent Level 1 routers, and end hosts. In such a case, multiple Level 1-2 border routers advertise the Level 1 area prefix into the backbone area, even though any one router can reach only a subset of the end hosts in the Level 1 area.

When enabled, the **partition avoidance** command prevents this partitioning by causing the border router to stop advertising the Level 1 area prefix into the Level 2 backbone.

Other cases of connectivity loss within the Level 1 area itself are not detected or corrected by the border router, and this command will have no effect.

■ partition avoidance

Examples

The following example causes the routing process Finance to stop advertising the prefix for the area named "area1" with the router no longer has any active adjacencies to area1.

```
router isis Finance
partition avoidance area1
```

Related Commands

Command	Description
is-type	Configures the routing level for an instance of the IS-IS routing process.
router isis	Enables the IS-IS routing protocol and specifies an IS-IS process.

prc-interval

To customize IS-IS throttling of partial route calculations (PRC), use the **prc-interval** command in router configuration mode. To restore default values, use the **no** form of this command.

prc-interval *prc-max-wait* [*prc-initial-wait prc-second-wait*]

no prc-interval

Syntax Description		
	<i>prc-max-wait</i>	Indicates the maximum interval (in seconds) between two consecutive PRC calculations. Value range is 1 to 120 seconds. The default is 5 seconds.
	<i>prc-initial-wait</i>	(Optional) Indicates the initial PRC calculation delay (in milliseconds) after a topology change. The range is 1 to 120,000 milliseconds. The default is 2000 milliseconds.
	<i>prc-second-wait</i>	(Optional) Indicates the hold time between the first and second PRC calculation (in milliseconds). The range is 1 to 120,000 milliseconds. The default is 5000 milliseconds (5 seconds).

Defaults	
	<i>prc-max-wait</i> : 5 seconds
	<i>prc-initial-wait</i> : 2000 milliseconds
	<i>prc-second-wait</i> : 5000 milliseconds

Command Modes	
	Router configuration

Command History	Release	Modification
	12.1	This command was introduced.

Usage Guidelines

PRC is the software's process of calculating routes without performing an SPF calculation. This is possible when the topology of the routing system itself has not changed, but a change is detected in the information announced by a particular IS or when it is necessary to attempt to reinstall such routes in the RIB.

The following description will help you determine whether to change the default values of this command:

- The *prc-initial-wait* argument indicates the initial wait time (in milliseconds) before generating the first LSP.
- The *prc-second-wait* argument indicates the amount of time to wait (in milliseconds) between the first and second LSP generation.
- Each subsequent wait interval is twice as long as the previous one until the wait interval reaches the *prc-max-wait* interval specified, so this value causes the throttling or slowing down of the PRC calculation after the initial and second intervals. Once this interval is reached, the wait interval continues at this interval until the network calms down.

- After the network calms down and there are no triggers for 2 times the *prc-max-wait* interval, fast behavior is restored (the initial wait time).

Examples

The following example configures intervals for SPF calculations, PRC, and LSP generation:

```
router isis
spf-interval 5 10 20
prc-interval 5 10 20
lsp-gen-interval 2 50 100
```

router isis

To enable the Intermediate System-to-Intermediate System (IS-IS) routing protocol and to specify an IS-IS process, use the **router isis** command in global configuration mode. To disable IS-IS routing, use the **no** form of this command.

router isis *area-tag*

no router isis *area-tag*

Syntax Description

area-tag

Required for multiarea IS-IS configuration. Optional for conventional IS-IS configuration.

Meaningful name for a routing process. If it 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.

Defaults

The **router isis** command is disabled.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	Multiarea functionality was added, changing the way the <i>tag</i> argument (now <i>area-tag</i>) is used.

Usage Guidelines

This command is used to enable routing for an area. An appropriate network entity title (NET) must be configured to specify the area address of the area and system ID of the router. Routing must be enabled on one or more interfaces before adjacencies may be established and dynamic routing is possible.

If you have IS-IS running and at least one International Standards Organization Interior Gateway Routing Protocol (ISO-IGRP) process, the IS-IS process and the ISO-IGRP process cannot both be configured without an area tag. The null tag can be used by only one process. If you run ISO-IGRP and IS-IS, a null tag can be used for IS-IS, but not for ISO-IGRP at the same time. However, each area in an IS-IS multiarea configuration should have a nonnull area tag to facilitate identification of the area.

You can configure only one IS-IS routing process to perform Level 2 (interarea) routing. You can configure this process to perform Level 1 (intra-area) routing at the same time. You can configure up to 29 additional processes as Level 1-only processes. If Level 2 routing is configured on any process, all additional processes are automatically configured as Level 1.

An interface cannot be part of more than one area, except in the case where the associated routing process is performing both Level 1 and Level 2 routing. On media (such as WAN media, for example) where subinterfaces are supported, different subinterfaces could be configured for different areas.

If Level 2 routing is not desired for a given area, use the **is-type** command to remove Level 2. Level 2 routing can then be enabled on some other router instance.

Explicit redistribution between IS-IS instances is prohibited (prevented by the parser). In other words, you cannot issue a **redistribute isis area-tag** command in the context of another IS-IS router instance (**router isis area-tag**). Redistribution from any other routing protocol into a particular area is possible, and is configured per router instance, as in Release 12.0 of the Cisco IOS software, using the **redistribute** and **route map** commands. By default, redistribution is into Level 2.

If multiple Level 1 areas are defined, the Target Address Resolution Protocol (TARP) behaves in the following way:

- The locally assigned target identifier gets the network service access point (NSAP) of the Level 2 area, if present.
- If only Level 1 areas are configured, the router uses the NSAP of the first active Level 1 area as shown in the configuration at the time of TARP configuration (“tarp run”). (Level 1 areas are sorted alphanumerically by tag name, with capital letters coming before lowercase letters. For example, AREA-1 precedes AREA-2, which precedes area-1.) Note that the target identifier NSAP could change following a reload if a new Level 1 area is added to the configuration after TARP is running.
- The router continues to process all Type 1 and 2 protocol data units (PDUs) that are for this router. Type 1 PDUs are processed locally if the specified target identifier is in the local target identifier cache. If not, they are “propagated” (routed) to all interfaces in the *same* Level 1 area. (The same area is defined as the area configured on the input interface.)
- Type 2 PDUs are processed locally if the specified target identifier is in the local target identifier cache. If not, they are propagated via all interfaces (all Level 1 or Level 2 areas) with TARP enabled. If the source of the PDU is from a different area, the information is also added to the local target identifier cache. Type 2 PDUs are propagated via all static adjacencies.
- Type 4 PDUs (for changes originated locally) are propagated to all Level 1 and Level 2 areas (because internally they are treated as “Level 1-2”).
- Type 3 and 5 PDUs continue to be routed.
- Type 1 PDUs are “propagated” (routed) only via Level 1 static adjacencies if the static NSAP is in one of the Level 1 areas in this router.

Examples

The following example configures IS-IS for IP routing, with system ID 0000.0000.0002 and area ID 01.0001, and enables IS-IS to form adjacencies on Ethernet 0 and serial 0 interfaces. The IP prefix assigned to Ethernet 0 will be advertised to other IS-IS routers:

```
router isis
 net 01.0001.0000.0000.0002.00
 is-type level-1
!
interface ethernet 0
 ip address 10.1.1.1 255.255.255.0
 ip router isis
!
interface serial 0
 ip unnumbered ethernet0
 ip router isis
```

The following example starts IS-IS routing with the optional *area-tag* argument, where CHESNUT is the value for the *area-tag* argument:

```
router isis CHESNUT
```

The following example specifies IS-IS as an IP routing protocol for a process named Finance, and specifies that the Finance process will be routed on interfaces Ethernet 0 and serial 0:

```
router isis Finance
 net 49.0001.aaaa.aaaa.aaaa.00
interface Ethernet 0
 ip router isis Finance
interface serial 0
 ip router isis Finance
```

Related Commands

Command	Description
clns router isis	Enables IS-IS routing for ISO CLNS on an interface and attaches an area designator to the routing process.
hello padding	Configures an IS-IS routing process for IP on an interface and attaches an area designator to the routing process.
net	Configures an IS-IS NET for the routing process.

set-overload-bit

To configure the router to signal other routers not to use it as an intermediate hop in their shortest path first (SPF) calculations, use the **set-overload-bit** command in router configuration mode. To remove the designation, use the **no** form of this command.

```
set-overload-bit [on-startup {seconds | wait-for-bgp}]
```

```
no set-overload-bit
```

Syntax Description	on-startup	(Optional) Sets the overload bit upon the system starting up, until either <i>n</i> seconds pass or until BGP has converged, depending on the subsequent argument or keyword specified.
	<i>seconds</i>	(Optional) When the on-startup keyword is configured, causes the overload bit to be set upon system startup and remain set for this number of seconds.
	wait-for-bgp	(Optional) When the on-startup keyword is configured, causes the overload bit to be set upon system startup and remain set until BGP has converged. If BGP does not signal IS-IS that it is converged, IS-IS will turn off the overload bit after 10 minutes.

Defaults The overload bit is not set.

Command Modes Router configuration

Command History	Release	Modification
	11.2	This command was introduced.
	11.3(2)	The on-startup keyword and the <i>seconds</i> argument were added.
	12.0(7)S	The wait-for-bgp keyword was added.
	12.1(9)	The wait-for-bgp keyword was added.

Usage Guidelines This command forces the router to set the overload bit (also known as the hippity bit) in its nonpseudonode link-state packets. Normally the setting of the overload bit is allowed only when a router runs into problems. For example, when a router is experiencing a memory shortage, it might be that the Link State database is not complete, resulting in an incomplete or inaccurate routing table. By setting the overload bit in its LSPs, other routers can ignore the unreliable router in their SPF calculations until the router has recovered from its problems.

The result will be that no paths through this router are seen by other routers in the IS-IS area. However, IP and CLNS prefixes directly connected to this router will be still be reachable.

This command can be useful when you want to connect a router to an ISIS network, but do not want real traffic flowing through it under any circumstances. Examples are:

- A test router in the lab, connected to a production network.

- A router configured as an LSP flooding server, for example, on a NBMA network, in combination with the mesh-group feature.
- A router that is aggregating VCs used only for network management. In this case, the network management stations must be on a network directly connected to the router with the **set-overload-bit** command configured.

Unless you specify the **on-startup** keyword, this command sets the overload bit immediately.

Examples

The following example sets the overload bit upon startup and until BGP has converged:

```
interface Ethernet0
 ip address 10.1.1.1 255.255.255.0
 ip router isis
router isis
 net 49.0001.0000.0000.0001.00
 set-overload-bit on-startup wait-for-bgp
router bgp 100
```

show isis database

To display the Intermediate System-to-Intermediate System (IS-IS) link state database, use the **show isis database** command in EXEC mode.

```
show isis area-tag database [level-1] [level-2] [l1] [l2] [detail] [lspid]
```

Syntax Description

<i>area-tag</i>	Required for multiarea IS-IS configuration. Optional for conventional IS-IS configuration. Meaningful name for a routing process. This name must be unique among all IP or Connectionless Network Service (CLNS) router processes for a given router. If an area tag is not specified, a null tag is assumed and the process is referenced with a null tag. If an area tag is specified, output is limited to the specified area.
level-1	(Optional) Displays the IS-IS link state database for Level 1.
level-2	(Optional) Displays the IS-IS link state database for Level 2.
l1	(Optional) Abbreviation for the option level-1 .
l2	(Optional) Abbreviation for the option level-2 .
detail	(Optional) When specified, the contents of each LSP are displayed. Otherwise, a summary display is provided.
lspid	(Optional) Link-state PDU identifier. When specified, the contents of a single LSP is displayed by its ID number.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Each of the options shown in brackets for this command can be entered in an arbitrary string within the same command entry. For example, the following are both valid command specifications and provide the same output: **show isis database detail l2** and **show isis database l2 detail**.

Examples

The following is sample output from the **show isis database** command when it is specified with no options or as **show isis database**:

```
Router# show isis database

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        792            0/0/0
0000.0C00.40AF.00-00* 0x00000009    0x8452        1077           1/0/0
0000.0C00.62E6.00-00 0x0000000A    0x38E7        383            0/0/0
0000.0C00.62E6.03-00 0x00000006    0x82BC        384            0/0/0
0800.2B16.24EA.00-00 0x00001D9F    0x8864        1188           1/0/0
0800.2B16.24EA.01-00 0x00001E36    0x0935        1198           1/0/0

IS-IS Level-2 Link State Database
LSPID                LSP Seq Num    LSP Checksum  LSP Holdtime  ATT/P/OL
0000.0C00.0C35.03-00 0x00000005    0x04C8        792            0/0/0
0000.0C00.3E51.00-00 0x00000007    0xAF96        758            0/0/0
0000.0C00.40AF.00-00* 0x0000000A    0x3AA9        1077           0/0/0
```

Table 65 describes significant fields shown in the display

Table 65 *show isis database Field Descriptions*

Field	Description
LSPID	<p>The LSP identifier. The first six octets form the System ID of the router that originated the LSP.</p> <p>The next octet is the pseudonode ID. When this byte is zero, the LSP describes links from the system. When it is nonzero, the LSP is a so called non-pseudonode LSP. This is similar to a router LSA in OSPF. The LSP will describe the state of the originating router.</p> <p>For each LAN, the designated router for that LAN will create and flood a pseudonode LSP, describing all systems attached to that LAN.</p> <p>The last octet is the LSP number. If there is more data than can fit in a single LSP, the LSP will be divided into multiple LSP fragments. Each fragment will have a different LSP number. An asterisk (*) indicates that the LSP was originated by the system on which this command is issued.</p>
LSP Seq Num	Sequence number for the LSP that allows other systems to determine if they have received the latest information from the source.
LSP Checksum	Checksum of the entire LSP packet.
LSP Holdtime	Amount of time the LSP remains valid, in seconds. An LSP holdtime of zero indicates that this LSP was purged and is being removed from all routers' LSDB. The value between brackets indicates how long the purged LSP will stay in the LSDB before being completely removed.

Table 65 show isis database Field Descriptions

Field	Description
ATT	The Attach bit. This indicates that the router is also a Level 2 router, and it can reach other areas. Level 1-only routers and Level 1-2 routers that have lost connection to other Level 2 routers will use the attached bit to find the closest Level 2 router. They will point a default route to the closest Level 2 router.
P	The P bit. Detects if the IS is area partition repair capable. Cisco and other vendors do not support area partition repair.
OL	The Overload bit. Determines if the IS is congested. If the Overload bit is set, other routers will not use this system as a transit router when calculating routers. Only packets for destinations directly connected to the overloaded router will be sent to this router.

Example Using Show IS-IS Database Detail

The following is sample output from the **show isis database detail** command.

```
Router# 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
  Metric: 10   IS 0800.2B16.24EA.01
  Metric: 10   IS 0000.0C00.62E6.03
  Metric: 0    ES 0000.0C00.40AF

IS-IS Level-2 Link State Database
LSPID                LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
0000.0C00.0C35.03-00 0x00000005  0x04C8        317           0/0/0
  Metric: 0    IS 0000.0C00.0C35.00
--More--
0000.0C00.3E51.00-00 0x00000009  0xAB98        1182          0/0/0
  Area Address: 39.0004
  Metric: 10   IS 0000.0C00.40AF.00
  Metric: 10   IS 0000.0C00.3E51.05
```

As the output shows, in addition to the information displayed with **show isis database**, the **show isis database detail** command displays the contents of each LSP.

Table 66 describes the additional fields shown in the display.

Table 66 *show isis database detail Field Descriptions*

Field	Description
Area Address:	Reachable area addresses from the router. For Level 1 LSPs, these are the area addresses configured manually on the originating router. For Level 2 LSPs, these are all the area addresses for the area this route belongs to.
Metric:	IS-IS metric for the cost of the adjacency between the originating router and the advertised neighbor, or the metric of the cost to get from the advertising router to the advertised destination (which can be an IP address, an ES or a CLNS prefix).

Example Using Show IS-IS Database Detail Displaying IP Addresses

The following is additional sample output from the **show isis database detail** command. This is a Level 2 LSP. The area address 39.0001 is the address of the area in which the router resides.

```
Router# show isis database detail l2
```

```
IS-IS Level-2 Link State Database
LSPID          LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
0000.0C00.1111.00-00* 0x00000006   0x4DB3        1194          0/0/0
  Area Address: 39.0001
  NLPID:        0x81 0xCC
  IP Address:   160.89.64.17
  Metric: 10   IS 0000.0C00.1111.09
  Metric: 10   IS 0000.0C00.1111.08
  Metric: 10   IP 160.89.65.0 255.255.255.0
  Metric: 10   IP 160.89.64.0 255.255.255.0
  Metric: 0    IP-External 10.0.0.0 255.0.0.0
```

Table 67 describes the additional field shown in the display.

Table 67 *show isis database detail Field Descriptions Displaying IP Addresses*

Field	Description
Various addresses	The “IP” entries are the directly connected IP subnets the router is advertising (with associated metrics). The “IP-External” is a redistribute route.

show isis lsp-log

To display the Level 1 and Level 2 Intermediate System-to-Intermediate System (IS-IS) link-state packet (LSP) log of the interfaces that triggered the new LSP, use the **show isis lsp-log** command in EXEC mode.

show isis lsp-log

Syntax Description This command has no arguments or keywords.

Command Modes EXEC

Command History	Release	Modification
	12.0	This command was introduced.

Examples The following is sample output from the **show isis lsp-log** command:

```
Router# show isis lsp-log

      Level 1 LSP log
      When      Count      Interface  Triggers
07:05:18         3
07:05:13         2      Ethernet0  NEWADJ DIS
07:04:43         1
07:01:38         2      Ethernet0  IPUP
07:01:33         2      Loopback0  CONFIG
07:01:24         1      Ethernet0  DELADJ
07:01:17         2      Ethernet0  DIS ES
07:01:02         1      Ethernet0  NEWADJ
07:00:57         2      Ethernet0  NEWADJ DIS

      Level 2 LSP log
      When      Count      Interface  Triggers
07:05:24         2
07:05:23         1      Ethernet0  NEWADJ
07:05:18         1      Ethernet0  DIS
07:05:00         1      Serial0    NEWADJ
07:01:44         2      Ethernet0  IPUP
07:01:39         3      Loopback0  CONFIG DELADJ
07:01:30         1      Ethernet0  DELADJ
07:01:25         1      Serial0    NEWADJ
07:00:56         1
07:00:47         2      AREASET IPIA
```

Table 68 describes the fields shown in the display.

Table 68 *show isis lsp-log Field Descriptions*

Field	Description
When	Time elapsed since the LSP was generated.
Count	Number of events that took place at this time.
Interface	Interface that caused the LSP regeneration.
Triggers	<p>Event that triggered the LSP to be flooded. Possible triggers for an LSP are as follows:</p> <ul style="list-style-type: none"> • AREASET—Active area set changed. • ATTACHFLAG—Attached bit changed state. • CLEAR—Some form of manual clear command was issued. • CONFIG—Any configuration change. • DELADJ—Adjacency went down. • DIS—DIS changed or pseudonode changed. • ES—End System adjacency changed. • HIPPIITY—LSPDB overload bit changed state. • IF_DOWN—Needs a new LSP. • IP_DEF_ORIG—Default information originate changed. • IPDOWN—Directly connected IP prefix down. • IP_EXTERNAL—Redistributed IP route appeared or gone. • IPIA—Interarea IP route appeared or gone. • IPUP—Directly connected IP prefix up. • NEWADJ—New adjacency came up. • REDIST—Redistributed level-2 CLNS route changed. • RRR_INFO—RRR bandwidth resource information.

show isis spf-log

To display how often and why the router has run a full shortest path first (SPF) calculation, use the **show isis spf-log** user command in EXEC mode.

show isis area-tag spf-log

Syntax Description	<i>area-tag</i>	Required for multiarea IS-IS configuration. Optional for conventional IS-IS configuration. Meaningful name for a routing process. This name must be unique among all IP or Connectionless Network Service (CLNS) router processes for a given router. If an area tag is not specified, a null tag is assumed and the process is referenced with a null tag. If an area tag is specified, output is limited to the specified area.
---------------------------	-----------------	--

Command Modes	User EXEC
----------------------	-----------

Command History	Release	Modification
	10.0	This command was introduced.

Examples

The following is sample output from the **show isis spf-log** command:

```
Router# show isis spf-log
```

```

Level 1 SPF log
  When      Duration  Nodes  Count  Last trigger LSP  Triggers
00:15:46   3124     40     1     milles.00-00  TLVCODE
00:15:24   3216     41     5     milles.00-00  TLVCODE NEWLSP
00:15:19   3096     41     1     deurze.00-00  TLVCODE
00:14:54   3004     41     2     milles.00-00  ATTACHFLAG LSPHEADER
00:14:49   3384     41     1     milles.00-01  TLVCODE
00:14:23   2932     41     3     milles.00-00  TLVCODE
00:05:18   3140     41     1                                     PERIODIC
00:03:54   3144     41     1     milles.01-00  TLVCODE
00:03:49   2908     41     1     milles.01-00  TLVCODE
00:03:28   3148     41     3     bakel.00-00  TLVCODE TLVCONTENT
00:03:15   3054     41     1     milles.00-00  TLVCODE
00:02:53   2958     41     1     mortel.00-00  TLVCODE
00:02:48   3632     41     2     milles.00-00  NEWADJ TLVCODE
00:02:23   2988     41     1     milles.00-01  TLVCODE
00:02:18   3016     41     1     gemert.00-00  TLVCODE
00:02:14   2932     41     1     bakel.00-00  TLVCONTENT
00:02:09   2988     41     2     bakel.00-00  TLVCONTENT
00:01:54   3228     41     1     milles.00-00  TLVCODE
00:01:38   3120     41     3     rips.03-00   TLVCONTENT

```

Table 69 describes the fields in the display.

Table 69 *show isis spf-log Field Descriptions*

Field	Description
When	How long ago (hh:mm:ss) a full SPF calculation occurred. The last 20 occurrences are logged.
Duration	Number of milliseconds required to complete this SPF run. Elapsed time is wall clock time, not CPU time.
Nodes	Number of routers and pseudonodes (LANs) that make up the topology calculated in this SPF run.
Count	Number of events that triggered this SPF run. When there is a topology change, often multiple LSPs are received in a short time. A router waits 5 seconds before running a full SPF run, so it can include all new information. This count denotes the number of events (such as receiving new LSPs) that occurred while the router was waiting its 5 seconds before running full SPF.
Last trigger LSP	Whenever a full SPF calculation is triggered by the arrival of a new LSP, the router stores the LSP id. The LSP id can give a clue as to the source of routing instability in an area. If multiple LSPs are causing an SPF run, only the LSP id of the last received LSP is remembered.
Triggers	A list of all reasons that triggered a full SPF calculation. For a list of possible triggers, see Table 70.

Table 70 gives a list of possible triggers of a full SPF calculation.

Table 70 *List of Possible Triggers*

Trigger	Description
ATTACHFLAG	This router is now attached to the Level 2 backbone or it has just lost contact to the Level 2 backbone.
ADMINDIST	Another administrative distance was configured for the IS-IS process on this router.
AREASET	Set of learned area addresses in this area changed.
BACKUPOVFL	An IP prefix disappeared. The router knows there is another way to reach that prefix but has not stored that backup route. The only way to find the alternative route is through a full SPF run.
DBCHANGED	A clear isis * command was issued on this router.
IPBACKUP	An IP route disappeared, which was not learned via IS-IS, but via another protocol with better administrative distance. IS-IS will run a full SPF to install an IS-IS route for the disappeared IP prefix.
IPQUERY	A clear ip route command was issued on this router.
LSPEXPIRED	Some LSP in the link-state database (LSDB) has expired.
LSPHEADER	ATT/P/OL bits or is-type in an LSP header changed.
NEWADJ	This router has created a new adjacency to another router.
NEWAREA	A new area (via NET) was configured on this router.

Table 70 List of Possible Triggers

Trigger	Description
NEWLEVEL	A new level (via is-type) was configured on this router.
NEWLSP	A new router or pseudonode appeared in the topology.
NEWMETRIC	A new metric was configured on an interface of this router.
NEWSYSID	A new system ID (via network entity title (NET)) was configured on this router.
PERIODIC	Typically, every 15 minutes a router runs a periodic full SPF calculation.
RTCLEARED	A clear cns route command was issued on this router.
TLVCODE	TLV code mismatch, indicating that different TLVs are included in the newest version of an LSP.
TLVCONTENT	TLV contents changed. This normally indicates that an adjacency somewhere in the area has come up or gone down. Look at the “Last trigger LSP” column to get an indication of where the instability may have occurred.

show isis topology

To display a list of all connected routers in all areas, use the **show isis topology** command in EXEC mode.

```
show isis area-tag topology [level-1] [level-2] [host-nsap]
```

Syntax Description		
<i>area-tag</i>	Required for multiarea IS-IS configuration. Optional for conventional IS-IS configuration.	Meaningful name for a routing process. This name must be unique among all IP or Connectionless Network Service (CLNS) router processes for a given router. If an area tag is not specified, a null tag is assumed and the process is referenced with a null tag. If an area tag is specified, output is limited to the specified area.
level-1	(Optional) Paths to all Level 1 routers in the area or areas in which this router resides. The abbreviated keyword l1 may be used in place of level-1 .	
level-2	(Optional) Paths to all Level 2 routers in the domain. The abbreviated keyword l2 may be used in place of level-2 .	
<i>host-nsap</i>	(Optional) Host name or network service access point (NSAP) of a router for which you would like to check reachability.	

Command Modes	
	EXEC

Command History	Release	Modification
	12.0(5)T	This command was introduced.
	12.1	The level-1 and level-2 keywords and the <i>host-nsap</i> argument were added.

Usage Guidelines	
	Use the show isis topology EXEC command to verify the presence and connectivity between all routers in all areas.

Examples	
	The following is sample output from the show isis topology command:

```
Router# show isis topology
```

```
IS-IS paths to level-1 routers
System Id      Metric  Next-Hop      Interface      SNPA
Router_A       --
Router_B       10     Router_B      Et0             00e0.b064.46ec
```

■ show isis topology

```
IS-IS paths to level-2 routers
System Id      Metric  Next-Hop      Interface      SNPA
Router_A      --
Router_B      10      Router_B      Et0             00e0.b064.46ec
Router_C      20      Router_B      Et0             00e0.b064.46ec
              Router_D      Se0             DLCI 100
              Router_D      Se1             *HDLC*
Router_D      10      Router_D      Se0             DLCI 100
              Router_D      Se1             *HDLC*
```

Table 71 describes the fields shown in the display.

Table 71 *show isis topology Field Descriptions*

Field	Description
System Id	Identification value of the system listed in the Level 1 or Level 2 forwarding table.
Metric	IS-IS metric for the route.
Next-Hop	System ID of best-cost next-hop to listed address.
Interface	Interface through which the next-hop system is known.
SNPA	Subnetwork point of attachment (MAC address) of next-hop.

Related Commands

Command	Description
show clns es-neighbors	Lists the ES neighbors that this router knows.
show clns is-neighbors	Displays IS-IS related information for IS-IS router adjacencies.
show clns neighbors	Displays both ES and IS neighbors.
show clns neighbor areas	Displays information about IS-IS neighbors and the areas to which they belong.
show clns route	Displays one or all of the destinations to which the router knows how to route CLNS packets.

spf-interval

To customize IS-IS throttling of shortest path first (SPF) calculations, use the **spf-interval** command in router configuration mode. To restore default values, use the **no** form of this command.

spf-interval [**level-1** | **level-2**] *spf-max-wait* [*spf-initial-wait* *spf-second-wait*]

no spf-interval

Syntax Description	
level-1	(Optional) Apply intervals to Level-1 areas only.
level-2	(Optional) Apply intervals to Level-2 areas only.
<i>spf-max-wait</i>	Indicates the maximum interval (in seconds) between two consecutive SPF calculations. The range is 1 to 120 seconds. The default is 10 seconds.
<i>spf-initial-wait</i>	(Optional) Indicates the initial SPF calculation delay (in milliseconds) after a topology change. The range is 1 to 120,000 milliseconds. The default is 5500 milliseconds (5.5 seconds).
<i>spf-second-wait</i>	(Optional) Indicates the hold time between the first and second SPF calculation (in milliseconds). The range is 1 to 120,000 milliseconds. The default is 5500 milliseconds (5.5 seconds).

Defaults

spf-max-wait: 10 seconds
spf-initial-wait: 5500 milliseconds
spf-second-wait: 5500 milliseconds

Command Modes

Router configuration

Command History

Release	Modification
12.1	This command was introduced.

Usage Guidelines

The following description will help you determine whether to change the default values of this command:

- The *spf-initial-wait* argument indicates the initial wait time (in milliseconds) before the first SPF calculation.
- The *spf-second-wait* argument indicates the amount of time to wait (in milliseconds) between the first and second SPF calculation.
- Each subsequent wait interval is twice as long as the previous one until the wait interval reaches the *spf-max-wait* interval specified, so this value causes the throttling or slowing down of the SPF calculations after the initial and second intervals. Once this interval is reached, the wait interval continues at this interval until the network calms down.
- After the network calms down and there are no triggers for 2 times the *spf-max-wait* interval, fast behavior is restored (the initial wait time).

SPF throttling is not a dampening mechanism; that is, SPF throttling does not prevent SPF calculations or mark any route, interface, or router as down. SPF throttling simply increases the intervals between SPF calculations.

Examples

The following example configures intervals for SPF calculations, PRC, and LSP generation:

```
router isis
  spf-interval 5 10 20
  prc-interval 5 10 20
  lsp-gen-interval 2 50 100
```

summary-address (IS-IS)

To create aggregate addresses for Intermediate System-to-Intermediate System (IS-IS) or Open Shortest Path First (OSPF), use the **summary-address** command in router configuration mode. Use the **no** form of the command to restore the default.

summary-address *address mask* {**level-1** | **level-1-2** | **level-2**}

no summary-address *address mask* {**level-1** | **level-1-2** | **level-2**}

Syntax Description		
<i>address</i>		Summary address designated for a range of addresses.
<i>mask</i>		IP subnet mask used for the summary route.
level-1		Only routes redistributed into Level 1 are summarized with the configured address and mask value.
level-1-2		The summary router will be applied both when redistributing routes into Level 1 and Level 2 IS-IS, and when L2 IS-IS advertises Level 1 routes as reachable in its area.
level-2		Routes learned by Level 1 routing will be summarized into the Level 2 backbone with the configured address and mask value, and redistributed routes into Level 2 IS-IS will be summarized also.

Defaults All redistributed routes are advertised individually.

Command Modes Router configuration

Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines Multiple groups of addresses can be summarized for a given level. Routes learned from other routing protocols can also be summarized. The metric used to advertise the summary is the smallest metric of all the more specific routes. This command helps reduce the size of the routing table.

This command also reduces the size of the link-state packets (LSPs) and thus the link-state Database. It also helps stability because a summary advertisement is depending on many more specific routes. A single route flap does not cause the summary advertisement to flap in most cases.

The drawback of summary addresses is that other routes might have less information to calculate the most optimal routing table for all individual destinations.

Examples

The following example redistributes Routing Information Protocol (RIP) routes into IS-IS. In a RIP network, there are IP routes for 10.1.1, 10.1.2, 10.1.3, 10.1.4, and so forth. This example advertises only 10.1.0.0 into our IS-IS Level 1 Link State PDU.

```
router isis
net 01.0000.0000.0001.00
redistribute rip level-1 metric 40
summary-address 10.1.0.0 255.255.0.0 level-1
```