Configuring IP Tunnels

This chapter contains the following sections:

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.

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.
- Carrier protocol—The protocol that is used to encapsulate the passenger protocol. Cisco NX-OS supports generic routing encapsulation (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.

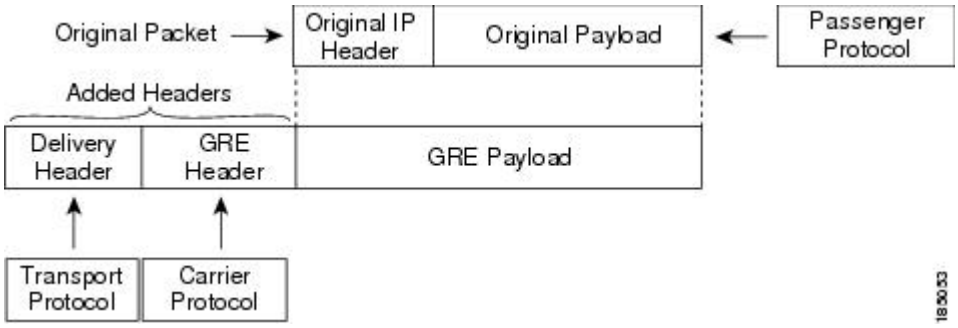
You must enable the tunnel feature before you can configure it.

GRE Tunnels

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

The figure 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 1: GRE PDU



Licensing Requirements for IP Tunnels

Product	License Requirement
Cisco NX-OS	IP tunnels require an Enterprise Services license. For a complete explanation of the Cisco NX-OS licensing scheme and how to obtain and apply licenses, see the *Cisco NX-OS Licensing Guide*.

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 for IP Tunnels

IP tunnels have the following configuration 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.
- Cisco Nexus 3000 Series switch supports a maximum of eight tunnels.
- Cisco Nexus 3000 Series switches do not support the following features:
  - Path maximum transmission unit (MTU) discovery
  - Statistics
  - Access control lists (ACLs)
  - Unicast reverse path forwarding (URPF)
  - Multicast traffic and associated multicast protocols such as Internet Group Management Protocol (IGMP) and Protocol Independent Multicast (PIM).
- Cisco NX-OS does not support the Web Cache Control Protocol (WCCP) on tunnel interfaces.

Default Settings for IP Tunneling

The following table lists the default settings for IP tunnel parameters.

Table 1: Default IP Tunnel Parameters

Parameters	Default
Tunnel feature	Disabled

Configuring IP Tunnels

Enabling Tunneling

Before You Begin

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

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **feature tunnel**	Enables the tunnel feature on the switch.
Step 3	switch(config)# **exit**	Returns to configuration mode.
Step 4	switch(config)# **show feature tunnel**	Displays the tunnel feature on the switch.
Step 5	switch# **copy running-config startup-config**	(Optional) Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

This example shows how to enable the tunnel feature:

```
switch# configure terminal
switch(config)# feature tunnel
switch(config)# exit
switch(config)# copy running-config startup-config
```

Creating a Tunnel Interface

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

Before You Begin

Both the tunnel source and the tunnel destination must exist within the same virtual routing and forwarding (VRF) instance.

Ensure that you have enabled the tunneling feature.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# [**no**] **interface tunnel** *number*	Creates a new tunnel interface.
Step 3	switch(config)#**tunnel source** {*ip address* | *interface-name*}	Configures the source address for this IP tunnel.
Step 4	switch(config)#**tunnel destination** {*ip address* | *host-name*}	Configures the destination address for this IP tunnel.

	Command or Action	Purpose
Step 5	switch(config)#**tunnel use-vrf** *vrf-name*	(Optional) Uses the configured VRF to look up the tunnel IP destination address.
Step 6	switch(config)#**show interface tunnel** *number*	(Optional) Displays the tunnel interface statistics.
Step 7	switch# **copy running-config startup-config**	(Optional) Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

This example shows how to create a tunnel interface:

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

Creating a GRE Tunnel

You can set a tunnel interface to GRE tunnel mode.

Before You Begin

Ensure that you have enabled the tunneling feature.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **interface tunnel** *number*	Enters a tunnel interface configuration mode.
Step 3	switch(config)#**tunnel mode gre ip**	Sets this tunnel mode to GRE.
Step 4	switch(config)#**show interface tunnel** *number*	(Optional) Displays the tunnel interface statistics.
Step 5	switch(config-if)# **copy running-config startup-config**	(Optional) Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

This example shows how to create the tunnel interface to GRE and set the GRE tunnel keepalives:

```
switch# configure terminal
switch(config)# interface tunnel 1
```

```
switch(config)# tunnel mode gre ip
switch(config)# copy running-config startup-config
```

Assigning VRF Membership to a Tunnel Interface

You can add a tunnel interface to a VRF.

Before You Begin

Ensure that you have enabled the tunneling feature.

Assign the IP address for a tunnel interface after you have configured the interface for a VRF.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **interface tunnel** *number*	Enters interface configuration mode.
Step 3	switch(config)# **vrf member** *vrf-name*	Adds this interface to a VRF.
Step 4	switch(config)# **ip address** *ip-prefix/length*	Configures an IP address for this interface. You must do this step after you assign this interface to a VRF.
Step 5	switch(config)# **show vrf** [*vrf-name*] **interface** *interface-type number*	(Optional) Displays VRF information.
Step 6	switch(config-if)# **copy running-config startup-config**	(Optional) Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

This example shows how to add a tunnel interface to the VRF:

```
switch# configure terminal
switch(config)# interface tunnel 0
switch(config-if)# vrf member RemoteOfficeVRF
switch(config-if)# ip address 209.0.2.1/16
switch(config-if)# copy running-config startup-config
```

Verifying the IP Tunnel Configuration

To verify IP tunnel configuration information, perform one of the following tasks:

Command	Purpose
show interface tunnel *number*	Displays the configuration for the tunnel interface (MTU, protocol, transport, and VRF). Displays input and output packets, bytes, and packet rates.

Command	Purpose
show interface tunnel *number* **brief**	Displays the operational status, IP address, encapsulation type, and MTU of the tunnel interface.
show interface tunnel *number* **description**	Displays the configured description of the tunnel interface.
show interface tunnel *number* **status**	Displays the operational status of the tunnel interface.
show interface tunnel *number* **status err-disabled**	Displays the error disabled status of the tunnel interface.

Configuration Examples for IP Tunneling

This 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 1/3 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
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 ethernet 1/3
  tunnel destination 192.0.2.55
  tunnel mode gre ip
interface ethernet 1/3
ip address 192.0.2.2/8
```

Related Documents for IP Tunnels

Related Topics	Document Title
IP Tunnel commands	*Cisco Nexus 3000 Series Interfaces Command Reference*

Standards for IP Tunnels

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

Feature History for Configuring IP Tunnels

Table 2: Feature History for Configuring IP Tunnels

Feature Name	Release	Feature Information
IP tunnels	5.0(3)U4(1)	This feature was introduced.