Reducing Failure Detection Times in IS-IS Networks

This module describes how to customize IS-IS configuration to help you achieve fast convergence in your network. This module describes tasks to optimize how a router that runs IS-IS detects link failures and topology changes, sends important topology change updates to its neighbors, and reacts to the topology change updates that it receives from its neighbors, in order to increase network performance.

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for Reducing Failure Detection Times in IS-IS Networks

You should be familiar with the concepts described in the "Overview of IS-IS Fast Convergence" module.

Information About Reducing Failure Detection Times in IS-IS Networks

IP event dampening introduces a configurable exponential delay mechanism to suppress the effects of excessive interface flapping events on routing protocols and routing tables in the network. This feature allows the network operator to configure a router to automatically identify and selectively dampen a local interface that is flapping, removing it from the network until it becomes stable again. Thus, the network becomes more stable, with a faster convergence time.

Tuning hello parameters should be considered only when the link type does not offer fast enough link failure detection. The standard default values for the hello interval and hello multiplier are 10 seconds and 3 seconds. Therefore, the multiplier times the interval will give a default hold-time of 30 seconds.

Although a slower hello interval saves bandwidth and CPU usage, there are some situations when a faster hello interval is preferred. In the case of a large configuration that uses Traffic Engineering (TE) tunnels, if the TE tunnel uses ISIS as the Interior Gateway Protocol (IGP), and the IP routing process is restarted at the router at the ingress point of the network (headend), then all the TE tunnels get resignaled with the default hello interval. A faster hello interval prevents this resignaling. To configure a faster hello interval, you need to decrease the ISIS hello interval manually using the **isis hello-interval**command.

Configuring a point-to-point adjacency over a broadcast media can improve convergence times of a customer's network because it prevents the system from electing a designated router (DR), prevents flooding from using CSNPs for database synchronization, and simplifies shortest path first (SPF) computations.

Importance of Fast Network Failure Detection

You can customize your IS-IS network to reduce the amount of time it takes for network failures to be discovered. When failures are detected more quickly, networks can react to them sooner and alternate paths can be selected more quickly, speeding up network convergence.

How to Reduce Failure Detection Times in IS-IS Networks

Using IP Event Dampening to Decrease Failure Detection Times

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **dampening** [*half-life-period reuse-threshold*] [*suppress-threshold max-suppress-time* [*restart-penalty*]]
5. **end**
6. **show dampening interface**
7. **show interface dampening**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:**	Enters interface configuration mode.
Step 4	**dampening** [*half-life-period reuse-threshold*] [*suppress-threshold max-suppress-time* [*restart-penalty*]] **Example:** `Device(config-if)# dampening`	Enables interface dampening. • Entering the **dampening** command without any keywords or arguments enables interface dampening with the default configuration parameters. **Note** The default values for the *half-life-period*, *reuse-threshold*, *suppress-threshold*, *max-suppress-time*, and *restart-penalty* arguments are 5, 1000, 2000, 20, and 2000, respectively. • When the timer for the *restart-penalty* argument is manually configured, the values must be manually entered for all arguments.
Step 5	**end** **Example:** `Device(config-if)# end`	Exits interface configuration mode and returns to privileged EXEC mode.
Step 6	**show dampening interface** **Example:** `Device# show dampening interface`	Displays a summary of dampened interfaces.
Step 7	**show interface dampening** **Example:** `Device# show interface dampening`	Displays dampened interfaces on the local router.

Tuning IS-IS Hello Parameters to Decrease Link Failure Detection Times

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *interface-type interface-number*
4. **isis hello-interval** {*seconds* | **minimal**} [**level-1** | **level-2**]
5. **isis hello-multiplier** *multiplier* [**level-1** | **level-2**]
6. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables higher privilege levels, such as privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *interface-type interface-number* **Example:**	Configures an interface type and enters interface configuration mode.
Step 4	**isis hello-interval** {*seconds*	**minimal**} [**level-1**	**level-2**] **Example:** `Device(config-if)# isis hello-interval 5 level-1`	Specifies the length of time between the sending of IS-IS hello PDUs. • The default value is 10. The hello interval multiplied by the hello multiplier equals the hold time. If the minimal keyword is specified, the hold time is 1 second and the system computes the hello interval based on the hello multiplier. • The hello interval can be configured independently for Level 1 and Level 2, except on serial point-to-point interfaces. (Because only a single type of hello PDU is sent on serial links, it is independent of Level 1 or Level 2.) The level-1 and level-2 keywords are used on X.25, SMDS, and Frame Relay multiaccess networks or LAN interfaces.

	Command or Action	Purpose
		Note A faster hello interval gives faster convergence, but increases bandwidth and CPU usage. It might also add to instability in the network, due to false failure detection events. A slower hello interval saves bandwidth and CPU. Especially when used in combination with a higher hello multiplier, this configuration may increase overall network stability, but has typical slower network convergence as a consequence.
Step 5	**isis hello-multiplier** *multiplier* [**level-1** | **level-2**] **Example:** `Device(config-if)# isis hello-multiplier 6 level-1`	Specifies the number of IS-IS hello PDUs a neighbor must miss before the router should declare the adjacency as down. • The default value is 3. A multiplier value of 1 is very aggressive--we recommend a value of at least 3.
Step 6	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.

Configuring an IS-IS Point-to-Point Adjacency over Broadcast Media

Perform this task for IS-IS networks that consist of only two networking devices connected to broadcast media. Such networks are usually configured as a point-to-point link rather than a broadcast link.

Note Having a multipoint interface instead of a point-to-point interface will cause the creation of a pseudonode on the network. The addition of the pseudonode means that the router must retain information about it. To decrease the size of the topology database of the router, thereby reducing the memory requirement of the router and increasing the efficiency of the SPF calculation since there is one less node involved, configure point-to-point interfaces when possible.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *interface-type interface-number*
4. **isis network point-to-point**
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables higher privilege levels, such as privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *interface-type interface-number* **Example:**	Configures an interface type and enters interface configuration mode.
Step 4	**isis network point-to-point** **Example:** `Device(config-if)# isis network point-to-point`	Configures a network of only two networking devices that use broadcast media and the integrated IS-IS routing protocol to function as a point-to-point link instead of a broadcast link.
Step 5	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.

Monitoring IS-IS Network Convergence Time

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **isis display delimiter** [**return** *count* | **character** *count*]
4. **exit**
5. **show isis database** [**level-1**] [**level-2**] [**l1**] [**l2**] [**detail**] [**lspid**]
6. **show isis** [*process-tag*] **route**
7. **show isis spf-log**
8. **show isis** [*process-tag*] **topology**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**isis display delimiter** [**return** *count* | **character** *count*] **Example:** `Device(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:** `Device(config)# exit`	Returns to privileged EXEC mode.
Step 5	**show isis database** [**level-1**] [**level-2**] [**l1**] [**l2**] [**detail**] [**lspid**] **Example:** `Device# show isis database detail`	Displays the IS-IS link-state database.
Step 6	**show isis** [*process-tag*] **route** **Example:** `Device# show isis financetag route`	Displays the IS-IS Level 1 forwarding table for IS-IS learned routes.
Step 7	**show isis spf-log** **Example:** `Device# 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:** `Device# show isis financetag topology`	Displays a list of all connected routers in all areas. • 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.

Configuration Examples for Reducing Failure Detection Times in IS-IS Networks

Example Configuring IS-IS to Achieve Fast Convergence by Reducing Failure Detection Times

The following example configures Ethernet interface 0/0 to use IP event dampening, setting the half life to 30 seconds, the reuse threshold to 1500, the suppress threshold to 10,000, and the maximum suppress time to 120 seconds. The IS-IS hello parameters have also been tuned for more rapid failure detection

```
enable
configure terminal
interface Ethernet 0/0
 dampening 30 1500 10000 120
 isis hello-interval minimal
 isis hello-multiplier 3
```

Where to Go Next

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

- "Setting Best Practice Parameters for IS-IS Fast Convergence"
- "Reducing Link Failure and Topology Change Notification Times in IS-IS Networks"
- "Reducing Alternate-Path Calculation Times in IS-IS Networks"

Additional References

Related Documents

Related Topic	Document Title
IS-IS commands: complete command syntax, command mode, defaults, command history, usage guidelines, and examples	*Cisco IOS IP Routing: ISIS Command Reference*
Overview of Cisco IS-IS conceptual information with links to all the individual IS-IS modules	"Integrated IS-IS Routing Protocol Overview"

Standards

Standard	Title
No new or modified standards are supported, and support for existing standards has not been modified.	--

RFCs

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

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Reducing Failure Detection Times in IS-IS Networks

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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Table 1: Feature Information for Reducing Failure Detection Times in IS-IS Networks

Feature Name	Software Releases	Feature Information
IS-IS Support for BFD over IPv4		Bidirectional Forwarding Detection (BFD) is a detection protocol designed to provide fast forwarding path failure detection times for all media types, encapsulations, topologies, and routing protocols. In addition to fast forwarding path failure detection, BFD provides a consistent failure detection method for network administrators. Because the network administrator can use BFD to detect forwarding path failures at a uniform rate, rather than the variable rates for different routing protocol hello mechanisms, network profiling and planning will be easier, and reconvergence time will be consistent and predictable.
Integrated IS-IS Point-to-Point Adjacency over Broadcast Media		When a network consists of only two networking devices connected to broadcast media and uses the integrated IS-IS protocol, it is better for the system to handle the link as a point-to-point link instead of as a broadcast link. This feature introduces a new command to make IS-IS behave as a point-to-point link between the networking devices.