# IP Routing: ODR Configuration Guide, Cisco IOS XE Gibraltar 16.10.x


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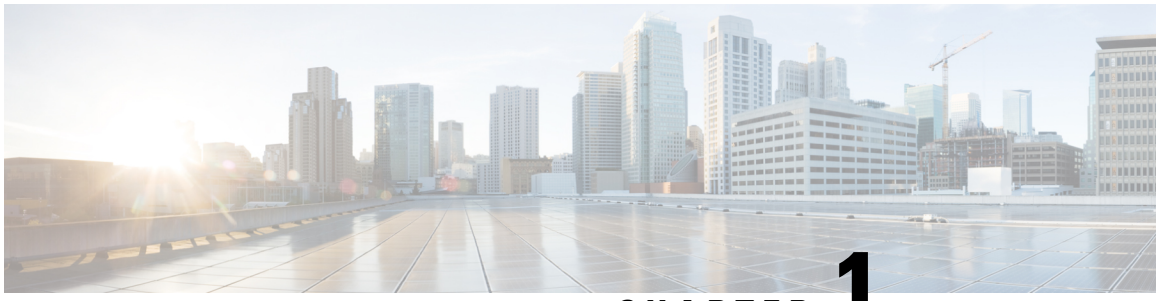


CHAPTER 1

# Read Me First

### Important Information about Cisco IOS XE 16

Effective Cisco IOS XE Release 3.7.0E (for Catalyst Switching) and Cisco IOS XE Release 3.17S (for Access and Edge Routing) the two releases evolve (merge) into a single version of converged release—the Cisco IOS XE 16—providing one release covering the extensive range of access and edge products in the Switching and Routing portfolio.

### Feature Information

Use Cisco Feature Navigator to find information about feature support, platform support, and Cisco software image support. An account on Cisco.com is not required.

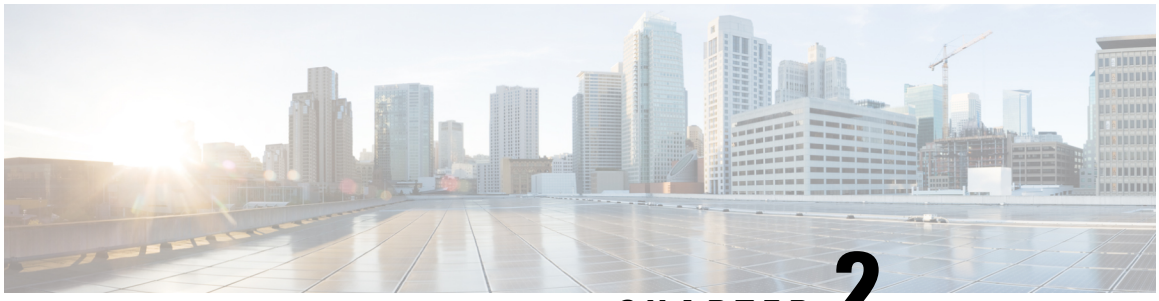
### Related References

- Cisco IOS Command References, All Releases

### Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see What's New in Cisco Product Documentation.

To receive new and revised Cisco technical content directly to your desktop, you can subscribe to the What's New in Cisco Product Documentation RSS feed. RSS feeds are a free service.



CHAPTER 2

# Configuring On-Demand Routing

The On-Demand Routing feature provides IP routing for stub sites, with minimum cost. The cost of a general, dynamic routing protocol is avoided without incurring the configuration and management burden of static routing.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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.

## Prerequisites for Configuring On-Demand Routing

Cisco Discovery Protocol must be enabled.

## Restrictions for Configuring On-Demand Routing

No IP routing protocol can be configured on the stub router.

# Information About On-Demand Routing

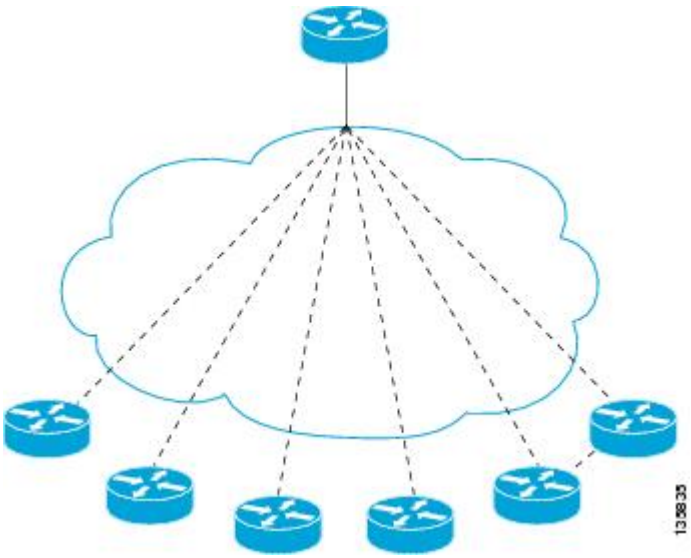
## Benefits of On-Demand Routing

This module describes how to configure On-Demand Routing (ODR). The ODR feature provides IP routing for stub sites, with minimum cost. The cost of a general, dynamic routing protocol is avoided without incurring the configuration and management burden of static routing.

## Stub Networks

A stub router can be considered a spoke router in a hub-and-spoke network topology--as shown in the figure below--where the only router to which the spoke is adjacent is the hub router. In such a network topology, the IP routing information required to represent this topology is fairly simple. These stub routers commonly have a WAN connection to the hub router, and a small number of LAN network segments (stub networks) are directly connected to the stub router. These stub networks might consist only of end systems and the stub router, and therefore do not require the stub router to learn any dynamic IP routing information.

***Figure 1: Hub-And-Spoke Network Topology Example***




## Overview of On-Demand Routing

ODR allows you to easily install IP stub networks where the hubs dynamically maintain routes to the stub networks. This installation is accomplished without requiring the configuration of an IP routing protocol on the stubs. In fact, from the standpoint of ODR, a router is automatically considered to be a stub when no IP routing protocols have been configured.

A stub router that supports the ODR feature advertises IP prefixes corresponding to the IP networks configured on all directly connected interfaces. If the interface has multiple logical IP networks configured, only the primary IP network is advertised through ODR. Because ODR advertises IP prefixes and not simply IP network numbers, ODR is able to carry variable-length subnet mask (VLSM) information.

Once ODR is enabled on a hub router, the hub router begins installing stub network routes in the IP forwarding table. The hub router also can be configured to redistribute these routes into any configured dynamic IP routing protocols.

ODR uses the Cisco Discovery Protocol to carry minimal routing information between the hub and stub routers. The stub routers send IP prefixes to the hub router. The hub router provides default route information to the stub routers, thereby eliminating the need to configure a default route on each stub router.

# How to Configure On-Demand Routing

## Enabling ODR

Once ODR is enabled on a hub router, the hub router begins installing stub network routes in the IP forwarding table. The hub router also can be configured to redistribute these routes into any configured dynamic IP routing protocols.

To enable ODR on a hub router, perform the steps in this task.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router odr**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>• Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| **Step 3** | **router odr**<br>**Example:**<br>`Router(config)# router odr` | Enables ODR on a Cisco router, and places the router in router configuration mode. |

## Disabling the Propagation of ODR Stub Routing Information

ODR uses Cisco Discovery Protocol to carry minimal routing information between the hub and stub routers, allowing stub routers to send IP prefixes to the hub router. Perform the steps in this task to disable the propagation of ODR stub routing information by disabling CDP.

**SUMMARY STEPS**

1. **enable**
2. **configure terminal**
3. **no cdp run**

**DETAILED STEPS**

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>• Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| **Step 3** | **no cdp run**<br>**Example:**<br>`Router(config)# no cdp run` | Disables Cisco Discovery Protocol. |

# Disabling the Propagation of ODR Stub Routing Information on a Specified Interface

On stub routers that support the ODR feature, the stub router advertises IP prefixes corresponding to the IP networks configured on all directly connected interfaces. Perform the steps in this task to disable the propagation of ODR stub routing information on a specified interface.

**SUMMARY STEPS**

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **no cdp enable**

**DETAILED STEPS**

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>• Enter your password if prompted. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 2** | **configure terminal**<br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| **Step 3** | **interface** *type number*<br>**Example:**<br>`Router(config)# interface GigabitEthernet 0/0/0` | Configures an interface type and enters interface configuration mode. |
| **Step 4** | **no cdp enable**<br>**Example:**<br>`Router(config-if)# no cdp enable` | Disables Cisco Discovery Protocol on an interface. |

# Filtering ODR Information

The hub router will attempt to populate the IP routing table with ODR routes as they are learned dynamically from stub routers. The IP next hop for these routes is the IP address of the neighboring router as advertised through Cisco Discovery Protocol. Use IP filtering to limit the network prefixes that the hub router will permit to be learned dynamically through ODR.

In this example, the ACL filters the following Class A network prefixes:

```
access-list 101 permit 10.48.0.3
access-list 101 deny 10.48.0.0  0.0.255.255
access-list 101 permit 10.0.0.0  0.255.255.255
interface gigabitethernet 0/0/0
 ip access-group 2 in
```

To filter ODR information, perform the steps in this task.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **access-list** *access-list-number* {**deny** | **permit**} *source* [*source-wildcard*] [**log**]
4. **access-list** *access-list-number* {**deny** | **permit**} *source* [*source-wildcard*] [**log**]
5. **access-list** *access-list-number* {**deny** | **permit**} *source* [*source-wildcard*] [**log**]
6. router odr
7. **distribute-list** [[*access-list-number* | *name*] | [**route-map** *map-tag*]] **in** [*interface-type* | *interface-number*]

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:** | Enables privileged EXEC mode.<br>• Enter your password if prompted. |

| | Command or Action | Purpose |
|---|---|---|
| | `Router> enable` | |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| **Step 3** | **access-list** *access-list-number* {**deny** \| **permit**} *source* [*source-wildcard*] [**log**]<br>**Example:**<br>`Router(config)# access-list 101 permit 10.48.0.3` | Access-list 101 permits the IP address 10.48.0.3. |
| **Step 4** | **access-list** *access-list-number* {**deny** \| **permit**} *source* [*source-wildcard*] [**log**]<br>**Example:**<br>`Router(config)# access-list 101 deny 10.48.0.0 0.0.255.255` | Access-list 101 denies the IP address 10.48.0.0 0.0.255.255. |
| **Step 5** | **access-list** *access-list-number* {**deny** \| **permit**} *source* [*source-wildcard*] [**log**]<br>**Example:**<br>`Router(config)# access-list 101 permit 10.0.0.0 0.255.255.255` | Access-list 101 permits the IP address 10.0.0.0 0.255.255.255. |
| **Step 6** | router odr<br>**Example:**<br>`Router(config)# router odr` | Enables ODR and enters router configuration mode. |
| **Step 7** | **distribute-list** [[*access-list-number* \| *name*] \| [**route-map** *map-tag*]] **in** [*interface-type* \| *interface-number*]<br>**Example:**<br>`Router(config-router)# distribute-list 101 in` | Filters ODR information on the hub router. |

# Redistributing ODR Information into the Dynamic Routing Protocol of the Hub

The exact command syntax needed to redistribute ODR information into the dynamic routing protocol of the hub depends upon the routing protocol into which ODR is being redistributed. See the "Redistributing Routing Information" section in the "Configuring IP Routing Protocol-Independent Features" module for further information.

# Reconfiguring Cisco Discovery Protocol or ODR Timers

By default, Cisco Discovery Protocol sends updates every 60 seconds. This update interval may not be frequent enough to provide fast reconvergence of IP routes on the hub router side of the network. A faster reconvergence rate may be necessary if the stub connects to one of several hub routers via asynchronous interfaces such as modem lines.

ODR expects to receive periodic Cisco Discovery Protocol updates containing IP prefix information. When ODR fails to receive such updates for routes that it has installed in the routing table, these ODR routes are first marked invalid and eventually removed from the routing table. (By default, ODR routes are marked invalid after 180 seconds and are removed from the routing table after 240 seconds.) These defaults are based on the default Cisco Discovery Protocol update interval. Configuration changes made to either the Cisco Discovery Protocol or ODR timers should be reflected through changes made to both.

To reconfigure Cisco Discovery Protocol or ODR timers, perform the steps in this task.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **cdp timer** *seconds*
4. router odr
5. **timers basic** *update invalid holddown flush sleeptime*

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>• Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| **Step 3** | **cdp timer** *seconds*<br>**Example:**<br>`Router(config)# cdp timer 80` | Specifies how often the Cisco IOS XE software sends Cisco Discovery Protocol updates. |
| **Step 4** | router odr<br>**Example:**<br>`Router(config)# router odr` | Enables ODR and enters router configuration mode. |
| **Step 5** | **timers basic** *update invalid holddown flush sleeptime*<br>**Example:** | Adjusts ODR network timers. |

| | Command or Action | Purpose |
|---|---|---|
| | `Router(config-router)# timers basic 5 15 15 30` | |

# Using Dialer Map Statements to Direct Cisco Discovery Protocol Broadcast Packets

For interfaces that specify dialer mappings, Cisco Discovery Protocol packets will make use of dialer map configuration statements that pertain to the IP protocol. Because Cisco Discovery Protocol packets are always broadcast packets, these dialer map statements must handle broadcast packets, typically through use of the **dialer map** command with the **broadcast** keyword. The **dialer string** command in interface configuration mode may also be used.

On dial-on-demand (DDR) routing interfaces, certain kinds of packets can be classified as interesting. These interesting packets can cause a DDR connection to be made or cause the idle timer of a DDR interface to be reset. For the purposes of DDR classification, Cisco Discovery Protocol packets are considered uninteresting. This classification occurs even while Cisco Discovery Protocol is making use of dialer map statements for IP, where IP packets are classified as interesting.

The following task describes how to use dialer map statements to direct Cisco Discovery Protocol broadcast packets.

or

**dialer string** *dial-string* [**:** *isdn-subaddress*]

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. Do one of the following:
   - **dialer map** *protocol-keyword protocol-next-hop-address* [**broadcast** | **class** *dialer-map-class-name* | **modem-script** *modem-regular-expression* | **vrf** *vrf-name* | **name** *host-name* | **spc** | **speed 56** | **speed 64** | **system-script** *system-regular-expression* | *dial-string*[**:** *isdn-subaddress*]]
   -
   -
   - **dialer string** *dial-string* [**:** *isdn-subaddress*]

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>• Enter your password if prompted. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 2** | **configure terminal**<br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| **Step 3** | **interface** *type number*<br>**Example:**<br>`Router(config)# interface async 1/0/0` | Configures an interface type, and enters interface configuration mode. |
| **Step 4** | Do one of the following:<br>• **dialer map** *protocol-keyword protocol-next-hop-address* [**broadcast** \| **class** *dialer-map-class-name* \| **modem-script** *modem-regular-expression* \| **vrf** *vrf-name* \| **name** *host-name* \| **spc** \| **speed 56** \| **speed 64** \| **system-script** *system-regular-expression* \| *dial-string*[**:** *isdn-subaddress*]]<br>•<br>•<br>• **dialer string** *dial-string* [**:** *isdn-subaddress*]<br>**Example:**<br>`Router(config)# dialer map ip 172.19.2.5 speed 56` | Configures an asynchronous interface to call multiple sites or to receive calls from multiple sites.<br>Specifies the string (telephone number) to be called for interfaces calling a single site. |

# Configuration Examples for On-Demand Routing

## Enabling ODR and Filtering ODR Information Example

The following example shows how to enable ODR on a Cisco router and enable filtering of ODR information. The configuration example for filtering ODR information causes the hub router to accept only advertisements for IP prefixes about (or subnets of) the Class C network 192.168.1.0:

```
Router(config)# access-list 101 permit ip host 10.0.0.1 192.168.1.0 0.0.0.255

Router(config)# access-list 101 permit ip 10.0.10.2 255.0.0.0 192.168.2.0 0.0.0.255
Router(config)# router odr
Router(config-router)# distribute-list 101 in
Router(config-router)# end
```

## Disabling ODR on a Specified Interface Example

The following example shows how to disable ODR on an interface:

```
Router# configure terminal
Router(config)# interface GigabitEthernet 0/0/0

Router(config-if)# no cdp enable
```

# Additional References

### Related Documents

| Related Topic | Document Title |
|---|---|
| Cisco Discovery Protocol features | "Using Cisco Discovery Protocol" chapter of the *Cisco IOS XE Network Management Configuration Guide*, Release 2 |
| ODR commands | "On-Demand Routing Commands" chapter of the *Cisco IOS IP Routing: ODR Command Reference.* |
| Cisco IOS master command list, all releases | Cisco IOS Master Command List, All Releases |

### Standards

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

### MIBs

| MIB | 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 IOS XE software releases, and feature sets, use Cisco MIB Locator found at the following URL:<br>http://www.cisco.com/go/mibs |

### RFCs

| RFC | 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 Configuring On-Demand Routing

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 1: Feature Information for Configuring On-Demand Routing*

| Feature Name | Releases | Feature Information |
|---|---|---|
| On-Demand Routing | 10.0<br>12.2(1)<br>12.2(2)T<br>15.3(1)S | The On-Demand Routing (ODR) feature provides IP routing for stub sites, with minimum overhead. |

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