



Enhanced Tracking Support

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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 at the end of this module.

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.

Restrictions for Enhanced Object Tracking

Enhanced Object Tracking is not stateful switchover (SSO)-aware and cannot be used with Hot Standby Routing Protocol (HSRP), Virtual Router Redundancy Protocol (VRRP), or Gateway Load Balancing Protocol (GLBP) in SSO mode.

Information About Enhanced Tracking Support

Feature Design of Enhanced Object Tracking

The Enhanced Object Tracking feature provides complete separation between the objects to be tracked and the action to be taken by a client when a tracked object changes. Thus, several clients such as HSRP, VRRP, or GLPB can register their interest with the tracking process, track the same object, and each take different action when the object changes.

Each tracked object is identified by a unique number that is specified on the tracking CLI. Client processes use this number to track a specific object.

The tracking process periodically polls the tracked objects and notes any change of value. The changes in the tracked object are communicated to interested client processes, either immediately or after a specified delay. The object values are reported as either up or down.

You can configure a combination of tracked objects in a list and a flexible method for combining objects using Boolean logic. This functionality includes the following capabilities:

- **Threshold**—The tracked list can be configured to use a weight or percentage threshold to measure the state of the list. Each object in a tracked list can be assigned a threshold weight. The state of the tracked list is determined by whether the threshold has been met.
- **Boolean "and" function**—When a tracked list has been assigned a Boolean "and" function, each object defined within a subset must be in an up state so that the tracked object can become up.
- **Boolean "or" function**—When the tracked list has been assigned a Boolean "or" function, at least one object defined within a subset must be in an up state so that the tracked object can become up.

With CSCtg75700, a maximum of 1000 objects can be tracked. Although 1000 tracked objects can be configured, each tracked object uses CPU resources. The amount of available CPU resources on a router depends on variables such as traffic load and how other protocols are configured and run. The ability to use 1000 tracked objects depends on the available CPU. Testing should be conducted on site to ensure that the service works under the specific site traffic conditions.

Interface State Tracking

An IP-routing object is considered up when the following criteria exist:

- IP routing is enabled and active on the interface.
- The interface line-protocol state is up.
- The interface IP address is known. The IP address is configured or received through Dynamic Host Configuration Protocol (DHCP) or IP Control Protocol (IPCP) negotiation.

Interface IP routing will go down when one of the following criteria exists:

- IP routing is disabled globally.
- The interface line-protocol state is down.

- The interface IP address is unknown. The IP address is not configured or received through DHCP or IPCP negotiation.

Tracking the IP-routing state of an interface using the **track interface ip routing** command can be more useful in some situations than just tracking the line-protocol state using the **track interface line-protocol** command, especially on interfaces for which IP addresses are negotiated. For example, on a serial interface that uses the PPP, the line protocol could be up (link control protocol [LCP] negotiated successfully), but IP could be down (IPCP negotiation failed).

The **track interface ip routing** command supports the tracking of an interface with an IP address acquired through any of the following methods:

- Conventional IP address configuration
- PPP/IPCP
- DHCP
- Unnumbered interface

You can configure Enhanced Object Tracking to consider the carrier-delay timer when tracking the IP-routing state of an interface by using the **carrier-delay** command in tracking configuration mode.

Scaled Route Metrics

The **track ip route** command enables tracking of a route in the routing table. If a route exists in the table, the metric value is converted into a number. To provide a common interface to tracking clients, normalize route metric values to the range from 0 to 255, where 0 is connected and 255 is inaccessible. Scaled metrics can be tracked by setting thresholds. Up and down state notification occurs when the thresholds are crossed. The resulting value is compared against threshold values to determine the tracking state as follows:

- State is up if the scaled metric for that route is less than or equal to the up threshold.
- State is down if the scaled metric for that route is greater than or equal to the down threshold.

Tracking uses a per-protocol configurable resolution value to convert the real metric to the scaled metric. The table below shows the default values used for the conversion. You can use the **track resolution** command to change the metric resolution default values.

Table 1: Metric Conversion

Route Type ¹	Metric Resolution
Static	10
Enhanced Interior Gateway Routing Protocol (EIGRP)	2560
Open Shortest Path First (OSPF)	1
Intermediate System-to-Intermediate System (IS-IS)	10

¹ RIP is scaled directly to the range from 0 to 255 because its maximum metric is less than 255.

For example, a change in 10 in an IS-IS metric results in a change of 1 in the scaled metric. The default resolutions are designed so that approximately one 2-Mbps link in the path will give a scaled metric of 255.

Scaling the very large metric ranges of EIGRP and IS-IS to a 0 to 255 range is a compromise. The default resolutions will cause the scaled metric to exceed the maximum limit with a 2-Mb/s link. However, this scaling allows a distinction between a route consisting of three Fast-Ethernet links and a route consisting of four Fast-Ethernet links.

Benefits of Enhanced Object Tracking

- Increases the availability and speed of recovery of a network.
- Decreases the number of network outages and their duration.
- Enables client processes such as VRRP and GLBP to track objects individually or as a list of objects. Prior to the introduction of this functionality, the tracking process was embedded within HSRP.

How to Configure Enhanced Tracking Support

Tracking the Line-Protocol State of an Interface

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **track timer interface** {seconds | msec milliseconds}
4. **track object-number interface** type number line-protocol
5. **carrier-delay**
6. **delay** {up seconds [down [seconds] | [up seconds] down seconds]}
7. **end**
8. **show track object-number**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.

	Command or Action	Purpose
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	track timer interface { <i>seconds</i> <i>msec milliseconds</i> } Example: Device(config)# track timer interface 5	(Optional) Specifies the interval in which the tracking process polls the tracked object. <ul style="list-style-type: none"> The default interval that the tracking process polls interface objects is 1 second. Note All polling frequencies can be configured down to 500 milliseconds, overriding the minimum 1-second interval configured using the msec keyword and <i>milliseconds</i> argument.
Step 4	track object-number interface type number line-protocol Example: Device(config)# track 3 interface ethernet 0/1 line-protocol	Tracks the line-protocol state of an interface and enters tracking configuration mode.
Step 5	carrier-delay Example: Device(config-track)# carrier-delay	(Optional) Enables EOT to consider the carrier-delay timer when tracking the status of an interface.
Step 6	delay { up <i>seconds</i> [down [<i>seconds</i>] [up <i>seconds</i>] down <i>seconds</i>]} Example: Device(config-track)# delay up 30	(Optional) Specifies a period of time (in seconds) to delay communicating state changes of a tracked object.
Step 7	end Example: Device(config-track)# end	Exits to privileged EXEC mode.
Step 8	show track object-number Example: Device# show track 3	(Optional) Displays tracking information. <ul style="list-style-type: none"> Use this command to verify the configuration.

Example

The following example shows the state of the line protocol on an interface when it is tracked:

```
Device# show track 3

Track 3
  Interface Ethernet0/1 line-protocol
  Line protocol is Up
    1 change, last change 00:00:05
  Tracked by:
    HSRP Ethernet0/3 1
```

Tracking the IP-Routing State of an Interface

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **track timer interface** {seconds | msec milliseconds}
4. **track object-number interface type number ip routing**
5. **carrier-delay**
6. **delay** {up seconds [down seconds] | [up seconds] down seconds}
7. **end**
8. **show track object-number**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	track timer interface {seconds msec milliseconds} Example: Device(config)# track timer interface 5	(Optional) Specifies the interval in which the tracking process polls the tracked object. <ul style="list-style-type: none"> • The default interval that the tracking process polls interface objects is 1 second. <p>Note All polling frequencies can be configured down to 500 milliseconds, overriding the minimum 1-second interval configured using the msec keyword and <i>milliseconds</i> argument.</p>

	Command or Action	Purpose
Step 4	track object-number interface type number ip routing Example: Device(config)# track 1 interface ethernet 0/1 ip routing	Tracks the IP-routing state of an interface and enters tracking configuration mode. <ul style="list-style-type: none"> • IP-route tracking tracks an IP route in the routing table and the ability of an interface to route IP packets.
Step 5	carrier-delay Example: Device(config-track)# carrier-delay	(Optional) Enables EOT to consider the carrier-delay timer when tracking the status of an interface.
Step 6	delay {up seconds [down seconds] [up seconds] down seconds} Example: Device(config-track)# delay up 30	(Optional) Specifies a period of time (in seconds) to delay communicating state changes of a tracked object.
Step 7	end Example: Device(config-track)# end	Returns to privileged EXEC mode.
Step 8	show track object-number Example: Device# show track 1	Displays tracking information. <ul style="list-style-type: none"> • Use this command to verify the configuration.

Example

The following example shows the state of IP routing on an interface when it is tracked:

```
Device# show track 1

Track 1
  Interface Ethernet0/1 ip routing
  IP routing is Up
  1 change, last change 00:01:08
  Tracked by:
    HSRP Ethernet0/3 1
```

Tracking IP-Route Reachability

Perform this task to track the reachability of an IP route. A tracked object is considered up when a routing table entry exists for the route and the route is accessible.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **track timer ip route** {*seconds* | **msec** *milliseconds*}
4. **track object-number ip route** *ip-address/prefix-length* **reachability**
5. **delay** {**up** *seconds* [**down** *seconds*] | [**up** *seconds*] **down** *seconds*}
6. **ip vrf** *vrf-name*
7. **end**
8. **show track** *object-number*

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	track timer ip route { <i>seconds</i> msec <i>milliseconds</i> } Example: Device(config)# track timer ip route 20	(Optional) Specifies the interval in which the tracking process polls the tracked object. <ul style="list-style-type: none"> • The default interval that the tracking process polls IP-route objects is 15 seconds. <p>Note All polling frequencies can be configured down to 500 milliseconds, overriding the minimum 1-second interval configured using the msec keyword and <i>milliseconds</i> argument.</p>
Step 4	track object-number ip route <i>ip-address/prefix-length</i> reachability Example: Device(config)# track 4 ip route 10.16.0.0/16 reachability	Tracks the reachability of an IP route and enters tracking configuration mode.

	Command or Action	Purpose
Step 5	delay { up <i>seconds</i> [down <i>seconds</i>] [up <i>seconds</i>] down <i>seconds</i> } Example: Device(config-track)# delay up 30	(Optional) Specifies a period of time (in seconds) to delay communicating state changes of a tracked object.
Step 6	ip vrf <i>vrf-name</i> Example: Device(config-track)# ip vrf VRF2	(Optional) Configures a VPN routing and forwarding (VRF) table.
Step 7	end Example: Device(config-track)# end	Returns to privileged EXEC mode.
Step 8	show track <i>object-number</i> Example: Device# show track 4	(Optional) Displays tracking information. <ul style="list-style-type: none"> • Use this command to verify the configuration.

Example

The following example shows the state of the reachability of an IP route when it is tracked:

```
Device# show track 4
Track 4
IP route 10.16.0.0 255.255.0.0 reachability
Reachability is Up (RIP)
  1 change, last change 00:02:04
First-hop interface is Ethernet0/1
Tracked by:
  HSRP Ethernet0/3 1
```

Tracking the Threshold of IP-Route Metrics

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **track timer ip route** {*seconds* | **msec** *milliseconds*}
4. **track resolution ip route** {**eigrp** | **isis** | **ospf** | **static**} *resolution-value*
5. **track object-number ip route** *ip-address/prefix-length* **metric threshold**
6. **delay** {**up** *seconds* [**down** *seconds*] | [**up** *seconds*] **down** *seconds*}
7. **ip vrf** *vrf-name*
8. **threshold metric** {**up** *number* [**down** *number*] | **down** *number* [**up** *number*] }
9. **end**
10. **show track object-number**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	track timer ip route { <i>seconds</i> msec <i>milliseconds</i> } Example: Device(config)# track timer ip route 20	(Optional) Specifies the interval in which the tracking process polls the tracked object. <ul style="list-style-type: none"> • The default interval that the tracking process polls IP-route objects is 15 seconds. Note All polling frequencies can be configured down to 500 milliseconds, overriding the minimum 1-second interval configured using the msec keyword and <i>milliseconds</i> argument.
Step 4	track resolution ip route { eigrp isis ospf static } <i>resolution-value</i> Example: Device(config)# track resolution ip route eigrp 300	(Optional) Specifies resolution parameters for a tracked object. <ul style="list-style-type: none"> • Use this command to change the default metric resolution values.

	Command or Action	Purpose
Step 5	<p>track <i>object-number</i> ip route <i>ip-address/prefix-length</i> metric threshold</p> <p>Example:</p> <pre>Device(config)# track 6 ip route 10.16.0.0/16 metric threshold</pre>	<p>Tracks the scaled metric value of an IP route to determine if it is above or below a threshold and enters tracking configuration mode.</p> <ul style="list-style-type: none"> • The default down value is 255, which equates to an inaccessible route. • The default up value is 254.
Step 6	<p>delay {up <i>seconds</i> [down <i>seconds</i>] [up <i>seconds</i>] down <i>seconds</i>}</p> <p>Example:</p> <pre>Device(config-track)# delay up 30</pre>	(Optional) Specifies a period of time (in seconds) to delay communicating state changes of a tracked object.
Step 7	<p>ip vrf <i>vrf-name</i></p> <p>Example:</p> <pre>Device(config-track)# ip vrf VRF1</pre>	(Optional) Configures a VRF table.
Step 8	<p>threshold metric {up <i>number</i> [down <i>number</i>] down <i>number</i> [up <i>number</i>] }</p> <p>Example:</p> <pre>Device(config-track)# threshold metric up 254 down 255</pre>	(Optional) Sets a metric threshold other than the default value.
Step 9	<p>end</p> <p>Example:</p> <pre>Device(config-track)# end</pre>	Exits to privileged EXEC mode.
Step 10	<p>show track <i>object-number</i></p> <p>Example:</p> <pre>Device# show track 6</pre>	<p>(Optional) Displays tracking information.</p> <ul style="list-style-type: none"> • Use this command to verify the configuration.

Example

The following example shows the metric threshold of an IP route when it is tracked:

```
Device# show track 6

Track 6
  IP route 10.16.0.0 255.255.0.0 metric threshold
  Metric threshold is Up (RIP/6/102)
```

```

1 change, last change 00:00:08
Metric threshold down 255 up 254
First-hop interface is Ethernet0/1
Tracked by:
  HSRP Ethernet0/3 1

```

Configuration Examples for Enhanced Tracking Support

Example: Interface Line Protocol

In the following example, the tracking process is configured to track the line-protocol state of GigabitEthernet interface 1/0/0. HSRP on GigabitEthernet interface 0/0/0 then registers with the tracking process to be informed of any changes to the line-protocol state of GigabitEthernet interface 1/0/0. If the line protocol on GigabitEthernet interface 1/0/0 goes down, the priority of the HSRP group is reduced by 10.

Router A Configuration

```

Device(config)# track 100 interface GigabitEthernet1/0/0 line-protocol
!
Device(config)# interface GigabitEthernet0/0/0
Device(config-if)# ip address 10.1.0.21 255.255.0.0
Device(config-if)# standby 1 preempt
Device(config-if)# standby 1 ip 10.1.0.1
Device(config-if)# standby 1 priority 110
Device(config-if)# standby 1 track 100 decrement 10

```

Router B Configuration

```

Device(config)# track 100 interface GigabitEthernet1/0/0 line-protocol
!
Device(config)# interface GigabitEthernet0/0/0
Device(config-if)# ip address 10.1.0.22 255.255.0.0
Device(config-if)# standby 1 preempt
Device(config-if)# standby 1 ip 10.1.0.1
Device(config-if)# standby 1 priority 105
Device(config-if)# standby 1 track 100 decrement 10

```

Example: Interface IP Routing

In the following example, the tracking process is configured to track the IP-routing capability of GigabitEthernet interface 1/0/0. HSRP on GigabitEthernet interface 0/0/0 then registers with the tracking process to be informed of any changes to the IP-routing state of GigabitEthernet interface 1/0/0. If the IP-routing state on GigabitEthernet interface 1/0/0 goes down, the priority of the HSRP group is reduced by 10.

If both serial interfaces are operational, Router A will be the HSRP active router because it has the higher priority. However, if IP on GigabitEthernet interface 1/0/0 in Router A fails, the HSRP group priority will be reduced and Router B will take over as the active router, thus maintaining a default virtual gateway service to hosts on the 10.1.0.0 subnet.

See the figure below for a sample topology.

Figure 1: Topology for IP-Routing Support



Router A Configuration

```
Device(config)# track 100 interface GigabitEthernet1/0/0 ip routing
!
Device(config)# interface GigabitEthernet0/0/0
Device(config-if)# ip address 10.1.0.21 255.255.0.0
Device(config-if)# standby 1 preempt
Device(config-if)# standby 1 ip 10.1.0.1
Device(config-if)# standby 1 priority 110
Device(config-if)# standby 1 track 100 decrement 10
```

Router B Configuration

```
Device(config)# track 100 interface GigabitEthernet1/0/0 ip routing
!
Device(config)# interface GigabitEthernet0/0/0
Device(config-if)# ip address 10.1.0.22 255.255.0.0
Device(config-if)# standby 1 preempt
Device(config-if)# standby 1 ip 10.1.0.1
Device(config-if)# standby 1 priority 105
Device(config-if)# standby 1 track 100 decrement 10
```

Example: IP-Route Reachability

In the following example, the tracking process is configured to track the reachability of IP route 10.2.2.0/24:

Router A Configuration

```
Device(config)# track 100 ip route 10.2.2.0/24 reachability
!
Device(config)# interface GigabitEthernet0/0/0
Device(config-if)# ip address 10.1.1.21 255.255.255.0
Device(config-if)# standby 1 preempt
Device(config-if)# standby 1 ip 10.1.1.1
Device(config-if)# standby 1 priority 110
Device(config-if)# standby 1 track 100 decrement 10
```

Router B Configuration

```
Device(config)# track 100 ip route 10.2.2.0/24 reachability
!
Device(config)# interface GigabitEthernet0/0/0
Device(config-if)# ip address 10.1.1.22 255.255.255.0
Device(config-if)# standby 1 preempt
```

```
Device(config-if)# standby 1 ip 10.1.1.1
Device(config-if)# standby 1 priority 105
Device(config-if)# standby 1 track 100 decrement 10
```

Example: IP-Route Threshold Metric

In the following example, the tracking process is configured to track the threshold metric of IP route 10.2.2.0/24:

Router A Configuration

```
Device(config)# track 100 ip route 10.2.2.0/24 metric threshold
!
Device(config)# interface GigabitEthernet0/0/0
Device(config-if)# ip address 10.1.1.21 255.255.255.0
Device(config-if)# standby 1 preempt
Device(config-if)# standby 1 ip 10.1.1.1
Device(config-if)# standby 1 priority 110
Device(config-if)# standby 1 track 100 decrement 10
```

Router B Configuration

```
Device(config)# track 100 ip route 10.2.2.0/24 metric threshold
!
Device(config)# interface GigabitEthernet0/0/0
Device(config-if)# ip address 10.1.1.22 255.255.255.0
Device(config-if)# standby 1 preempt
Device(config-if)# standby 1 ip 10.1.1.1
Device(config-if)# standby 1 priority 105
Device(config-if)# standby 1 track 100 decrement 10
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
Embedded Event Manager	<i>Embedded Event Manager Overview</i>
HSRP concepts and configuration tasks	<i>Configuring HSRP</i>
GLBP concepts and configuration tasks	<i>Configuring GLBP</i>
IP SLAs commands	<i>Cisco IOS IP SLAs Command Reference</i>
VRRP concepts and configuration tasks	<i>Configuring VRRP</i>
GLBP, HSRP, and VRRP commands	<i>Cisco IOS IP Application Services Command Reference</i>

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

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

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

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
Embedded Event Manager	<i>Embedded Event Manager Overview</i>
HSRP concepts and configuration tasks	<i>Configuring HSRP</i>
GLBP concepts and configuration tasks	<i>Configuring GLBP</i>
IP SLAs commands	<i>Cisco IOS IP SLAs Command Reference</i>
VRRP concepts and configuration tasks	<i>Configuring VRRP</i>
GLBP, HSRP, and VRRP commands	<i>Cisco IOS IP Application Services Command Reference</i>

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

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RFCs

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

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 Enhanced Tracking Support

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 2: Feature Information for Enhanced Tracking Support

Feature Name	Releases	Feature Information
Enhanced Tracking Support	12.2(15)T 12.2(25)S 12.2(28)SB 12.2(33)SRA 12.2(33)SXH Cisco IOS XE Release 2.1 Cisco IOS XE 3.1.0SG	The Enhanced Tracking Support feature separates the tracking mechanism from HSRP and creates a separate standalone tracking process that can be used by other Cisco IOS processes as well as HSRP. This feature allows tracking of other objects in addition to the interface line-protocol state. The following commands were introduced or modified by this feature: debug track , delay tracking , ip vrf , show track , standby track , threshold metric , track interface , track ip route , track timer .

