

VLANs over IP Unnumbered SubInterfaces

The VLANs over IP Unnumbered Subinterfaces feature allows IP unnumbered interface support to be configured on Ethernet VLAN subinterfaces. This feature also provides support for DHCP on VLAN subinterfaces. Configuring Ethernet VLANs on IP unnumbered subinterfaces can save IPv4 address space and simplify configuration management, address management, and migration for DSL providers from ATM networks to IP.

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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.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for VLANs over IP Unnumbered Subinterfaces

Configure DHCP and ensure that it is operational.

Restrictions for VLANs over IP Unnumbered Subinterfaces

- Only Ethernet VLAN subinterfaces, in addition to serial interfaces, can be configured as IP unnumbered interfaces.
- Interface ranges (the **interface range** command) are not supported in Cisco IOS Release 12.2(18)SXE.
- A physical interface cannot be used for Layer 3 services (no IP address configurations are supported on the physical interface) if one of the subinterface is configured as native.

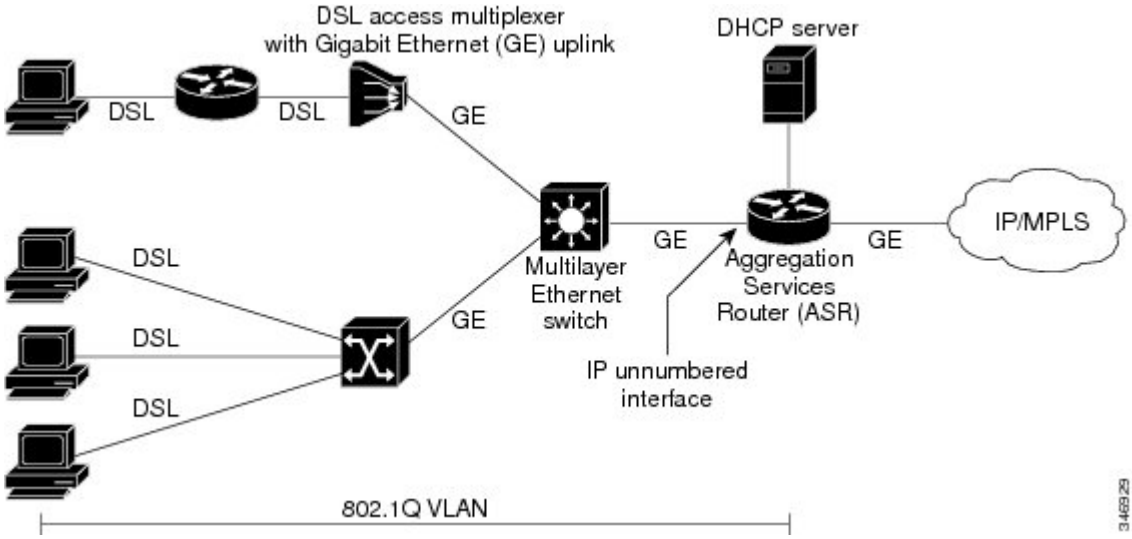
Information About VLANs over IP Unnumbered Subinterfaces

Support for VLANs over IP Unnumbered Subinterfaces

The VLANs over IP Unnumbered Subinterfaces feature enables Ethernet VLANs to be configured on IP unnumbered subinterfaces. The IP unnumbered interface configuration enables IP processing on an interface without assigning an IP address to the interface. The IP unnumbered interface borrows an IP address from another interface that is already configured on the device to conserve network and address space.

Figure 1 shows the implementation of the VLANs over IP Unnumbered Subinterfaces feature in a sample network topology. In this topology, the aggregation services routers dynamically establish IP routes when the DHCP server assigns IP addresses to hosts.

Figure 1: Sample Network Topology Using VLANs over IP Unnumbered Subinterfaces Feature



The VLANs over IP Unnumbered Subinterfaces feature supports the following functions:

- Allocating peer IP address through DHCP.
- Configuring IP unnumbered interface support for a range of VLAN subinterfaces.
- Configuring service selection gateway support for VLANs over IP unnumbered subinterfaces.

- Supporting DHCP relay agent information feature (Option 82).

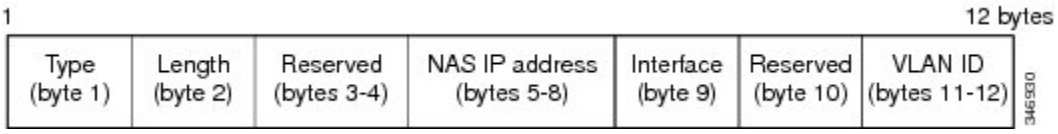
DHCP Option 82

DHCP provides a framework for passing configuration information to hosts on a TCP/IP network. Configuration parameters and other control information are carried in tagged data items (also called options) that are stored in the options field of the DHCP message. Option 82 is organized as a single DHCP option that contains information known by the relay agent.

The DHCP Relay Agent Information feature communicates information to the DHCP server using a suboption of the DHCP relay agent information option called agent remote ID. The information sent in the agent remote ID includes an IP address identifying the relay agent and information about the interface and the connection over which the DHCP request was received. The DHCP server uses this information to assign IP addresses to interfaces and to form security policies.

Figure 2 shows the agent remote ID suboption format that is used with the VLANs over IP Unnumbered Subinterfaces feature.

Figure 2: Format of the Agent Remote ID Suboption



Field	Description
Type	Format type (1 byte). Value 2 specifies the format for use with this feature.
Length	Length of the agent remote ID suboption (1 byte). The type field and the remaining bytes of the length field are not included.
Reserved	Reserved (2 bytes).
NAS IP Address	Network-attached storage (NAS) IP address (4 bytes) of the interface specified by the **ip unnumbered** command.
Interface	Physical interface (1 byte). This field has the following format: slot (4 bits) | module (1 bit) | port (3 bits). For example, if the interface is Ethernet 2/1/1, the slot is 2, the module is 1, and the port is 1.
Reserved	Reserved (1 byte).
VLAN ID	VLAN identifier (2 bytes) for the Ethernet subinterface.

Benefits of VLANs over IP Unnumbered Subinterfaces

The VLANs over IP Unnumbered Subinterfaces feature provides the following benefits:

- Migration from other interfaces to Gigabit Ethernet uplinks and IP core becomes easier for DSL providers.
- All ports share the same subnet, therefore saving the IPv4 address space.
- Each user is on a separate VLAN. DHCP communicates routing information, and there is no Address Resolution Protocol (ARP) or MAC address spoofing, which leads to enhancement in security layers.
- IP address management with DHCP becomes simpler.
- Configuring interface ranges with Ethernet VLAN subinterfaces leads to easier NVRAM configuration and saves overall memory.

How to Configure VLANs over IP Unnumbered Subinterfaces

Configuring IP Unnumbered Interface Support on an Ethernet VLAN Subinterface

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number* [*name-tag*]
4. **encapsulation dot1q** *vlan-id* [**native**]
5. **ip unnumbered** *type number*
6. **end**
7. **show running-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**interface** *type number* [*name-tag*] **Example:** `Device(config)# interface fastethernet 1/0.1`	Configures an interface type and enters interface or subinterface configuration mode.
Step 4	**encapsulation dot1q** *vlan-id* [**native**] **Example:** `Device(config-subif)# encapsulation dot1q 10`	Enables IEEE 802.1Q encapsulation of traffic on a specified subinterface in a VLAN.
Step 5	**ip unnumbered** *type number* **Example:** `Device(config-subif)# ip unnumbered ethernet 3/0`	Enables IP processing on an interface without assigning an explicit IP address to the interface. • The *type* and *number* arguments specify an interface with a predefined IP address on the device. Do not specify an unnumbered interface, if one already exists.
Step 6	**end** **Example:** `Device(config-subif)# end`	Exits subinterface configuration mode and returns to privileged EXEC mode.
Step 7	**show running-config** **Example:** `Device# show running-config`	Displays contents of the current running configuration file on the device including the configuration of the IP unnumbered support feature.

Configuring IP Unnumbered Interface Support on a Range of Ethernet VLAN Subinterfaces

Note The **interface range** command is not supported in Cisco IOS Release 12.2(18)SXE.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface range** {{**ethernet** | **fastethernet** | **gigabitethernet** | **vlan** *vlan*} *slot*/*interface.subinterface* - {**ethernet** | **fastethernet** | **gigabitethernet** | **vlan** *vlan*} *slot*/*interface.subinterface* | **macro** *macro-name*}
4. **encapsulation dot1q** *vlan-id* [**native**]
5. **ip unnumbered** *type number*
6. **end**
7. **show running-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface range** {{**ethernet** | **fastethernet** | **gigabitethernet** | **vlan** *vlan*} *slot*/*interface.subinterface* - {**ethernet** | **fastethernet** | **gigabitethernet** | **vlan** *vlan*} *slot*/*interface.subinterface* | **macro** *macro-name*} **Example:** `Device(config)# interface range fastethernet 1/0.1 - fastethernet 1/0.100`	Executes commands on multiple subinterfaces simultaneously. The device prompt changes to configuration interface range mode after the commands are executed. • Separate the interface range with a hyphen and space as shown in the example.
Step 4	**encapsulation dot1q** *vlan-id* [**native**] **Example:** `Device(config-if-range)# encapsulation dot1q 10`	Applies a unique VLAN ID to each subinterface within the range. • The VLAN ID specified by the *vlan-id* argument is applied to the first subinterface in the range. Each subsequent interface is assigned a VLAN ID, which is the specified *vlan-id* including the subinterface number and excluding the first subinterface number (VLAN ID + subinterface number - first subinterface number).
Step 5	**ip unnumbered** *type number* **Example:** `Device(config-if-range)# ip unnumbered ethernet 3/0`	Enables IP processing on an interface without assigning an explicit IP address to the interface. • The *type* and *number* arguments specify an interface with a predefined IP address on the device. Do not specify an unnumbered interface, if one already exists.
Step 6	**end** **Example:** `Device(config-if-range)# end`	Exits interface-range configuration mode and returns to privileged EXEC mode.
Step 7	**show running-config** **Example:** `Device# show running-config`	Displays contents of the current running configuration file on the device including the configuration of the IP unnumbered support feature.

Configuration Examples for VLANs over IP Unnumbered Subinterfaces

Example: VLAN Configuration on a Single IP Unnumbered Subinterface

The following example shows how to configure IP unnumbered subinterface using Ethernet VLAN subinterface 3/0.2:

```
interface ethernet 3/0.2
 encapsulation dot1q 200
 ip unnumbered ethernet 3/1
```

Example: VLAN Configuration on a Range of IP Unnumbered Subinterfaces

The following example shows how to configure IP unnumbered subinterfaces using Fast Ethernet subinterfaces in the range from 5/1.1 to 5/1.4:

```
interface range fastethernet 5/1.1 - fastethernet 5/1.4
 ip unnumbered ethernet 3/1
```

Additional References for VLANs over IP Unnumbered Subinterfaces

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Command List, All Releases
IP Addressing commands	Cisco IOS IP Addressing Services Command Reference
IP Addressing Services configuration tasks	Cisco IOS IP Addressing Services Configuration Guide
VLAN configuration tasks	Cisco IOS LAN Switching Configuration Guide
VLAN configuration commands	Cisco IOS LAN Switching Command Reference

RFCs

RFCs	Title
RFC 1812	*Requirements for IP Version 4 Routers*, June 1995

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 VLANs over IP Unnumbered Subinterfaces

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 https://cfnng.cisco.com/. An account on Cisco.com is not required.

Table 1: Feature Information for VLANs over IP Unnumbered Subinterfaces

Feature Name	Releases	Feature Information
VLANs over IP Unnumbered Subinterfaces	Cisco IOS XE Release 3.9S	The VLANs over IP Unnumbered Subinterfaces feature allows IP unnumbered interface support to be configured on Ethernet VLAN subinterfaces. This feature also provides support for DHCP on VLAN subinterfaces. Configuring Ethernet VLANs on IP unnumbered subinterfaces can save IPv4 address space and simplify configuration management, address management, and migration for DSL providers from ATM networks to IP. The following command was modified: **ip unnumbered**