EIGRP Dynamic Metric Calculations

The EIGRP Dynamic Metric Calculations features enables the Enhanced Interior Gateway Routing Protocol (EIGRP) to use dynamic raw radio-link characteristics (current and maximum bandwidth, latency, and resources) to compute a composite EIGRP metric. A tunable hysteresis mechanism helps to avoid churn in the network as a result of the change in the link characteristics. In addition to the link characteristics, the L2/L3 API provides an indication when a new adjacency is discovered, or an existing unreachable adjacency is again reachable. When the Interior Gateway Routing Protocol (IGRP) receives the adjacency signals, it responds with an immediate Hello out the specified interface to expedite the discovery of the EIGRP peer.

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 EIGRP Dynamic Metric Calculations

Complete the virtual template and the appropriate PPP over Ethernet (PPPoE) configurations before performing this tasks in this module.

Information About EIGRP Dynamic Metric Calculations

Link-Quality Metrics Reporting for EIGRP

The quality of a radio link has a direct impact on the throughput that can be achieved by device-to-device traffic. The PPP over Ethernet (PPPoE) provides a process by which a device can request, or a radio can report, link-quality metric information. With the Cisco Enhanced Interior Gateway Routing Protocol (EIGRP) implementation, the route cost to a neighbor is dynamically updated based on metrics reported by the radio, thus allowing the best route to be chosen within a given set of radio links and reducing the effect of frequent routing changes.

The routing protocols receive raw radio-link data and compute a composite quality metric for each link In computing these metrics, you should consider these factors:

- Maximum data rate--the theoretical maximum data rate of the radio link, in scaled bits per second
- Current data rate--the current data rate achieved on the link, in scaled bits per second
- Resources--a percentage (0 to 100) that can represent the remaining amount of a resource (such as battery power)
- Latency--the transmission delay packets encounter, in milliseconds
- Relative link quality--a numeric value (0 to 100) representing relative quality, with 100 being the highest quality

You can weight metrics during the configuration process to emphasize or deemphasize particular characteristics. For example, if throughput is a particular concern, you can weight the *throughput* metric so that it is factored more heavily into the composite route cost. Similarly, a metric of no concern can be omitted from the composite calculation

Link metrics can change rapidly, often by very small degrees, which can result in a flood of meaningless routing updates. In a worst-case scenario, the network could churn almost continuously as it struggles to react to minor variations in link quality. To alleviate this concern, Cisco provides a tunable dampening mechanism that allows you to configure threshold values. Any metric change that falls below the threshold is ignored. The quality of a connection to a neighbor varies, based on various characteristics of the interface when EIGRP is used as the routing protocol. The routing protocol receives dynamic raw radio-link characteristics and computes a composite metric that is used to reduce the effect of frequent routing changes.

By using the tunable hysteresis mechanism, you can adjust the threshold to the routing changes that occur when the device receives a signal that a new peer has been discovered or that an existing peer is unreachable. The tunable metric is weighted and is adjusted dynamically to account for these characteristics:

- Current and maximum bandwidth
- Latency
- Resources
- Relative link quality (RLQ)

You can deconfigure individual weights, and you can clear all weights so that the cost returns to the default value for the interface type. Based on the routing changes that occur, you can determine the cost by applying these metrics.

EIGRP Cost Metrics for VMIs

When the Enhanced Interior Gateway Routing Protocol (EIGRP) is used as the routing protocol, metrics allow EIGRP to respond to routing changes. The link-state metric is advertised as the link cost in the device link advertisement. The reply sent to any routing query always contains the latest metric information. The exceptions that result in an immediate update being sent are:

- A down interface
- A down route
- Any change in a metric that results in the device selecting a new next hop

EIGRP receives dynamic raw radio-link characteristics and computes a composite EIGRP metric based on a proprietary formula. To avoid churn in the network as a result of the change in the link characteristics, EIGRP uses a tunable dampening mechanism.

EIGRP uses the metric weights along with a set of vector metrics to compute the composite metric for local routing information base (RIB) installation and route selections. The EIGRP composite metric is calculated using the formula:

metric = [K1 * BW + (K2 * BW) / (256 - Load) + K3 * Delay] * [K5 / (Reliability + K4)]

If K5 = 0, the formula reduces to metric = [K1 * BW + (K2 * BW)/(256 - Load) + K3 * Delay]

Note Use K values only after careful planning. Mismatched K values prevent a neighbor relationship from being built, which can cause your network to fail to converge.

The table below lists the EIGRP vector metrics and their descriptions.

Table 1: EIGRP Vector Metrics

Vector Metric	Description
BW	Minimum bandwidth of the route in kb/s. It can be 0 or any positive integer.
Delay	Route delay in tens of microseconds. It can be 0 or any positive number that is a multiple of 39.1 nanoseconds.
Reliability	Likelihood of successful packet transmission expressed as a number from 0 to 255. The value 255 means 100 percent reliability; 0 means no reliability.
Load	Effective load of the route expressed as a number from 0 to 255 (255 is 100 percent loading).
MTU	Minimum maximum transmission unit (MTU) size of the route in bytes. It can be 0 or any positive integer.

EIGRP monitors metric weights on an interface to allow for the tuning of EIGRP metric calculations and indicate the type of service (ToS). The table below lists the K-values and their default.

Table 2: EIGRP K-Value Defaults

Setting	Default Value
K1	1
K2	0
K3	1
K4	0
K5	0

Most configurations use the first two metrics—delay and bandwidth. The default formula of (BW + Delay) is the EIGRP metric. The bandwidth for the formula is scaled and inverted by this formula:

(10^7/minimum BW in kilobits per second)

You can change the weights, but these weights must be the same on all the devices.

For example, look at an EIGRP link where the bandwidth to a particular destination is 128k and the Relative Link Quality (RLQ) is 50 percent.

BW = (256 * 10000000) / 128 = 20000000

Delay = (((10000000000 / 128) * 100) / (50 * 1000)) * 256 = (40000000 / 10) = 4000000

Using the cut-down formula, the EIGRP metric calculation would simplify to 256*(BW + Delay), resulting in the following value:

Metric = (BW + Delay) = 20000000 + 4000000 = 240000000

VMI Metric to EIGRP Metric Conversion

The quality of connection to a virtual multipoint interface (VMI) neighbor varies based on various characteristics computed dynamically based on the feedback from Layer 2 to Layer 3. The table below lists the Enhanced Interior Gateway Routing Protocol (EIGRP) metrics and their significance.

Table 3: EIGRP MANET Metrics for VMI Interfaces

Metric		Significance
Current data rate	uint64_t	The current data rate reported from the radio. EIGRP converts the value into kilobits per second.
Max data rate	uint64_t	The maximum data rate reported from the radio. EIGRP converts the value into kilobits per second.
Latency	unsigned int	The latency computed and reported by the radio in milliseconds.
Resources	unsigned int	The resources computed by the radio. A representation of resources, such as battery power, ranges from 0 to 100. If a radio does not report dynamic resources, the value is always 100.

Metric		Significance
Relative link quality	unsigned int	An opaque number that ranges from 0 to 100 is computed by the radio, representing radio's view of link quality. 0 represents the worst possible link, 100 represents the best possible link.
Link-load	unsigned int	An opaque number that ranges from 0 to 100 is computed by VMI, representing the load on the Ethernet link. 0 represents an idle Ethernet link, 100 represents a fully loaded Ethernet link. Note that this is not associated with the radio link.

The table below shows how these EIGRP vector metric values map to the basic EIGRP interface parameters.

Table 4: Mapping of VMI Metric Values to EIGRP Vector Metrics Values

VMI Metric	EIGRP Metric	Mapping
Current data rate	Bandwidth	Calculated: bandwidth = (256 * 10000000) / (current data rate / 1000)
Relative link quality resources	Reliability	Calculated: reliability = (255 * (relative link quality) / 100)) * (resources / 100)
Current data rate Relative link quality	Delay	Calculated: delay = 256 * (1E10 / (current data rate / 1000)) * ((100 / relative link quality) / 1000) / 10
Load	Load	Calculated: load = ((255 * link-load) / 100)

EIGRP Metric Dampening for VMIs

Rapid changes in metric components can affect the network by requiring that prefixes learned though the virtual multipoint interface (VMI) be updated and sent to all adjacencies. This update can result in further updates and, in a worst-case scenario, cause network-wide churn. To prevent such effects, metrics can be dampened, or thresholds set, so that any change that does not exceed the dampening threshold is ignored.

Network changes that cause an immediate update include

- A down interface
- A down route
- Any change in a metric that results in the device selecting a new next hop

Dampening the metric changes can be configured based on change or time intervals.

If the dampening method is change-based, changes in routes learned though a specific interface, or in the metrics for a specific interface, are not advertised to adjacencies until the computed metric changes from the last advertised value significantly enough to cause an update to be sent.

If this dampening method is interval-based, changes in routes learned though a specific interface, or in the metrics for a specific interface, are not advertised to adjacencies until the specified interval is met, unless the change results in a new route path selection.

When the timer expires, any routes that have outstanding changes to report are sent. If a route changes, such that the final metric of the route matches the last updated metric, no update is sent.

How to Configure EIGRP Dynamic Metric Calculations

Setting the EIGRP Change-based Dampening Interval Using Classic-Style Configuration

Perform this optional task to set the Enhanced Interior Gateway Routing Protocol (EIGRP) change-based dampening interval for virtual multipoint interfaces (VMIs) using classic-style configuration. Configuring the **router eigrp** *autonomous-system-number* command creates an EIGRP configuration referred to as autonomous system (AS) configuration. An EIGRP AS configuration creates an EIGRP routing instance that can be used for tagging routing information.

You can configure this feature with either an IPv4 or an IPv6 address, or you can use both. If you are using both IPv4 and IPv6, complete the entire configuration.

This configuration sets the threshold to 50 percent tolerance for routing updates involving VMIs and peers.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *address mask*
5. **no ip redirects**
6. **no ip split-horizon eigrp** *autonomous-system-number*
7. **ip dampening-change eigrp** *autonomous-system-number percentage*
8. Enter one of the following commands:
   - **ipv6 address** *address*
   - **ipv6 enable**
9. **ipv6 eigrp** *autonomous-system-number*
10. **no ipv6 split-horizon eigrp** *autonomous-system-number*
11. **ipv6 dampening-change eigrp** *autonomous-system-number percentage*
12. **router eigrp** *autonomous-system-number*
13. **network** *address*
14. **ipv6 router eigrp** *autonomous-system-number*
15. **end**

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:** `Device(config)# interface vmi 1`	Enters interface configuration mode and creates a VMI.
Step 4	**ip address** *address mask* **Example:** `Device(config-if)# ip address 209.165.200.225 255.255.255.224`	Specifies the IP address of the VMI.
Step 5	**no ip redirects** **Example:** `Device(config-if)# no ip redirects`	Prevents the device from sending redirects.
Step 6	**no ip split-horizon eigrp** *autonomous-system-number* **Example:** `Device(config-if)# no ip split-horizon eigrp 101`	Disables the EIGRP split horizon.
Step 7	**ip dampening-change eigrp** *autonomous-system-number percentage* **Example:** `Device(config-if)# ip dampening-change eigrp 1 50`	Sets a threshold percentage to minimize or dampen the effect of frequent routing changes for IPv4.
Step 8	Enter one of the following commands: • **ipv6 address** *address* • **ipv6 enable** **Example:** `Device(config-if)# ipv6 address 2001:0DB8::/32` **Example:**	Specifies the IPv6 address. or Enables IPv6 routing on the interface.

	Command or Action	Purpose
	`Device(config-if)# ipv6 enable`	
Step 9	**ipv6 eigrp** *autonomous-system-number* **Example:** `Device(config-if)# ipv6 eigrp 1`	Enables EIGRP for IPv6 on the interface.
Step 10	**no ipv6 split-horizon eigrp** *autonomous-system-number* **Example:** `Device(config-if)# no ipv6 split-horizon eigrp 1`	Disables the sending of IPv6 redirect messages on an interface.
Step 11	**ipv6 dampening-change eigrp** *autonomous-system-number percentage* **Example:** `Device(config-if)# ipv6 dampening-change eigrp 1 30`	Sets a threshold percentage to minimize or dampen the effect of frequent routing changes for IPv6.
Step 12	**router eigrp** *autonomous-system-number* **Example:** `Device(config-if)# router eigrp 1`	Configures the EIGRP address family process and enters router configuration mode.
Step 13	**network** *address* **Example:** `Device(config-router)# network 209.165.200.225`	Configures the network address.
Step 14	**ipv6 router eigrp** *autonomous-system-number* **Example:** `Device(config-router)# ipv6 router eigrp 1`	Configures an EIGRP routing process in IPv6.
Step 15	**end** **Example:** `Device(config-router)# end`	(Optional) Returns to privileged EXEC mode.

Setting the EIGRP Change-based Dampening Interval Using Named-Style Configuration

Perform this optional task to set the Enhanced Interior Gateway Routing Protocol (EIGRP) change-based dampening interval for virtual multipoint interfaces (VMIs) using named-style configuration. Configuring the **router eigrp** *virtual-instance-name* command creates an EIGRP configuration referred to as an EIGRP named configuration. An EIGRP named configuration does not create an EIGRP routing instance by itself.

EIGRP named configuration is a base configuration that is required to define address-family configurations under it that are used for routing.

You can configure this feature with either an IPv4 or an IPv6 address, or you can use both. If you are using both IPv4 and IPv6, then complete the entire configuration.

This configuration sets the threshold to 50 percent tolerance for routing updates involving VMIs and peers.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *address mask*
5. **no ip redirects**
6. Enter one of the following commands:
   - **ipv6 address** *address*
   - **ipv6 enable**
7. **router eigrp** *virtual-instance-name*
8. **address-family ipv4 autonomous-system** *autonomous-system-number*
9. **network** *address*
10. **af-interface** *type number*
11. **dampening-change** *percentage*
12. **exit**
13. **exit**
14. **address-family ipv6 autonomous-system** *autonomous-system-number*
15. **af-interface** *type number*
16. **dampening-change** *percentage*
17. **end**

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:** `Device(config)# interface vmi 1`	Enters interface configuration mode and creates a VMI.

	Command or Action	Purpose
Step 4	**ip address** *address mask* **Example:** `Device(config-if)# ip address 209.165.200.225 255.255.255.224`	Specifies the IP address of the VMI.
Step 5	**no ip redirects** **Example:** `Device(config-if)# no ip redirects`	Prevents the device from sending redirects.

Step 6	Enter one of the following commands:
	• **ipv6 address** *address*
	• **ipv6 enable**
	Example:
	`Device(config-if)# ipv6 address 2001:0DB8::/32`
	Example:
	`Device(config-if)# ipv6 enable`
		Specifies the IPv6 address.
		or
		Enables IPv6 routing on the interface.

Step 7	**router eigrp** *virtual-instance-name* **Example:** `Device(config-if)# router eigrp name`	Enables EIGRP for IPv6 on the interface, and enters router configuration mode.
Step 8	**address-family ipv4 autonomous-system** *autonomous-system-number* **Example:** `Device(config-router)# address-family ipv4 autonomous-system 1`	Enters address family configuration mode to configure an EIGRP routing instance.
Step 9	**network** *address* **Example:** `Device(config-router-af)# network 209.165.200.225`	Configures the network address.
Step 10	**af-interface** *type number* **Example:** `Device(config-router-af)# af-interface vmi 1`	Enters address family interface configuration mode.

	Command or Action	Purpose
Step 11	**dampening-change** *percentage* **Example:** `Device(config-router-af-interface)# dampening-change 50`	Sets a threshold percentage to minimize or dampen the effect of frequent routing changes through an interface in an EIGRP address family.
Step 12	**exit** **Example:** `Device(config-router-af-interface)# exit`	Exits address-family interface configuration mode.
Step 13	**exit** **Example:** `Device(config-router-af)# exit`	Exits address-family configuration mode and enters router configuration mode.
Step 14	**address-family ipv6 autonomous-system** *autonomous-system-number* **Example:** `Device(config-router)# address-family ipv6 autonomous-system 1`	Enters address family configuration mode to configure an EIGRP routing instance for IPv6.
Step 15	**af-interface** *type number* **Example:** `Device(config-router-af)# af-interface vmi 1`	Enters address family interface configuration mode.
Step 16	**dampening-change** *percentage* **Example:** `Device(config-router-af-interface)# dampening-change 50`	Sets a threshold percentage to minimize or dampen the effect of frequent routing changes through an interface.
Step 17	**end** **Example:** `Device(config-router-af-interface)# end`	(Optional) Returns to privileged EXEC mode.

Setting the EIGRP Interval-based Dampening Interval Using Classic-Style Configuration

Perform this optional task to set an Enhanced Interior Gateway Routing Protocol (EIGRP) interval-based dampening interval for virtual multipoint interfaces (VMIs) using classic-style configuration. Configuring the **router eigrp** *autonomous-system-number* command creates an EIGRP configuration referred to as

autonomous system (AS) configuration. An EIGRP AS configuration creates an EIGRP routing instance that can be used for tagging routing information.

This configuration sets the interval to 30 seconds at which updates occur for topology changes that affect VMIs and peers.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *address mask*
5. **no ip redirects**
6. **no ip split-horizon eigrp** *autonomous-system-number*
7. **ip dampening-interval eigrp** *autonomous-system-number interval*
8. Enter one of the following commands:
   - **ipv6 address** *address*
   - **ipv6 enable**
9. **ipv6 eigrp** *autonomous-system-number*
10. **no ipv6 split-horizon eigrp** *autonomous-system-number*
11. **ipv6 dampening-interval eigrp** *autonomous-system-number interval*
12. **router eigrp** *autonomous-system-number*
13. **network** *address*
14. **ipv6 router eigrp** *autonomous-system-number*
15. **end**

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:** `Device(config)# interface vmi 1`	Enters interface configuration mode and creates a VMI.
Step 4	**ip address** *address mask* **Example:**	Specifies the IP address of the VMI.

	Command or Action	Purpose
	`Device(config-if)# ip address 209.165.200.225 255.255.255.224`	
Step 5	**no ip redirects** **Example:** `Device(config-if)# no ip redirect`	Prevents the device from sending redirects.
Step 6	**no ip split-horizon eigrp** *autonomous-system-number* **Example:** `Device(config-if)# no ip split-horizon eigrp 101`	Disables the EIGRP split horizon.
Step 7	**ip dampening-interval eigrp** *autonomous-system-number interval* **Example:** `Device(config-if)# ip dampening-change eigrp 1 30`	Sets a threshold time interval to minimize or dampen the effect of frequent routing changes through an interface.

Step 8	Enter one of the following commands:
	• **ipv6 address** *address*
	• **ipv6 enable**
	Example:
	`Device(config-if)# ipv6 address 2001:0DB8::/32`
	Example:
	`Device(config-if)# ipv6 enable`
		Specifies the IPv6 address.
		or
		Enables IPv6 routing on the interface.

Step 9	**ipv6 eigrp** *autonomous-system-number* **Example:** `Device(config-if)# ipv6 eigrp 1`	Enables EIGRP for IPv6 on the interface.
Step 10	**no ipv6 split-horizon eigrp** *autonomous-system-number* **Example:** `Device(config-if)# no ipv6 split-horizon eigrp 1`	Disables the sending of IPv6 redirect messages on an interface.
Step 11	**ipv6 dampening-interval eigrp** *autonomous-system-number interval* **Example:** `Device(config-if)# ipv6 dampening-interval eigrp 1 30`	Sets a threshold time interval to minimize or dampen the effect of frequent routing changes through an interface.

	Command or Action	Purpose
Step 12	**router eigrp** *autonomous-system-number* **Example:** `Device(config-if)# router eigrp 1`	Configures the EIGRP address family process and enters router configuration mode.
Step 13	**network** *address* **Example:** `Device(config-router)# network 209.165.200.225`	Configures the network address.
Step 14	**ipv6 router eigrp** *autonomous-system-number* **Example:** `Device(config-router)# ipv6 router eigrp 1`	Configures an EIGRP routing process in IPv6.
Step 15	**end** **Example:** `Device(config-router)# end`	(Optional) Returns to privileged EXEC mode.

Setting the EIGRP Interval-based Dampening Interval Using Named-Style Configuration

Perform this optional task to set an Enhanced Interior Gateway Routing Protocol (EIGRP) interval-based dampening interval for virtual multipoint interfaces (VMIs) using named-style configuration. Configuring the **router eigrp eigrp** *virtual-instance-name* command creates an EIGRP configuration referred to as an EIGRP named configuration. An EIGRP named configuration does not create an EIGRP routing instance by itself. EIGRP named configuration is a base configuration that is required to define address-family configurations under it that are used for routing.

This configuration sets the interval to 30 seconds at which updates occur for topology changes that affect VMIs and peers.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *address mask*
5. **no ip redirects**
6. Enter one of the following commands:
   - **ipv6 address** *address*
   - **ipv6 enable**
7. **router eigrp** *virtual-instance-name*
8. **address-family ipv4 autonomous-system** *autonomous-system-number*

9. **network** *address*
10. **af-interface** *type number*
11. **dampening-interval** *interval*
12. **exit**
13. **exit**
14. **address-family ipv6 autonomous-system** *autonomous-system-number*
15. **af-interface** *type number*
16. **dampening-interval** *interval*
17. **end**

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:** `Device(config)# interface vmi 1`	Enters interface configuration mode and creates a VMI.
Step 4	**ip address** *address mask* **Example:** `Device(config-if)# ip address 209.165.200.225 255.255.255.224`	Specifies the IP address of the VMI.
Step 5	**no ip redirects** **Example:** `Device(config-if)# no ip redirects`	Prevents the device from sending redirects.
Step 6	Enter one of the following commands: • **ipv6 address** *address* • **ipv6 enable** **Example:** `Device(config-if)# ipv6 address 2001:0DB8::/32` **Example:**	Specifies the IPv6 address. or Enables IPv6 routing on the interface.

	Command or Action	Purpose
	`Device(config-if)# ipv6 enable`	
Step 7	**router eigrp** *virtual-instance-name* **Example:** `device(config-if)# router eigrp name`	Enables EIGRP for IPv6 on the interface, and enters router configuration mode.
Step 8	**address-family ipv4 autonomous-system** *autonomous-system-number* **Example:** `device(config-router)# address-family ipv4 autonomous-system 1`	Enters address family configuration mode to configure an EIGRP routing instance.
Step 9	**network** *address* **Example:** `device(config-router-af)# network 209.165.200.225`	Configures the network address.
Step 10	**af-interface** *type number* **Example:** `device(config-router-af)# af-interface vmi 1`	Enters address family interface configuration mode.
Step 11	**dampening-interval** *interval* **Example:** `device(config-router-af-interface)# dampening-interval 30`	Sets a threshold time interval to minimize or dampen the effect of frequent routing changes through an interface.
Step 12	**exit** **Example:** `device(config-router-af-interface)# exit`	Exits address family interface configuration mode.
Step 13	**exit** **Example:** `device(config-router-af)# exit`	Exits address family configuration mode and enters the router configuration mode.
Step 14	**address-family ipv6 autonomous-system** *autonomous-system-number* **Example:** `device(config-router)# address-family ipv6 autonomous-system 1`	Enters address family configuration mode to configure an EIGRP routing instance for IPv6.

	Command or Action	Purpose
Step 15	**af-interface** *type number* **Example:** `device(config-router-af)# af-interface vmi 1`	Enters address family interface configuration mode.
Step 16	**dampening-interval** *interval* **Example:** `device(config-router-af-interface)# dampening-interval 30`	Sets a threshold time interval to minimize or dampen the effect of frequent routing changes through an interface.
Step 17	**end** **Example:** `device(config-router-af-interface)# end`	(Optional) Returns to privileged EXEC mode.

Configuration Examples for EIGRP Dynamic Metric Calculations

Example: EIGRP Change-based Dampening for VMIs

The following example configures the Enhanced Interior Gateway Routing Protocol (EIGRP) address-family Ethernet interface 0/0 to limit the metric change frequency to no more than one change in a 45-second interval:

```
Device(config)# router eigrp virtual-name
Device(config-router)# address-family ipv4 autonomous-system 5400
Device(config-router-af)# af-interface ethernet 0/0
Device(config-router-af-interface)# dampening-interval 45
```

Example: EIGRP Interval-based Dampening for VMIs

The following example configures the Enhanced Interior Gateway Routing Protocol (EIGRP) address-family Ethernet interface 0/0 to limit the metric change frequency to no more than one change in a 45-second interval:

```
Device(config)# router eigrp virtual-name
Device(config-router)# address-family ipv4 autonomous-system 5400
Device(config-router-af)# af-interface ethernet 0/0
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Command List, All Releases
Enhanced Interior Gateway Routing Protocol (EIGRP) configuration tasks and commands	*IP Routing: EIGRP Configuration Guide* Cisco IOS IP Routing: EIGRP Command Reference
IPv6 configuration tasks and commands	*IPv6 Configuration Library* Cisco IOS IPv6 Command Reference

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 EIGRP Dynamic Metric Calculations

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.

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.

Table 5: Feature Information for EIGRP Dynamic Metric Calculations

Feature Name	Releases	Feature Information
EIGRP Dynamic Metric Calculations	12.4(15)XF 12.4(15)T 15.0(1)M	The EIGRP Dynamic Metric Calculations features enables the Enhanced Interior Gateway Routing Protocol (EIGRP) to use dynamic raw radio-link characteristics (current and maximum bandwidth, latency, and resources) to compute a composite EIGRP metric. A tunable hysteresis mechanism helps to avoid churn in the network as a result of the change in the link characteristics. In addition to the link characteristics, the L2/L3 API provides an indication when a new adjacency is discovered, or an existing unreachable adjacency is again reachable. When the Interior Gateway Routing Protocol (IGRP) receives the adjacency signals, it responds with an immediate Hello out the specified interface to expedite the discovery of the EIGRP peer. The following commands were introduced or modified: **dampening-change**, **dampening-interval**, **debug eigrp notifications**, **debug vmi**.