



Reducing Alternate-Path Calculation Times in IS-IS Networks

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The tasks in this module explain how to tune IS-IS and enable routers to more quickly respond to topology changes and network failures when they receive routing updates that advertise topology changes.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the “[Feature Information for Reducing Alternate-Path Calculation Times in IS-IS Networks](#)” section on page 32.

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Prerequisites for Reducing Alternate-Path Calculation Times in IS-IS Networks

Before performing the tasks in this module, you should be familiar with the concepts described in the “[Overview of IS-IS Fast Convergence](#)” module.

Information About Reducing Alternate-Path Calculation Times in IS-IS Networks

Before you configure the features in this module, you should understand the following concepts:

- [Route Redistribution, page 2](#)
- [IS-IS Caching of Redistributed Routes, page 2](#)

Route Redistribution

Routers are allowed to redistribute external prefixes, or routes, that are learned from any other routing protocol, static configuration, or connected interfaces. The redistributed routes are allowed in either a Level 1 router or a Level 2 router. When Level 2 routes are injected as Level 1 routes, this is called route leaking.

IS-IS Caching of Redistributed Routes

Beginning with Cisco IOS Release 12.0(27)S, and later releases, IS-IS caches routes that are redistributed from other routing protocols or from another IS-IS level into a local redistribution cache that is maintained by IS-IS. Caching occurs automatically and requires no configuration. The caching of redistributed routes improves IS-IS convergence time when routes are being redistributed into IS-IS. IS-IS caching of redistributed routes increases the performance of LSP generation, significantly improving network scalability.

How to Reduce Alternate-Path Calculation Times in IS-IS Networks

You can configure features to enhance how routers process the routing information that they receive to more quickly calculate alternate paths based on the updated information. This section contains the following tasks:

- [Configuring Incremental SPF, page 3](#)
- [Prioritizing the Update of IP Prefixes in the RIB to Reduce Alternate-Path Calculation Time, page 4](#)
- [Tagging IS-IS Routes to Control Their Redistribution, page 7](#)
- [Limiting the Number of Routes That Are Redistributed into IS-IS, page 15](#)

- [Streamlining the Routing Table Update Process by Excluding Connected IP Prefixes from LSP Advertisements, page 19](#)
- [Monitoring IS-IS Network Convergence Time, page 24](#)

Configuring Incremental SPF

IS-IS uses Dijkstra's SPF algorithm to compute the shortest path tree (SPT). During the computation of the SPT, the shortest path to each node is discovered. The topology tree is used to populate the routing table with routes to IP networks. When changes occur, the entire SPT is recomputed. In many cases, the entire SPT need not be recomputed because most of the tree remains unchanged. Incremental SPF allows the system to recompute only the affected part of the tree. Recomputing only a portion of the tree rather than the entire tree results in faster IS-IS convergence and saves CPU resources.

Incremental SPF computes only the steps needed to apply the changes in the network topology diagram. That process requires that the system keep more information about the topology in order to apply the incremental changes. Also, more processing must be done on each node for which the system receives a new LSP. However, incremental SPF typically reduces demand on CPU.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router isis** [*area-tag*]
4. **ispf** [*level-1* | *level-2* | *level-1-2*] [*seconds*]
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	router isis [<i>area-tag</i>] Example: Router(config)# router isis	Enables IS-IS as an IP routing protocol and assigns a tag to a process, if required. <ul style="list-style-type: none"> • Enters router configuration mode.

	Command or Action	Purpose
Step 4	<pre>ispsf [level-1 level-2 level-1-2] [seconds]</pre> <p>Example: Router(config-router)# ispsf level-1-2 60</p>	<p>Enables incremental SPF.</p> <ul style="list-style-type: none"> The seconds argument represents the number of seconds after configuring this command that incremental SPF is activated. Value can be in the range from 1 to 600. The default value is 120 seconds. The seconds argument applies only when you have enabled IS-IS.
Step 5	<pre>end</pre> <p>Example: Router(config-router)# end</p>	<p>Returns to privileged EXEC mode.</p>

Prioritizing the Update of IP Prefixes in the RIB to Reduce Alternate-Path Calculation Time

The time needed for the IS-IS Routing Information Base (RIB) or routing table to update depends on the number of changed IS-IS prefixes or routes that must be updated. You can tag important IS-IS IP prefixes and configure the router to give priority to the tagged prefixes so that high-priority prefixes are updated first in the RIB. For example, the loopback addresses for the routers in an MPLS VPN environment are considered high priority prefixes. You should understand the following concepts before you prioritize the update of IP prefixes:

- [IS-IS Priority-Driven IP Prefix RIB Installation, page 4](#)
- [Benefit of Assigning a High Priority Tag to an IS-IS IP Prefix, page 5](#)

IS-IS Priority-Driven IP Prefix RIB Installation

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

After performing an SPF, IS-IS must install updated routes in the RIB. If the number of prefixes advertised by IS-IS is large, the time between the installation of the first prefix and the last prefix is significant. Priority-driven IP prefix RIB installation allows a subset of the prefixes advertised by IS-IS to be designated as having a higher priority. Updates to the paths to these prefixes will be installed before updates to prefixes that do not have this designation. This reduces the convergence time for the important IS-IS IP prefixes and results in faster updating for routes that are dependent on these prefixes. This in turn shortens the time during which stale information is used for forwarding packets to these destinations.

Prefixes are characterized as having one of three levels of importance:

1. High priority prefixes—prefixes that have been tagged with a tag designated for fast convergence.
2. Medium priority prefixes—any /32 prefixes that have not been designated as high priority prefixes.
3. Low priority prefixes—all other prefixes.

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

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

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

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip router isis** [*area-tag*]
5. **isis tag** *tag-number*
6. **exit**
7. **router isis** [*area-tag*]
8. **ip route priority high tag** *tag-value*
9. **end**
10. **show isis rib** [*ip-address | ip-address-mask*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	interface <i>type number</i> Example: Router(config)# interface Ethernet 0	Configures an interface type and enters interface configuration mode.

	Command or Action	Purpose
Step 4	<pre>ip router isis [area-tag]</pre> <p>Example: Router(config-if)# ip router isis tag13</p>	<p>Enables IS-IS as an IP routing protocol, and assigns a tag to a process, if required.</p> <p>Note If the <i>area-tag</i> argument is not specified, a null tag is assumed and the process is referenced with a null tag. This name must be unique among all IP or Connectionless Network Service (CLNS) router processes for a given router.</p>
Step 5	<pre>isis tag tag-number</pre> <p>Example: Router(config-if)# isis tag 17</p>	<p>Sets a tag on the IP address configured for an interface when this IP prefix is put into an IS-IS LSP.</p> <ul style="list-style-type: none"> The <i>tag-number</i> argument requires an integer in a range from 1 to 4294967295 and serves as a tag on an IS-IS route.
Step 6	<pre>exit</pre> <p>Example: Router(config-if)# exit</p>	<p>Returns to global configuration mode.</p>
Step 7	<pre>router isis [area-tag]</pre> <p>Example: Router(config)# router isis marketing</p>	<p>Enables the IS-IS routing protocol and specifies an IS-IS process. Enters router configuration mode.</p> <p>Note If the <i>area-tag</i> argument is not specified, a null tag is assumed and the process is referenced with a null tag. This name must be unique among all IP or CLNS router processes for a given router.</p>
Step 8	<pre>ip route priority high tag tag-value</pre> <p>Example: Router(config-router)# ip route priority high tag 17</p>	<p>Assigns a high priority to prefixes associated with the specified tag value.</p> <ul style="list-style-type: none"> Assigns a high priority to IS-IS IP prefixes with a specific route tag in a range from 1 to 4294967295 that you specify for the <i>tag-value</i> argument.
Step 9	<pre>end</pre> <p>Example: Router(config-router)# end</p>	<p>(Optional) Saves configuration commands to the running configuration file and returns to privileged EXEC mode.</p>
Step 10	<pre>show isis rib [ip-address ip-address-mask]</pre> <p>Example: Router# show isis rib 255.255.255.0</p>	<p>Displays paths for a specific route in the IP Version 4 IS-IS local RIB.</p> <ul style="list-style-type: none"> IS-IS maintains a local database for all IS-IS routing information. This local database is referred to as the IS-IS local RIB. It contains additional attributes that are not maintained in the global IP routing table. Access to the contents of the local RIB is used to support the show isis rib command, which is used here to verify routing information related to the Priority-Driven IP Prefix RIB Installation feature.

Troubleshooting Tips

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

Tagging IS-IS Routes to Control Their Redistribution

You can control the redistribution of IS-IS routes by tagging them. The term “route leaking” refers to controlling distribution through tagging of routes.

You should understand at least the first three concepts before implementing IS-IS route tags, and you should understand the fourth concept if you plan to configure route leaking:

- [How Route Summarization Can Enhance Scalability in IS-IS Networks, page 7](#)
- [Benefits of IS-IS Route Tags, page 7](#)
- [IS-IS Route Tag Characteristics, page 7](#)
- [IS-IS Route Leaking Based on a Route Tag, page 8](#)
- [Prerequisites, page 8](#)

How Route Summarization Can Enhance Scalability in IS-IS Networks

Summarization is a key factor that affects the scalability of a routing protocol. Summarization reduces the number of routing updates that are flooded across areas or routing domains. Especially for multi-area IS-IS, a good addressing scheme can optimize summarization by not allowing an overly large Level 2 database that is unnecessarily populated with updates that have come from Level 1 areas.

A router can summarize prefixes on redistribution whether the prefixes have come from internal prefixes, local redistribution, or Level 1 router redistribution. Routes that have been leaked from Level 2 to Level 1 and routes that are advertised into Level 2 from Level 1 can also be summarized.

Benefits of IS-IS Route Tags

- The IS-IS Support for Route Tags feature allows you to tag IP addresses of an interface and use the tag to apply administrative policy with a route map.
- You can tag IS-IS routes to control their redistribution. You can configure a route map to set a tag for an IS-IS IP prefix (route) and/or match on the tag (perhaps on a different router) to redistribute IS-IS routes. Although the **match tag** and **set tag** commands existed for other protocols before this feature, they were not implemented for IS-IS, so they did nothing when specified in an IS-IS network until now.
- You can tag a summary route and then use a route map to match the tag and set one or more attributes for the route.

IS-IS Route Tag Characteristics

An IS-IS route tag number can be up to 4 bytes long. The tag value is set into a sub-TLV 1 for TLV (Type Length Value) Type 135. For more information about TLV Type 135, see the *Intermediate System-to-Intermediate System (IS-IS) TLVs* document referenced in the “[Related Documents](#)” section.

Only one tag can be set to an IS-IS IP route (prefix). The tag is sent out in link-state PDUs (LSPs) advertising the route. Setting a tag to a route alone does nothing for your network. You can use the route tag at area or Level 1/Level 2 boundaries by matching on the tag and then applying administrative policies such as redistribution, route summarization, or route leaking.

Configuring a tag for an interface (with the **isis tag** command) triggers the generation of new LSPs from the router because the tag is new information for the PDUs.

IS-IS Route Leaking Based on a Route Tag

You can tag IS-IS routes to configure route leaking (redistribution). Since only the appropriate routes are redistributed—or leaked—the results is network scalability and faster convergence for the router update. If you configure route leaking and you want to match on a tag, use a route map (not a distribute list). For more information on route leaking, see the *IS-IS Route Leaking* document referenced in the “[Related Documents](#)” section.

There are two general steps to using IS-IS route tags: tagging routes and referencing the tag to set values for the routes and/or redistribute routes.

There are three ways to tag IS-IS routes: tag routes for networks directly connected to an interface, set a tag in a route map, or tag a summary route. All three methods are described in this section. The tagging method is independent of how you use the tag.

After you tag the routes, you can use the tag to set values (such as a metric, or next hop, and so on) and/or redistribute routes. You might tag routes on one router, but reference the tag on other routers, depending on what you want to achieve. For example, you could tag the interface on Router A with a tag, match the tag on Router B to set values, and redistribute routes on Router C based on values using a route map.

Prerequisites

- Because the IS-IS route tag will be used in a route map, you must understand how to configure a route map.
- In order to use the route tag, you must configure the **metric-style wide** command. (The **metric-style narrow** command is configured by default). The tag value is set into sub-TLV 1 for TLV (Type Length Value) Type 135.
- You must understand the task for which you are using the route tag, such as route redistribution, route summarization, or route leaking.

Before you tag any IS-IS routes, you need to decide on the following:

1. Your goal to set values for routes or redistribute routes (or both).
2. Where in your network you want to tag routes.
3. Where in your network you want to reference the tags.
4. Which tagging method you will use, which determines which task in this section to perform.

After you know which tagging method suits your need, proceed to one of the following tasks:

- [Tagging Routes for Networks Directly Connected to an Interface, page 8](#) (optional)
- [Tagging Routes Using a Route Map, page 10](#) (optional)
- [Tagging a Summary Address, page 12](#) (optional)
- [Using the Tag to Set Values and/or Redistribute Routes, page 14](#) (optional)

Tagging Routes for Networks Directly Connected to an Interface

Perform this task if you want to tag routes for networks that are directly connected to an interface.

SUMMARY STEPS

1. **enable**
2. **configure terminal**

3. **interface** *type number*
4. **ip address** *ip-address mask*
5. **ip address** *ip-address mask secondary*
6. **isis tag** *tag-number*
7. **end**
8. **show isis database verbose**
9. **show ip route** [*ip-address [mask] [longer-prefixes] | protocol [process-id] | list [access-list-number | access-list-name]*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	interface <i>type number</i> Example: Router(config)# interface ethernet 0	Configures an interface.
Step 4	ip address <i>ip-address mask</i> Example: Router(config-if)# ip address 10.1.1.1 255.255.255.0	Sets a primary IP address for an interface. <ul style="list-style-type: none">In this example, the network 10.1.1.0 will be tagged.
Step 5	ip address <i>ip-address mask secondary</i> Example: Router(config-if)# ip address 10.2.2.1 255.255.255.0 secondary	(Optional) Sets a secondary IP address for an interface. <ul style="list-style-type: none">In this example, the network 10.2.2.0 will be tagged.
Step 6	isis tag <i>tag-number</i> Example: Router(config-if)# isis tag 120	Sets a tag on the IP addresses configured under this interface when those IP prefixes are put into an IS-IS LSP. <ul style="list-style-type: none">The tag must be an integer.
Step 7	end Example: Router(config-if)# end	(Optional) Exits configuration mode and returns to privileged EXEC mode.

	Command or Action	Purpose
Step 8	<pre>show isis database verbose</pre> <p>Example: Router# show isis database verbose</p>	(Optional) Displays details about the IS-IS link-state database, including the route tag. <ul style="list-style-type: none"> Perform this step if you want to verify the tag.
Step 9	<pre>show ip route [ip-address [mask] [longer-prefixes] protocol [process-id] list [access-list-number access-list-name]]</pre> <p>Example: Router# show ip route 10.1.1.1 255.255.255.0</p>	(Optional) Displays the current state of the routing table. <ul style="list-style-type: none"> Perform this step if you want to verify the tag.

What to Do Next

Applying the tag does nothing of value for your network until you use the tag by referencing it in a route map, either to set values, to redistribute routes, or to do both. Proceed to the section, [“Using the Tag to Set Values and/or Redistribute Routes, page 14.”](#)

Tagging Routes Using a Route Map

Perform this task when you want to redistribute connected routes, static routes, or routes from other routing protocols using a route map. You can optionally set some new values for the redistributed routes. You should create the route map first and then reference the tag according to the [“Using the Tag to Set Values and/or Redistribute Routes”](#) section on page 14.

It is possible that you might configure some commands on one router and other commands on another router. For example, you might have a route map that matches on a tag and sets a different tag on a router at the edge of a network, and on different routers you might configure the redistribution of routes based on the route map.

SUMMARY STEPS

- enable**
- configure terminal**
- route-map** *map-tag* [**permit** | **deny**] [*sequence-number*]
- match tag** *tag-number* [...*tag-number*]
- Use an additional **match** command for each match criterion that you want.
- set tag** *tag-number*
- Set another value, depending on what else you want to do with the tagged routes.
- Repeat Step 7 for each value that you want to set.
- Repeat Steps 3 through 8 for each route-map statement that you want.
- end**
- show isis database verbose**
- show ip route** [*ip-address* [*mask*] [**longer-prefixes**] | *protocol* [*process-id*] | **list** [*access-list-number* | *access-list-name*]]

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	route-map <i>map-tag</i> [permit deny] [<i>sequence-number</i>] Example: Router(config)# route-map static-color permit 15	Defines the conditions for redistributing routes from one routing protocol into another or from one IS-IS level to another. <ul style="list-style-type: none"> This command causes the router to enter route-map configuration mode.
Step 4	match tag <i>tag-number</i> [... <i>tag-number</i>] Example: Router(config-route-map)# match tag 15	(Optional) Matches routes tagged with the specified tag numbers. <ul style="list-style-type: none"> If you are setting a tag for the first time, you cannot match on tag; this step is an option if you are changing tags.
Step 5	Use an additional match command for each match criterion that you want.	(Optional) See the appropriate match commands in the “IP Routing Protocol-Independent Commands” chapter of the <i>Cisco IOS IP Routing Protocols Command Reference</i> . <ul style="list-style-type: none"> Repeat this step for each match criterion you that want.
Step 6	set tag <i>tag-number</i> Example: Router(config-route-map)# set tag 10	Specifies the tag number to set.
Step 7	Set another value, depending on what else you want to do with the tagged routes.	(Optional) See the following set commands in the “IP Routing Protocol-Independent Commands” chapter of the <i>Cisco IOS IP Routing Protocols Command Reference</i> . <ul style="list-style-type: none"> set level set metric set metric-type
Step 8	Repeat Step 7 for each value that you want to set.	(Optional)
Step 9	Repeat Steps 3 through 8 for each route-map statement that you want.	(Optional)
Step 10	end Example: Router(config-route-map)# end	(Optional) Exits configuration mode and returns to privileged EXEC mode.

	Command or Action	Purpose
Step 11	<pre>show isis database verbose</pre> <p>Example: Router# show isis database verbose</p>	(Optional) Displays details about the IS-IS link-state database, including the route tag. <ul style="list-style-type: none"> • Perform this step if you want to verify the tag.
Step 12	<pre>show ip route [ip-address [mask] [longer-prefixes] protocol [process-id] [list access-list-number [access-list-name]]</pre> <p>Example: Router# show ip route 10.1.1.1 255.255.255.0</p>	(Optional) Displays the current state of the routing table. <ul style="list-style-type: none"> • Perform this step if you want to verify the tag.

What to Do Next

Applying the tag does nothing of value for your network until you use the tag by referencing it in a route map, either to set values, to redistribute routes, or to do both. Proceed to the [“Using the Tag to Set Values and/or Redistribute Routes”](#) section on page 14.

Tagging a Summary Address

Perform this task if you want to summarize IS-IS routes at an area boundary or level boundary and tag the summarized route. You will later use the tag to set values for the summarized route.



Note

If a tagged route is summarized and the tag is not explicitly configured in the **summary-address** command, then the tag is lost.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router isis** *[area-tag]*
4. **metric-style wide**
5. **summary-address** *address mask {level-1 | level-1-2 | level-2} [tag tag-number] [metric metric-value]*
6. **end**
7. **show isis database verbose**
8. **show ip route** *[ip-address [mask] [longer-prefixes] | protocol [process-id] | list [access-list-number | access-list-name]]*

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	router isis [area-tag] Example: Router(config)# router isis	Enables IS-IS as an IP routing protocol and assigns a tag to a process, if required. <ul style="list-style-type: none"> Enters router configuration mode.
Step 4	metric-style wide Example: Router(config-router)# metric-style wide	Configures a router running IS-IS so that it generates and accepts type, length, and value object (TLV) 135 for IP addresses.
Step 5	summary-address address mask {level-1 level-1-2 level-2} [tag tag-number] [metric metric-value] Example: Router(config-router)# summary-address 192.168.0.0 255.255.0.0 tag 12345 metric 321	Creates aggregate addresses for IS-IS.
Step 6	end Example: Router(config-router)# end	(Optional) Exits configuration mode and returns to privileged EXEC mode.
Step 7	show isis database verbose Example: Router# show isis database verbose	(Optional) Displays details about the IS-IS link-state database, including the route tag. <ul style="list-style-type: none"> Perform this step if you want to verify the tag.
Step 8	show ip route [ip-address [mask] [longer-prefixes] protocol [process-id] [list access-list-number [access-list-name]] Example: Router# show ip route 10.1.1.1 255.255.255.0	(Optional) Displays the current state of the routing table. <ul style="list-style-type: none"> Perform this step if you want to verify the tag.

What to Do Next

Applying the tag does nothing of value for your network until you use the tag by referencing it in a route map to set values. It is unlikely that you will redistribute summary routes. Proceed to the [“Using the Tag to Set Values and/or Redistribute Routes”](#) section on page 14.

Using the Tag to Set Values and/or Redistribute Routes

Now that you have applied a tag to one or more routes, you can use that tag to set various values for routes or to redistribute the routes, or both. This task shows you how to set values and redistribute routes. Note that you will likely use the tag on a different router from the router on which you applied the tag.

Prerequisites

You must have already applied a tag on the interface, in a route map, or on a summary route. See the [“Tagging IS-IS Routes to Control Their Redistribution”](#) section on page 7.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **route-map** *map-tag* [**permit** | **deny**] [*sequence-number*]
4. **match tag** *tag-number*
5. Specify a **match** command for each match criterion that you want.
6. Set a value, depending on what you want to do with the tagged routes.
7. Repeat Step 6 for each value that you want to set.
8. Repeat Steps 3 through 7 for each route-map statement that you want.
9. **exit**
10. **exit**
11. **router isis**
12. **metric-style wide**
13. **redistribute** *protocol* [*process-id*] [**level-1** | **level-1-2** | **level-2**] [**metric** *metric-value*] [**metric-type** *type-value*] [**route-map** *map-tag*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	route-map <i>map-tag</i> [permit deny] [<i>sequence-number</i>] Example: Router(config)# route-map static-color permit 15	Defines the conditions for redistributing routes from one routing protocol into another or from one IS-IS level to another. <ul style="list-style-type: none"> • This command causes you to enter route-map configuration mode.

	Command or Action	Purpose
Step 4	match tag <i>tag-number</i> Example: Router(config-route-map)# match tag 120	(Optional) Applies the subsequent set commands to routes that match routes tagged with this tag number.
Step 5	Specify a match command for each match criterion that you want.	(Optional) Reference the appropriate match commands in the “ IP Routing Protocol-Independent Commands ” chapter of the <i>Cisco IOS IP Routing Protocols Command Reference</i> .
Step 6	Set a value, depending on what you want to do with the tagged routes.	(Optional) See the following set commands in the “IP Routing Protocol-Independent Commands” chapter of the <i>Cisco IOS IP Routing Protocols Command Reference</i> . <ul style="list-style-type: none"> • set level • set metric • set metric-type
Step 7	Repeat Step 6 for each value that you want to set.	(Optional)
Step 8	Repeat Steps 3 through 7 for each route-map statement that you want.	(Optional)
Step 9	exit Example: Router(config-route-map)# exit	(Optional) Returns to global configuration mode.
Step 10	router isis Example: Router(config)# router isis	(Optional) Enables the IS-IS routing protocol and specifies an IS-IS process.
Step 11	metric-style wide Example: Router(config-router)# metric-style wide	Configures a router running IS-IS so that it generates and accepts type, length, and value object (TLV) 135 for IP addresses.
Step 12	redistribute <i>protocol</i> [<i>process-id</i>] [level-1 level-1-2 level-2] [metric <i>metric-value</i>] [metric-type <i>type-value</i>] [route-map <i>map-tag</i>] Example: Router(config-router)# redistribute static ip metric 2 route-map static-color	(Optional) Redistributes routes from one routing domain into another routing domain.

Limiting the Number of Routes That Are Redistributed into IS-IS

If someone mistakenly injects a large number of IP routes into IS-IS, perhaps by redistributing Border Gateway Protocol (BGP) into IS-IS, the network can be severely flooded. Limiting the number of redistributed routes prevents this potential problem. You can either configure IS-IS to stop allowing routes to be redistributed once your maximum configured value has been reached or configure the software to generate a system warning once the number of redistributed prefixes has reached the maximum value. Before configuring the tasks in this section, you should be familiar with the following concept.

LSP Full State

In some cases when a limit is not placed on the number of redistributed routes, the LSP may become full and routes may be dropped. A user can specify which routes should be suppressed in that event so that the consequence of an LSP full state is handled in a graceful and predictable manner.

Redistribution is usually the cause of the LSP full state. By default, external routes redistributed into IS-IS are suppressed if the LSP full state occurs. IS-IS can have 255 fragments for an LSP in a level. When there is no space left in any of the fragments, an LSPFULL error message is generated.

Once the problem that caused the LSP full state is resolved, a user can clear the LSPFULL state.

This section contains the following procedures, which are mutually exclusive. That is, you cannot both limit redistributed prefixes and also choose to be warned only.

- [Limiting the Number of IS-IS Redistributed Routes, page 16](#)
- [Requesting a Warning About the Number of Prefixes Redistributed into IS-IS, page 17](#)

Limiting the Number of IS-IS Redistributed Routes

This task describes how to limit the number of IS-IS redistributed routes. If the number of redistributed routes reaches the maximum value configured, no more routes will be redistributed.

The redistribution limit applies only to external IP prefixes. Default routes and summarized routes are not limited.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router isis** [*area-tag*]
4. **redistribute protocol** [*process-id*] {**level-1** | **level-1-2** | **level-2**} [*as-number*] [**metric** *metric-value*] [**metric-type** *type-value*] [**match** {**internal** | **external 1** | **external 2**}] [**tag** *tag-value*] [**route-map** *map-tag*]
5. **redistribute maximum-prefix** *maximum* [*percentage*] [**warning-only** | **withdraw**]
6. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
Step 3	<pre>router isis [area-tag]</pre> <p>Example: Router(config)# router isis</p>	<p>Enables IS-IS as an IP routing protocol and assigns a tag to a process, if required.</p> <ul style="list-style-type: none"> Enters router configuration mode.
Step 4	<pre>redistribute protocol [process-id] {level-1 level-1-2 level-2} [as-number] [metric metric-value] [metric-type type-value] [match {internal external 1 external 2}] [tag tag-value] [route-map map-tag]</pre> <p>Example: Router(config-router)# redistribute eigrp 10 level-1</p>	<p>Redistributes routes from one routing domain into another routing domain.</p>
Step 5	<pre>redistribute maximum-prefix maximum [percentage] [warning-only withdraw]</pre> <p>Example: Router(config-router)# redistribute maximum-prefix 1000 80</p>	<p>Sets a maximum number of IP prefixes that are allowed to be redistributed into IS-IS.</p> <ul style="list-style-type: none"> There is no default value for the <i>maximum</i> argument. The <i>percentage</i> value defaults to 75 percent. If the withdraw keyword is specified and the maximum number of prefixes is exceeded, IS-IS rebuilds the link-state protocol data unit (PDU) fragments without the external IP prefixes. That is, the redistributed prefixes are removed from the PDUs. <p>Note If the warning-only keyword had been configured in this command, no limit would be enforced; a warning message is simply logged.</p>
Step 6	<pre>end</pre> <p>Example: Router(config-router)# end</p>	<p>Exits router configuration mode.</p>

Requesting a Warning About the Number of Prefixes Redistributed into IS-IS

This task describes how to cause the system to generate a warning message when the number of redistributed prefixes reaches a maximum value. However, additional redistribution is not prevented.

The redistribution count applies only to external IP prefixes. Default prefixes and summarized prefixes are not considered.

Because you are deciding not to impose a limit on the number of redistributed prefixes, the LSP may become full. You might want to configure which prefixes are dropped in that event, as shown in the optional step in this task.

SUMMARY STEPS

- enable
- configure terminal
- router isis [area-tag]

4. **redistribute** *protocol* [*process-id*] {**level-1** | **level-1-2** | **level-2**} [*as-number*] [**metric** *metric-value*] [**metric-type** *type-value*] [**match** {**internal** | **external 1** | **external 2**}] [**tag** *tag-value*] [**route-map** *map-tag*]
5. **redistribute maximum-prefix** *maximum* [*percentage*] [**warning-only** | **withdraw**]
6. **isp-full suppress** {[**external**] [**interlevel**] | **none**}
7. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	router isis [<i>area-tag</i>] Example: Router(config)# router isis	Enables IS-IS as an IP routing protocol and assigns a tag to a process, if required. <ul style="list-style-type: none"> Enters router configuration mode.
Step 4	redistribute protocol [<i>process-id</i>] { level-1 level-1-2 level-2 } [<i>as-number</i>] [metric <i>metric-value</i>] [metric-type <i>type-value</i>] [match { internal external 1 external 2 }] [tag <i>tag-value</i>] [route-map <i>map-tag</i>] Example: Router(config-router)# redistribute eigrp 10 level-1	Redistributes routes from one routing domain into another routing domain.
Step 5	redistribute maximum-prefix <i>maximum</i> [<i>percentage</i>] [warning-only withdraw] Example: Router(config-router)# redistribute maximum-prefix 1000 80 warning-only	Causes a warning message to be logged when the maximum number of IP prefixes has been redistributed into IS-IS. <ul style="list-style-type: none"> Because the warning-only keyword is included, no limit is imposed on the number of redistributed prefixes into IS-IS. There is no default value for the <i>maximum</i> argument. The <i>percentage</i> value defaults to 75 percent. In this example configuration, two warnings are generated: one at 80 percent of 1000 (800 prefixes redistributed) and another at 1000 prefixes redistributed.

	Command or Action	Purpose
Step 6	<pre>lsp-full suppress {[external] [interlevel] none}</pre> <p>Example: Router(config-router)# lsp-full suppress external interlevel</p>	<p>(Optional) Controls which routes are suppressed when the link-state PDU becomes full.</p> <ul style="list-style-type: none"> • The default is external (redistributed routes are suppressed). • The interlevel keyword causes routes from another level to be suppressed. • The external and interlevel keywords can be specified together or separately. • See the “LSP Full State” section on page 16”.
Step 7	<pre>end</pre> <p>Example: Router(config-router)# end</p>	<p>Exits router configuration mode.</p>

Streamlining the Routing Table Update Process by Excluding Connected IP Prefixes from LSP Advertisements

In order to speed up IS-IS convergence, the number of IP prefixes carried in LSPs needs to be limited. Configuring interfaces as unnumbered would limit the prefixes. However, for network management reasons, you might want to have numbered interfaces and also want to prevent advertising interface addresses into IS-IS. There are two alternative methods to avoid the overpopulation of routing tables and thereby reduce IS-IS convergence time. In order to choose the method that will work best for your network, you should become familiar with the following concepts.

Small-Scale Method to Reduce IS-IS Convergence Time

You can explicitly configure an IS-IS interface not to advertise its IP network to the neighbors (by using the **no isis advertise-prefix** command). This method is feasible for a small network; it does not scale well. If you have dozens or hundreds of routers in your network, with possibly ten times as many physical interfaces involved, it would be difficult to add this command to each router’s configuration.

Large-Scale Method to Reduce IS-IS Convergence Time

An easier way to reduce IS-IS convergence is to configure the IS-IS instance on a router to advertise only passive interfaces (by using the **advertise-passive-only** command). This command relies on the fact that when enabling IS-IS on a loopback interface, you usually configure the loopback as passive (to prevent sending unnecessary hello PDUs out through it because there is no chance of finding a neighbor behind it). Thus, if you want to advertise only the loopback and if it has already been configured as passive, configuring the **advertise-passive-only** command per IS-IS instance would prevent the overpopulation of the routing tables.

Benefit of Excluding IP Prefixes of Connected Networks in LSP Advertisements

Whether you choose to prevent the advertising of IS-IS interface subnetworks or to advertise only the IS-IS prefixes that belong to passive (loopback) interfaces, you will reduce IS-IS convergence time. The IS-IS Mechanisms to Exclude Connected IP Prefixes from LSP Advertisements feature is recommended in any case where fast convergence is required.

This section provides two alternative IS-IS mechanisms to exclude connected IP prefixes from LSP advertisements:

- [Excluding Connected IP Prefixes on a Small Scale, page 20](#) (optional)
- [Excluding Connected IP Prefixes on a Large Scale, page 22](#) (optional)

Excluding Connected IP Prefixes on a Small Scale

This section provides the steps necessary to exclude connected IP prefixes from IS-IS LSP advertisements in a small network.

For a configuration example of this feature where IS-IS acts as the MPLS backbone, see the [“Excluding Connected IP Prefixes on a Small Scale: Example”](#) section on page 30.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *ip-address netmask*
5. **no ip directed-broadcast**
6. **ip router isis** [*area-tag*]
7. **no isis advertise-prefix**
8. **exit**
9. Repeat Steps 3 through 8 for each interface on which you do not want to advertise IP prefixes.
10. **router isis** *area-tag*
11. **net** *network-entity-title*
12. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	interface <i>type number</i> Example: Router(config)# interface Ethernet 0	Configures an interface type and enters interface configuration mode.
Step 4	ip address <i>ip-address netmask</i> Example: Router(config-if)# ip address 192.168.20.1 255.255.255.0	Sets a primary IP address for an interface. <ul style="list-style-type: none"> The network mask can be indicated as a 4-part dotted decimal address or as a prefix. This example uses a 4-part dotted decimal number.
Step 5	no ip directed-broadcast Example: Router(config-if)# no ip directed-broadcast	(Optional) Disables the translation of a directed broadcast to physical broadcasts.
Step 6	ip router isis [<i>area-tag</i>] Example: Router(config-if)# ip router isis	Configures an IS-IS routing process for IP on an interface and attaches an area designator to the routing process.
Step 7	no isis advertise-prefix Example: Router(config-if)# no isis advertise-prefix	Prevents the advertising of IP prefixes of connected networks in LSP advertisements per IS-IS interface.
Step 8	exit Example: Router(config-if)# exit	Returns to global configuration mode.
Step 9	Repeat Steps 3 through 8 for each interface on which you do not want to advertise IP prefixes.	(Optional)
Step 10	router isis [<i>area-tag</i>] Example: Router(config)# router isis	Enables IS-IS as an IP routing protocol and assigns a tag to a process, if required. <ul style="list-style-type: none"> Enters router configuration mode.

	Command or Action	Purpose
Step 11	net <i>network-entity-title</i> Example: Router(config-router)# net 47.0004.004d.0001.0001.0c11.1111.00	Configures an IS-IS network entity title (NET) for the routing process.
Step 12	end Example: Router(config-router)# end	(Optional) Saves configuration commands to the running configuration file, exits configuration mode, and returns to privileged EXEC mode.

Excluding Connected IP Prefixes on a Large Scale

This section provides the steps necessary to exclude connected IP prefixes from LSP advertisements in a large network where IS-IS acts as the MPLS backbone.

For a configuration example of this feature where IS-IS acts as the MPLS backbone, see the [“Excluding Connected IP Prefixes on a Large Scale: Example”](#) section on page 30.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface loopback** *number*
4. **ip address** *ip-address netmask*
5. **no ip directed-broadcast**
6. **exit**
7. **interface** *type number*
8. **ip address** *ip-address netmask*
9. **no ip directed-broadcast**
10. **ip router isis** [*area-tag*]
11. **exit**
12. **router isis** *area-tag*
13. **passive-interface** [**default**] *type number*
14. **net** *network-entity-title*
15. **advertise-passive-only**
16. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	interface loopback number Example: Router(config)# interface loopback 0	Configures a loopback interface and enters interface configuration mode.
Step 4	ip address ip-address netmask Example: Router(config-if)# ip address 192.168.10.1 255.255.255.255	Sets a primary IP address for an interface. <ul style="list-style-type: none"> The network mask can be indicated as a 4-part dotted decimal address or as a prefix. This example uses a 4-part dotted decimal number.
Step 5	no ip directed-broadcast Example: Router(config-if)# no ip directed-broadcast	(Optional) Disables the translation of a directed broadcast to physical broadcasts.
Step 6	exit Example: Router(config-if)# exit	Returns to global configuration mode.
Step 7	interface type number Example: Router(config)# interface Ethernet 0	Configures an interface type and enters interface configuration mode.
Step 8	ip address ip-address netmask Example: Router(config-if)# ip address 192.168.20.1 255.255.255.0	Sets a primary IP address for an interface. <ul style="list-style-type: none"> The network mask can be indicated as a 4-part dotted decimal address or as a prefix. This example uses a 4-part dotted decimal number.
Step 9	no ip directed-broadcast Example: Router(config-if)# no ip directed-broadcast	(Optional) Disables the translation of a directed broadcast to physical broadcasts.
Step 10	ip router isis [area-tag] Example: Router(config-if)# ip router isis	Configures an IS-IS routing process for IP on an interface and attaches an area designator to the routing process.

	Command or Action	Purpose
Step 11	exit Example: Router(config-if)# exit	Returns to global configuration mode.
Step 12	router isis [area-tag] Example: Router(config)# router isis	Enables IS-IS as an IP routing protocol and assigns a tag to a process, if required. <ul style="list-style-type: none"> Enters router configuration mode.
Step 13	passive-interface [default] type number Example: Router(config-router)# passive-interface loopback 0	Disables sending routing updates on an interface.
Step 14	net network-entity-title Example: Router(config-router)# net 47.0004.004d.0001.0001.0c11.1111.00	Configures an IS-IS NET for the routing process.
Step 15	advertise-passive-only Example: Router(config-router)# advertise-passive-only	Configures IS-IS to advertise only prefixes that belong to passive interfaces.
Step 16	end Example: Router(config-router)# end	(Optional) Saves configuration commands to the running configuration file, exits configuration mode, and returns to privileged EXEC mode.

Monitoring IS-IS Network Convergence Time

You can use one or more of the following **show** commands to monitor convergence times for your IS-IS network. You do not need to enter the **show** commands in any specific order.

SUMMARY STEPS

- enable**
- configure terminal**
- isis display delimiter** [return count | character count]
- exit**
- show isis database** [level-1] [level-2] [l1] [l2] [detail] [lspid]
- show isis** [area-tag] routes
- show isis** [area-tag] [ipv6 | *] spf-log
- show isis** [process-tag] topology

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	isis display delimiter [return count character count] Example: Router(config)# isis display delimiter return 2	Makes output from multiarea displays easier to read by specifying the delimiter to use to separate displays of information.
Step 4	exit Example: Router(config)# exit	Returns to privileged EXEC mode.
Step 5	show isis database [level-1] [level-2] [11] [12] [detail] [lspid] Example: Router# show isis database detail	Displays the IS-IS link-state database.
Step 6	show isis [area-tag] routes Example: Router# show isis financetag routes	Displays the IS-IS Level 1 forwarding table for IS-IS learned routes.
Step 7	show isis [area-tag] [ipv6 *] spf-log Example: Router# show isis spf-log	Displays how often and why the router has run a full SPF calculation.
Step 8	show isis [process-tag] topology Example: Router# show isis financetag topology	Displays a list of all connected routers in all areas. <ul style="list-style-type: none">• If a process tag is specified, output is limited to the specified routing process. When “null” is specified for the process tag, output is displayed only for the router process that has no tag specified. If a process tag is not specified, output is displayed for all processes.

Examples

The following sample output from the **show isis spf-log** command displays the following important information:

- At what time the SPFs have been executed
- Total elapsed time for the SPT computation, LRIB update, and RIB and FIB update

- Number of nodes in the graph
- Number of triggers that caused the SPF calculation
- Information regarding what triggered the SPF calculation

```
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
```

Configuration Examples for Reducing Alternate-Path Calculation Times in IS-IS Networks

This section contains the following examples:

- [Assigning a High Priority Tag Value to an IS-IS IP Prefix: Example, page 26](#)
- [Tagging Routes for Networks Directly Connected to an Interface and Redistributing Them: Example, page 27](#)
- [Redistributing IS-IS Routes Using a Route Map: Example, page 27](#)
- [Tagging a Summary Address and Applying a Route Map: Example, page 28](#)
- [Filtering and Redistributing IS-IS Routes Using an Access List and a Route Map: Example, page 28](#)
- [IS-IS Limit on Number of Redistributed Routes: Example, page 29](#)
- [Requesting a Warning About the Number of Redistributed Routes: Example, page 29](#)
- [Excluding Connected IP Prefixes on a Small Scale: Example, page 30](#)
- [Excluding Connected IP Prefixes on a Large Scale: Example, page 30](#)

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

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

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

Tagging Routes for Networks Directly Connected to an Interface and Redistributing Them: Example

In this example, two interfaces are tagged with different tag values. By default, these two IP addresses would have been put into the IS-IS Level 1 and Level 2 database. However, by using the **redistribute** command with a route map to match tag 110, only IP address 172.16.10.5 255.255.255.0 is put into the Level 2 database.

```
interface ethernet 1/0
 ip address 192.168.129.1 255.255.255.0
 ip router isis
 isis tag 120
interface ethernet 1/1
 ip address 172.16.10.5 255.255.255.0
 ip router isis
 isis tag 110
router isis
 net 49.0001.0001.0001.0001.00
 redistribute isis ip level-1 into level-2 route-map match-tag
 route-map match-tag permit 10
 match tag 110
```

Redistributing IS-IS Routes Using a Route Map: Example

In a scenario using route tags, you might configure some commands on one router and other commands on another router. For example, you might have a route map that matches on a tag and sets a different tag on a router at the edge of a network, and on different routers you might configure the redistribution of routes based on a tag in a different route map.

Figure 1 Example of Redistributing IS-IS Routes Using a Route Map

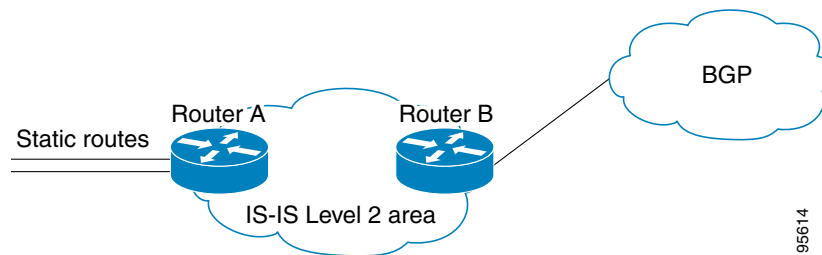


Figure 1 illustrates a flat Level 2 IS-IS area. On the left edge are static routes from Router A to reach some IP prefixes. Router A redistributes the static routes into IS-IS. Router B runs BGP and redistributes IS-IS routes into BGP and then uses the tag to apply different administrative policy based on different tag values.

Router A

```
router isis
 net 49.0000.0000.0001.00
 metric-style wide
 redistribute static ip route-map set-tag
 !
 route-map set-tag permit 5
 set tag 10
```

Router B

```

router bgp 100
 redistribute isis level-2 route-map tag-policy
 route-map tag-policy permit 20
 match tag 10
 set metric 1000

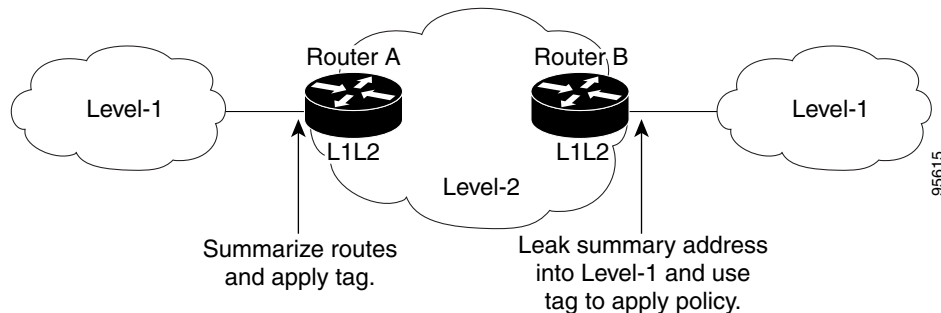
```

Tagging a Summary Address and Applying a Route Map: Example

Figure 2 illustrates two Level 1 areas and one Level 2 area between them. Router A and Router B are Level 1/Level 2 edge routers in the Level 2 area. On edge Router A, a summary address is configured to reduce the number of IP addresses put into the Level 2 IS-IS database. Also, a tag value of 100 is set to the summary address.

On Router B, the summary address is leaked into the Level 1 area, and administrative policy is applied based on the tag value.

Figure 2 Tag on a Summary Address

**Router A**

```

router isis
 net 49.0001.0001.0001.00
 metric-style wide
 summary-address 10.0.0.0 255.0.0.0 tag 100

```

Router B

```

router isis
 net 49.0002.0002.0002.0002.0
 metric-style wide
 redistribute isis ip level-2 into level-1 route-map match-tag
 route-map match-tag permit 10
 match tag 100

```

Filtering and Redistributing IS-IS Routes Using an Access List and a Route Map: Example

In this example, the first **redistribute isis ip** command controls the redistribution of Level 1 routes into Level 2. Only the routes with the tag of 90 and whose IP prefix is not 192.168.130.5/24 will be redistributed from Level 1 into Level 2.

The second **redistribute isis ip** command controls the route leaking from Level 2 into the Level 1 domain. Only the routes tagged with 60 or 50 will be redistributed from Level 2 into Level 1.

```
interface ethernet 1
 ip address 192.168.130.5 255.255.255.0
 ip router isis
 isis tag 60
!
interface ethernet 2
 ip address 192.168.130.15 255.255.255.0
 ip router isis
 isis tag 90
!
interface ethernet 3
 ip address 192.168.130.25 5 255.255.255.0
 ip router isis
 isis tag 50
!
router isis
 net 49.0001.0001.0001.0001.00
 metric-style wide
 redistribute isis ip level-1 into level-2 route-map redist1-2
 redistribute isis ip level-2 into level-1 route-map leak2-1
!
access-list 102 deny ip host 192.168.130.5 host 255.255.255.255
access-list 102 permit ip any any
!
route-map leak2-1 permit 10
 match tag 60
!
route-map leak2-1 permit 20
 match tag 50
!
route-map redist1-2 permit 10
 match ip address 102
 match tag 90
```

IS-IS Limit on Number of Redistributed Routes: Example

This example shows how to set a maximum of 1200 prefixes that can be redistributed into IS-IS. When the number of prefixes redistributed reaches 80 percent of 1200 (960 prefixes), a warning message is logged. When 1200 prefixes are redistributed, IS-IS rebuilds the LSP fragments without external prefixes and no redistribution occurs.

```
router isis 1
 redistribute maximum-prefix 1200 80 withdraw
```

Requesting a Warning About the Number of Redistributed Routes: Example

This example shows how to allow two warning messages to be logged. The first message is generated if the number of prefixes redistributed reaches 85 percent of 600 (510 prefixes), and the second message is generated if the number of redistributed prefixes reaches 600. However, the number of redistributed prefixes is not limited. If the LSPFULL state occurs, external prefixes will be suppressed.

```
router isis 1
 redistribute maximum-prefix 600 85 warning-only
 lsp-full suppress external
```

Excluding Connected IP Prefixes on a Small Scale: Example

The following example uses the **no isis advertise-prefix** command on Ethernet interface 0. Only the IP address of loopback interface 0 is advertised.

```
!
interface loopback 0
 ip address 192.168.10.1 255.255.255.255
 no ip directed-broadcast
!
interface Ethernet 0
 ip address 192.168.20.1 255.255.255.0
 no ip directed-broadcast
 ip router isis
 no isis advertise-prefix
.
.
.
router isis
 passive-interface loopback 0
 net 47.0004.004d.0001.0001.0c11.1111.00
 log-adjacency-changes
!
```

Excluding Connected IP Prefixes on a Large Scale: Example

The following example uses the **advertise-passive-only** command, which applies to the entire IS-IS instance, thereby preventing IS-IS from advertising the IP network of Ethernet interface 0. Only the IP address of loopback interface 0 is advertised.

```
!
interface loopback 0
 ip address 192.168.10.1 255.255.255.255
 no ip directed-broadcast
!

interface Ethernet0
 ip address 192.168.20.1 255.255.255.0
 no ip directed-broadcast
 ip router isis
.
.
.
router isis
 passive-interface Loopback0
 net 47.0004.004d.0001.0001.0c11.1111.00
 advertise-passive-only
 log-adjacency-changes
!
```

Where to Go Next

To configure features to improve IS-IS network convergence times, complete the optional tasks in one or more of the following modules:

- [“Overview of IS-IS Fast Convergence”](#)
- [“Reducing Failure Detection Times in IS-IS Networks”](#)

- [“Reducing Link Failure and Topology Change Notification Times in IS-IS Networks”](#)

Additional References

The following sections provide references related to configuring IS-IS tasks to achieve fast convergence and scalability.

Related Documents

Related Topic	Document Title
Description of IS-IS type length value (TLV) and its use.	Intermediate System-to-Intermediate Systems (IS-IS) TLVs
IS-IS commands: complete command syntax, command mode, defaults, command history, usage guidelines, and examples	Cisco IOS IP Routing Protocols Command Reference
IS-IS route leaking	IS-IS Route Leaking
Roadmap of IS-IS features	“ Integrated IS-IS Features Roadmap ” module
Overview of Cisco IS-IS conceptual information with links to all the individual IS-IS modules	“ Integrated IS-IS Routing Protocol Overview ” module

RFCs

RFC	Title
No new or modified RFCs are supported, and support for existing RFCs has not been modified.	—

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<p>http://www.cisco.com/techsupport</p>

Feature Information for Reducing Alternate-Path Calculation Times in IS-IS Networks

Table 1 lists the features in this module and provides links to specific configuration information. Only features that were introduced or modified in Cisco IOS Release 12.3(2)T, 12.0(22)S, 12.2(18)S, or a later release appear in the table.

For information on a feature in this technology that is not documented here, see the “[Integrated IS-IS Features Roadmap](#)” module.

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

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



Note

Table 1 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 1 *Feature Information for Reducing Alternate-Path Calculation Times in IS-IS Networks*

Feature Name	Releases	Feature Information
IS-IS Caching of Redistributed Routes	12.0(27)S 12.2(25)S 12.3(7)T	<p>The IS-IS Caching of Redistributed Routes feature improves Intermediate System-to-Intermediate System (IS-IS) convergence time when routes are being redistributed into IS-IS. This document introduces new commands for monitoring and maintaining IS-IS redistributed routes.</p> <p>The following section provides information about this feature:</p> <ul style="list-style-type: none"> • IS-IS Caching of Redistributed Routes, page 2 • Monitoring IS-IS Network Convergence Time, page 24
IS-IS Incremental SPF	12.0(24)S 12.2(18)S 12.3(2)T	<p>Integrated IS-IS can be configured to use an incremental SPF algorithm for calculating the shortest path first routes. Incremental SPF is more efficient than the full SPF algorithm, thereby allowing IS-IS to converge faster on a new routing topology in reaction to a network event.</p> <p>The following section provides information about this feature:</p> <ul style="list-style-type: none"> • Configuring Incremental SPF, page 3
IS-IS Limit on Number of Redistributed Routes	12.0(25)S 12.2(18)S 12.3(4)T	<p>The IS-IS Limit on Number of Redistributed Routes feature provides for a user-defined maximum number of prefixes that are allowed to be redistributed into IS-IS from other protocols or other IS-IS processes. Such a limit can help prevent the router from being flooded by too many redistributed routes.</p> <p>The following section provides information about this feature:</p> <ul style="list-style-type: none"> • Limiting the Number of Routes That Are Redistributed into IS-IS, page 15
IS-IS Mechanisms to Exclude Connected IP Prefixes from LSP Advertisements	12.0(22)S 12.2(18)S 12.3(2)T	<p>This document describes two Integrated Intermediate System-to-Intermediate System (IS-IS) mechanisms to exclude IP prefixes of connected networks from link-state PDU (LSP) advertisements, thereby reducing IS-IS convergence time.</p> <p>The following section provides information about this feature:</p> <ul style="list-style-type: none"> • Streamlining the Routing Table Update Process by Excluding Connected IP Prefixes from LSP Advertisements, page 19

Table 1 Feature Information for Reducing Alternate-Path Calculation Times in IS-IS Networks (continued)

Feature Name	Releases	Feature Information
IS-IS Support for Priority-Driven IP Prefix RIB Installation	12.0(26)S 12.2(18)SXE 12.2(25)S 12.3(4)T	<p>The IS-IS Support for Priority-Driven Prefix RIB Installation feature allows customers to designate a subset of IP prefixes advertised by IS-IS for faster processing and installation in the global routing table as one way to achieve faster convergence. For example, Voice over IP (VoIP) gateway addresses may need to be processed first to help VoIP traffic get updated faster than other types of packets.</p> <p>The following section provides information about this feature:</p> <ul style="list-style-type: none"> • Prioritizing the Update of IP Prefixes in the RIB to Reduce Alternate-Path Calculation Time, page 4
IS-IS Support for Route Tags	12.2(18)S 12.2(27)SBC 12.3(2)T	<p>The IS-IS Support for Route Tags feature provides the capability to tag IS-IS route prefixes and use those tags in a route map to control IS-IS route redistribution or route leaking.</p> <p>The following section provides information about this feature:</p> <ul style="list-style-type: none"> • Tagging IS-IS Routes to Control Their Redistribution, page 7

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