



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 *Network Protocols Configuration Guide, Part 1*.

area-password

To configure the 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 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.				
Defaults	This command is disabled by default.				
Command Modes	Router configuration				
Command History	<table border="1"> <thead> <tr> <th style="border-top: 1px solid black; border-bottom: 1px solid black;">Release</th> <th style="border-top: 1px solid black; border-bottom: 1px solid black;">Modification</th> </tr> </thead> <tbody> <tr> <td style="border-bottom: 1px solid black;">10.0</td> <td style="border-bottom: 1px solid black;">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 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>				
Examples	<p>The following example forces the software to generate a default external route into an IS-IS domain:</p> <pre> 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 </pre>				

■ 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 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.			
Release	Modification							
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.	
Command	Description							
area-password	Configures the IS-IS area authentication password.							
isis password	Configures the authentication password for an interface.							

ip router isis

To configure an IS-IS routing process for IP on an interface, use the **ip router isis** command in interface configuration mode. To disable IS-IS for IP, use the **no** form of this command.

ip router isis [*tag*]

no ip router isis [*tag*]

Syntax Description

tag (Optional) Defines a meaningful name for a routing process. If not specified, a null tag is assumed. It must be unique among all IP router processes for a given router. Use the same text for the argument *tag* as specified in the **router isis** global configuration command.

Note Each area in a multiarea configuration should have a nonnull area tag to facilitate identification of the area.

Defaults

No routing processes are specified.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Before the IS-IS router process is useful, a NET must be assigned with the **net** command and some interfaces must be enabled with IS-IS.

If you have IS-IS running and at least one ISO-IGRP process, the IS-IS process and the ISO-IGRP process cannot both be configured without a tag. The null tag can be used by only one process. Therefore, if you do not use ISO-IGRP, the IS-IS tag should be null. If you run ISO-IGRP and IS-IS, a null tag can still be used for IS-IS, but not for ISO-IGRP at the same time.

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
```

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 L2 or L1L2 routers and their interfaces are configured for L1L2 or L2. 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 L1-only, L1L2 or L2-only system. Only on routers that are between areas (L1L2 routers) should you configure some interfaces to be L2-only to prevent wasting bandwidth by sending out unused L1 hellos. Note that on point-to-point interfaces, the L1 and L2 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 L1 hellos.

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

isis csnp-interval

To configure the 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	<i>seconds</i>	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

Command Modes Interface configuration

Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines

It is very unlikely you will need to change the default value of this command.

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.

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.

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.

Examples The following example configures Ethernet interface 0 for transmitting CSN PDUs every 30 seconds.

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

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

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

no isis csnp-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 transmitted. (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.
	level-1	Configures the hello interval for Level 1 independently. Use this on X.25, 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

Command Modes Interface configuration

Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines 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 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

multiplier is 3

Command Modes

Interface configuration

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.

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-interval	Specifies the length of time between hello packets that the Cisco IOS software sends.

isis lsp-interval

To configure the time delay between successive 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>	Interval between successive link state packets, in milliseconds.
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Defaults	33 milliseconds
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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.
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Examples	The following example causes the system to transmit LSPs every 100 milliseconds (10 packets per second) on serial interface 0:
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```
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 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 (inter-area) routing.

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

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

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 time between retransmission of each LSP (IS-IS link-state PDU) over point-to-point links, 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.
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Defaults	5 seconds Interface 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>The setting of the <i>seconds</i> argument should be conservative, or needless retransmission will result. 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>
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Examples	<p>The following example configures serial interface 0 for retransmission of IS-IS LSP, every 60 seconds for a large serial line:</p> <pre>interface serial 0 isis retransmit-interval 60</pre>
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Related Commands	<table border="1"> <thead> <tr> <th>Command</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>isis lsp-interval</td> <td>Configures the time delay between successive IS-IS link state packet transmissions.</td> </tr> <tr> <td>isis retransmit-throttle-interval</td> <td>Configures the amount of time between retransmissions of any IS-IS link-state PDUs (LSPs) on a point-to-point interface.</td> </tr> </tbody> </table>	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 link-state PDUs (LSPs) on a point-to-point interface.
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 link-state PDUs (LSPs) on a point-to-point interface.						

isis retransmit-throttle-interval

To configure the amount of time between retransmissions of any IS-IS link-state PDUs (LSPs) 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 lsp-interval

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

The **isis retransmit-throttle-interval** command is distinct from the rate at which LSPs are transmitted 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 IS-IS level at which the Cisco IOS software operates, 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	Router acts as a station router. This router will learn only about destinations inside its area. For inter-area routing, it depends on the closest L1L2 router.
	level-1-2	Router acts as both a station router and an area router. This router will run two instances of the routing algorithm. It will have one linkstate database (LSDB) for destinations inside the area (L1 routing) and run a SPF calculation to discover the area topology. It will also have another LSDB with LSPs of all other backbone (L2) routers and run another SPF calculation to discover the topology of the backbone, and the existence of all other areas.
	level-2-only	Router acts as an area router only. This router is part of the backbone, and does not talk to L1-only routers in its own area.

Defaults Router acts as both a station router and an area router.

Command Modes Router configuration

Command History	Release	Modification
	10.3	This command was introduced.

Usage Guidelines It is highly recommended that you configure the type of an IS-IS router.

If there is only one area, there is no need to run two copies of the same algorithm. You have the option to run L1-only or L2-only everywhere. If IS-IS is used for CLNS routing, L1-only must be used everywhere. If IS-IS is used for IP routing, only, it is slightly preferred to run L2-only everywhere, as this allows easy addition of other areas later.

Examples The following example specifies an area router:

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

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).
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Defaults	900 seconds (15 minutes)
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Command Modes	Router configuration
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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
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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 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.

Usage Guidelines

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

A NET is an 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 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 (L1) and throughout the backbone (L2).

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

Even when IS-IS is used to do IP routing only (no CLNS routing enabled), a NET must still be configured. This is needed to instruct the router about its 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 in the process of being split into more areas. Multiple area addresses enable you to renumber an area slowly, without the need of a flag day.

Examples The following example configures a router with system ID 0000.0c11.11 and area ID 47.0004.004d.0001:

```
router isis CHESNUT
 net 47.0004.004d.0001.0000.0c11.1111.00
```

router isis

To enable the 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 [*tag*]

no router isis [*tag*]

Syntax Description	<i>tag</i>	(Optional) 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 router processes for a given router.
---------------------------	------------	---

Defaults This command is disabled by default.

Command Modes Global configuration

Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines This command is needed to configure a NET and configure an interface with **cls router isis** or **ip router isis**.

You can specify only one IS-IS process per router. Only one IS-IS process is allowed whether you run it in integrated mode, ISO CLNS only, or IP only.

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
```

Related Commands

Command	Description
clsns router isis	Enables the IS-IS routing protocol and specifies an IS-IS process for ISO CLNS.
ip router isis	Enables the IS-IS routing protocol and specifies an IS-IS process for IP.
net	Configures an IS-IS network entity title (NET) for the routing process.

set-overload-bit

To configure the router to signal other routers not to use it as intermediate hop in their 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

no set-overload-bit

Syntax Description This command has no arguments or keywords.

Defaults The overload bit is not set.

Command Modes Router configuration

Release	Modification
11.2	This command was introduced.

Usage Guidelines This command forces the router to set the overload bit (also known as the hippity bit) in its non-pseudonode LSPs. 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 don't 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.

Examples The following example configures the set-overload bit:

```
router isis
 set-overload-bit
```

show isis database

To display the IS-IS link state database, use the **show isis database** command in EXEC mode.

show isis database [**level-1**] [**level-2**] [**I1**] [**I2**] [**detail**] [**lspid**]

Syntax Description	
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.
I1	(Optional) Abbreviation for the option level-1 .
I2	(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 EXE

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 I2** and **show isis database I2 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 35 describes significant fields shown in the display

Table 35 *show isis database Display Fields*

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.
ATT	The Attach bit. This indicates that the router is also a Level 2 router, and it can reach other areas. L1-only routers and L1L2 routers that have lost connection to other L2 routers will use the attached bit to find the closest L2 router. They will point a default route to the closest L2 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 36 describes the additional fields shown in the display

Table 36 *show isis database Detail Field Descriptions*

Field	Description
Area Address:	Reachable area addresses from the router. For L1 LSPs, these are the area addresses configured manually on the originating router. For L2 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:     172.16.64.17
  Metric: 10     IS 0000.0C00.1111.09
  Metric: 10     IS 0000.0C00.1111.08
  Metric: 10     IP 172.16.65.0 255.255.255.0
  Metric: 10     IP 172.16.64.0 255.255.255.0
  Metric: 0      IP-External 10.0.0.0 255.0.0.0
```

Table 37 describes the additional field shown in the display.

Table 37 *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 38 describes the fields shown in the display.

Table 38 *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 SPF calculation, use the **show isis spf-log** command in EXEC mode.

show isis spf-log

Syntax Description This command has no arguments or keywords.

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 39 describes the fields in the display.

Table 39 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.

Table 39 *show isis spf-log Field Descriptions (continued)*

Field	Description
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.

summary-address (IS-IS)

Use the **summary-address** command in router configuration mode to create aggregate addresses for IS-IS or OSPF. The **no summary-address** command restores 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 L1 and L2 IS-IS, and when L2 IS-IS advertises L1 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 L2 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 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 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
```