

S Series Switch

Interoperation with Cisco VTP

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About This Document

Purpose

This document describes how to realize interoperation between a Cisco switch with Cisco VLAN Trunking Protocol (VTP) deployed and a Huawei switch, and provides detailed configuration procedures.






Intended Audience

This document is intended for:

- Network planning engineers
- Commissioning engineers
- Data configuration engineers
- Onsite maintenance engineers
- Network monitoring engineers
- System maintenance engineers

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
 DANGER	Alerts you to a high risk hazard that could, if not avoided, result in serious injury or death.
 WARNING	Alerts you to a medium or low risk hazard that could, if not avoided, result in moderate or minor injury.
 CAUTION	Alerts you to a potentially hazardous situation that could, if not avoided, result in equipment damage, data loss, performance degradation, or unanticipated results.
 TIP	Provides a tip that may help you solve a problem or save time.
 NOTE	Provides additional information to emphasize or supplement important points in the main text.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 01 (2013-08-05)

This is the first official release.

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1 Overview

1.1 Cisco VTP

VLAN Trunking Protocol (VTP) is a Cisco proprietary protocol. VTP synchronizes VLAN configurations in a VTP domain so that you do not need to configure the same VLANs on every switch in the VTP domain. This protocol supports mapping between different types of VLANs to allow traffic transmission over heterogeneous backbone networks. For example, it can map an Ethernet to an ATM LANE emulated LAN (ATM LANE ELAN) or fiber distributed data interface (FDDI) IEEE 802.10 VLAN. ATM is short for asynchronous transfer mode, and LANE is short for LAN emulation.

VTP minimizes the inconsistent configurations when the network topology changes.

1.1.1 Implementation

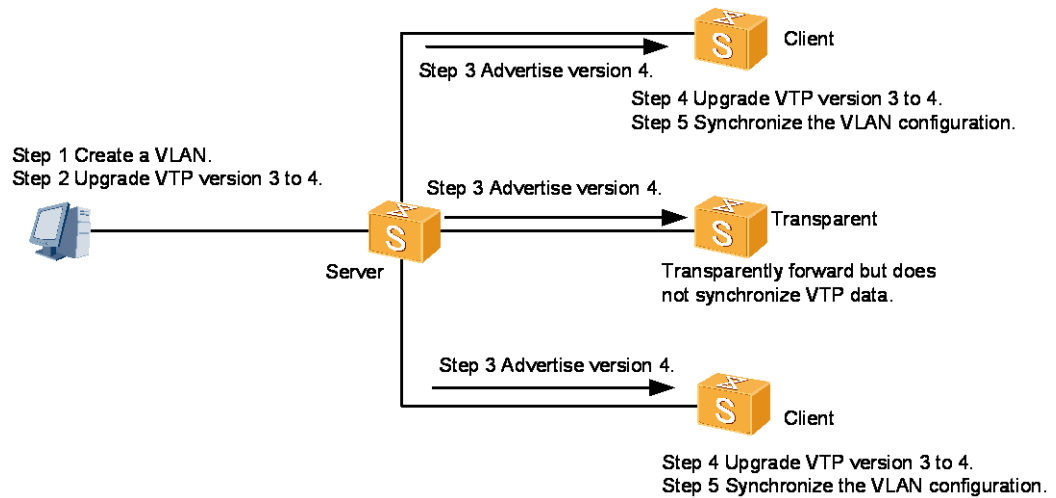
VTP is a communication protocol running at the data link layer (Layer 2) of the OSI model and manages the VLAN creation, deletion, and modification in a domain. When a VLAN is configured on a VTP server, the VTP server automatically advertises the VLAN configuration to other switches in the local domain. After receiving the VLAN configuration, the switches modify their VLAN configurations to the same as that on the VTP server. This reduces the VLAN configuration workload while retaining consistent VLAN configuration.

A VTP server sends Inter-Switch Link (ISL) frames or Cisco proprietary Dynamic Trunking Protocol (DTP) frames to advertise the VLAN creation, deletion, and modification to other switches in the local domain. VTP clients can automatically learn VLAN configurations, making management convenient.

VTP supports three working modes: VTP server, VTP client, and VTP transparent. By default, a switch is configured with VLAN 1 and the VTP server working mode before delivery. A VTP domain can have only one VTP server.

- On a VTP server, you can maintain all VLAN lists in the local VTP domain and create, delete, and modify VLANs.
- A VTP client learns VLAN configurations from the VTP server and maintains all VLAN lists, but you cannot create, delete, or modify VLANs on the client.
- A VTP transparent switch is an independent switch that does not participate in VTP implementation or learn VLAN configurations from the VTP server. On the VTP transparent switch, you can create, delete, and modify only the local VLANs.

Figure 1-1 VTP implementation



1.2 Huawei VCMP

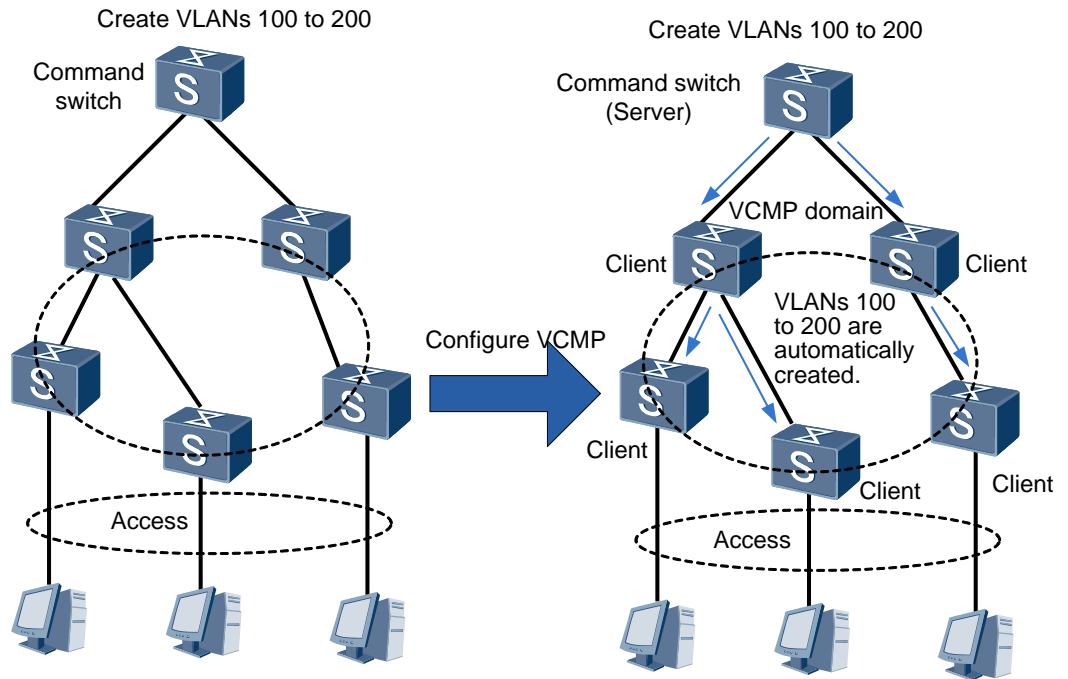
1.2.1 Implementation

VLAN Central Management Protocol (VCMP) is a Huawei proprietary protocol that supports the configuration, management, and delivery of VLANs on a VCMP server. A VCMP domain is composed of switches that have the same VCMP domain name and are connected through trunk ports. A switch belongs to only one VCMP domain. Switches in a VCMP domain are managed by the VCMP server in the local domain. The VCMP domain allows one VCMP server and multiple VCMP clients. Attributes of the devices in the VCMP domain depend on their roles, including:

- **Server:** A VCMP server synchronizes VLAN configurations to other switches in the local domain.
- **Client:** A VCMP client synchronizes VLAN configurations from the VCMP server.
- **Transparent:** A VCMP transparent switch neither affects other switches in the local VCMP domain nor is affected by management behaviors. The VCMP transparent switch forwards received frames through trunk ports.
- **Silent:** Deployed at the edge of a VCMP domain, a VCMP silent switch neither affects other switches in the local VCMP domain nor is affected by management behaviors. The VCMP silent switch discards received VCMP frames.

As shown in Figure 1-2, a command switch functions as the VCMP server, and switches connected to the command switch function as VCMP clients. After VLANs 100 to 200 are configured on the command switch, the command switch advertises the VLAN configurations to the entire domain using VCMP frames. When receiving the VCMP frames, VCMP clients create VLANs 100 to 200.

Figure 1-2 VCMP implementation



2 Replaceability Analysis

2.1 Replaceability

Huawei switches cannot directly interoperate with Cisco VTP-capable switches. However, interoperation between Huawei switches and Cisco VTP-capable switches can be implemented on a hybrid network. This requires only some configurations on directly connected parts of Huawei and Cisco switches. For detailed configurations, see chapter 3 "Hybrid Networking Examples."

Huawei S series switches of V200R005 and later versions support VCMP, which can replace Cisco VTP for VLAN configuration synchronization.

2.2 Comparison

2.2.1 Comparison Between Cisco VTP and Huawei VCMP

Table 2-1 compares Cisco VTP and Huawei VCMP.

Table 2-1 Comparison between Cisco VTP and Huawei VCMP

Configuration	Cisco	Huawei
Global	Any switch in a VTP domain can function as a VTP server, and VTP servers synchronize VLAN configurations with each other.	One switch in a VCMP domain functions as the VCMP server to control all VLAN configurations in the domain.

2.2.2 Comparison Between Cisco VTP and Huawei VCMP Commands

- Cisco VTP configuration:

```
Switch(config)# vtp mode server  
Switch(config)# vtp domain 111
```

```
Switch(config)# end
Switch# show vtp status
VTP Version capable      : 1 to 3
VTP version running     : 1
VTP Domain Name         : 111
VTP Pruning Mode        : Disabled
VTP Traps Generation    : Disabled
Device ID                : 0024.972b.5100
Configuration last modified by 10.137.159.61 at 3-16-93 23:57:47
Local updater ID is 10.137.159.60 on interface Fa0 (first layer3 interface found)
```

Feature VLAN:

```
VTP Operating Mode      : Server
Maximum VLANs supported locally : 1005
Number of existing VLANs : 8
Configuration Revision   : 0
MD5 digest               : 0x51 0xDA 0x77 0xF2 0x39 0x78 0xD0 0xE8
                        0x4A 0xC7 0x1B 0x95 0x5A 0xDF 0x70 0x0A
```

- **Huawei VCMP configuration:**

```
[HUAWEI] vcmp role server
[HUAWEI] vcmp device-id huawei
[HUAWEI] vcmp domain huawei
[HUAWEI] display vcmp status
VCMP information:
Domain          : huawei
Role            : Server
Server ID       : huawei
Configuration Revision : 0xcd660007
Password
```

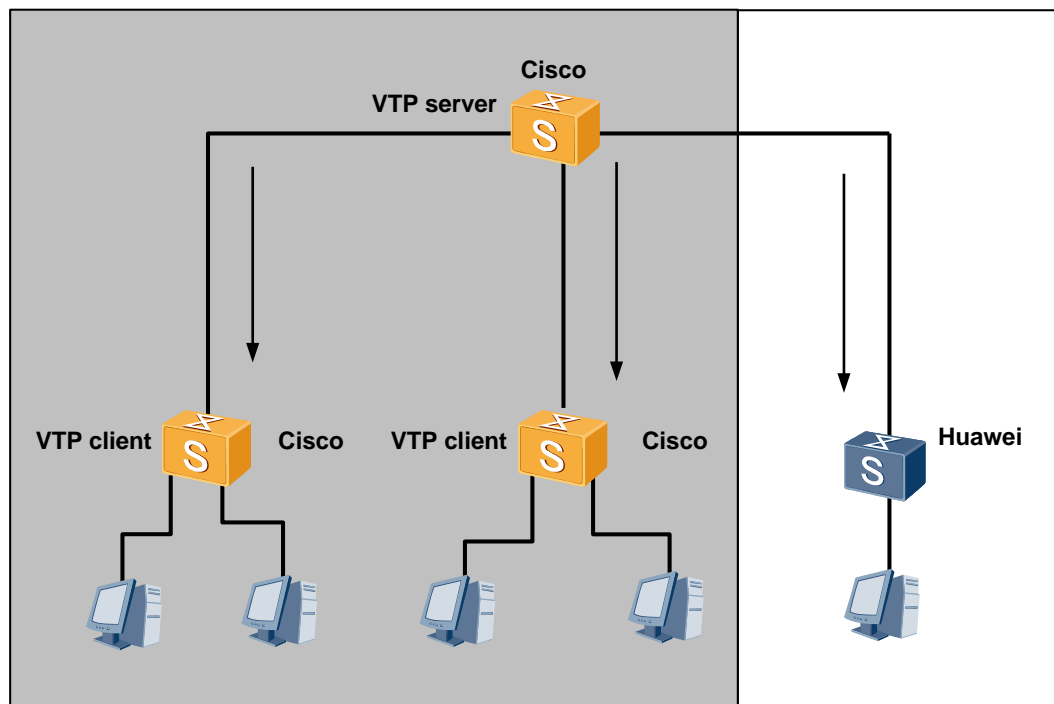
3 Hybrid Networking Examples

3.1 Example 1: C-H Model

In the C-H model, a Cisco switch directly connects to a Huawei switch that has no downstream Cisco switch connected, as shown in Figure 3-1.

3.1.1 Network Topology

Figure 3-1 C-H model networking



3.1.2 Network Configuration

Configuration Requirements

Huawei switches need to interwork with Cisco VTP-capable switches on a network.

Configuration Methods

On Cisco switches: Enable VTP, configure ports between switches as trunk ports, add the trunk ports to all VLANs, and configure user-side ports as access ports.

On Huawei switches: Configure local VLANs, configure ports between switches as trunk ports, add the trunk ports to all VLANs, and configure user-side ports as access ports.

Configuration Files

- Cisco switch in VTP server mode

```
Switch(config)#vtp domain Cisco //Set the VTP domain name to Cisco.
Switch(config)#vtp mode server //Set the VTP mode to server.
Switch(config)#vtp password Cisco //Set the VTP password to Cisco.
Switch(config)#vlan 10
!
interface GigabitEthernet5/48
 switchport access vlan 10
 switchport mode access
end
!
interface GigabitEthernet5/1
 switchport mode trunk
end
!
interface GigabitEthernet5/2
 switchport mode trunk
end
!
interface GigabitEthernet5/3
 switchport mode trunk
end
!
```

- Cisco switch in VTP client mode

```
Switch(config)#vtp domain Cisco
Switch(config)#vtp mode client //Set the VTP mode to client.
Switch(config)#vtp password Cisco
!
interface GigabitEthernet0/48
 switchport access vlan 10
 switchport mode access
end
!
interface GigabitEthernet0/1
 switchport mode trunk
end
!
```

- Huawei switch

```
vlan 10 //Create a VLAN.
#
interface GigabitEthernet0/0/1
 port link-type trunk
 port trunk allow-pass vlan 2 to 4094
#
interface GigabitEthernet0/0/48
 port link-type access
 port default vlan 10
#
```

3.1.3 Configuration Notes

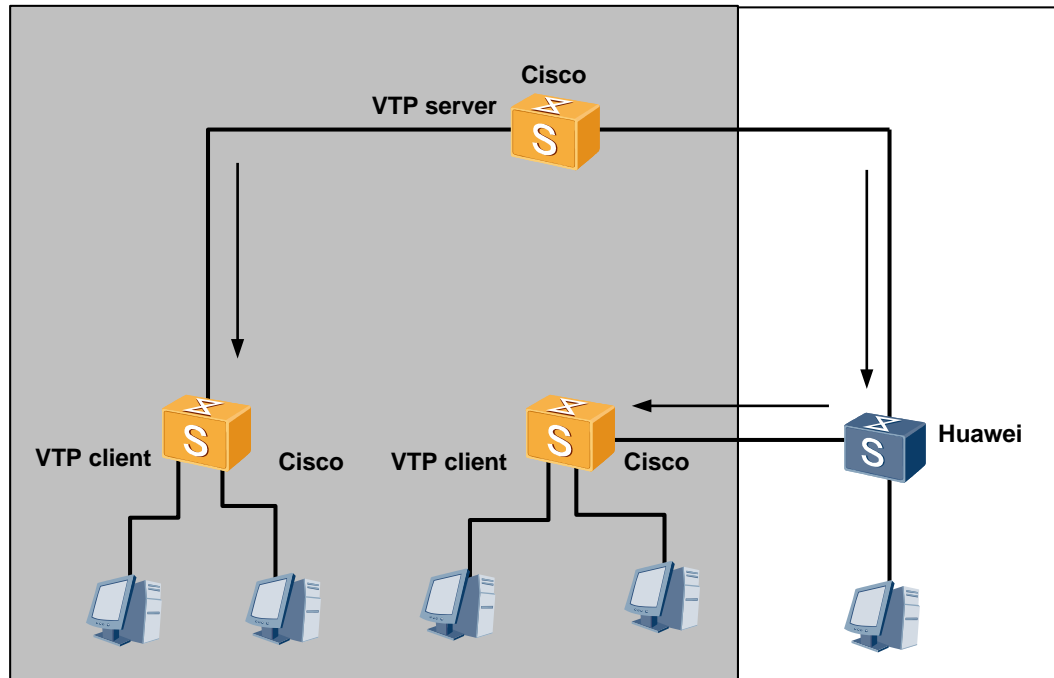
- The domain name and password of Cisco VTP clients must be the same as those of the Cisco VTP server.
- If VTP pruning is configured on a Cisco switch in a VTP domain, downstream switches must send traffic to the upstream switch first so that the pruned trunk ports can detect VLAN requirements from downstream switches. Then the upstream switch can send traffic to downstream switches.

3.2 Example 2: C-H-C Model

In the C-H-C model, a Cisco switch directly connects to a Huawei switch that has a downstream Cisco switch connected, as shown in Figure 3-2. After Layer 2 Protocol Tunneling (L2PT) is configured on the Huawei switch, the switch transparently transmits VTP frames to its downstream Cisco switch. This model is similar to the Cisco VTP transparent mode.

3.2.1 Network Topology

Figure 3-2 C-H-C model networking



3.2.2 Network Configuration

Configuration Requirements

Huawei switches need to interwork with Cisco VTP-capable switches on a network.

Configuration Methods

On Cisco switches: Enable VTP, configure ports between switches as trunk ports, add the trunk ports to all VLANs, and configure user-side ports as access ports.

On Huawei switches: Configure L2PT and local VLANs, configure ports between switches as trunk ports, add the trunk ports to all VLANs, and configure user-side ports as access ports.

Configuration Files

- Cisco switch in VTP server mode

```
Switch(config)#vtp domain Cisco //Set the VTP domain name to Cisco.
Switch(config)#vtp mode server //Set the VTP mode to server.
Switch(config)#vtp password Cisco //Set the VTP password to Cisco.
Switch(config)#vlan 20
!
interface GigabitEthernet5/48
 switchport access vlan 20
 switchport mode access
end
```

```

!
interface GigabitEthernet5/1
  switchport mode trunk
end
!
interface GigabitEthernet5/3
  switchport mode trunk
end
!

```

- Cisco switch in VTP client mode

```

Switch(config)#vtp domain Cisco
Switch(config)#vtp mode client
Switch(config)#vtp password Cisco
!
interface GigabitEthernet0/48
  switchport access vlan 20
  switchport mode access
end
!
interface GigabitEthernet0/3
  switchport mode trunk
end
!

```
- Huawei switch

```

vlan 20                                     //Create a local VLAN.
#
l2protocol-tunnel vtp group-mac 0100-5e00-0011 // Map the VTP destination MAC address to
                                                a specified multicast address.

interface GigabitEthernet0/0/1
  port link-type trunk
  port trunk allow-pass vlan 2 to 4094
l2protocol-tunnel vtp vlan 1 //Set up a Layer 2 protocol tunnel to transmit VTP frames in VLAN 1.
#
interface GigabitEthernet0/0/26
  port link-type trunk
  port trunk allow-pass vlan 2 to 4094
l2protocol-tunnel vtp vlan 1 //Set up a Layer 2 protocol tunnel to transmit VTP frames in VLAN 1.
#
interface GigabitEthernet0/0/48
  port link-type access
  port default vlan 20
#

```

3.2.3 Configuration Notes

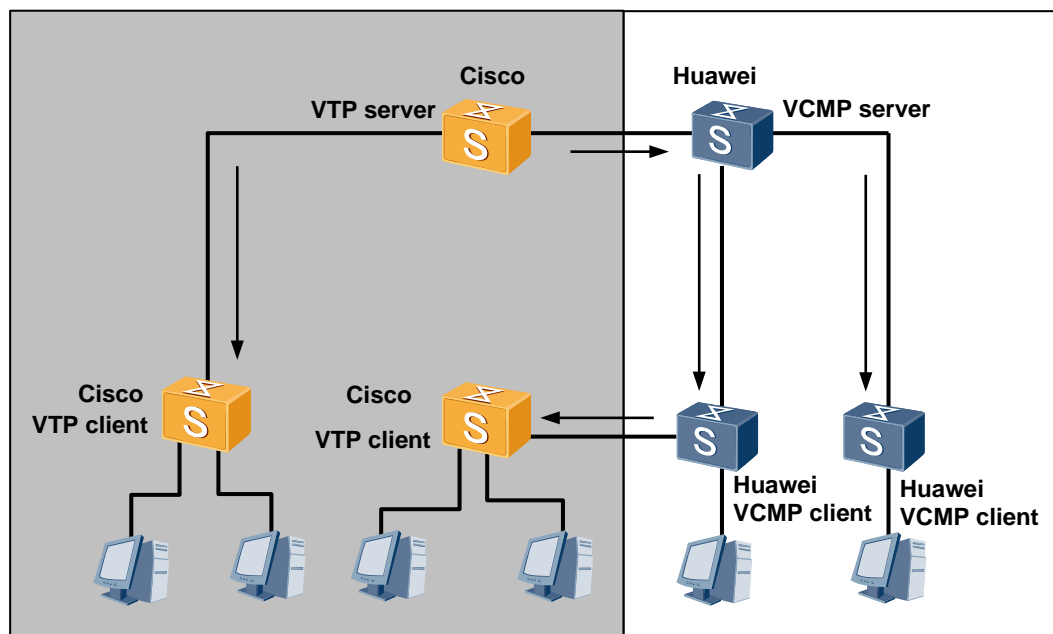
- When setting up a Layer 2 protocol tunnel on the Huawei switch, map the VTP destination MAC address to a multicast address not in use to prevent address conflicts.
- The Layer 2 protocol tunnel must be set up on ports in VLAN 1 where VTP frames are transmitted.

3.3 Example 3: C-H-H-C Model

In the C-H-H-C model, a Cisco switch directly connects to an edge switch on a Huawei network, and another edge switch of the Huawei network connects to a Cisco switch, as shown in Figure 3-3. After L2PT is configured on Huawei switches, the switches transparently transmit VTP frames to the downstream Cisco switch. This model is similar to the Cisco VTP transparent mode. VCMP is configured on the Huawei network.

3.3.1 Network Topology

Figure 3-3 C-H-H-C model networking



3.3.2 Network Configuration

Configuration Requirements

Huawei switches need to interwork with Cisco VTP-capable switches on a network.

Configuration Methods

On Cisco switches: Enable VTP, configure ports between switches as trunk ports, add the trunk ports to all VLANs, and configure user-side ports as access ports.

On Huawei switches: Configure L2PT and local VLANs, configure ports between switches as trunk ports, add the trunk ports to all VLANs, and configure user-side ports as access ports. Enable VCMP and Link Negotiation Protocol (LNP) on the Huawei network.

Configuration Files

- Cisco switch in VTP server mode

```
Switch(config)#vtp domain Cisco //Set the VTP domain name to Cisco.
```

```
Switch(config)#vtp mode server //Set the VTP mode to server.
Switch(config)#vtp password Cisco //Set the VTP password to Cisco.
Switch(config)#vlan 20
!
interface GigabitEthernet5/48
 switchport access vlan 20
 switchport mode access
end
!
interface GigabitEthernet5/1
 switchport mode trunk
end
!
interface GigabitEthernet5/3
 switchport mode trunk
end
!
```

- Cisco switch in VTP client mode

```
Switch(config)#vtp domain Cisco
Switch(config)#vtp mode client
Switch(config)#vtp password Cisco
!
interface GigabitEthernet0/48
 switchport access vlan 20
 switchport mode access
!
end
interface GigabitEthernet0/3
 switchport mode trunk
end
!
```

- Huawei switch in VCMP server mode

```
vlan 20 //Create a local VLAN.
#
vcmp domain huawei //Set the VCMP domain name to huawei.
vcmp role server //Set the VCMP mode to server.
vcmp authentication sha2-256 password huawei //Set the VCMP password to huawei.
#
l2protocol-tunnel vtp group-mac 0100-5e00-0011 // Map the VTP destination MAC address to
a specified multicast address.
#
interface GigabitEthernet0/0/1
 port link-type trunk
 port trunk allow-pass vlan 2 to 4094
 l2protocol-tunnel vtp vlan 1 //Set up a Layer 2 protocol tunnel to transmit VTP frames in VLAN 1.
#
interface GigabitEthernet0/0/26
 port link-type trunk
 port trunk allow-pass vlan 2 to 4094
 l2protocol-tunnel vtp vlan 1 //Set up a Layer 2 protocol tunnel to transmit VTP frames in VLAN 1.
#
interface GigabitEthernet0/0/48
 port link-type access
 port default vlan 20
```

```
#
interface GigabitEthernet0/0/2
 port link-type negotiation-desirable
 //By default, link auto-negotiation is enabled on the Huawei network.
 port default vlan 20
#
• Huawei switch in VCMP client mode
vlan 20 //Create a local VLAN.
#
vcmp domain huawei //Set the VCMP domain name to huawei.
vcmp role client //Set the VCMP mode client.
vcmp authentication sha2-256 password huawei //Set the VCMP password to huawei.
#
l2protocol-tunnel vtp group-mac 0100-5e00-0011 // Map the VTP destination MAC address to
a specified multicast address.

interface GigabitEthernet0/0/1
 port link-type trunk
 port trunk allow-pass vlan 2 to 4094
l2protocol-tunnel vtp vlan 1 //Set up a Layer 2 protocol tunnel to transmit VTP frames in VLAN 1.
#
interface GigabitEthernet0/0/26
 port link-type trunk
 port trunk allow-pass vlan 2 to 4094
l2protocol-tunnel vtp vlan 1 //Set up a Layer 2 protocol tunnel to transmit VTP frames in VLAN 1.
#
interface GigabitEthernet0/0/48
 port link-type access
 port default vlan 20
#
interface GigabitEthernet0/0/2
 port link-type negotiation-desirable
 //By default, link auto-negotiation is enabled on the Huawei network.
 port default vlan 20
#
```

3.3.3 Configuration Notes

- When setting up a Layer 2 protocol tunnel on the Huawei switch, map the VTP destination MAC address to a multicast address not in use to prevent address conflicts.
- The Layer 2 protocol tunnel must be set up on ports in VLAN 1 where VTP frames are transmitted.
- The **vcmp role off** command must be executed on the Huawei edge switch to restrict traffic forwarding within the VCMP domain.

4 Cisco Switch Replacement Guide

4.1 Replacing an Edge Cisco Switch

This section describes the configuration required after an edge Cisco switch is replaced by a Huawei switch. For detailed networking, see section 3.1 "Example 1: C-H Model."

4.1.1 Layer 2 Port Configuration

After replacing an edge Cisco switch with a Huawei switch, run the **port link-type access** or **port link-type negotiation-auto** command on the user-side Layer 2 ports of the Huawei switch.

On the new Huawei switch, run the **port link-type trunk** command on the port directly connected to a Cisco switch, and add the port to the VLANs to which corresponding port on the replaced Cisco switch belongs.

4.1.2 Global VLAN Configuration

Create global VLANs according to the existing global VLANs on Cisco switches.

4.1.3 Other Configurations

The edge switch is not required to transparently transmit Cisco VTP frames; therefore, you do not need to configure L2PT on the new Huawei switch.

If the Layer 2 port on a Cisco switch directly connected to the new Huawei switch is configured with **switchport dynamic auto** or **switchport dynamic desirable**, DTP negotiation fails. You need to run the **switchport mode trunk** command on the Layer 2 port of the Cisco switch.

4.2 Replacing a Cisco Switch in VTP Client Mode

This section describes the configuration required after a Cisco VTP client is replaced by a Huawei switch. For detailed networking, see section 3.2 "Example 2: C-H-C Model."

4.2.1 Layer 2 Port Configuration

On the new Huawei switch, run the **port link-type trunk** command on the port directly connected to a Cisco switch, and add the port to the VLANs to which corresponding port on the replaced Cisco switch belongs. Run the **switchport mode trunk** command on the Layer 2 port of the Cisco switch directly connected to the new Huawei switch to configure the port as a trunk port.

On the new Huawei switch, run the **port link-type negotiation-desirable** or **port link-type negotiation-auto** command to configure the Layer 2 ports that are not directly connected to the Cisco switch as trunk or access ports as required. Add these ports to the VLANs to which corresponding ports on the replaced Cisco switch belong.

4.2.2 Global VLAN Configuration

If the new Huawei switches can communicate with existing Huawei switches without help of any Cisco switch, these switches form an independent VCMP domain. Configure the VCMP domain name and roles. Create VLANs on the VCMP server, which then dynamically delivers the VLAN configurations to VCMP clients. The created VLAN list must be consistent with the global VLAN list deployed on the replaced Cisco switches.

If some new Huawei switches are located on the Cisco network and cannot form an independent domain, configure global VLANs statically on the switches.

4.2.3 Other Configurations

Cisco VTP clients are not located on the network edge. After replacing a Cisco VTP client with a Huawei switch, configure the Huawei switch to transparently transmit Cisco VTP frames to ensure VTP communication.

If the Layer 2 port on a Cisco switch directly connected to the new Huawei switch is configured with **switchport dynamic auto** or **switchport dynamic desirable**, DTP negotiation fails. You need to run the **switchport mode trunk** command on the Layer 2 port of the Cisco switch.

If the new Huawei switch is configured to transparently transmit DTP frames, a Layer 2 port on the switch may have multiple neighbors and is therefore becomes an access port after DTP negotiation.

4.3 Replacing a Cisco Switch in VTP Server Mode

This section describes the configuration required after a Cisco VTP server is replaced by a Huawei switch. After the original VTP server is replaced, configure another Cisco switch as the VTP server. For detailed networking, see section 3.3 "Example 3: C-H-H-C Model."

4.3.1 Other Configurations

After the Cisco VTP server is replaced with a Huawei switch, the VTP domain has no server. If the Cisco network runs VTP version 1 or 2, you only need to configure another Cisco switch as the new server. If the Cisco network runs VTP version 3 alone or with other VTP versions, run the **vtp primary** command to configure a Cisco switch running VTP version 3 as the VTP server to manage the VTP domain.

For other configurations, see section 4.2.3 "Other Configurations."

5 References

- RFC 2281: <http://www.rfc-editor.org/info/rfc2281>
- RFC 2338: <http://www.rfc-editor.org/info/rfc2338>