

Configuring EIGRP

This chapter describes how to configure the Enhanced Interior Gateway Routing Protocol (EIGRP) on Cisco NX-OS switches.

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Information About EIGRP

EIGRP combines the benefits of distance vector protocols with the features of link-state protocols. EIGRP sends out periodic hello messages for neighbor discovery. Once EIGRP learns a new neighbor, it sends a one-time update of all the local EIGRP routes and route metrics. The receiving EIGRP router calculates the route distance based on the received metrics and the locally assigned cost of the link to that neighbor. After this initial full route table update, EIGRP sends incremental updates to only those neighbors affected by the route change. This process speeds convergence and minimizes bandwidth.

EIGRP Components

EIGRP has the following basic components:

Reliable Transport Protocol

The Reliable Transport Protocol guarantees ordered delivery of EIGRP packets to all neighbors. (See the Neighbor Discovery and Recovery section.) The Reliable Transport Protocol supports the transmission of

unicast packets. This provision helps to ensure that the convergence time remains low for various speed links. See the Configuring Advanced EIGRP section for details about modifying the default timers that control the unicast packet transmissions.

The Reliable Transport Protocol includes the following message types:

- Hello—Used for neighbor discovery and recovery. By default, EIGRP sends a periodic multicast hello message on the local network at the configured hello interval. By default, the hello interval is 5 seconds.
- Acknowledgement—Verifies reliable reception of Updates, Queries, and Replies.
- Updates—Sends to affected neighbors when routing information changes. Updates include the route destination, address mask, and route metrics such as delay and bandwidth. The update information is stored in the EIGRP topology table.
- Queries and Replies—Sent as necessary as part of the Diffusing Update Algorithm used by EIGRP.

Neighbor Discovery and Recovery

EIGRP uses the hello messages from the Reliable Transport Protocol to discover neighboring EIGRP routers on directly attached networks. EIGRP adds neighbors to the neighbor table. The information in the neighbor table includes the neighbor address, the interface it was learned on, and the hold time, which indicates how long EIGRP should wait before declaring a neighbor unreachable. By default, the hold time is three times the hello interval or 15 seconds.

EIGRP sends a series of Update messages to new neighbors to share the local EIGRP routing information. This route information is stored in the EIGRP topology table. After this initial transmission of the full EIGRP route information, EIGRP sends Update messages only when a routing change occurs. These Update messages contain only the new or changed information and are sent only to the neighbors affected by the change. See the EIGRP Route Updates section.

EIGRP also uses the hello messages as a keepalive to its neighbors. As long as hello messages are received, Cisco NX-OS can determine that a neighbor is alive and functioning.

Diffusing Update Algorithm

The Diffusing Update Algorithm (DUAL) calculates the routing information based on the destination networks in the topology table. The topology table includes the following information:

- IPv4 address/mask—The network address and network mask for this destination.
- Successors—The IP address and local interface connection for all feasible successors or neighbors that advertise a shorter distance to the destination than the current feasible distance.
- Feasibility distance (FD)—The lowest calculated distance to the destination. The feasibility distance is the sum of the advertised distance from a neighbor plus the cost of the link to that neighbor.

DUAL uses the distance metric to select efficient, loop-free paths. DUAL selects routes to insert into the unicast Routing Information Base (RIB) based on feasible successors. When a topology change occurs, DUAL looks for feasible successors in the topology table. If there are feasible successors, DUAL selects the feasible successor with the lowest feasible distance and inserts that into the unicast RIB, avoiding unnecessary recomputation.

When there are no feasible successors but there are neighbors advertising the destination, DUAL transitions from the passive state to the active state and triggers a recomputation to determine a new successor or next-hop router to the destination. The amount of time required to recompute the route affects the convergence time.

EIGRP sends Query messages to all neighbors, searching for feasible successors. Neighbors that have a feasible successor send a Reply message with that information. Neighbors that do not have feasible successors trigger a DUAL recomputation.

EIGRP Route Updates

When a topology change occurs, EIGRP sends an Update message with only the changed routing information to affected neighbors. This Update message includes the distance information to the new or updated network destination.

The distance information in EIGRP is represented as a composite of available route metrics, including bandwidth, delay, load utilization, and link reliability. Each metric has an associated weight that determines if the metric is included in the distance calculation. You can configure these metric weights. You can fine-tune link characteristics to achieve optimal paths, but we recommend that you use the default settings for most configurable metrics.

Internal Route Metrics

Internal routes are routes that occur between neighbors within the same EIGRP autonomous system. These routes have the following metrics:

- Next hop—The IP address of the next-hop router.
- Delay—The sum of the delays configured on the interfaces that make up the route to the destination network. Configured in tens of microseconds.
- Bandwidth—The calculation from the lowest configured bandwidth on an interface that is part of the route to the destination.



Note We recommend that you use the default bandwidth value. This bandwidth parameter is also used by EIGRP.

- MTU—The smallest maximum transmission unit value along the route to the destination.
- Hop count—The number of hops or routers that the route passes through to the destination. This metric is not directly used in the DUAL computation.
- Reliability—An indication of the reliability of the links to the destination.
- Load—An indication of how much traffic is on the links to the destination.

By default, EIGRP uses the bandwidth and delay metrics to calculate the distance to the destination. You can modify the metric weights to include the other metrics in the calculation.

External Route Metrics

External routes are routes that occur between neighbors in different EIGRP autonomous systems. These routes have the following metrics:

- Next hop—The IP address of the next-hop router.
- Router ID—The router ID of the router that redistributed this route into EIGRP.
- AS Number—The autonomous system number of the destination.

- Protocol ID—A code that represents the routing protocol that learned the destination route.
- Tag—An arbitrary tag that can be used for route maps.
- Metric—The route metric for this route from the external routing protocol.

EIGRP and the Unicast RIB

EIGRP adds all learned routes to the EIGRP topology table and the unicast RIB. When a topology change occurs, EIGRP uses these routes to search for a feasible successor. EIGRP also listens for notifications from the unicast RIB for changes in any routes redistributed to EIGRP from another routing protocol.

Advanced EIGRP

You can use the advanced features of EIGRP to optimize your EIGRP configuration.

Address Families

EIGRP supports the IPv4 address family.

Address family configuration mode includes the following EIGRP features:

- Authentication
- AS number
- Default route
- Metrics
- Distance
- Graceful restart
- Logging
- Load balancing
- Redistribution
- Router ID
- Stub router
- Timers

You cannot configure the same feature in more than one configuration mode. For example, if you configure the default metric in router configuration mode, you cannot configure the default metric in address family mode

Authentication

You can configure authentication on EIGRP messages to prevent unauthorized or invalid routing updates in your network. EIGRP authentication supports MD5 authentication digest.

You can configure the EIGRP authentication per virtual routing and forwarding (VRF) instance or interface using key-chain management for the authentication keys. Key-chain management allows you to control changes

to the authentication keys used by MD5 authentication digest. See the Cisco Nexus 3548 Switch NX-OS Security Configuration Guide for more details about creating key-chains.

For MD5 authentication, you configure a password that is shared at the local router and all remote EIGRP neighbors. When an EIGRP message is created, Cisco NX-OS creates an MD5 one-way message digest based on the message itself and the encrypted password and sends this digest along with the EIGRP message. The receiving EIGRP neighbor validates the digest using the same encrypted password. If the message has not changed, the calculation is identical and the EIGRP message is considered valid.

MD5 authentication also includes a sequence number with each EIGRP message that is used to ensure that no message is replayed in the network.

Stub Routers

You can use the EIGRP stub routing feature to improve network stability, reduce resource usage, and simplify stub router configuration. Stub routers connect to the EIGRP network through a remote router. See the Stub Routing section.

When using EIGRP stub routing, you need to configure the distribution and remote routers to use EIGRP and configure only the remote router as a stub. EIGRP stub routing does not automatically enable summarization on the distribution router. In most cases, you need to configure summarization on the distribution routers.

Without EIGRP stub routing, even after the routes that are sent from the distribution router to the remote router have been filtered or summarized, a problem might occur. For example, if a route is lost somewhere in the corporate network, EIGRP could send a query to the distribution router. The distribution router could then send a query to the remote router even if routes are summarized. If a problem communicating over the WAN link between the distribution router and the remote router occurs, EIGRP could get stuck in active condition and cause instability elsewhere in the network. EIGRP stub routing allows you to prevent queries to the remote router.

Route Summarization

You can configure a summary aggregate address for a specified interface. Route summarization simplifies route tables by replacing a number of more-specific addresses with an address that represents all the specific addresses. For example, you can replace 10.1.1.0/24, 10.1.2.0/24, and 10.1.3.0/24 with one summary address, 10.1.0.0/16.

If more specific routes are in the routing table, EIGRP advertises the summary address from the interface with a metric equal to the minimum metric of the more specific routes.



Note EIGRP does not support automatic route summarization.

Route Redistribution

You can use EIGRP to redistribute direct routes, static routes, routes learned by other EIGRP autonomous systems, or routes from other protocols. You configure route map with the redistribution to control which routes are passed into EIGRP. A route map allows you to filter routes based on attributes such as the destination, origination protocol, route type, route tag, and so on. See Configuring Route Policy Manager.

You also configure the default metric that is used for all imported routes into EIGRP.

Load Balancing

You can use load balancing to allow a router to distribute traffic over all the router network ports that are the same distance from the destination address. Load balancing increases the utilization of network segments, which increases effective network bandwidth.

Cisco NX-OS supports the Equal Cost Multiple Paths (ECMP) feature with up to 32 equal-cost paths in the EIGRP route table and the unicast RIB. You can configure EIGRP to load balance traffic across some or all of those paths.



Note EIGRP in Cisco NX-OS does not support unequal cost load balancing.



Note In the Cisco Nexus 3548 switch, ECMP is not supported on warp mode.

Split Horizon

You can use split horizon to ensure that EIGRP never advertises a route out of the interface where it was learned.

Split horizon is a method that controls the sending of EIGRP update and query packets. When you enable split horizon on an interface, Cisco NX-OS does not send update and query packets for destinations that were learned from this interface. Controlling update and query packets in this manner reduces the possibility of routing loops.

Split horizon with poison reverse configures EIGRP to advertise a learned route as unreachable back through that the interface that EIGRP learned the route from.

EIGRP uses split horizon or split horizon with poison reverse in the following scenarios:

- Exchanging topology tables for the first time between two routers in startup mode.
- Advertising a topology table change.
- Sending a query message.

By default, the split horizon feature is enabled on all interfaces.

Virtualization Support

Cisco NX-OS supports multiple instances of the EIGRP protocol that runs on the same system. EIGRP supports Virtual Routing and Forwarding instances (VRFs). By default, Cisco NX-OS places you in the default VRF unless you specifically configure another VRF.

By default, every instance uses the same system router ID. You can optionally configure a unique router ID for each instance.

Prerequisites for EIGRP

EIGRP has the following prerequisites:

- You must enable the EIGRP feature (see the Enabling the EIGRP Feature section).

Guidelines and Limitations for EIGRP

EIGRP has the following configuration guidelines and limitations:

- A metric configuration (either through the default-metric configuration option or through a route map) is required for redistribution from any other protocol, connected routes, or static routes (see Configuring Route Policy Manager).
- Cisco NX-OS EIGRP is compatible with EIGRP in the Cisco IOS software.
- Do not change the metric weights without a good reason. If you change the metric weights, you must apply the change to all EIGRP routers in the same autonomous system.
- Consider using stubs for larger networks.
- Avoid redistribution between different EIGRP autonomous systems because the EIGRP vector metric will not be preserved.
- The **no ip next-hop-self** command does not guarantee reachability of the next hop.
- The **ip passive-interface eigrp** command suppresses neighbors from forming.
- Cisco NX-OS does not support IGRP or connecting IGRP and EIGRP clouds.
- Autosummarization is not enabled by default.
- Cisco NX-OS supports only IP.

Note If you are familiar with the Cisco IOS CLI, be aware that the Cisco NX-OS commands for this feature might differ from the Cisco IOS commands that you would use.

Default Settings for EIGRP

Table below lists the default settings for EIGRP parameters.

Table 1: Default EIGRP Parameters

Parameters	Default
Administrative distance	• Internal routes—90 • External routes—170
Bandwidth percent	50 percent

Parameters	Default
Default metric for redistributed routes	• bandwidth—100000 Kb/s • delay—100 (10 microsecond units) • reliability—255 • loading—1 • MTU—1500
EIGRP feature	Disabled
Hello interval	5 seconds
Hold time	15 seconds
Equal-cost paths	8
Metric weights	1 0 1 0 0
Next-hop address advertised	IP address of local interface
Redistribution	Disabled
Split horizon	Enabled

Configuring Basic EIGRP

Enabling the EIGRP Feature

You must enable the EIGRP feature before you can configure EIGRP.

SUMMARY STEPS

1. **configure terminal**
2. **feature eigrp**
3. (Optional) **show feature**
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:**	Enters configuration mode.

	Command or Action	Purpose
	`switch# configure terminal` `switch(config)#`	
Step 2	**feature eigrp** **Example:** `switch(config)# feature eigrp`	Enables the EIGRP feature.
Step 3	(Optional) **show feature** **Example:** `switch(config)# show feature`	Displays information about enabled features.
Step 4	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Saves this configuration change.

Example

Use the **no feature eigrp** command to disable the EIGRP feature and remove all associated configuration.

Command	Purpose
no feature eigrp **Example:** `switch(config)# no feature eigrp`	Disables the EIGRP feature and removes all associated configuration.

Creating an EIGRP Instance

You can create an EIGRP instance and associate an interface with that instance. You assign a unique autonomous system number for this EIGRP process (see the Autonomous Systems section). Routes are not advertised or accepted from other autonomous systems unless you enable route redistribution.

Before you begin

Ensure that you have enabled the EIGRP feature (see the Enabling the EIGRP Feature section).

EIGRP must be able to obtain a router ID (for example, a configured loopback address) or you must configure the router ID option.

If you configure an instance tag that does not qualify as an AS number, you must configure the AS number explicitly or this EIGRP instance will remain in the shutdown state.

SUMMARY STEPS

1. **configure terminal**
2. **router eigrp** *instance-tag*
3. (Optional) **autonomous-system** *as-number*

4. (Optional) **log-adjacency-changes**
5. **log-neighbor-warnings** [*seconds*]
6. **interface** *interface-type slot/port*
7. **no switchport**
8. **ip router eigrp** *instance-tag*
9. (Optional) **copy running-config startup-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters configuration mode.

Step 2	**router eigrp** *instance-tag*
	Example:
	`switch(config)# router eigrp Test1`
	`switch(config-router)#`
		Creates a new EIGRP process with the configured instance tag. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.
		If you configure an *instance-tag* that does not qualify as an AS number, you must use the **autonomous-system** command to configure the AS number explicitly or this EIGRP instance will remain in the shutdown state.

Step 3	(Optional) **autonomous-system** *as-number* **Example:** `switch(config-router)# autonomous-system 33`	Configures a unique AS number for this EIGRP instance. The range is from 1 to 65535.
Step 4	(Optional) **log-adjacency-changes** **Example:** `switch(config-router)# log-adjacency-changes`	Generates a system message whenever an adjacency changes state. This command is enabled by default.
Step 5	**log-neighbor-warnings** [*seconds*] **Example:** `switch(config-router)# log-neighbor-warnings`	Generates a system message whenever a neighbor warning occurs. You can configure the time between warning messages, from 1 to 65535, in seconds. The default is 10 seconds. This command is enabled by default.

Step 6	**interface** *interface-type slot/port*
	Example:
	`switch(config-router)# interface ethernet 1/2`
	`switch(config-if)#`
		Enters interface configuration mode. Use **?** to determine the slot and port ranges.

Step 7	**no switchport** **Example:** `switch(config-if)# no switchport`	Configures the interface as a Layer 3 routed interface.

	Command or Action	Purpose
Step 8	**ip router eigrp** *instance-tag* **Example:** `switch(config-if)# ip router eigrp Test1`	Associates this interface with the configured EIGRP process. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.
Step 9	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Saves this configuration change.

Example

Use the **no router eigrp** command to remove the EIGRP process and the associated configuration.

Command	Purpose
no router eigrp *instance-tag* **Example:** `switch(config)# no router eigrp Test1`	Deletes the EIGRP process and all associated configuration.

Note You should also remove any EIGRP commands configured in interface mode if you remove the EIGRP process.

This example shows how to create an EIGRP process and configure an interface for EIGRP:

```
switch# configure terminal
switch(config)# router eigrp Test1
switch(config)# i nterface ethernet 1/2
switch(config-if)# no switchport
switch(config-if)# ip router eigrp Test1
switch(config-if)# no shutdown
switch(config-if)# copy running-config startup-config
```

For more information about other EIGRP parameters, see the Configuring Advanced EIGRP section.

Restarting an EIGRP Instance

You can restart an EIGRP instance. This clears all neighbors for the instance.

To restart an EIGRP instance and remove all associated neighbors, use the following commands:

Command	Purpose
flush-routes **Example:** `switch(config)# flush-routes`	Flushes all EIGRP routes in the unicast RIB when this EIGRP instance restarts.

Command	Purpose
restart eigrp *instance-tag* **Example:** `switch(config)# restart eigrp Test1`	Restarts the EIGRP instance and removes all neighbors. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.

Shutting Down an EIGRP Instance

You can gracefully shut down an EIGRP instance. This action moves all routes and adjacencies but preserves the EIGRP configuration.

To disable an EIGRP instance, use the following command in router configuration mode:

Command	Purpose
shutdown **Example:** `switch(config-router)# shutdown`	Disables this instance of EIGRP. The EIGRP router configuration remains.

Configuring a Passive Interface for EIGRP

You can configure a passive interface for EIGRP. A passive interface does not participate in EIGRP adjacency but the network address for the interface remains in the EIGRP topology table.

To configure a passive interface for EIGRP, use the following command in interface configuration mode:

Command	Purpose
ip passive-interface eigrp *instance-tag*	Suppresses EIGRP hellos, which prevents neighbors from forming and sending routing updates on an EIGRP interface. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.

Shutting Down EIGRP on an Interface

You can gracefully shut down EIGRP on an interface. This action removes all adjacencies and stops EIGRP traffic on this interface but preserves the EIGRP configuration.

To disable EIGRP on an interface, use the following command in interface configuration mode:

Command	Purpose
ip eigrp *instance-tag shutdown* **Example:** `switch(config-router)# ip eigrp Test1 shutdown`	Disables EIGRP on this interface. The EIGRP interface configuration remains. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.

Configuring Advanced EIGRP

This section includes the following topics:

Configuring Authentication in EIGRP

You can configure authentication between neighbors for EIGRP. See the Authentication section.

You can configure EIGRP authentication for the EIGRP process or for individual interfaces. Interface EIGRP authentication configuration overrides the EIGRP process-level authentication configuration.

Before you begin

Ensure that you have enabled the EIGRP feature (see the Enabling the EIGRP Feature section).

Ensure that all neighbors for an EIGRP process share the same authentication configuration, including the shared authentication key.

Create the key-chain for this authentication configuration. See the Cisco Nexus 3548 Switch NX-OS Security Configuration Guide.

SUMMARY STEPS

1. **configure terminal**
2. **router eigrp** *instance-tag*
3. **address-family ipv4 unicast**
4. **authentication key-chain** *key-chain*
5. **authentication mode md5**
6. **interface** *interface-type slot/port*
7. **no switchport**
8. **ip router eigrp** *instance-tag*
9. **ip authentication key-chain eigrp** *instance-tag key-chain*
10. **ip authentication mode eigrp** *instance-tag* **md5**
11. (Optional) **copy running-config startup-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters configuration mode.

	Command or Action	Purpose

Step 2	**router eigrp** *instance-tag*
	Example:
	`switch(config)# router eigrp Test1`
	`switch(config-router)#`
		Creates a new EIGRP process with the configured instance tag. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.
		If you configure an *instance-tag* that does not qualify as an AS number, you must use the **autonomous-system** command to configure the AS number explicitly or this EIGRP instance will remain in the shutdown state.

Step 3	**address-family ipv4 unicast**
	Example:
	`switch(config-router)# address-family ipv4 unicast`
	`switch(config-router-af)#`
		Enters the address-family configuration mode. This command is optional for IPv4.

Step 4	**authentication key-chain** *key-chain* **Example:** `switch(config-router-af)# authentication key-chain routeKeys`	Associates a key chain with this EIGRP process for this VRF. The key chain can be any case-sensitive, alphanumeric string up to 20 characters.
Step 5	**authentication mode md5** **Example:** `switch(config-router-af)# authentication mode md5`	Configures MD5 message digest authentication mode for this VRF.

Step 6	**interface** *interface-type slot/port*
	Example:
	`switch(config-router-af) interface ethernet 1/2`
	`switch(config-if)#`
		Enters interface configuration mode. Use **?** to find the supported interfaces.

Step 7	**no switchport** **Example:** `switch(config-if)# no switchport`	Configures the interface as a Layer 3 routed interface.
Step 8	**ip router eigrp** *instance-tag* **Example:** `switch(config-if)# ip router eigrp Test1`	Associates this interface with the configured EIGRP process. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.
Step 9	**ip authentication key-chain eigrp** *instance-tag key-chain* **Example:** `switch(config-if)# ip authentication key-chain eigrp Test1 routeKey`	Associates a key chain with this EIGRP process for this interface. This configuration overrides the authentication configuration set in the router VRF mode. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.
Step 10	**ip authentication mode eigrp** *instance-tag* **md5** **Example:** `switch(config-if)# ip authentication mode eigrp Test1 md5`	Configures the MD5 message digest authentication mode for this interface. This configuration overrides the authentication configuration set in the router VRF mode. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.

	Command or Action	Purpose
Step 11	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Saves this configuration change.

Example

This example shows how to configure MD5 message digest authentication for EIGRP over Ethernet interface 1/2:

```
switch# configure terminal
switch(config)# router eigrp Test1
switch(config-router)# exit
switch(config)# interface ethernet 1/2
switch(config-if)# no switchport
switch(config-if)# ip router eigrp Test1
switch(config-if)# ip authentication key-chain eigrp Test1 routeKeys
switch(config-if)# ip authentication mode eigrp Test1 md5
switch(config-if)# copy running-config startup-config
```

Configuring EIGRP Stub Routing

To configure a router for EIGRP stub routing, use the following command in address-family configuration mode:

Command	Purpose
stub [**direct** | **receive-only** | **redistributed** [**direct**] **leak-map** *map-name*] **Example:** `switch(config-router-af)# eigrp stub redistributed`	Configures a remote router as an EIGRP stub router. The leak-map map-name name refers to a configured route-map. Multiple options can be configured at once to enable the desired stub router functionality.

This example shows how to configure a stub router to advertise directly connected and redistributed routes:

```
switch# configure terminal
switch(config)# router eigrp Test1
switch(config-router)# address-family ipv4 unicast
switch(config-router-af)# stub direct redistributed
switch(config-router-af)# copy running-config startup-config
```

Use the show ip eigrp neighbor detail command to verify that a router has been configured as a stub router. The last line of the output shows the stub status of the remote or spoke router. This example shows the output from the **show ip eigrp neighbor detail** command:

```
Router# show ip eigrp neighbor detail
IP-EIGRP neighbors for process 201
H Address Interface Hold Uptime SRTT RTO Q Seq Type
(sec) (ms) Cnt Num
0 10.1.1.2 Se3/1 11 00:00:59 1 4500 0 7
Version 12.1/1.2, Retrans: 2, Retries: 0
Stub Peer Advertising ( CONNECTED SUMMARY) Routes
```

Configuring a Summary Address for EIGRP

You can configure a summary aggregate address for a specified interface. If any more specific routes are in the routing table, EIGRP will advertise the summary address out the interface with a metric equal to the minimum of all more specific routes. See the Route Summarization section.

To configure a summary aggregate address, use the following command in interface configuration mode:

Command	Purpose
ip summary-address eigrp *instance-tag ip-prefix/length* [*distance* | **leak-map** *map-name*] **Example:** `switch(config-if)# ip summary-address eigrp Test1 192.0.2.0/8`	Configures a summary aggregate address as an IP prefix/length. The instance tag and map name can be any case-sensitive, alphanumeric string up to 20 characters which refers to a configured route-map. You can optionally configure the administrative distance for this aggregate address. The default administrative distance is 5 for aggregate addresses. **Note** We recommend that you configure the IP address using the prefix/length format instead of address mask unless EIGRP is already running. If you use the address mask format before the EIGRP instance has started, you will be unable to remove or alter the summary address later.

This example causes EIGRP to summarize network 192.0.2.0 out Ethernet 1/2 only:

```
switch(config)# interface ethernet 1/2
switch(config-if)# no switchport
switch(config-if)# ip summary-address eigrp Test1 192.0.2.0 255.255.255.0
```

Redistributing Routes into EIGRP

Ensure that you have enabled the EIGRP feature (see the Enabling the EIGRP Feature section).

You must configure the metric (either through the default-metric configuration option or through a route map) for routes redistributed from any other protocol.

You must create a route map to control the types of routes that are redistributed into EIGRP. See Configuring Route Policy Manager.

Before you begin

You can redistribute routes in EIGRP from other routing protocols.

SUMMARY STEPS

1. **configure terminal**
2. **router eigrp** *instance-tag*
3. **address-family ipv4 unicast**
4. **redistribute** { **bgp** *as* | { **eigrp** | **ospf** | **ospfv3** | rip } *instance-tag* | **direct** | **static** } **route-map** *name*
5. **default-metric** *bandwidth delay reliability loading mtu*
6. **show ip eigrp route-map statistics redistribute**
7. (Optional) **copy running-config startup-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters configuration mode.

Step 2	**router eigrp** *instance-tag*
	Example:
	`switch(config)# router eigrp Test1`
	`switch(config-router)#`
		Creates a new EIGRP process with the configured instance tag. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.
		If you configure an *instance-tag* that does not qualify as an AS number, you must use the **autonomous-system**command to configure the AS number explicitly or this EIGRP instance will remain in the shutdown state.

Step 3	**address-family ipv4 unicast**
	Example:
	`switch(config-router)# address-family ipv4 unicast`
	`switch(config-router-af)#`
		Enters the address-family configuration mode. This command is optional for IPv4.

Step 4	**redistribute** { **bgp** *as* | { **eigrp** | **ospf** | **ospfv3** | rip } *instance-tag* | **direct** | **static** } **route-map** *name* **Example:** `switch(config-router-af)# redistribute bgp 100 route-map BGPFilter`	Injects routes from one routing domain into EIGRP. The instance tag and map name can be any case-sensitive, alphanumeric string up to 20 characters.
Step 5	**default-metric** *bandwidth delay reliability loading mtu* **Example:** `switch(config-router-af)# default-metric 500000 30 200 1 1500`	Sets the metrics assigned to routes learned through route redistribution. The default values are as follows: • bandwidth—100000 Kb/s • delay—100 (10 microsecond units) • reliability—255 • loading—1 • MTU—1492
Step 6	**show ip eigrp route-map statistics redistribute** **Example:** `switch(config-router-af)# show ip eigrp route-map statistics redistribute bgp`	Displays information about EIGRP route map statistics.
Step 7	(Optional) **copy running-config startup-config** **Example:**	Saves this configuration change.

	Command or Action	Purpose
	`switch(config)# copy running-config startup-config`	

Example

This example shows how to redistribute BGP into EIGRP for IPv4:

```
switch# configure terminal
switch(config)# router eigrp Test1
switch(config-router)# redistribute bgp 100 route-map BGPFilter
switch(config-router)# default-metric 500000 30 200 1 1500
switch(config-router)# copy running-config startup-config
```

Limiting the Number of Redistributed Routes

Route redistribution can add many routes to the EIGRP route table. You can configure a maximum limit to the number of routes accepted from external protocols. EIGRP provides the following options to configure redistributed route limits:

- Fixed limit—Logs a message when EIGRP reaches the configured maximum. EIGRP does not accept any more redistributed routes. You can optionally configure a threshold percentage of the maximum where EIGRP will log a warning when that threshold is passed.
- Warning only—Logs a warning only when EIGRP reaches the maximum. EIGRP continues to accept redistributed routes.
- Withdraw—Start the timeout period when EIGRP reaches the maximum. After the timeout period, EIGRP requests all redistributed routes if the current number of redistributed routes is less than the maximum limit. If the current number of redistributed routes is at the maximum limit, EIGRP withdraws all redistributed routes. You must clear this condition before EIGRP accepts more redistributed routes. You can optionally configure the timeout period.

Before you begin

Be sure the EIGRP feature is enabled (see the Enabling the EIGRP Feature section).

SUMMARY STEPS

1. **configure terminal**
2. **router eigrp** *instance-tag*
3. **redistribute** { **bgp** *id* | **direct** | **eigrp** *id* | **ospf** *id* | **rip** *id* | **static** } **route-map** *map-name*
4. **redistribute maximum-prefix** *max* [*threshold*] [**warning-only** | **withdraw** [*num-retries timeout*]]
5. (Optional) **show running-config eigrp**
6. (Optional) **copy running-config startup-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters configuration mode.

Step 2	**router eigrp** *instance-tag*
	Example:
	`switch(config)# router eigrp Test1`
	`switch(config-router)#`
		Creates a new EIGRP process with the configured instance tag.

Step 3	**redistribute** { **bgp** *id* | **direct** | **eigrp** *id* | **ospf** *id* | **rip** *id* | **static** } **route-map** *map-name* **Example:** `switch(config-router)# redistribute bgp route-map FilterExternalBGP`	Redistributes the selected protocol into EIGRP through the configured route map.
Step 4	**redistribute maximum-prefix** *max* [*threshold*] [**warning-only** | **withdraw** [*num-retries timeout*]] **Example:** `switch(config-router)# redistribute maximum-prefix 1000 75 warning-only`	Specifies a maximum number of prefixes that EIGRP will distribute. The range is from 0 to 65536. Optionally specifies the following: • *threshold* —Percent of maximum prefixes that will trigger a warning message. • **warning-only** —Logs an warning message when the maximum number of prefixes is exceeded. • **withdraw** —Withdraws all redistributed routes. Optionally tries to retrieve the redistributed routes. The *num-retries* range is from 1 to 12. The *timeout* is from 60 to 600 seconds. The default is 300 seconds. Use **clear ip eigrp redistribution** if all routes are withdrawn.
Step 5	(Optional) **show running-config eigrp** **Example:** `switch(config-router)# show running-config eigrp`	Displays the EIGRP configuration.
Step 6	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Saves this configuration change.

Example

This example shows how to limit the number of redistributed routes into EIGRP:

```
switch# configure terminal
switch(config)# router eigrp Test1
switch(config-router)# redistribute bgp route-map FilterExternalBGP
switch(config-router)# redistribute maximum-prefix 1000 75
```

Configuring Load Balancing in EIGRP

You can configure load balancing in EIGRP. You can configure the number of Equal Cost Multiple Path (ECMP) routes using the maximum paths option.

Before you begin

Ensure that you have enabled the EIGRP feature. See the Enabling the EIGRP Feature section.

SUMMARY STEPS

1. **configure terminal**
2. **router eigrp** *instance-tag*
3. **address-family ipv4 unicast**
4. **maximum-paths** *num-paths*
5. (Optional) **copy running-config startup-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters configuration mode.

Step 2	**router eigrp** *instance-tag*
	Example:
	`switch(config)# router eigrp Test1`
	`switch(config-router)#`
		Creates a new EIGRP process with the configured instance tag. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.
		If you configure an *instance-tag* that does not qualify as an autonomous system number, you must use the **autonomous-system** command to configure the autonomous system number explicitly or this EIGRP instance will remain in the shutdown state.

Step 3	**address-family ipv4 unicast** **Example:**	Enters the address-family configuration mode. This command is optional for IPv4.

	Command or Action	Purpose
	`switch(config-router)# address-family ipv4 unicast` `switch(config-router-af)#`	
Step 4	**maximum-paths** *num-paths* **Example:** `switch(config-router-af)# maximum-paths 5`	Sets the number of equal cost paths that EIGRP will accept in the route table. The range is from 1 to 32. The default is 8.
Step 5	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Saves this configuration change.

Example

This example shows how to configure equal cost load balancing for EIGRP over IPv4 with a maximum of six equal cost paths:

```
switch# configure terminal
switch(config)# router eigrp Test1
switch(config-router)# maximum-paths 6
switch(config-router)# copy running-config startup-config
```

Adjusting the Interval Between Hello Packets and the Hold Time

You can adjust the interval between hello messages and the hold time.

By default, hello messages are sent every 5 seconds. The hold time is advertised in hello messages and indicates to neighbors the length of time that they should consider the sender valid. The default hold time is three times the hello interval, or 15 seconds.

To change the interval between hello packets, use the following command in interface configuration mode:

Command	Purpose
ip hello-interval eigrp *instance-tag seconds* **Example:** `switch(config-if)# ip hello-interval eigrp Test1 30`	Configures the hello interval for an EIGRP routing process. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters. The range is from 1 to 65535 seconds. The default is 5.

On very congested and large networks, the default hold time might not be sufficient time for all routers to receive hello packets from their neighbors. In this case, you might want to increase the hold time.

To change the hold time, use the following command in interface configuration mode:

Command	Purpose
ip hold-time eigrp *instance-tag seconds* **Example:** `switch(config-if)# ip hold-time eigrp Test1 30`	Configures the hold time for an EIGRP routing process. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters. The range is from 1 to 65535.

Use the **show ip eigrp interface detail** command to verify timer configuration.

Disabling Split Horizon

You can use split horizon to block route information from being advertised by a router out of any interface from which that information originated. Split horizon usually optimizes communications among multiple routing switches, particularly when links are broken.

By default, split horizon is enabled on all interfaces.

To disable split horizon, use the following command in interface configuration mode:

Command	Purpose
no ip split-horizon eigrp *instance-tag* **Example:** `switch(config-if)# no ip split-horizon eigrp Test1`	Disables split horizon.

Tuning EIGRP

You can configure optional parameters to tune EIGRP for your network.

You can configure the following optional parameters in address-family configuration mode:

Command	Purpose
default-information originate [**always** | **route-map** *map-name*] **Example:** `switch(config-router-af)# default-information originate always`	Originates or accepts the default route with prefix 0.0.0.0/0. When a route map is supplied, the default route is originated only when the route map yields a true condition. The map name can be any case-sensitive, alphanumeric string up to 20 characters.
distance *internal external* **Example** : `switch(config-router-af)# distance 25 100`	Configures the administrative distance for this EIGRP process. The range is from 1 to 255. The internal value sets the distance for routes learned from within the same autonomous system (the default value is 90). The external value sets the distance for routes learned from an external autonomous system (the default value is 170).
metric maximum-hops *hop-count* **Example:** `switch(config-router-af)# metric maximum-hops 70`	Sets maximum allowed hops for an advertised route. Routes over this maximum are advertised as unreachable. The range is from 1 to 255. The default is 100.

Command	Purpose
metric weights *tos k1 k2 k3 k4 k5* **Example:** `switch(config-router-af)# metric weights 0 1 3 2 1 0`	Adjusts the EIGRP metric or K value. EIGRP uses the following formula to determine the total metric to the network: metric = [k1*bandwidth + (k2*bandwidth)/(256 – load) + k3*delay] * [k5/(reliability + k4)] Default values and ranges are as follows: • TOS—0. The range is from 0 to 8. • k1—1. The range is from 0 to 255. • k2—0. The range is from 0 to 255. • k3—1. The range is from 0 to 255. • k4—0. The range is from 0 to 255. • k5—0. The range is from 0 to 255.
timers active-time { *time-limit* | **disabled** } **Example** : `switch(config-router-af)# timers active-time 200`	Sets the time the router waits in minutes (after sending a query) before declaring the route to be stuck in the active (SIA) state. The range is from 1 to 65535. The default is 3.

You can configure the following optional parameters in interface configuration mode:

Command	Purpose
ip bandwidth eigrp *instance-tag bandwidth* **Example:** `switch(config-if)# ip bandwidth eigrp Test1 30000`	Configures the bandwidth metric for EIGRP on an interface. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters. The bandwidth range is from 1 to 2,560,000,000 Kb/s.
ip bandwidth-percent eigrp *instance-tag percent* **Example:** `switch(config-if)# ip bandwidth-percent eigrp Test1 30`	Configures the percentage of bandwidth that EIGRP might use on an interface. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters. The percent range is from 0 to 100. The default is 50.
no ip delay eigrp *instance-tag delay* **Example:** `switch(config-if)# ip delay eigrp Test1 100`	Configures the delay metric for EIGRP on an interface. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters. The delay range is from 1 to 16777215 (in tens of microseconds).

Command	Purpose
ip distribute-list eigrp *instance-tag* { **prefix-list** *name* | **route-map** *name*} { **in** | **out** } **Example:** `switch(config-if)# ip distribute-list eigrp Test1 route-map EigrpTest in`	Configures the route filtering policy for EIGRP on this interface. The instance tag, prefix list name, and route map name can be any case-sensitive, alphanumeric string up to 20 characters.
no ip next-hop-self eigrp *instance-tag* **Example:** `switch(config-if)# ip next-hop-self eigrp Test1`	Configures EIGRP to use the received next-hop address rather than the address for this interface. The default is to use the IP address of this interface for the next-hop address. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.
ip offset-list eigrp *instance-tag* { **prefix-list** *name* | **route-map** *name*} { **in** | **out** } *offset* **Example:** `switch(config-if)# ip offfset-list eigrp Test1 prefix-list EigrpList in`	Adds an offset to incoming and outgoing metrics to routes learned by EIGRP. The instance tag, prefix list name, and route map name can be any case-sensitive, alphanumeric string up to 20 characters.
ip passive-interface eigrp *instance-tag* **Example:** `switch(config-if)# ip passive-interface eigrp Test1`	Suppresses EIGRP hellos, which prevents neighbors from forming and sending routing updates on an EIGRP interface. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.

Configuring Virtualization for EIGRP

You can create multiple VRFs and use the same or multiple EIGRP processes in each VRF. You assign an interface to a VRF.



Note Configure all other parameters for an interface after you configure the VRF for an interface. Configuring a VRF for an interface deletes all other configuration for that interface.

Before you begin

Ensure that you have enabled the EIGRP feature (see the xrefEnabling the EIGRP Feature, on page 8section).

SUMMARY STEPS

1. **configure terminal**
2. **vrf context** *vrf-name*
3. **router eigrp** *instance-tag*
4. **interface ethernet slot/port**
5. **no switchport**

6. **vrf member** *vrf-name*
7. **ip router eigrp** *instance-tag*
8. (Optional) **copy running-config startup-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters configuration mode.

Step 2	**vrf context** *vrf-name*
	Example:
	`switch(config)# vrf context RemoteOfficeVRF`
	`switch(config-vrf)#`
		Creates a new VRF and enters VRF configuration mode. The VRN name can be any case-sensitive, alphanumeric string up to 20 characters.

Step 3	**router eigrp** *instance-tag*
	Example:
	`switch(config)# router eigrp Test1`
	`switch(config-router)#`
		Creates a new EIGRP process with the configured instance tag. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.
		If you configure an *instance-tag* that does not qualify as an AS number, you must use the **autonomous-system**command to configure the AS number explicitly or this EIGRP instance will remain in the shutdown state.

Step 4	**interface ethernet slot/port**
	Example:
	`switch(config)# interface ethernet 1/2`
	`switch(config-if)#`
		Enters interface configuration mode. Use **?** to find the slot and port ranges.

Step 5	**no switchport** **Example:** `switch(config-if)# no switchport`	Configures the interface as a Layer 3 routed interface.
Step 6	**vrf member** *vrf-name* **Example:** `switch(config-if)# vrf member RemoteOfficeVRF`	Adds this interface to a VRF. The VRF name can be any case-sensitive, alphanumeric string up to 20 characters.
Step 7	**ip router eigrp** *instance-tag* **Example:** `switch(config-if)# ip router eigrp Test1`	Adds this interface to the EIGRP process. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.
Step 8	(Optional) **copy running-config startup-config** **Example:**	Saves this configuration change.

	Command or Action	Purpose
	`switch(config)# copy running-config startup-config`	

Example

This example shows how to create a VRF and add an interface to the VRF:

```
switch# configure terminal
switch(config)# vrf context NewVRF
switch(config-vrf)# router eigrp Test1
switch(config-router)# i nterface ethernet 1/2
switch(config-if)# no switchport
switch(config-if)# ip router eigrp Test1
switch(config-if)# vrf member NewVRF
switch(config-if)# copy running-config startup-config
```

Verifying the EIGRP Configuration

To display the EIGRP configuration information, perform one of the following tasks:

Command	Purpose
show ip eigrp [*instance-tag*]	Displays a summary of the configured EIGRP processes.
show ip eigrp [*instance-tag*] **interfaces** [*type number*] [**brief**] [**detail**]	Displays information about all configured EIGRP interfaces.
show ip eigrp *instance-tag* **neighbors** [*type number*]	Displays information about all the EIGRP neighbors. Use this command to verify the EIGRP neighbor configuration.
show ip eigrp [*instance-tag*] **route** [*ip-prefix/length*] [**active**] [**all-links**] [**detail-links**] [**pending**] [**summary**] [**zero-successors**] [**vrf** *vrf-name*]	Displays information about all the EIGRP routes.
show ip eigrp [*instance-tag*] **topology** [*ip-prefix/length*] [**active**] [**all-links**] [**detail-links**] [**pending**] [**summary**] [**zero-successors**] [**vrf** *vrf-name*]	Displays information about the EIGRP topology table.
show running-configuration eigrp	Displays the current running EIGRP configuration.

Displaying EIGRP Statistics

To display EIGRP statistics, use the following commands:

Command	Purpose
show ip eigrp [*instance-tag*] **accounting** [**vrf** *vrf-name*]	Displays accounting statistics for EIGRP.

Command	Purpose
show ip eigrp [*instance-tag*] **route-map statistics redistribute**	Displays redistribution statistics for EIGRP.
show ip eigrp [*instance-tag*] **traffic** [**vrf** *vrf-name*]	Displays traffic statistics for EIGRP.

Configuration Examples for EIGRP

This example shows how to configure EIGRP:

```
feature eigrp
interface ethernet 1/2
no switchport
ip address 192.0.2.55/24
ip router eigrp Test1
no shutdown
router eigrp Test1
router-id 192.0.2.1
```

Related Topics

See Configuring Route Policy Manager for more information on route maps.

Additional References

For additional information related to implementing EIGRP, see the following sections:

- Related Documents
- MIBs

Related Documents

Related Topic	Document Title
EIGRP CLI commands	Cisco Nexus 3000 Series Command Reference
https://www.cisco.com/c/en/us/support/docs/ip/enhanced-interior-gateway-routing-protocol-eigrp/16406-eigrp-toc.html?dtid=osscdc000283	Introduction to EIGRP Tech Note

Related Topic	Document Title
http://www.cisco.com/en/US/tech/tk365/technologies_q_and_a_item09186a008012dac4.shtml	EIGRP Frequently Asked Questions

MIBs

MIBs	MIBs Link
CISCO-EIGRP-MIB	To locate and download MIBs, go to the following: MIB Locator.