IPv6 GRE Tunnels in CLNS Networks

GRE tunneling of IPv4 and IPv6 packets through CLNS networks enables Cisco CTunnels to interoperate with networking equipment from other vendors.

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.

# Information About IPv6 GRE Tunnels in CLNS Networks

Overlay Tunnels for IPv6

Overlay tunneling encapsulates IPv6 packets in IPv4 packets for delivery across an IPv4 infrastructure (a core network or the figure below). By using overlay tunnels, you can communicate with isolated IPv6 networks without upgrading the IPv4 infrastructure between them. Overlay tunnels can be configured between border devices or between a border device and a host; however, both tunnel endpoints must support both the IPv4 and IPv6 protocol stacks. IPv6 supports the following types of overlay tunneling mechanisms:

• Manual

- Generic routing encapsulation (GRE)

- IPv4-compatible

- 6to4

- Intrasite Automatic Tunnel Addressing Protocol (ISATAP)

Figure 1: Overlay Tunnels
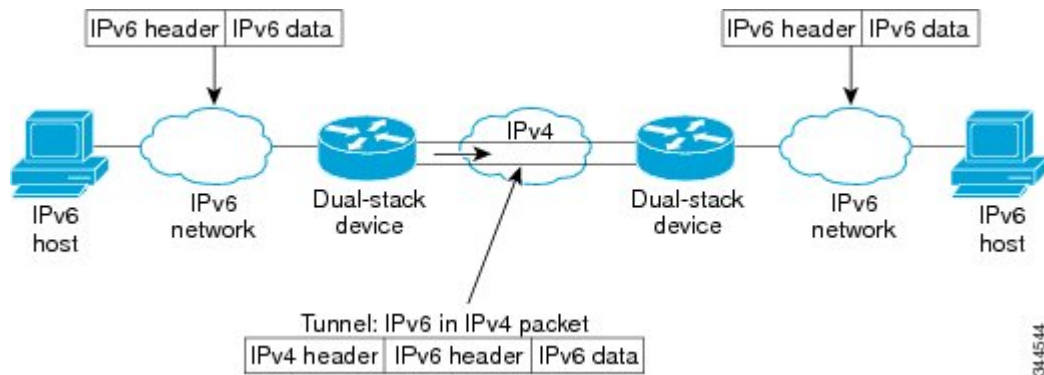
Note   Overlay tunnels reduce the maximum transmission unit (MTU) of an interface by 20 octets (assuming that the basic IPv4 packet header does not contain optional fields). A network that uses overlay tunnels is difficult to troubleshoot. Therefore, overlay tunnels that connect isolated IPv6 networks should not be considered a final IPv6 network architecture. The use of overlay tunnels should be considered as a transition technique toward a network that supports both the IPv4 and IPv6 protocol stacks or just the IPv6 protocol stack.

Use the table below to help you determine which type of tunnel that you want to configure to carry IPv6 packets over an IPv4 network.

Table 1: Suggested Usage of Tunnel Types to Carry IPv6 Packets over an IPv4 Network

Tunneling Type	Suggested Usage	Usage Notes
Manual	Simple point-to-point tunnels that can be used within a site or between sites.	Can carry IPv6 packets only.
GRE- and IPv4- compatible	Simple point-to-point tunnels that can be used within a site or between sites.	Can carry IPv6, Connectionless Network Service (CLNS), and many other types of packets.
IPv4- compatible	Point-to-multipoint tunnels.	Uses the ::/96 prefix. We do not recommend using this tunnel type.
6to4	Point-to-multipoint tunnels that can be used to connect isolated IPv6 sites.	Sites use addresses from the 2002::/16 prefix.

Tunneling Type	Suggested Usage	Usage Notes
6RD	IPv6 service is provided to customers over an IPv4 network by using encapsulation of IPv6 in IPv4.	Prefixes can be from the SP's own address block.
ISATAP	Point-to-multipoint tunnels that can be used to connect systems within a site.	Sites can use any IPv6 unicast addresses.

Individual tunnel types are discussed in detail in this document. We recommend that you review and understand the information about the specific tunnel type that you want to implement. When you are familiar with the type of tunnel you need, see the table below for a summary of the tunnel configuration parameters that you may find useful.

Table 2: Tunnel Configuration Parameters by Tunneling Type

Tunneling Type	Tunnel Configuration Parameter		
Tunnel Mode	**Tunnel Source**	**Tunnel Destination**	**Interface Prefix or Address**
Manual	ipv6ip	An IPv4 address, or a reference to an interface on which IPv4 is configured.	An IPv4 address.	An IPv6 address.
GRE/IPv4	gre ip		An IPv4 address.	An IPv6 address.
IPv4- compatible	ipv6ip auto-tunnel	Not required. These are all point-to-multipoint tunneling types. The IPv4 destination address is calculated, on a per-packet basis, from the IPv6 destination.	Not required. The interface address is generated as ::*tunnel-source*/96.
6to4	ipv6ip 6to4		An IPv6 address. The prefix must embed the tunnel source IPv4 address.
6RD	ipv6ip 6rd		An IPv6 address.
ISATAP	ipv6ip isatap		An IPv6 prefix in modified eui-64 format. The IPv6 address is generated from the prefix and the tunnel source IPv4 address.

GRE CLNS Tunnel Support for IPv4 and IPv6 Packets

GRE tunneling of IPv4 and IPv6 packets through CLNS networks enables Cisco CLNS Tunnels (CTunnels) to interoperate with networking equipment from other vendors. This feature provides compliance with RFC 3147.

The optional GRE services defined in header fields, such as checksums, keys, and sequencing, are not supported. Any packet received requesting such services will be dropped.

Configuration Examples for IPv6 GRE Tunnels in CLNS Networks

Example: Configuring CTunnels in GRE Mode to Carry IPv6 Packets in CLNS

The following example configures a GRE CTunnel running both IS-IS and IPv6 traffic between Router A and Router B in a CLNS network. The **ctunnel mode gre** command allows tunneling between Cisco and third-party networking devices and carries both IPv4 and IPv6 traffic.

The **ctunnel mode gre** command provides a method of tunneling that is compliant with RFC 3147 and allows tunneling between Cisco equipment and third-party networking devices.

Router A

```
ipv6 unicast-routing
clns routing
interface ctunnel 102
 ipv6 address 2001:DB8:1111:2222::1/64
 ctunnel destination 49.0001.2222.2222.2222.00
 ctunnel mode gre
interface Ethernet0/1
 clns router isis
router isis
 net 49.0001.1111.1111.1111.00
```

Router B

```
ipv6 unicast-routing
clns routing
interface ctunnel 201
 ipv6 address 2001:DB8:1111:2222::2/64
 ctunnel destination 49.0001.1111.1111.1111.00
 ctunnel mode gre
interface Ethernet0/1
 clns router isis
router isis
 net 49.0001.2222.2222.2222.00
```

To turn off GRE mode and restore the CTunnel to the default Cisco encapsulation routing only between endpoints on Cisco equipment, use either the **no ctunnel mode** command or the **ctunnel mode cisco** command. The following example shows the same configuration modified to transport only IPv4 traffic.

Additional References

Related Documents

Related Topic	Document Title
IPv6 addressing and connectivity	*IPv6 Configuration Guide*
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
IPv6 commands	Cisco IOS IPv6 Command Reference
Cisco IOS IPv6 features	Cisco IOS IPv6 Feature Mapping

Standards and RFCs

Standard/RFC	Title
RFCs for IPv6	*IPv6 RFCs*

MIBs

MIB	MIBs Link
	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

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 IPv6 GRE Tunnels in CLNS Networks

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 3: Feature Information for IPv6 GRE Tunnels in CLNS Networks

Feature Name	Releases	Feature Information
CLNS Support for GRE Tunneling of IPv4 and IPv6	12.2(25)S 12.2(33)SRA 12.3(7)T	GRE tunneling of IPv4 and IPv6 packets through CLNS networks enables Cisco CTunnels to interoperate with networking equipment from other vendors. The following commands were introduced or modified: **ctunnel mode**.