



CHAPTER 6

Configuring IP Tunnels

This chapter describes how to configure IP tunnels using Generic Route Encapsulation (GRE) on the device.

This chapter includes the following sections:

- [Information About IP Tunnels, page 6-1](#)
- [Licensing Requirements for IP Tunnels, page 6-3](#)
- [Prerequisites for IP Tunnels, page 6-3](#)
- [Guidelines and Limitations, page 6-3](#)
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Information About IP Tunnels

IP tunnels can encapsulate a same-layer or higher layer protocol and transport the result over IP through a tunnel created between two devices.

This section includes the following topics:

- [Overview of IP Tunnels, page 6-1](#)
- [GRE Tunnels, page 6-2](#)
- [Path MTU Discovery, page 6-2](#)
- [Virtualization Support, page 6-3](#)
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Overview of IP Tunnels

IP tunnels consists of the following three main components:

- **Passenger protocol**—The protocol that needs to be encapsulated. IPv4 is an example of a passenger protocol.

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- Carrier protocol—The protocol that is used to encapsulate passenger protocol. Cisco NX-OS supports GRE as a carrier protocol.
- Transport protocol—The protocol that is used to carry the encapsulated protocol. IPv4 is an example of a transport protocol.

An IP tunnel takes a passenger protocol, such as IPv4, and encapsulates that protocol within a carrier protocol, such as GRE. The device then transmits this carrier protocol over a transport protocol, such as IPv4.

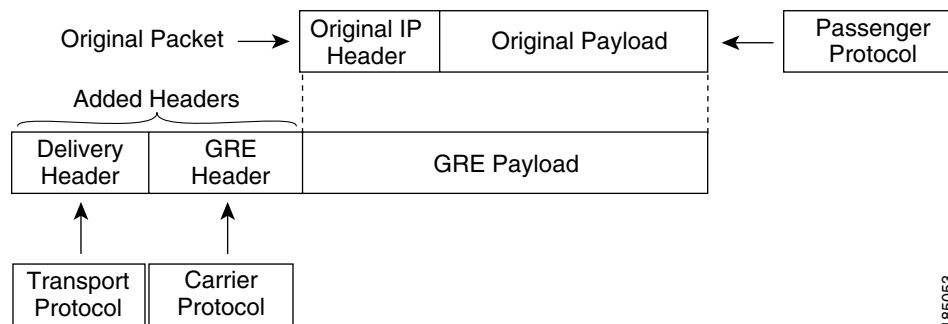
You configure a tunnel interface with matching characteristics on each end of the tunnel. For more information, see the “[Configuring IP Tunnels](#)” section on page 6-4.

GRE Tunnels

You can use GRE as the carrier protocol for a variety of passenger protocols.

[Figure 6-1](#) shows the IP tunnel components for a GRE tunnel. The original passenger protocol packet becomes the GRE payload and the device adds a GRE header to the packet. The device then adds the transport protocol header to the packet and transmits it.

Figure 6-1 GRE PDU



Path MTU Discovery

Path maximum transmission unit (MTU) discovery (PMTUD) prevents fragmentation in the path between two endpoints by dynamically determining the lowest MTU along the path from the packet's source to its destination. PMTUD reduces the send MTU value for the connection if the interface receives information that the packet would require fragmentation.

When you enable PMTUD, the interface sets the Don't Fragment (DF) bit on all packets that traverse the tunnel. If a packet that enters the tunnel encounters a link with a smaller MTU than the MTU value for the packet, the remote link drops the packet and sends an ICMP message back to the sender of the packet. This message indicates that fragmentation was required (but not permitted) and provides the MTU of the link that dropped the packet.



Note

PMTUD on a tunnel interface requires that the tunnel endpoint can receive ICMP messages generated by devices in the path of the tunnel. Check that ICMP messages can be received before using PMTUD over firewall connections.

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Virtualization Support

You can configure IP tunnels only in the default virtual device context (VDC) and the default Virtual Routing and Forwarding (VRF) instance.

By default, Cisco NX-OS places you in the default VDC and default VRF.

See the *Cisco Nexus 7000 Series NX-OS Virtual Device Context Configuration Guide, Release 4.0* for information about VDCs and see the *Cisco Nexus 7000 Series NX-OS Unicast Routing Configuration Guide, Release 4.0* for information about VRFs.

High Availability

IP tunnels support stateful restarts. A stateful restart occurs on a supervisor switchover. After the switchover, Cisco NX-OS applies the runtime configuration after the switchover.

Licensing Requirements for IP Tunnels

The following table shows the licensing requirements for this feature:

Product	License Requirement
NX-OS	IP tunnels require an Enterprise Services license. For a complete explanation of the NX-OS licensing scheme and how to obtain and apply licenses, see the <i>Cisco Nexus 7000 Series NX-OS Licensing Guide, Release 4.0</i> .

Prerequisites for IP Tunnels

IP tunnels have the following prerequisites:

- You must be familiar with TCP/IP fundamentals to configure IP tunnels.
- You are logged on to the switch.
- You have installed the Enterprise Services license for Cisco NX-OS.
- You must enable the tunneling feature in a device before you can configure and enable any IP tunnels.

Guidelines and Limitations

IP tunnels have the following guidelines and limitations:

- Cisco NX-OS supports the GRE Header defined in IETF RFC 2784. Cisco NX-OS does not support tunnel keys and other options from IETF RFC 1701.

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Configuring IP Tunnels

This section includes the following topics:

- [Enabling Tunneling](#), page 6-4
- [Creating a Tunnel Interface](#), page 6-4
- [Configuring a GRE Tunnel](#), page 6-6
- [Enabling Path MTU Discovery](#), page 6-7



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.

Enabling Tunneling

You must enable the tunneling feature before you can configure any IP tunnels.

DETAILED STEPS

Command	Purpose
<code>feature tunnel</code>	Enables the tunneling feature.
Example: <code>switch(config)# feature tunnel</code>	

Creating a Tunnel Interface

You can create a tunnel interface and then configure this logical interface for your IP tunnel.

BEFORE YOU BEGIN

Ensure that you have enabled the tunneling feature.

SUMMARY STEPS

1. `config t`
2. `interface tunnel number`
3. `tunnel source {ip-address | interface-name}`
4. `tunnel destination {ip-address | host-name}`
5. `show interfaces tunnel number`
6. `copy running-config startup-config`

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DETAILED STEPS

	Command	Purpose
Step 1	config t Example: switch# config t switch(config)#	Enters configuration mode.
Step 2	interface tunnel number Example: switch(config)# interface tunnel 1 switch(config-if)#	Creates a new tunnel interface.
Step 3	tunnel source {ip-address interface-name} Example: switch(config-if)# tunnel source ethernet 1/2	Configures the source address for this IP tunnel.
Step 4	tunnel destination {ip-address host-name} Example: switch(config-if)# tunnel destination 192.0.2.1	Configures the destination address for this IP tunnel.
Step 5	show interfaces tunnel number Example: switch(config-if)# show interfaces tunnel 1	(Optional) Displays the tunnel interface statistics.
Step 6	copy running-config startup-config Example: switch(config-if)# copy running-config startup-config	(Optional) Saves this configuration change.

Use the **no interface tunnel** command to remove the tunnel interface and all associated configuration.

Command	Purpose
no interface tunnel number Example: switch(config)# no interface tunnel 1	Deletes the tunnel interface and the associated configuration.

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

Command	Purpose
description <i>string</i> Example: switch(config-if)# description GRE tunnel	Configures a description for the tunnel.
mtu <i>value</i> Example: switch(config-if)# mtu 1400	Sets the MTU of IP packets sent on an interface.
tunnel ttl <i>value</i> Example: switch(config-if)# tunnel ttl 100	Sets the tunnel time-to-live value. The range is from 1 to 255.

The following example shows how to create a tunnel interface:

```
switch# config t
switch(config)# interface tunnel 1
switch(config-if)# tunnel source ethernet 1/2
switch(config-if)# tunnel destination 192.0.2.1
switch(config-if)# copy running-config startup-config
```

Configuring a GRE Tunnel

You can set a tunnel interface to GRE tunnel mode.

BEFORE YOU BEGIN

Ensure that you have enabled the tunneling feature.

SUMMARY STEPS

1. **config t**
2. **interface tunnel** *number*
3. **tunnel mode gre ip**
4. **show interfaces tunnel** *number*
5. **copy running-config startup-config**

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DETAILED STEPS

	Command	Purpose
Step 1	<code>config t</code> Example: switch# config t switch(config)#	Enters configuration mode.
Step 2	<code>interface tunnel number</code> Example: switch(config)# interface tunnel 1 switch(config-if)#	Enters a tunnel interface configuration mode.
Step 3	<code>tunnel mode gre ip</code> Example: switch(config-if)# tunnel mode gre ip	Sets this tunnel mode to GRE
Step 4	<code>show interfaces tunnel number</code> Example: switch(config-if)# show interfaces tunnel 1	(Optional) Displays the tunnel interface statistics.
Step 5	<code>copy running-config startup-config</code> Example: switch(config-if)# copy running-config startup-config	(Optional) Saves this configuration change.

The following example shows how to configure the tunnel interface to GRE and set the GRE tunnel keepalives:

```
switch# config t
switch(config)# interface tunnel 1
switch(config-if)# tunnel mode gre ip
switch(config-if)# copy running-config startup-config
```

Enabling Path MTU Discovery

To enable path MTU discovery on a tunnel, use the following command in interface configuration mode:

Command	Purpose
<code>tunnel path-mtu-discovery [age-timer min] [min-mtu bytes]</code> Example: switch(config-if)# tunnel path-mtu-discovery 25 1500	Enables Path MTU Discovery (PMTUD) on a tunnel interface. The parameters are as follows: <ul style="list-style-type: none"> <i>mins</i>—Number of minutes. The range is from 10 to 30. The default is 10. <i>mtu-bytes</i>—Minimum MTU recognized. The range is from 92 to 65535. The default is 92.

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Verifying IP Tunnel Configuration

To verify IP tunnel configuration information, use the following commands:

Command	Purpose
<code>show interface tunnel <i>number</i></code>	Displays the configuration for the tunnel interface (MTU, protocol, transport, and VRF). Displays input and output packets, bytes, and packet rates.
<code>show interface tunnel <i>number</i> brief</code>	Displays the operational status, IP address, encapsulation type, and MTU of the tunnel interface.
<code>show interface tunnel <i>number</i> description</code>	Displays the configured description of the tunnel interface.
<code>show interface tunnel <i>number</i> status</code>	Displays the operational status of the tunnel interface.
<code>show interface tunnel <i>number</i> status err-disabled</code>	Displays the error disabled status of the tunnel interface.

IP Tunnel Configuration Example

The following example shows a simple GRE tunnel. Ethernet 1/2 is the tunnel source for router A and the tunnel destination for router B. Ethernet interface 2/1 is the tunnel source for router B and the tunnel destination for router A.

router A:

```
feature tunnel
interface tunnel 0
  ip address 209.165.20.2/8
  tunnel source ethernet 1/2
  tunnel destination 192.0.2.2
  tunnel mode gre ip
  tunnel path-mtu-discovery 25 1500
interface ethernet1/2
  ip address 192.0.2.55/8
```

router B:

```
feature tunnel
interface tunnel 0
  ip address 209.165.20.1/8
  tunnel source ethernet2/1
  tunnel destination 192.0.2.55
  tunnel mode gre ip
interface ethernet 2/1
  ip address 192.0.2.2/8
```

Default Settings

Table 6-1 lists the default settings for IP tunnel parameters.

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Table 6-1 Default IP Tunnel Parameters

Parameters	Default
Path MTU discovery age timer	10 seconds
Path MTU discovery minimum MTU	64
Tunnel feature	disabled

Additional References

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

- [Related Documents, page 6-9](#)
- [Standards, page 6-9](#)

Related Documents

Related Topic	Document Title
IP Tunnel commands	<i>Cisco Nexus 7000 Series NX-OS Interfaces Command Reference, Release 4.0</i>
IP Fragmentation and Path MTU discovery	<i>Resolve IP Fragmentation, MTU, MSS, and PMTUD Issues with GRE and IPSEC</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.	—

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