



## Configuring Advanced FabricPath Features

This chapter describes how to configure advanced FabricPath features, such as using the Intermediate System-to-Intermediate System (IS-IS) protocol on Cisco NX-OS 5500 Series switches.

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**Note**

For information about prerequisites, guidelines and limitations, and licensing requirements for FabricPath, see [Chapter 1, “Overview.”](#)

## Information About Advanced FabricPath Layer 2 IS-IS Configurations

Layer 2 IS-IS is based on Layer 3 IS-IS with enhancements to run on Layer 2. The commands for Layer 2 IS-IS and Layer 3 IS-IS are not the same. Layer 2 IS-IS is the control plane in FabricPath and a single protocol controls all unicast and multicast traffic. From a forwarding perspective, FabricPath Layer 2 IS-IS forwards traffic for unicast, unknown unicast, broadcast, and multicast frames. Using Layer 2 IS-IS, the software maintains loop-free paths throughout the FabricPath network. For information on default FabricPath Layer 2 IS-IS functionality, see [Chapter 2, “Configuring FabricPath Switching.”](#) For information on FabricPath forwarding, see [Chapter 4, “Configuring FabricPath Forwarding.”](#)

You can use these advanced FabricPath Layer 2 IS-IS configurations to fine-tune the operation of the FabricPath network.

We recommend that you run the FabricPath network using the default Layer 2 IS-IS configurations.

You can change many of the IS-IS settings as follows:

- Globally on the entire switch and on each switch in the FabricPath network
- On specified FabricPath switches within the FabricPath network

If you change any of the FabricPath Layer 2 IS-IS settings, ensure that you make the same changes for those global parameters on every switch in the FabricPath network and for those parameters on every applicable FabricPath switch in the network.

## Overload Bit

IS-IS uses the overload bit to tell other routers to not use the local router to forward traffic but to continue routing traffic destined for that local router.

You can use the overload bit in these situations:

- The router is in a critical condition.
- Graceful introduction and removal of the router to or from the network.
- Other (administrative or traffic engineering) reasons such as waiting for BGP convergence.

The overload bit feature is not backward compatible. For this feature to work properly, all FabricPath switches must support this feature.

You can configure the router to signal other routers not to use this router as an intermediate hop in their shortest path first (SPF) calculations. You can optionally configure the overload bit temporarily on startup until BGP converges.

In addition to setting the overload bit, you might also want to suppress certain types of IP prefix advertisements from LSPs for Level 1 or Level 2 traffic.

## Setting Advanced FabricPath Layer 2 IS-IS Parameters

Although the Layer 2 IS-IS protocol functions automatically after you enable FabricPath you can optionally configure parameters. You globally configure some FabricPath Layer 2 IS-IS parameters and some parameters you configure per switch. This section includes the following topics:

- [Setting Advanced FabricPath Layer 2 IS-IS Parameters Globally, page 5-2](#)
- [Setting Advanced FabricPath Layer 2 IS-IS Parameters per Interface, page 5-7](#)
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## Setting Advanced FabricPath Layer 2 IS-IS Parameters Globally



### Note

Graceful restart of IS-IS is not supported in Cisco 5500 Series Switches. While the `graceful-restart` command exists in the CLI, it is not supported at this time.

### SUMMARY STEPS

1. **configure terminal**
2. **fabricpath domain default**
3. (Optional) **authentication-check**
4. (Optional) **authentication key-chain** *auth-key-chain-name*
5. (Optional) **authentication type** { **cleartext** | **md5** }
6. (Optional) **log-adjacency-changes**
7. (Optional) **lsp-gen-interval** *msecs* [*msecs msecs*]
8. (Optional) **lsp-mtu** *mtu*

9. (Optional) **max-lsp-lifetime** *secs*
10. (Optional) **maximum-paths** *max-paths*
11. (Optional) **reference-bandwidth** {*ref-mbps* [Mbps] | *ref-gbps* [Gbps]}
12. (Optional) **spf-interval** *msecs* [*msecs* *msecs*]
13. (Optional) **topology** *topology number*
14. (Optional) **hostname** *dynamic*
15. (Optional) **root-priority** *value*
16. (Optional) **set-overload-bit** {**always** | **on-start-up** {*seconds* } }
17. **exit**
18. **exit**
19. (Optional) **show running-config**
20. (Optional) **copy running-config startup-config**

## DETAILED STEPS

	Command	Purpose
Step 1	<b>configure terminal</b>  <b>Example:</b> switch# configure terminal	Enters global configuration mode.
Step 2	<b>fabricpath domain default</b>  <b>Example:</b> switch(config)# fabricpath domain default switch(config-fabricpath-isis)#	Enters the global FabricPath Layer 2 IS-IS configuration mode.
Step 3	<b>authentication-check</b>  <b>Example:</b> switch(config-fabricpath-isis)# authentication-check switch(config-fabricpath-isis)#	(Optional) Configures an authentication check when the switch receives a protocol data unit (PDU). To turn the authentication check off, enter the <b>no</b> form of this command.  <b>Note</b> The default is “ON”.

	Command	Purpose
Step 4	<p><b>authentication key-chain</b>  <code>auth-key-chain-name</code></p> <p><b>Example:</b>  <pre>switch(config-fabricpath-isis)# authentication key-chain trees switch(config-fabricpath-isis)#</pre></p>	<p>(Optional) Configures the authentication keychain. To clear this parameter, enter the <b>no</b> form of this command.</p> <p>The maximum size for the name of an authentication keychain is 63 alphanumeric characters.</p> <p>This is an example of keychain creation:</p> <pre>key chain trees   key 0     key-string cisco01     accept-lifetime 07:00:00 Sep 20 2011 infinite   send-lifetime 07:00:00 Sep 20 2011 infinite</pre> <p>See the <i>Cisco Nexus 5500 Series NX-OS Security Configuration Guide, Release 7.x</i> for information about keychains.</p>
Step 5	<p><b>authentication-type {cleartext   md5}</b></p> <p><b>Example:</b>  <pre>switch(config-fabricpath-isis)# authentication-type md5 switch(config-fabricpath-isis)#</pre></p>	<p>(Optional) Configures the authentication type. To clear this parameter, enter the <b>no</b> form of this command.</p> <p>You can set one of the following authentication types:</p> <ul style="list-style-type: none"> <li>• <b>cleartext</b>—Specifies the cleartext authentication method.</li> <li>• <b>md5</b>—Specifies the Message Digest (MD5) authentication.</li> </ul>
Step 6	<p><b>log-adjacency-changes</b></p> <p><b>Example:</b>  <pre>switch(config-fabricpath-isis)# log- adjacency-changes switch(config-fabricpath-isis)#</pre></p>	<p>(Optional) Sets the switch to send a log message when the state of a FabricPath Layer 2 IS-IS neighbor changes. To stop the log messages, enter the <b>no</b> form of this command. The default is “OFF”.</p>

	Command	Purpose
Step 7	<p><b>lsp-gen-interval</b> <i>msecs</i> [<i>msecs msecs</i>]</p> <p><b>Example:</b>  switch(config-fabricpath-isis)# lsp-gen-interval 100  switch(config-fabricpath-isis)#</p>	<p>(Optional) Configures the link-state packet (LSP) generation interval. To return to the default values, enter the <b>no</b> form of this command. The optional parameters are as follows:</p> <ul style="list-style-type: none"> <li>• <b>max-wait</b>—The initial wait between the trigger and LSP generation. The range is from 50 to 120000 milliseconds, and the default value is 8000 milliseconds.</li> <li>• <b>lsp-initial-wait</b>—The initial wait between the trigger and LSP generation. The range is from 50 to 120000 milliseconds, and the default value is 50 milliseconds.</li> <li>• <b>lsp-second-wait</b>—The second wait used for LSP throttle during backoff. The range is from 50 to 120000 milliseconds, and the default value is 50 milliseconds.</li> </ul>
Step 8	<p><b>lsp-mtu</b> <i>mtu</i></p> <p><b>Example:</b>  switch(config-fabricpath-isis)# lsp-mtu 2000  switch(config-fabricpath-isis)#</p>	<p>(Optional) Sets the LSP MTU. To return to the default values, enter the <b>no</b> form of this command. The range is from 128 to 4352, and the default value is 1492.</p>
Step 9	<p><b>max-lsp-lifetime</b> <i>secs</i></p> <p><b>Example:</b>  switch(config-fabricpath-isis)# max-lsp-lifetime 1000  switch(config-fabricpath-isis)#</p>	<p>(Optional) Sets the maximum LSP lifetime in seconds. To return to the default values, enter the <b>no</b> form of this command. The range is from 128 to 4352, and the default value is 1200.</p>
Step 10	<p><b>maximum-paths</b> <i>max-paths</i></p> <p><b>Example:</b>  switch(config-fabricpath-isis)# maximum-paths 4  switch(config-fabricpath-isis)#</p>	<p>(Optional) Sets the maximum number of paths per destination. To return to the default values, enter the <b>no</b> form of this command. The range is from 1 to 16, and the default value is 16.</p>
Step 11	<p><b>reference-bandwidth</b> {<i>ref-mbps</i> [<i>Mbps</i>]   <i>ref-gbps</i> [<i>Gbps</i>]}</p> <p><b>Example:</b>  switch(config-fabricpath-isis)# reference-bandwidth 200000  switch(config-fabricpath-isis)#</p>	<p>(Optional) Configures the reference bandwidth, which is used to assign the FabricPath Layer 2 IS-IS cost. The default value is 400000 Mbps. To return to the default values, enter the <b>no</b> form of this command. The optional parameters are as follows:</p> <ul style="list-style-type: none"> <li>• <b>ref-mbps</b>—The range is from 1 to 4000000, and the default value is 400000.</li> <li>• <b>ref-gbps</b>—The range is from 1 to 4000, and the default value is 400.</li> </ul>

	Command	Purpose
Step 12	<p><b>spf-interval</b> <i>msecs</i> [<i>msecs msecs</i>]</p> <p><b>Example:</b>  switch(config-fabricpath-isis)# spf-interval 10000  switch(config-fabricpath-isis)#</p>	<p>(Optional) Configures the interval between link-state advertisement (LSA) arrivals. To return to the default values, enter the <b>no</b> form of this command. The optional parameters are as follows:</p> <ul style="list-style-type: none"> <li>• <b>spf-max-wait</b>—The maximum wait between the trigger and shortest path first (SPF) computation. The range is from 50 to 120000 milliseconds, and the default value is 8000 milliseconds.</li> <li>• <b>spf-initial-wait</b>—The initial wait between the trigger and SPF computation. The range is from 50 to 120000 milliseconds, and the default value is 50 milliseconds.</li> <li>• <b>spf-second-wait</b>—The second wait used for SPF computation during backoff. The range is from 50 to 120000 milliseconds, and the default value is 50 milliseconds.</li> </ul>
Step 13	<p><b>topology</b> <i>topology number</i></p> <p><b>Example:</b>  switch(config-fabricpath-isis)# topology 1  switch(config-fabricpath-isis)#</p>	<p>(Optional) Configures the topology number. The topology number can be from 1 to 63.</p>
Step 14	<p><b>hostname dynamic</b></p> <p><b>Example:</b>  switch(config-fabricpath-isis)# hostname dynamic  switch(config-fabricpath-isis)#</p>	<p>(Optional) Enables dynamic hostname for the FabricPath Layer 2 IS-IS protocol. To disable the dynamic hostname, enter the <b>no</b> form of this command.</p>
Step 15	<p><b>root-priority</b> <i>value</i></p> <p><b>Example:</b>  switch(config-fabricpath-isis)# root-priority 100  switch(config-fabricpath-isis)#</p>	<p>(Optional) Sets the priority for which node becomes the Layer 2 IS-IS protocol root in the FabricPath network. The highest numerical value for the priority is likely to become the root. To return to the default values, enter the <b>no</b> form of this command. The range is from 1 to 255, and the default value is 64.</p>
Step 16	<p><b>set-overload-bit</b> {<i>always</i>   <i>on-startup</i> {<i>seconds</i>}}</p> <p><b>Example:</b>  switch(config-fabricpath-isis)# set-overload-bit on-startup 30</p>	<p>(Optional) Sets the overload bit for IS-IS. The <i>seconds</i> range is from 5 to 86,400.</p>
Step 17	<p><b>exit</b></p> <p><b>Example:</b>  switch(config-fabricpath-isis)# exit  switch(config)#</p>	<p>Exits global FabricPath Layer 2 IS-IS configuration mode.</p>
Step 18	<p><b>exit</b></p> <p><b>Example:</b>  switch(config)# exit  switch#</p>	<p>Exits global configuration mode.</p>

	Command	Purpose
Step 19	<b>show running-config</b>  <b>Example:</b> switch# show running-config switch#	(Optional) Displays the running configuration.
Step 20	<b>copy running-config startup-config</b>  <b>Example:</b> switch# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

For more information on IS-IS commands, see the *Cisco Nexus 5500 Series NX-OS Unicast Routing Configuration Guide, Release 7.x*.

## Setting Advanced FabricPath Layer 2 IS-IS Parameters per Interface

Although the FabricPath Layer 2 IS-IS protocol works automatically once you enable FabricPath, you can optionally configure the interface parameters.

### SUMMARY STEPS

1. **configure terminal**
2. **interface** { *ethernet mod/slot* | **port-channel** *channel-number* }
3. (Optional) **fabricpath isis authentication-check**
4. (Optional) **fabricpath isis authentication key-chain** *auth-key-chain-name*
5. (Optional) **fabricpath isis authentication type** { **cleartext** | **md5** }
6. (Optional) **fabricpath isis csnp-interval** *seconds*
7. (Optional) **fabricpath isis hello-interval** *seconds*
8. (Optional) **fabricpath isis hello-multiplier** *multiplier*
9. (Optional) **fabricpath isis hello-padding**
10. (Optional) **fabricpath isis lsp-interval** *milliseconds*
11. (Optional) **fabricpath isis metric** *metric*
12. (Optional) **fabricpath isis retransmit-interval** *seconds*
13. (Optional) **fabricpath isis retransmit-throttle- interval** *milliseconds*
14. **exit**
15. (Optional) **show running-config**
16. (Optional) **copy running-config startup-config**

## DETAILED STEPS

	Command	Purpose
Step 1	<b>configure terminal</b>  <b>Example:</b> switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	<b>interface {ethernet mod/slot   port-channel channel-number}</b>  <b>Example:</b> switch(config)# interface ethernet 5/2 switch(config-if)#	Enters interface configuration mode and specifies the interfaces that you want to configure.  The slot can be from 1 to 3. The following list defines the slots available: <ul style="list-style-type: none"> <li>• Slot 1 includes all the fixed ports. A Fabric Extender only has one slot.</li> <li>• Slot 2 includes the ports on the upper expansion module (if populated).</li> <li>• Slot 3 includes the ports on the lower expansion module (if populated).</li> </ul> The port number within a particular slot can be from 1 to 128.  The port channel number assigned to the EtherChannel logical interface can be from 1 to 4096.
Step 3	<b>fabricpath isis authentication-check</b>  <b>Example:</b> switch(config-if)# fabricpath isis authentication-check switch(config-if)#	(Optional) Enables authentication checking on incoming FabricPath Layer 2 IS-IS hello protocol data units (PDUs) for the interface. The default is "ON". To disable authentication, enter the <b>no</b> form of the command.  <b>Note</b> Level specification is not required.



	Command	Purpose
Step 4	<p><b>fabricpath isis authentication key-chain</b> <i>auth-key-chain-name</i></p> <p><b>Example:</b> switch(config-if)# fabricpath isis authentication key-chain trees switch(config-if)#</p>	<p>(Optional) Assigns a password to authentication hello PDUs. To remove this password, enter the <b>no</b> form of the command.</p> <p>The maximum size for the name of an authentication keychain is 63 alphanumeric characters.</p> <p><b>Note</b> Level specification is not required.</p> <p>The following is an example of keychain creation:</p> <pre>key chain trees   key 0     key-string cisco01     accept-lifetime 07:00:00 Sep 20 2011   infinite     send-lifetime 07:00:00 Sep 20 2011   infinite</pre> <p>See the <i>Cisco Nexus 5500 Series NX-OS Security Configuration Guide, Release 7.x</i>, for information about key chains.</p>
Step 5	<p><b>fabricpath isis authentication-type</b> {<b>cleartext</b>   <b>md5</b>}</p> <p><b>Example:</b> switch(config-if)# fabricpath isis authentication-type md5 switch(config-if)#</p>	<p>(Optional) Specifies the authentication type for an interface for FabricPath Layer 2 IS-IS hello PDUs. To remove this type, enter the <b>no</b> form of the command.</p> <p>You can set one of the following authentication types:</p> <ul style="list-style-type: none"> <li>• <b>cleartext</b>—Specifies the cleartext authentication method.</li> <li>• <b>md5</b>—Specifies the Message Digest (MD5) authentication.</li> </ul> <p><b>Note</b> Level specification is not required.</p>
Step 6	<p><b>fabricpath isis csnp-interval</b> <i>seconds</i></p> <p><b>Example:</b> switch(config-if)# fabricpath isis csnp-interval 60 switch(config-if)#</p>	<p>(Optional) Specifies the interval in seconds between Complete Sequence Number (CSNP) PDUs sent on the interface. To return to the default value, enter the <b>no</b> form of this command.</p> <p>The range is from 1 to 65535, and the default value is 10.</p>
Step 7	<p><b>fabricpath isis hello-interval</b> <i>seconds</i></p> <p><b>Example:</b> switch(config-if)# fabricpath isis hello-interval 20 switch(config-if)#</p>	<p>(Optional) Sets the hello interval between PDUs sent on the interface. To return to the default value, enter the <b>no</b> form of this command. The range is from 1 to 65535, and the default value is 10.</p> <p><b>Note</b> Level specification is not required.</p>

	Command	Purpose
Step 8	<p><b>fabricpath isis hello-multiplier</b> <i>multiplier</i></p> <p><b>Example:</b> switch(config-if)# fabricpath isis hello-multiplier 20 switch(config-if)#</p>	<p>(Optional) Specifies the multiplier used to calculate the interval within which hello PDUs must be received or adjacency goes down. To return to the default value, enter the <b>no</b> form of this command. The range is from 3 to 1000. The default is 3.</p> <p><b>Note</b> Level specification is not required.</p>
Step 9	<p><b>fabricpath isis hello-padding</b></p> <p><b>Example:</b> switch(config-if)# fabricpath hello-padding switch(config-if)#</p>	<p>(Optional) Enables padding on the hello PDUs. The default is “ON”. To disable authentication, enter the <b>no</b> form of the command.</p> <p><b>Note</b> If you enter the <b>always</b> keyword with the <b>no</b> form of this command, the padding is always on.</p>
Step 10	<p><b>fabricpath isis lsp-interval</b> <i>milliseconds</i></p> <p><b>Example:</b> switch(config-if)# fabricpath isis lsp-interval 100 switch(config-if)#</p>	<p>(Optional) Sets the interval in milliseconds between link-state packets (LSPs) sent on this interface during flooding. To return to the default value, enter the <b>no</b> form of this command. The range is from 10 to 65535. The default is 33.</p>
Step 11	<p><b>fabricpath isis metric</b> <i>metric</i></p> <p><b>Example:</b> switch(config-if)# fabricpath isis metric 100 switch(config-if)#</p>	<p>(Optional) Configures the FabricPath Layer 2 IS-IS metric for this interface. The range is from 0 to 16777215. To return to the default value, enter the <b>no</b> form of this command. The default values are as follows:</p> <ul style="list-style-type: none"> <li>• 1 GB—400</li> <li>• 10 GB—40</li> </ul>
Step 12	<p><b>fabricpath isis retransmit-interval</b> <i>seconds</i></p> <p><b>Example:</b> switch(config-if)# fabricpath isis retransmit-interval 100 switch(config-if)#</p>	<p>(Optional) Sets the interval between initial LSP retransmissions. To return to the default value, enter the <b>no</b> form of this command. The range is from 1 to 65535. The default is 5.</p>
Step 13	<p><b>fabricpath isis retransmit-throttle-interval</b> <i>milliseconds</i></p> <p><b>Example:</b> switch(config-if)# fabricpath isis retransmit-throttle-interval 100 switch(config-if)#</p>	<p>(Optional) Sets the interval between subsequent LSP retransmissions. To return to the default value, enter the <b>no</b> form of this command. The range is from 20 to 65535. The default is 66.</p>
Step 14	<p><b>exit</b></p> <p><b>Example:</b> switch(config-if)# exit switch(config)#</p>	<p>Exits interface configuration mode.</p>

	Command	Purpose
Step 15	<b>show running-config</b>  <b>Example:</b> switch(config)# show running-config switch(config)#	(Optional) Displays the running configuration.
Step 16	<b>copy running-config startup-config</b>  <b>Example:</b> switch(config)# copy running-config startup-config switch(config)#	(Optional) Copies the running configuration to the startup configuration.

See the *Cisco Nexus 5500 Series NX-OS Unicast Routing Configuration Guide, Release 7.x* and the *Cisco Nexus 5500 Series NX-OS FabricPath Command Reference* for more information on IS-IS commands.

## Clearing Advanced FabricPath Layer 2 IS-IS Counters

### SUMMARY STEPS

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- Step 1** (Optional) **clear fabricpath isis adjacency** [\* | system-id | interface { ethernet *mod/slot* | port-channel *channel-number*}]
  - Step 2** (Optional) **clear fabricpath isis statistics** \*
  - Step 3** (Optional) **clear fabricpath isis traffic** [\* | interface { ethernet *mod/slot* | port-channel *channel-number*}]

## DETAILED STEPS

	Command	Purpose
Step 1	<pre>clear fabricpath isis adjacency [ *   ethernet   port-channel   system-id {ethernet mod/slot   port-channel channel-number   system-id sid}]</pre> <p><b>Example:</b> switch# clear fabricpath isis adjacency switch#</p>	<p>(Optional) Clears the FabricPath Layer 2 IS-IS adjacency state.</p> <ul style="list-style-type: none"> <li>• <b>*</b>—Specifies the IS-IS adjacencies on all interfaces.</li> <li>• <b>ethernet</b>—Specifies the Ethernet interface.</li> <li>• <b>mod/slot</b>—The slot can be from 1 to 6. The port number within a particular slot can be from 1 to 96.</li> <li>• <b>port-channel</b>—Specifies the port channel interface.</li> <li>• <b>channel-number</b>—Port channel number. The range is from 1 to 4096.</li> <li>• <b>system-id</b>—Specifies the system ID.</li> <li>• <b>sid</b>—System ID in the form of XXXX.XXXX.XXXX.</li> </ul> <p><b>Note</b> If you enter the * variable, you affect the forwarding function which might interrupt traffic; this command tears down all adjacencies.</p>
Step 2	<pre>clear fabricpath isis statistics *</pre> <p><b>Example:</b> switch# clear fabricpath isis statistics * switch#</p>	<p>(Optional) Clears all FabricPath Layer 2 IS-IS protocol statistics.</p>
Step 3	<pre>clear fabricpath isis traffic {*   ethernet mod/slot [. sub-int ]   port-channel channel-number}}</pre> <p><b>Example:</b> switch# clear fabricpath traffic switch#</p>	<p>(Optional) Clears FabricPath Layer 2 IS-IS traffic information.</p> <ul style="list-style-type: none"> <li>• <b>*</b>—Specifies the IS-IS adjacencies on all interfaces.</li> <li>• <b>ethernet</b>—Specifies the Ethernet interface.</li> <li>• <b>mod/slot</b>—The slot can be from 1 to 3. The port number within a particular slot can be from 1 to 128.</li> <li>• <b>sub-int</b>—Specifies the subinterface number.</li> <li>• <b>port-channel</b>—Specifies the port channel interface.</li> <li>• <b>channel-number</b>—Port channel number. The range is from 1 to 4096.</li> </ul>

# Multi-Destination Tree

## Information About MDT

The Multi-Destination Tree (MDT) feature removes the restriction of two MDTs per topology and permits a user to configure up to 16 MDTs per topology. This feature allows load-sharing of multicast traffic across different multi-destination trees within a topology, which improves the network performance.

An MDT, also referred to as a Forwarding Tag or FTag, is a spanning tree used for forwarding packets within a topology. By default, a topology has two MDTs FTags: topology 0 has 1 and 2, topology 1 has FTag 3 and 4. In a default configuration, the first ftag of a topology is used for broadcast and unknown unicast. The second is used for multicast only. In addition, multicast traffic might use the first FTag for load sharing.

**Note**

The 256 and 257 FTags are reserved ftags used for a CE VPC topology.

## Guidelines and Limitations for MDT

Configuration and usage of MDT on the Cisco Nexus device needs to follow the following rules:

- **Minimum of maximum MDTs:** A contiguous fabricpath network has the maximum number of multi-destination trees (MDT) configured on every node in the network. Each node advertises the maximum number of trees it can support. The minimum value of the maximum trees across the nodes is used as the final operational count for MDT.

For example, if there are ten switches in a fabricpath network and nine switches are configured with 8 MDTs but the tenth switch is not configured with MDT, then by this rule, the tenth switch advertises its maximum supported trees as two. Each switch has two MDTs, which is the minimum number of MDTs in the fabricpath network.

- **Number of zero rooted trees related to the number of nodes.** The number of multi-destination trees with zero root is equal to the number of MDTs configured minus the number of nodes in the FabricPath network.

For example, if there are three switches in the FabricPath network and each of these switches is configured with 8 MDTs, each switch would have  $(8 - 3 = 5)$  zero rooted trees. Only three trees are used with each node acting as the root for each tree.

- **Maximum number of MDTs per topology**—The maximum number of MDTs supported per topology is 16. If no MDT is configured on a topology, the default of two MDTs takes effect.
- **Total number of MDTs across all topologies**—The maximum number of MDTs supported functionally is 16 across all topologies. For example, if topology-0 has 8 trees, topology-1 is allowed to have a maximum of eight trees functionally.
- You can configure more than two MDTs for topologies 0 and 1.
- **MDT root unreachable**—Root recalculation for the trees is triggered whenever any node in the setup becomes unreachable. This can also affect traffic in the network. For example, if there are four nodes with four MDTs configured with root priority as Node1>Node2>Node3>Node4 and Node 2 (Root for tree 2) reboots, root recalculation is triggered as per the node priority. In this situation, Node 3

becomes root for Tree2, Node 4 becomes root for Tree 3 and Tree 4 will be zero-rooted. Traffic for all the trees whose path went through Node 2 is affected temporarily in this case. The higher the priority of the disabled root, the more traffic is disrupted.

- Number of nodes is less than the number of MDTs—If the MDT configuration changes during run-time causing the number of MDTs configured to be greater than the number of nodes in the network, the root-calculation of traffic is not affected. This adheres to the minimum of maximum rule.

For example, if there are four nodes and four MDTs configured and later the administrator configures eight MDTs on all four nodes, we see four MDTs and the root calculation remains the same.

- Mismatch in MDT configuration in the beginning—If each switch in the FabricPath network has a different number configured as the number of MDTs, again the minimum of maximum rule applies and we see the least number of trees on all nodes.

For example, if there are three switches in the FabricPath network and switch 1 = 3 MDTs, switch 2 = 5 MDTs, switch 3 = 8 MDTs, the total number of MDTs seen on the setup is three.

## Configuring MDT for Default Topology

	Command	Purpose
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	switch(config)# <b>fabricpath domain default</b>	Enters FabricPath IS-IS domain configuration mode.
<b>Step 3</b>	switch(config-fabricpath-isis)# <b>multi-destination trees tree-num</b>	Specifies the number of multi-destination trees for a topology.

## Configuring Per-Topology MDT

You can configure MDT per topology.

	Command	Purpose
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	switch(config)# <b>fabricpath domain default</b>	Enters FabricPath IS-IS domain configuration mode.
<b>Step 3</b>	switch(config-fabricpath-isis)# <b>topology</b> <i>topology number</i>	Specifies the Layer 2 FabricPath topology ID. The range of <i>topology number</i> is from 1 to 63.
<b>Step 4</b>	switch(config-fabricpath-isis-topo)# <b>multi-destination trees tree-num</b>	Specifies the number of multi-destination trees for a topology. The default value is 2.

# Verifying the FabricPath Advanced Configurations

To display FabricPath information for advanced configurations perform one of the following tasks:

Command	Purpose
<b>show fabricpath isis adjacency</b> [ { <b>ethernet mod/slot</b>   <b>port-channel channel-number</b> }   <b>system-id</b>   <b>detail</b>   <b>summary</b> ]	Displays the FabricPath Layer 2 IS-IS adjacency database.
<b>show fabricpath isis database</b> [ <i>level-1</i> ] [ <b>mgroup</b> ] [ <b>detail</b>   <b>summary</b> ] { <b>zero-seq</b>   <b>router-id</b>   <b>adjacency</b> } [ <i>SID.XX-XX</i> ]	Displays the FabricPath Layer 2 IS-IS database.
<b>show fabricpath isis hostname</b> [ <b>detail</b> ]	Displays the FabricPath Layer 2 IS-IS dynamic hostname exchange information.
<b>show fabricpath isis interface</b> [ <b>ethernet mod/slot</b>   <b>port-channel channel-number</b> ] [ <b>brief</b> ]	Displays the FabricPath Layer 2 IS-IS related interface information.
<b>show fabricpath isis route</b> [ <b>summary</b>   <b>detail</b> ]	Displays the FabricPath Layer 2 IS-IS routing table for unicast routes.
<b>show fabricpath isis spf-log</b> [ <b>detail</b> ]	Displays the FabricPath Layer 2 IS-IS SPF calculation statistics.
<b>show fabricpath isis statistics</b>	Displays the FabricPath Layer 2 IS-IS event counters.
<b>show fabricpath isis ftag</b> [ <b>multidestination tree_id</b> ]	Displays the FTag values associated with the trees in the topology.
<b>show fabricpath isis vlan-range</b>	Displays the congruent VLAN-set to topology mapping.
<b>show fabricpath isis trees</b> [ <b>multidestination tree_id</b> ]	Displays the nodes in the trees, reachability to these nodes through a specific interface, and the configured metric.
<b>show fabricpath isis switch-id</b>	Displays the switch IDs and reachability information for the topology.
<b>show fabricpath isis ip redistribute mroute</b> [ <b>vlan vlan-id</b> [ <b>group group-id</b> [ <b>source source-id</b> ]]]	Displays the locally learned multicast routes.
<b>show fabricpath isis ip mroute</b> [ <b>vlan vlan-id</b> [ <b>group group-id</b> [ <b>source source-id</b> ]]]	Displays the multicast routes learned from neighbors.
<b>show fabricpath isis</b> [ <b>protocol</b> ]	Displays the FabricPath Layer 2 IS-IS process level information.
<b>show fabricpath isis rrm</b> [ <b>gm</b> ] { <b>ethernet mod/slot</b>   <b>port-channel channel-number</b> }	Displays the FabricPath Layer 2 IS-IS retransmit-routing-message information.
<b>show fabricpath isis srm</b> [ <b>gm</b> ] { <b>ethernet mod/slot</b>   <b>port-channel channel-number</b> }	Displays the FabricPath Layer 2 IS-IS send-routing-message information.
<b>show fabricpath isis topology summary</b>	Displays the FabricPath Layer 2 IS-IS topology database.

Command	Purpose
<b>show fabricpath isis traffic</b> { <i>ethernet mod/slot</i>   <i>port-channel channel-number</i> }	Displays the FabricPath Layer 2 IS-IS traffic information.
<b>show fabricpath isis ssn</b> [gm] { <i>ethernet mod/slot</i>   <i>port-channel channel-number</i> }	Displays the FabricPath Layer 2 IS-IS send-sequence-number information.
<b>show fabricpath isis topology summary</b>	Displays all the ftags allocated by IS-IS for all configured topologies.
<b>show fabricpath isis trees</b>	Displays the configured topologies and ftags.
<b>show fabricpath ftag</b>	Displays the topo-id, ftag-ids, various ftags flags, allocating system-ids.
<b>show system internal m2rib ftag</b>	Displays the topo-id, ftag-ids, ftag flags and states from M2RIB's point of view.