CloudEngine 12800 Series Switches

VS Technology White Paper

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Contents

1 VS Overview

This section describes the definition and functions of VS.

Definition

Virtual system (VS) technology virtualizes a single physical system (PS) into multiple logical systems that are independent of each other. Each VS functions like an individual physical device to process services, as shown in Figure 1-1.

Figure 1-1 Virtual systems
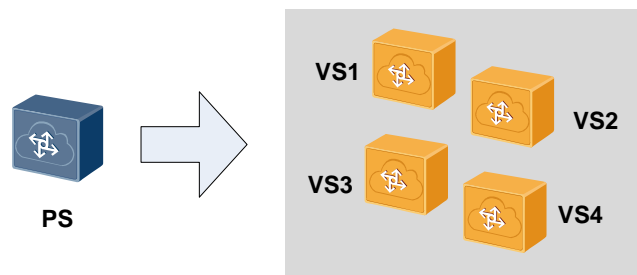
Purpose

As the network scale expands, more network infrastructure devices are required. However, some of the devices are not fully utilized, which causes a waste of resources.

VS technology allows a PS to function as multiple physical network nodes, which makes full use of existing resources and reduces the operating expenditure (OPEX). Different VSs have different services deployed to isolate services and faults, which improves network security and reliability.

2 Principles

About This Chapter

This section describes the VS implementation principles.

2.1 Basic VS Principles

The system software copies processes of the physical system (PS) to implement virtualization in the following aspects.

- Virtualization of the control plane: Each VS runs its own control protocol processes. A process error in one VS does not affect processes in other VSs. For example, if the STP process fails in a VS, STP processes run normally in other VSs, as shown in Figure 2-1.

Figure 2-1 VS fault isolation
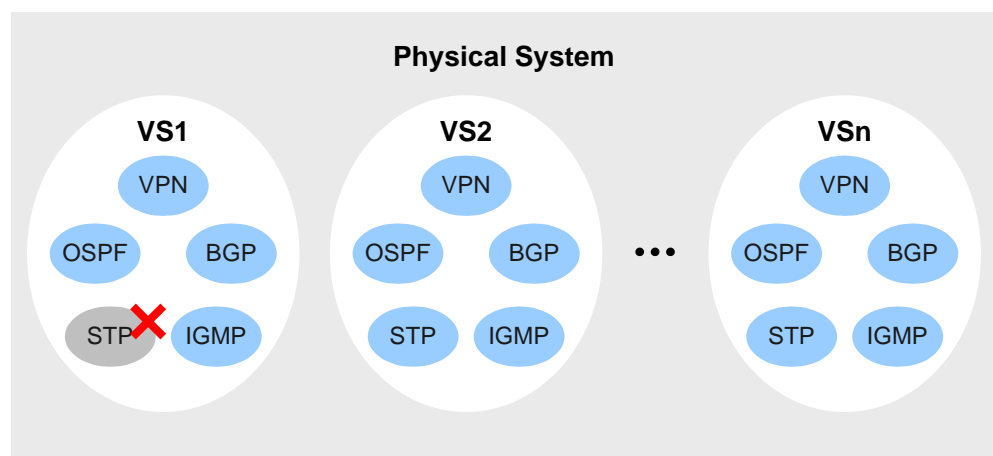
- Virtualization of the management plane: Each VS maintains its own configuration files and can be managed by a different administrator.

- Virtualization of the forwarding plane: Each VS maintains its own forwarding table and protocol stacks. Traffic is processed independently on each VS. Data flows are isolated between VSs to ensure service isolation and security.

Through plane virtualization, a new VS functions as an individual physical device.

Admin-VS

Admin-VS: the administrative VS. Each PS has an Admin-VS that retains in running state. The Admin-VS cannot be created, deleted, or shut down. An administrator enters the Admin-VS after logging in to the PS. In the Admin-VS, the administrator can create, delete, or allocate resources to VSs.

Administrator

Users on a PS can be a PS administrator or a VS administrator. The two kinds of administrators are assigned different rights.

- PS administrator: the only user that can perform operations in the Admin-VS. A PS administrator has the highest privilege level and can create, delete, or allocate resources to VSs. The PS administrator can also enter a non Admin-VS.

- VS administrator: manages only a local VS. A VS administrator can configure services in the local VS but cannot perform operations related to the entire PS, such as resetting boards and backing up electrical labels.

MAC Address

Each VS including the Admin-VS is automatically assigned a MAC address. The MAC address cannot be changed.

File System

Each VS has an independent file system and manages its configuration files and log files. A VS administrator is only allowed to perform file operations on the local file system. Operations on one VS do not affect other VSs, so security is guaranteed.

Communication Between VSs

VSs can communicate with each other only through configured physical interfaces between them, and cannot communicate directly, as shown in Figure 2-2.

Figure 2-2 Communication between VSs
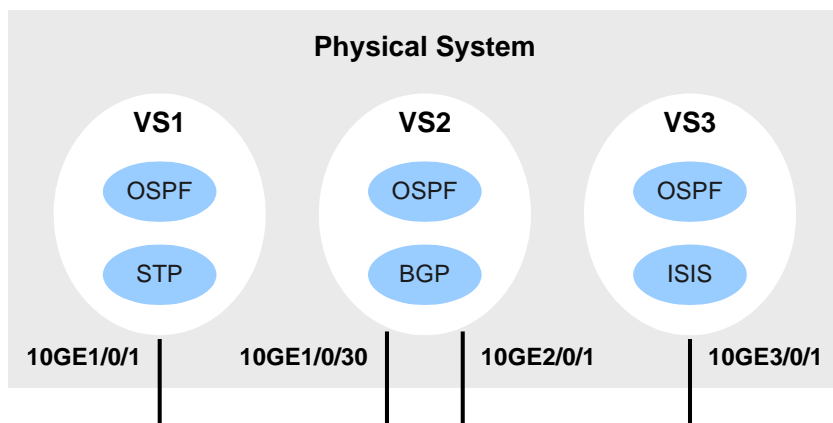
2.2 Resources Allocation

The physical system (PS) administrator can allocate resources on the PSto VSs. Resources allocated to a VS are exclusively used by the VS. A VS administrator can check and manage only local VS resources after logging in to the VS.

Allocable resources on the PS include physical and logical resources.

Physical Resources

Only physical Ethernet interfaces on interface cards can be allocated to VSs. Physical interfaces can be allocated in two modes:

- Port mode: All interfaces on an interface card can be allocated to any VS, as shown in Figure 2-3.

Figure 2-3 Port mode
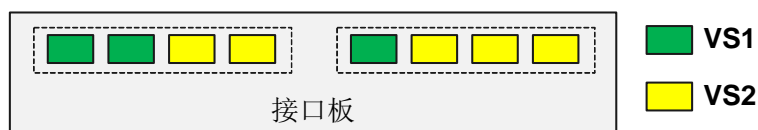
- Group mode: All interfaces on the same forwarding chip of an interface card must be allocated to the same VS, as shown in Figure 2-4.

Figure 2-4 Group mode

Interface resource allocation has the following characteristics:

- A PS can have both VS using the port mode and VSs using the group mode.
- By default, all interfaces on an interface card belong to the Admin-VS.
- The PS administrator can assign interfaces in the Admin-VS to VSs, but an interface can only be allocated to one VS.
- Interfaces on different interface cards can be allocated to the same VS.
- After an interface is allocated to a VS, original configurations on the interface are deleted.
- A VS administrator can check and configure only interfaces in the local VS.

Logical Resources

Table 2-1 lists logical resources that can be allocated to VSs.

Table 2-1 Logical resources and specifications

Resource	System Specifications	Default VS Specifications	
		Group mode	**Port mode**
IPv4 unicast routing entries	64000000	60000	60000
IPv4 multicast routing entries	60000	1000	1000
IPv6 unicast routing entries	4096000	16000	16000
IPv6 multicast routing entries	8000	100	100
VLANs	Port mode: 4063 Group mode: 28441	4063	200
VPN instances	Port mode: 4096 Group mode: 61440	4096	256
MPLS	Supported	Supported	Not supported
TRILL	Supported	Supported	Not supported
Multicast	Supported	Supported	Not supported
Weight of the maximum CPU usage	-	5	5
Maximum memory usage	-	100	100
Maximum percentage of the occupied storage space (disk ratio-threshold)	-	100	100

Logical resource allocation has the following characteristics:

- A new VS has the default logical resource specifications. The PS administrator can change the specifications in the VS.

- Logical resources of two VSs can have the same name. For example, VS1 and VS2 can both have a VLAN named **VLAN 10**.

- VSs in port mode share service specifications configured on a PS. For example, a PS supports a maximum of service 4063 VLANs, and interfaces are assigned to VS1 and VS2 in port mode. If VS1 and the Admin-VS are allocated a total of 3000 VLANs (the Admin-VS is in port mode), VS2 can only use the remaining 1063 VLANs.

- Service specifications are exclusive to VSs in group mode. For example, if a maximum of 4063 VLANs are supported by device PS, and interfaces are assigned to VS1 and VS2 in group mode, VS1 and VS2 each can have a maximum of 4063 VLANs. Note that resource allocation is restricted by the system specifications. For example, a PS supports a maximum of 28441 VLANs. If seven VSs in group mode occupy a total of 28441 (7 x 4063) VLANs, the remaining VLAN resources are insufficient for another VS in group mode.

- The maximum CPU usage of a VS is calculated through weight using the following formula:

  (Weight of the VS/Total weight of all VSs) * 100%

- A VS administrator can check and manage only logical resources in the local VS.

2.3 VS Management

A user can implement remote VS management in inband and out-of-band mode.

Out-of-Band Management

The system software provides each VS with a virtual network interface MEth0/0/0. Each virtual management interface can have an independent IP address for each virtual management interface. Through the virtual management interfaces, different VSs can be managed remotely using the same management network, as shown in Figure 2-5.

Figure 2-5 Out-of-band management
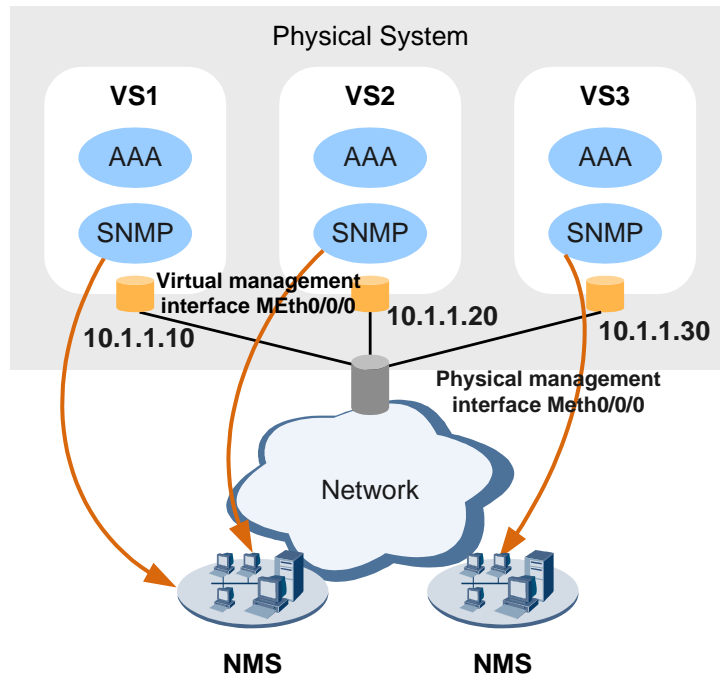
Inband Management

A user can connect to a VS through the assigned physical interface. Through inband management, the user can manage each VS using an independent management network.

Figure 2-6 Inband management
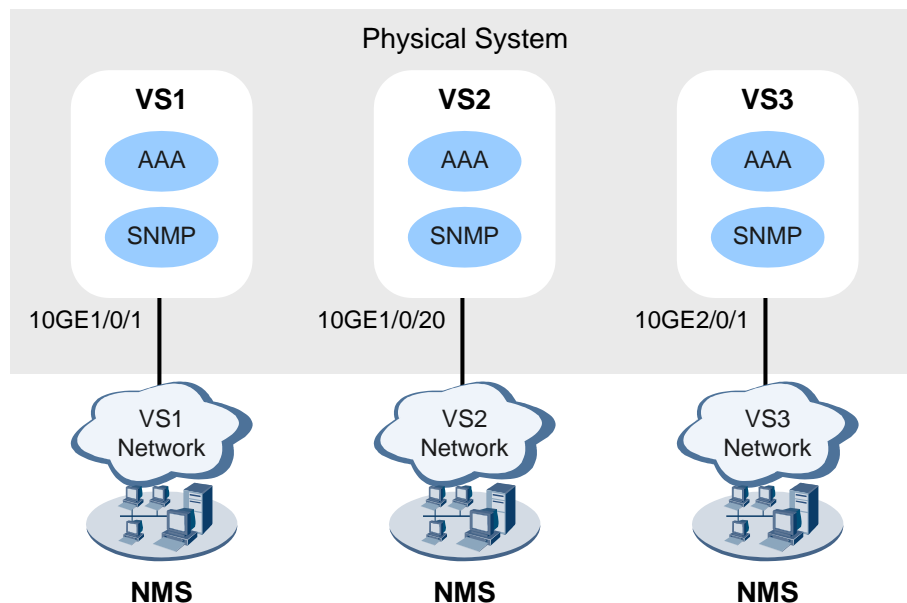
3 Applications

This section describes VS applications.

User Group Virtualization

As shown in Figure 3-1, VSs serve different user groups to isolate traffic and faults. The user groups are managed through different networks, ensuring high network reliability and security.

Figure 3-1 VS assignment based on user groups
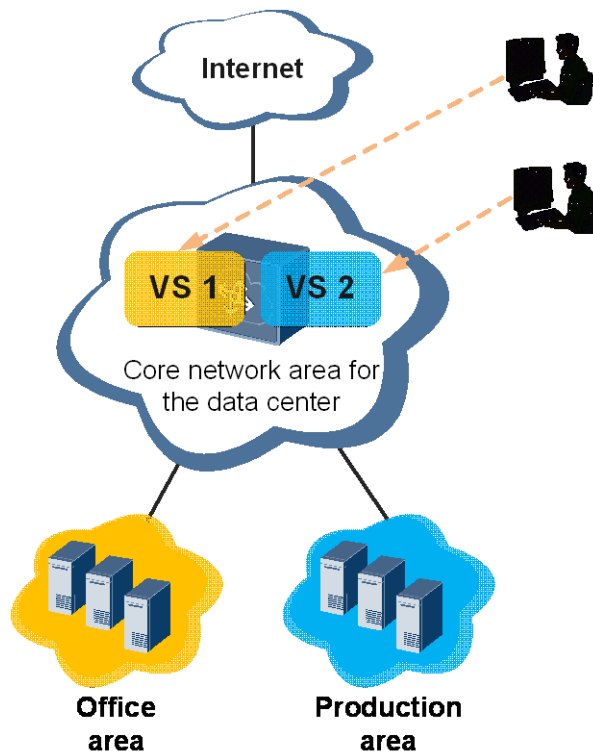
Network Node Virtualization

As shown in Figure 3-2, VS technology allows vertical and horizontal network virtualization without changing the logical network topology. This reduces the number of physical devices on a network, improves the resource use efficiency, and lowers network OPEX.

Figure 3-2 VS assignment based on network nodes
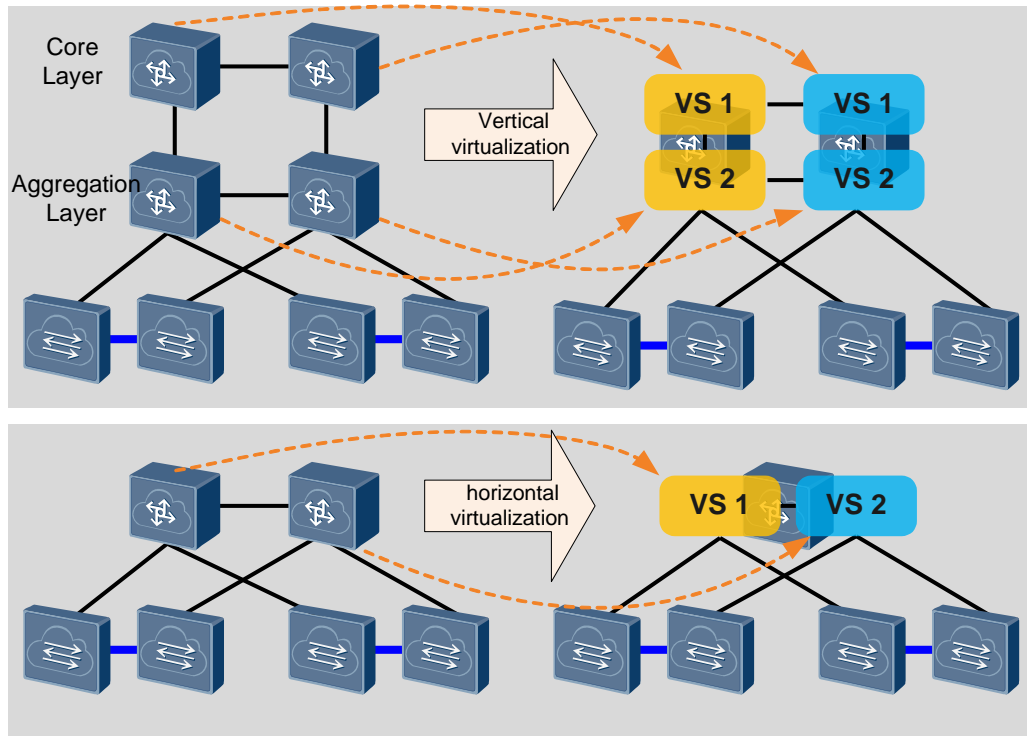
Service virtualization

As shown in Figure 3-3, different services are isolated and processed independently on VSs to improve security and reliability.

Figure 3-3 VS assignment based on services
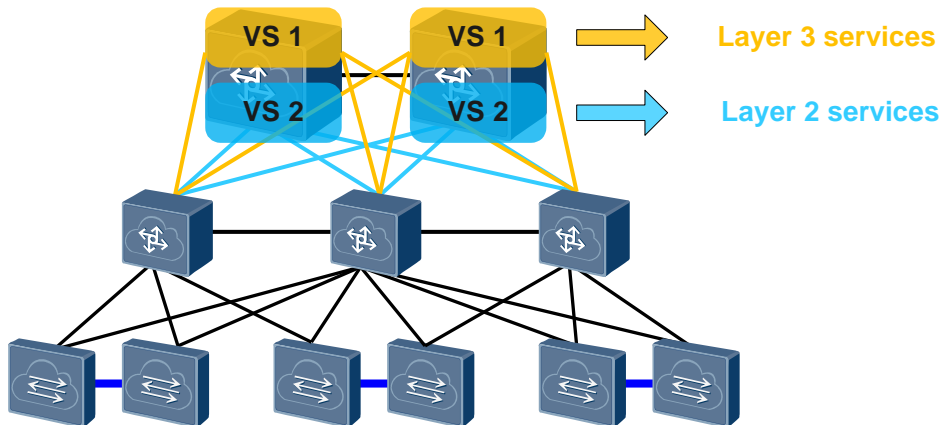
4 Configuration Notes

This section describes notes for VS configuration and support for some features in VSs.

Involved Network Elements

No other network elements (NEs) are required.

License Support

The VS function is controlled by a license and is disabled on a new device by default. To use the VS function, apply for and purchase the license from the equipment supplier.

Version Support

Table 4-1 Products and minimum version supporting VS

Series	Product	Minimum Version Required
CE12800	CE12804/CE12808/CE12812	V100R002C00
	CE12816	V100R003C00
	CE12804S/CE12808S	V100R005C00

Feature Dependencies and Limitations

Precautions

When configuring VSs, pay attention to the following points:

- A physical system (PS) supports a maximum of 16 VSs (including the admin-VS). By default, seven VSs in group mode can be created. To create more VSs in group mode, adjust the number of VLANs occupied by VSs.
- Only the PS administrator can create VSs and allocate resources to VSs.
- VSs can be created only when the PS has sufficient physical and logical resources to be allocated.

- Only physical ports on LPUs can be assigned to VSs. However, physical member ports in a stack and member ports of an Eth-Trunk cannot be assigned to VSs.

- After a physical port is assigned to a VS, the port cannot be configured as a physical member port.

- There is no mapping between a logical resource template and a VS. After a logical resource template is loaded on a VS, modifying the logical resource template does not affect the VS. The modified logical resource template takes effect only after it is loaded to the VS again.

- Different IP addresses need to be configured for the management network ports of different VSs.

- In V100R005C00 and later versions, other ports on the forwarding chip where stack physical member ports reside can be allocated to VSs in group mode (physical member ports will not be assigned to VSs). This configuration is not supported in versions earlier than V100R005C00.

  When V100R005C00 or later versions have the configuration in this scenario, it is not recommended to downgrade the software to a version earlier than V100R005C00. If the software needs to be downgraded, before the downgrade, configure the next startup configuration file as the backup configuration file used before a version upgrade.

Support for Features in a VS

Support for most service features in a VS is the same as that on a physical device, except for the features listed in Table 4-2.

Table 4-2 Support for features in a VS

Feature	Support in a VS
Hardware management	Hardware operations, such as device restart, card reset, and e-label backup, can be performed only in the admin-VS and are not supported in non-admin-VSs. VS information such as CPU and memory usage can be viewed in non-admin-VSs.
Number of VTY users	The admin-VS supports a maximum of 21 VTY users. In V100R003C00 and earlier versions, a non-admin-VS supports a maximum of 5 VTY users. In versions later than V100R003C00, a non-admin-VS supports a maximum of 20 VTY users.
Port split	Ports assigned to non-admin-VSs cannot be split.
CSS	• CSS can only be configured in the admin-VS. • VSs can be created in a CSS. Configure the CSS before creating VSs. If VSs are created before configuring the CSS, the configuration may be lost. • Similar to a single switch, a CSS supports a maximum of 16 VSs. • In a CSS, dual-active detection (DAD) can only be configured in the admin-VS.
SVF	• The SVF function can only be enabled in the admin-VS. • A fabric port can be configured in the non-admin-VS. Subsequently, all the ports of the leaf switches to which the

Feature	Support in a VS
	fabric port connects belong to the admin-VS.
ISSU	In-service software upgrade (ISSU) can only be configured in the admin-VS. All the VSs in the PS share the same version software. Therefore, when ISSU is configured in the admin-VS, the software versions of other VSs are also upgraded.
MPLS, GRE, L3VPN, VLL, PWE3, VPLS, EVN and multicast	• Among all VSs in port mode, MPLS, GRE, L3VPN, VLL, PWE3, VPLS, EVN and multicast functions can only be configured in the admin-VS. • MPLS, GRE, L3VPN, VLL, PWE3, VPLS, EVN and multicast functions can be configured in any VS in group mode.
MPLS TE	In V100R003C00 and earlier versions, MPLS TE functions can only be configured in the admin-VS. In V100R003C10 and later versions: • Among all VSs in port mode, MPLS TE functions can only be configured in the admin-VS. • MPLS TE functions can be configured in any VS in group mode.
TRILL	• Transparent Interconnection of Lots of Links (TRILL) can be configured in the admin-VS if there is no VS in port mode. No VS in port mode can be configured after TRILL is configured in the admin-VS. • If VSs in port mode are configured, TRILL cannot be configured in any VS in port mode, including the admin-VS. • All VSs in group mode support TRILL configuration.
VXLAN	In V100R003C10 and V100R005C00, VXLAN takes effect only in the admin-VS. From V100R005C10: • Among all VSs in port mode, VXLAN function can only be configured in the admin-VS. • VXLAN function can be configured in any VS in group mode.
M-LAG	• Among all VSs in port mode, M-LAG can only be configured in the admin-VS. • M-LAG can be configured in any VS in group mode.
TCAM ACL customization	• All VSs in group mode support TCAM ACL customization. • In earlier versions of V100R006C00, among VSs in port mode, only the admin-VS supports TCAM ACL customization. In V100R006C00 and later versions, the VS in port mode and TCAM ACL customization cannot be configured simultaneously.
NTP	NTP can only be configured in Admin-VS. After a VS is created, the non-Admin-VS system time is the same as the Admin-VS

Feature	Support in a VS
	system time.

Port Assignment on Cards

You must assign ports to VSs in group mode based on port groups. That is, assign or delete ports on the same forwarding chip to or from the same VS.

Table 4-3 lists the maximum number of port groups on different types of cards and ports in each port group.

Table 4-3 Port groups on cards and ports in each port group

Port Rate on a Card	Card Model	Port Group and Port Assignment (Port Group: Port Number)
GE	• CE-L48GS-EA • CE-L48GT-EA • CE-L48GS-EC • CE-L48GT-EC • CE-L48GS-ED • CE-L48GT-ED	Group 0: 0-47
10GE	• CE-L48XS-EA • CE-L48XS-SA • CE-L48XS-BA • CE-L48XS-EC • CE-L48XS-ED • CE-L48XS-EF • CE-L48XT-EC	Group 0: 24-47 Group 1: 0-23
	• CE-L24XS-EA • CE-L24XS-BA • CE-L24XS-EC • CE-L24XS-ED	Group 0: 0-23
	CE-L12XS-ED	Group 0: 0-11
	• CE-FWA • CE-IPSA	Group 0: 0-3
40GE	• CE-L24LQ-EA • CE-L24LQ-EC • CE-L24LQ-EC1	Group 0: 0-5 Group 1: 6-11 Group 2: 12-17 Group 3: 18-23
	CE-L12LQ-EF	Group 0: 6-11

Port Rate on a Card	Card Model	Port Group and Port Assignment (Port Group: Port Number)
		Group 1: 0-5
	CE-L36LQ-EG	In V100R005C10 and earlier versions: • Group 0: 0-35 In V100R006C00 and later versions: • Group 0: 0-17 • Group 1: 18-35
100GE	CE-L04CF-EF	Group 0: 2-3 Group 1: 0-1
	CE-L06LQ-EC	Group 0: 0-5
	CE-L08CC-EC	Group 0: 0-1 Group 1: 2-3 Group 2: 4-5 Group 3: 6-7
	CE-L12CF-EG	In V100R005C10 and earlier versions: • Group 0: 0-11 In V100R006C00 and later versions: • Group 0: 0-5 • Group 1: 6-11
Contiguous ports on a card are added to each port group in sequence. For example, a CE-L48XS-EA card has two port groups, and ports 10GE1/0/0 to 10GE1/0/23 are added to one port group, and ports 10GE1/0/24 to 10GE1/0/47 are added to the other port group.		

5 Default Configuration

This section describes the default VS configurations.

Table 5-1 Default configurations of VS logical resources

Parameter	Default Setting	
	Port mode	Group mode
Maximum number of IPv4 unicast routing entries	60000	60000
Maximum number of IPv4 multicast routing entries	1000	1000
Maximum number of IPv6 unicast routing entries	16000	16000
Maximum number of IPv6 multicast routing entries	100	100
Maximum number of VLANs	200	4063
Maximum number of VPN instances	256	4096
MPLS	disable	enable
TRILL	disable	enable
Multicast	disable	enable
Weight of the maximum CPU usage	5	5
Maximum memory usage	100	100
Maximum percentage of the occupied storage space (disk ratio-threshold)	100	100

6 Configuring VSs

About This Chapter

You can create and allocate resources to virtual systems (VSs) on a physical system (PS) to virtualize the PS into multiple VSs.

Pre-configuration Tasks

Before configuring VSs, complete the following tasks:

- Ensuring that the device has obtained a license.
- Logging in to the device as a PS administrator.

6.1 (Optional) Creating a Logical Resource Template

Context

The physical system (PS) administrator can create a logical resource template to assign logical resources to VSs. A logical resource template defines multiple logical resource items and their specifications. The PS can use a logical resource template to assign multiple logical resource items to a VS at a time, allowing for flexible VS resource management.

Procedure

Step 1 Run:

```
system-view
```

The system view is displayed.

Step 2 Run:

admin

The admin view is displayed.

Step 3 Run:

resource-template *template-name*

A logical resource template is created and the logical resource template view is displayed.

A maximum of 64 logical resource templates can be created.

Step 4 Add resource items to the logical resource template and set their specifications.

- Run:

  resource { **u4route** | **m4route** | **u6route** | **m6route** | **vlan** | **vpn-instance** } **upper-limit** *resource-limit*

  The specifications of the routing entry, VLAN, or VPN instance are configured.

- Run:

  resource { **cpu weight** *weight* | **memory ratio-threshold** *ratio-threshold* | **disk ratio-threshold** *disk-ratio-threshold* }

  The maximum CPU usage, storage space, and memory usage are set.

- Run:

  resource { **mpls** | **trill** | **mcast** } **enable**

  MPLS, TRILL, or multicast is enabled.

Step 5 Run:

commit

The configuration is committed.

----End

6.2 Creating a VS

Context

Physical interfaces can be assigned to the VS in two modes:

- Port mode: All interfaces on an interface card can be allocated to any VS, which has high flexibility. VSs in port mode share service specifications.

- Group mode: All interfaces on the same forwarding chip of an interface card must be allocated to the same VS. Service specifications are exclusive to VSs in group mode.

☐ NOTE

- One physical system (PS) can be virtualized into a maximum of 16 VSs including the Admin-VS.
- Only the PS administrator can create VSs.

Procedure

Step 1 Run:

system-view

The system view is displayed.

Step 2 Run:

admin

The admin view is displayed.

Step 3 Run:

virtual-system *vs-name*

A VS is created.

Step 4 Run:

port-mode { **group** | **port** } [**resource-template** *template-name*]

The interface assignment mode and a logical resource template are specified for the VS.

Step 5 (Optional) Run:

description *description*

Description information is configured for the VS.

By default, no description information is configured for a VS.

Step 6 Run:

commit

The configuration is committed.

----End

6.3 Configuring Resources for a VS

Context

After creating a VS, the PS administrator needs to assign both physical resources and logical resources to the VS.

- Physical resources: Only physical Ethernet interfaces on interface cards can be allocated. By default, all interfaces on an interface card belong to the Admin-VS.

- Logical resources: Allocable logical resources include unicast routing entries, multicast routing entries, VLANs, and other resources. By default, a new VS has the default logical resource specifications. For details, see 5 Default Configuration. You can use a

logical resource template to modify specifications of logical resources in batches or modify specifications of a specified resource item for a VS.

📖 NOTE

- Only the PS administrator can allocate physical interfaces to VSs.

- Only physical interfaces on interface cards can be assigned to VSs. However, the CSS and Eth-Trunk member interfaces cannot be assigned to VSs. After an interface is allocated to a VS, original configurations on the interface are deleted.

- In port mode, all interfaces on an interface card can be allocated to any VS; in group mode, all interfaces on the same forwarding chip of an interface card must be allocated to the same VS.

- There is no binding between a logical resource template and a VS. After a logical resource template is loaded on a VS, modifying the logical resource template does not affect the VS. The modified logical resource template takes effect only after it is loaded to the VS again.

Procedure

- Assign physical interface resources.

1. Run:

    system-view

    The system view is displayed.

2. Run:

    admin

    The admin view is displayed.

3. Run:

    virtual-system *vs-name*

    The VS management view is displayed.

4. Run:

    assign interface *interface-type interface-number1* [**to** *interface-number2*]

    Physical interfaces are assigned to the VS.

    Before assigning physical interfaces to a VS in port group mode, run the **display device port-map** [**slot** *slot-id*] command in the user view or system view to view the mapping between forwarding chips and interfaces to learn which interfaces will be assigned to the VS.

5. Run:

    commit

    The configuration is committed.

- (Optional) Assign logical resources.

1. Run:

    system-view

    The system view is displayed.

2. Run:

    admin

    The admin view is displayed.

3. Run:

    virtual-system *vs-name*

    The VS management view is displayed.

4. Set logical resource specifications.

– Use a logical resource template to allocate logical resources to the VS.

Run:

assign resource-template *template-name*

A logical resource template is loaded on the VS.

📖 NOTE

● A user can run the **port-mode** { **group** | **port** } [**resource-template** *template-name*] command to specify a logical resource template for a VS when configuring the interface assignment mode or run the **assign resource-template** *template-name* command to specify a logical resource template for the VS.

● Skip this step if a logical resource template has been specified for the VS in the **port-mode** { **group** | **port** } [**resource-template** *template-name*] command.

– Set specifications of specified resource items.

– Run:

resource { **u4route** | **m4route** | **u6route** | **m6route** | **vlan** | **vpn-instance** } **upper-limit** *resource-limit*

The specifications of the routing entry, VLAN, or VPN instance are set.

– Run:

resource { **cpu weight** *weight* | **memory ratio-threshold** *ratio-threshold* | **disk ratio-threshold** *disk-ratio-threshold* }

The maximum CPU usage, storage space, and memory usage are set.

– Run:

resource { **mpls** | **trill** | **mcast** } **enable**

MPLS, TRILL, or multicast is enabled.

5. Run:

commit

The configuration is committed.

----End

6.4 Switching to a VS and Configuring a Management Account for the VS

Context

A VS functions as an individual physical device. The PS administrator must perform initialization configurations, for example, configuring an IP address or a management account for the VS to facilitate VS user login and management.

The PS administrator can switch from the Admin-VS to a VS using a command. After entering the VS, the PS administrator has the highest privilege level and can configure an IP address or a management account for the VS in a way same as for a PS. The VS administrator can log in to the VS using the configured IP address and user name to perform service configurations.

📖 NOTE

Only the PS administrator can switch from the Admin-VS to a VS.

Procedure

Step 1 (Optional) Disable the VS command-line prompt from containing an admin-VS hostname.

1. Run:

   ```
   system-view
   ```

   The system view is displayed.

2. Run:

   ```
   admin
   ```

   The admin view is displayed.

3. Run:

   ```
   combined-sysname disable
   ```

   The VS command-line prompt is disabled from containing an admin-VS hostname.

   By default, when you run the **switch virtual-system** *vs-name* command to switch from the admin-VS to a non-admin-VS, the VS command-line prompt contains an admin-VS hostname and a VS hostname.

4. Run:

   ```
   commit
   ```

   The configuration is committed.

5. Run:

   ```
   return
   ```

   Return to the user view.

Step 2 Run the following command in the user view:

```
switch virtual-system vs-name
```

The PS administrator switches from the Admin-VS to the VS.

After switching to the VS, you can run the **quit** command to switch back to the user view of the PS.

Step 3 Configure an IP address.

1. Run:

   ```
   system-view
   ```

   The system view is displayed.

2. Run:

   ```
   interface interface-type interface-number
   ```

   The interface view is displayed.

   In addition to the virtual management interface MEth0/0/0, you can also configure IP addresses for other Layer 3 interfaces such as a VLANIF interface on the VS.

3. Run:

   ```
   ip address ip-address { mask | mask-length }
   ```

   The IP address is configured.

   Configure IP addresses and deploy routes based on the network plan to ensure that routes between terminals and VSs are reachable.

4. Run:

   ```
   commit
   ```

The configuration is committed.

Step 4 Configure a management account. For details, see dc/dc_cfg_login_0028.xml in the *CloudEngine 12800 Series Switches　Configuration Guide - Basic Configuration*

----End

6.5 Setting the Delay Before VS Ports Can Become Up

Context

During a VS startup, the peer device will send traffic to the VS after detecting that the VS's ports become Up. As a result, traffic will be lost for a long period of time because the local VS configuration has not been restored. To prevent traffic loss, set the delay before VS ports can become Up so that the ports can become Up after the local VS configuration has been restored.

Procedure

Step 1 In the user view, run:

```
switch virtual-system vs-name
```

Switch from the admin-VS to the specified VS.

Step 2 Run:

```
system-view
```

The system view is displayed.

Step 3 Run:

```
set vs port up-delay up-delay
```

The delay before VS ports can become Up is set.

By default, VS ports become Up immediately when a VS starts.

Step 4 Run:

```
commit
```

The configuration is committed.

----End

6.6 Checking the Configuration

Procedure

- Run the **display virtual-system** [**name** *vs-name*] [**verbose**] command to check VS information. The parameter **name** *vs-name* is valid only in the admin view.
- Run the **display virtual-system** [**name** *vs-name*] **resource** command to check VS resource information. The parameter **name** *vs-name* is valid only in the admin view.

- Run the **display virtual-system resource-template** command to check logical resource template information.

----End

Follow-up Procedure

Some ports in the VS is in TRIGGER DOWN state.

If a VS in group mode uses a different tunnel mode (set by the **ip tunnel mode** { **gre** | **vxlan** } than the admin-AS, all ports in a port group newly added to the VS transit to the TRIGGER DOWN state. (The system sets a port's state to TRIGGER DOWN after detecting a failure of the port. A port in this state cannot send or receive packets and its indicator is off.) Details about the TRIGGER DOWN state of a port are as follows:

```
<HUAWEI> display interface 10ge 1/0/1
10GE1/0/1 current state : TRIGGER DOWN (resource-mismatch) (ifindex: 141)
Line protocol current state : DOWN
......
```

To restore a port in TRIGGER DOWN state, reset the LPU where the port is located.

You are advised not to remove the TRIGGER DOWN state of a port using the **shutdown** and **undo shutdown**. Although this method can restore a port in TRIGGER DOWN state, it cannot solve the problem of inconsistent tunnel modes in the VSs.

7 Maintaining a VS

About This Chapter

Maintaining a VS includes restarting, shutting down, deleting, and saving configurations on the VS.

7.1 Saving VS Configurations

Context

A VS has independent configuration files as the physical system (PS) does. When the VS is restarted or shut down, configurations on the VS may be lost. To prevent this situation, save the configurations after services are configured.

The PS administrator can run commands in the Admin-VS to save configurations of all VSs, but the VS administrator can only save configurations of the local VS.

Procedure

- Save configurations of all VSs as a PS administrator.
1. Run the **save all virtual-systems** command in the user view of the PS to save configurations of all VSs.
- Save configurations of the local VS as the VS administrator.
1. Run the **save** command in the user view of the VS to save configurations of the local VS.

----End

Checking the Configuration

Run the **display virtual-system configuration state** command in the admin view to check the VS configuration storage status.

7.2 Restarting a VS

Context

The physical system (PS) administrator and VS administrator can restart a VS. The PS administrator can run commands in the Admin-VS to restart a VS; the VS administrator can restart a local VS after logging in to the VS.

📖 **NOTE**

- Only a non-admin-VS can be restarted.
- It is not recommended to restart multiple VSs at the same time. Otherwise, the VS configurations may be incorrect.
- Before restarting a VS, save configurations on the VS; otherwise, the configurations may get lost.
- During the VS restart, all interfaces on the VS are shut down, services are interrupted, and users on the VS are disconnected.
- If the active/standby switchover is performed during the VS restart, all interfaces are in Down state after the VS restarts. You can restart the VS to solve the problem.
- During the restart of a VS, service traffic will be interrupted for a certain period after ports of the VS become Up again. You are advised to shut down the ports of the VS before restarting the VS and enable the ports 1 minute after the VS is restarted.

Procedure

- Restart the VS as the PS administrator.
1. Run the **reset virtual-system** *vs-name* command in the user view of the PS to restart a VS.
- Restart the VS as the VS administrator.
1. Run the **reset** command in the user view of a VS to restart the VS.

----End

7.3 Shutting Down a VS

Context

You can use commands to shut down a running VS for fault diagnosis or to terminate VS services.

NOTE

- Only a non-admin-VS can be shut down.

- Only the PS administrator can shut down the VS.

- After a VS is shut down, physical resources or logical resources in the VS cannot be allocated or retrieved.

- After a VS is shut down, all interfaces on the VS become Down; services on the VS are interrupted, and users are disconnected.

- When the **shutdown** and then **undo shutdown** commands are executed to restart a VS, service traffic will be interrupted for a certain period after ports of the VS become Up again. You are advised to shut down the ports of the VS before restarting the VS and enable the ports 1 minute after the VS is restarted.

Procedure

Step 1 Run the **system-view** command to enter the system view.

Step 2 Run the **admin** command to enter the admin view.

Step 3 Run the **virtual-system** *vs-name* command to enter the VS management view.

Step 4 Run the **shutdown** command to shut down the VS.

You can run the **undo shutdown** command to start the shutdown VS.

Step 5 Run the **commit** command to commit the configuration.

----End

7.4 Deleting a VS

Context

Only the physical system (PS) administrator is allowed to delete VSs, and only non Admin-VSs can be deleted. After a VS is deleted, all services on the VS is interrupted. Resources allocated to the VS are retrieved.

⚠ **NOTICE**

After a VS is deleted, all services on the VS are interrupted and cannot be restored. Therefore, exercise caution when you delete the VS.

Procedure

Step 1 Run the **system-view** command to enter the system view.

Step 2 Run the **admin** command to enter the admin view.

Step 3 Run the **undo virtual-system** *vs-name* command to delete the VS.

Step 4 Run the **commit** command to commit the configuration.

----End

8 Configuration Examples

About This Chapter

This section provides VS configuration examples including networking requirements, configuration roadmap, and configuration procedure.

8.1   Example for Configuring VSs

8.1 Example for Configuring VSs

Networking Requirements

As shown in Figure 8-1, SwitchA is a core switch on the network and carries multiple Layer 2 and Layer 3 services.

On the network, all services need to be processed by the main processing units (MPUs) of the physical system (PS). In such a case, when a service failure on the PS causes a failure of the PS, other services running on the PS cannot be properly forwarded. To prevent this problem, users require that Layer 2 and Layer 3 services deployed on the PS be isolated from each other to improve network security.

Figure 8-1 Networking diagram for configuring VSs
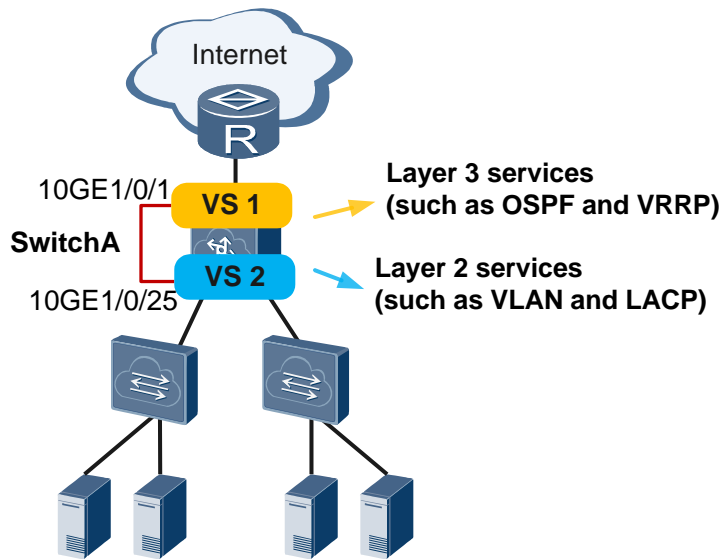
Configuration Roadmap

The configuration roadmap is as follows:

1. Create VS1 and VS2, and allocate physical interfaces and logical resources to them.
2. Configure management IP addresses and management accounts for VSs to facilitate VS management.

Procedure

Step 1 Create VSs and allocate resources to them.

Create two VSs (VS1 and VS2) in group mode, and assign ports 10GE1/0/0 to 10GE1/0/23 to VS1 and 10GE1/0/24 to 10GE1/0/47 to VS2.

> **NOTE**
>
> After you assign any port to a VS in group mode, the other ports that use the same forwarding chip as this port are automatically assigned to the VS. For example, ports 10GE1/0/0 to 10GE1/0/23 use the same forwarding chip. After you assign 10GE1/0/0 to VS1, ports 10GE1/0/0 to 10GE1/0/23 are automatically assigned to VS1.
>
> Before assigning physical interfaces to a VS in port group mode, run the **display device port-map** [**slot** *slot-id*] command in the user view or system view to view the mapping between forwarding chips and interfaces to learn which interfaces will be assigned to the VS.

```
<HUAWEI> system-view
[~HUAWEI] sysname SwitchA
[*HUAWEI] commit
[~SwitchA] admin
[~SwitchA-admin] virtual-system vs1
[*SwitchA-admin-vs:vs1] port-mode group
[*SwitchA-admin-vs:vs1] assign interface 10ge 1/0/0
Warning: All configurations of the interfaces will be deleted. Interfaces 10GE1/0/0-23
of the same group will be assigned. Continue? [Y/N]: y
[*SwitchA-admin-vs:vs1] quit
[*SwitchA-admin] commit
```

```
[~SwitchA-admin] virtual-system vs2
[*SwitchA-admin-vs:vs2] port-mode group
[*SwitchA-admin-vs:vs2] assign interface 10ge 1/0/24
Warning: All configurations of the interfaces will be deleted. Interfaces 10GE1/0/24-47
of the same group will be assigned. Continue? [Y/N]: y
[*SwitchA-admin-vs:vs2] quit
[*SwitchA-admin] commit
```

Create two logical resource templates (**temp1** and **temp2**) and load the templates on VS1 and VS2 to adjust the logical resource specifications of the two VSs.

📖 **NOTE**

A VS will be assigned default logical resource specifications after being created. To adjust the logical resource specifications, use a logical resource template or run the **resource** command in the VS management view. To view the logical resource specifications of a specified VS, run the **display virtual-system**[**name** *vs-name*] **verbose** command.

```
[~SwitchA-admin] resource-template temp1
[*SwitchA-admin-template:temp1] resource vlan upper-limit 2000
[*SwitchA-admin-template:temp1] quit
[*SwitchA-admin] resource-template temp2
[*SwitchA-admin-template:temp2] resource vpn-instance upper-limit 1000
[*SwitchA-admin-template:temp2] quit
[*SwitchA-admin] commit
[~SwitchA-admin] virtual-system vs1
[~SwitchA-admin-vs:vs1] assign resource-template temp1
[*SwitchA-admin-vs:vs1] quit
[*SwitchA-admin] virtual-system vs2
[*SwitchA-admin-vs:vs2] assign resource-template temp2
[*SwitchA-admin-vs:vs2] quit
[*SwitchA-admin] commit
```

Check the status and assigned resources of VSs. The following example displays information about VS1.

```
[~SwitchA-admin] display virtual-system name vs1 verbose
Name       : vs1
Status     : running
Description :
Create time : 2015-08-03 03:41:51
Port mode  : group
System MAC : 0019-7459-3320
Assigned slot(s)
pvmb       : 5
pvmb       : 6
CPU(s)
slot 5     : 0%
Memory(s)
slot 5     : 2%, 112228/3884220 (Used Kbytes/Max Kbytes)
Disk(s)
5#flash:/VS_vs1: 0%, 1336/3480880 (Used Kbytes/Max Kbytes)
Assigned interface(s)
  10GE1/0/0, slot 1
  10GE1/0/1, slot 1
  10GE1/0/2, slot 1
  10GE1/0/3, slot 1
```

```
          10GE1/0/4, slot 1
          10GE1/0/5, slot 1
          10GE1/0/6, slot 1
          10GE1/0/7, slot 1
          10GE1/0/8, slot 1
          10GE1/0/9, slot 1
          10GE1/0/10, slot 1
          10GE1/0/11, slot 1
          10GE1/0/12, slot 1
          10GE1/0/13, slot 1
          10GE1/0/14, slot 1
          10GE1/0/15, slot 1
          10GE1/0/16, slot 1
          10GE1/0/17, slot 1
          10GE1/0/18, slot 1
          10GE1/0/19, slot 1
          10GE1/0/20, slot 1
          10GE1/0/21, slot 1
          10GE1/0/22, slot 1
          10GE1/0/23, slot 1
Assigned resource(s)
u4route      : 60000(Max)
m4route      : 1000(Max)
u6route      : 16000(Max)
m6route      : 100(Max)
vlan         : 2000(Max)
vpn-instance : 4096(Max)
cpu          : 5(weight)
memory       : 100(ratio-threshold)
disk         : 100(ratio-threshold)
mpls         : enable
trill        : enable
mcast        : enable
```

Step 2   Configure management IP addresses and management accounts for VSs.

Switch from the Admin-VS to VS1 and configure a management IP address and management account for VS1. The configuration of VS2 is the same as that of VS1 and is not provided here. For detailed configuration of management accounts, see dc/dc_cfg_login_0028.xml in the *CloudEngine 12800 Series Switches   Configuration Guide - Basic Configuration*.

```
[~SwitchA-admin] return
<SwitchA> switch virtual-system vs1
<SwitchA-vs1> system-view
[~SwitchA-vs1] interface MEth 0/0/0
[~SwitchA-vs1-MEth0/0/0] ip address 10.1.1.10 24
[*SwitchA-vs1-MEth0/0/0] quit
[*SwitchA-vs1] user-interface vty 0 4
[*SwitchA-vs1-ui-vty0-4] authentication-mode aaa
[*SwitchA-vs1-ui-vty0-4] user privilege level 15
[*SwitchA-vs1-ui-vty0-4] quit
[*SwitchA-vs1] aaa
[*SwitchA-vs1-aaa] local-user vs1_user password irreversible-cipher VS1_password
```

```
[*SwitchA-vs1-aaa] local-user vs1_user service-type telnet
[*SwitchA-vs1-aaa] local-user vs1_user level 3
[*SwitchA-vs1-aaa] quit
[*SwitchA-vs1] undo telnet server disable
[*SwitchA-vs1] commit
[~SwitchA-vs1] quit
<SwitchA-vs1> quit
```

Use the configured IP address, user name, and password to log in to the VSs through a remote client. The following example configures a login to VS1 from a PC.

📖 NOTE

- The routes between the client and VSs must be reachable.

```
C:\Documents and Settings\Administrator> telnet 10.1.1.10
Username:vs1_user
Password:
Warning: Please change the original password.
The password needs to be changed. Change now? [Y/N]: n
Info: The max number of VTY users is 5, the number of current VTY users online is 1,
and total number of terminal users online is 1.
    The current login time is 2013-03-22 19:06:41.
    First login successfully.
<vs1>
```

Step 3 Configure VS1 and VS2 to communicate with each other.

Configure IP addresses for the interfaces that connect VS1 and VS2. VSs can directly communicate only when they are connected using physical ports, similar to direct communication between physical devices.

```
<SwitchA> switch virtual-system vs1
<SwitchA-vs1> system-view
[~SwitchA-vs1] interface 10ge 1/0/1
[~SwitchA-vs1-10GE1/0/1] undo portswitch
[*SwitchA-vs1-10GE1/0/1] ip address 10.10.10.1 24
[*SwitchA-vs1-10GE1/0/1] commit
[~SwitchA-vs1-10GE1/0/1] return
<SwitchA-vs1> quit
<SwitchA> switch virtual-system vs2
<SwitchA-vs2> system-view
[~SwitchA-vs2] interface 10ge 1/0/25
[~SwitchA-vs2-10GE1/0/25] undo portswitch
[*SwitchA-vs2-10GE1/0/25] ip address 10.10.10.2 24
[*SwitchA-vs2-10GE1/0/25] commit
[~SwitchA-vs2-10GE1/0/25] return
<SwitchA-vs2> quit
```

Configure VSs to ping each other. The following example pings VS2 from VS1.

```
<SwitchA> switch virtual-system vs1
<SwitchA-vs1> ping 10.10.10.2
  PING 10.10.10.2: 56  data bytes, press CTRL_C to break
    Reply from 10.10.10.2: bytes=56 Sequence=1 ttl=254 time=4 ms
    Reply from 10.10.10.2: bytes=56 Sequence=2 ttl=254 time=10 ms
```

```
       Reply from 10.10.10.2: bytes=56 Sequence=3 ttl=254 time=8 ms
       Reply from 10.10.10.2: bytes=56 Sequence=4 ttl=254 time=4 ms
       Reply from 10.10.10.2: bytes=56 Sequence=5 ttl=254 time=4 ms

    --- 10.10.10.2 ping statistics ---
      5 packet(s) transmitted
      5 packet(s) received
      0.00% packet loss
      round-trip min/avg/max = 4/6/10 ms
```

----End

Configuration File

- Configuration file of SwitchA

```
#
sysname SwitchA
#
admin
 resource-template temp1
  resource vlan upper-limit 2000
 resource-template temp2
  resource vpn-instance upper-limit 1000
 virtual-system vs1
  port-mode group
  resource u4route upper-limit 60000
  resource m4route upper-limit 1000
  resource u6route upper-limit 16000
  resource m6route upper-limit 100
  resource vlan upper-limit 2000
  resource mpls enable
  resource trill enable
  resource mcast enable
  resource vpn-instance upper-limit 4096
  resource cpu weight 5
  resource memory ratio-threshold 100
  resource disk ratio-threshold 100
  assign interface 10GE1/0/0
  assign interface 10GE1/0/1
  assign interface 10GE1/0/2
  assign interface 10GE1/0/3
  assign interface 10GE1/0/4
  assign interface 10GE1/0/5
  assign interface 10GE1/0/6
  assign interface 10GE1/0/7
  assign interface 10GE1/0/8
  assign interface 10GE1/0/9
  assign interface 10GE1/0/10
  assign interface 10GE1/0/11
  assign interface 10GE1/0/12
  assign interface 10GE1/0/13
  assign interface 10GE1/0/14
  assign interface 10GE1/0/15
  assign interface 10GE1/0/16
```

```
   assign interface 10GE1/0/17
   assign interface 10GE1/0/18
   assign interface 10GE1/0/19
   assign interface 10GE1/0/20
   assign interface 10GE1/0/21
   assign interface 10GE1/0/22
   assign interface 10GE1/0/23
 virtual-system vs2
  port-mode group
  resource u4route upper-limit 60000
  resource m4route upper-limit 1000
  resource u6route upper-limit 16000
  resource m6route upper-limit 100
  resource vlan upper-limit 4063
  resource mpls enable
  resource trill enable
  resource mcast enable
  resource vpn-instance upper-limit 1000
  resource cpu weight 5
  resource memory ratio-threshold 100
  resource disk ratio-threshold 100
  assign interface 10GE1/0/24
  assign interface 10GE1/0/25
  assign interface 10GE1/0/26
  assign interface 10GE1/0/27
  assign interface 10GE1/0/28
  assign interface 10GE1/0/29
  assign interface 10GE1/0/30
  assign interface 10GE1/0/31
  assign interface 10GE1/0/32
  assign interface 10GE1/0/33
  assign interface 10GE1/0/34
  assign interface 10GE1/0/35
  assign interface 10GE1/0/36
  assign interface 10GE1/0/37
  assign interface 10GE1/0/38
  assign interface 10GE1/0/39
  assign interface 10GE1/0/40
  assign interface 10GE1/0/41
  assign interface 10GE1/0/42
  assign interface 10GE1/0/43
  assign interface 10GE1/0/44
  assign interface 10GE1/0/45
  assign interface 10GE1/0/46
  assign interface 10GE1/0/47
 #
 return
```

- Configuration file of VS1

```
#
sysname vs1
#
aaa
 local-user vs1_user password irreversible-cipher
$1a$uN"/9ONM%0$f!#s6Vh_dDly!i-e|/b7\C6Z-|75VJK>R3OLiXN:$
```

```
 local-user vs1_user service-type telnet
 local-user vs1_user level 3
#
interface MEth0/0/0
 ip address 10.1.1.10 255.255.255.0
#
interface 10GE1/0/1
 undo portswitch
 ip address 10.10.10.1 255.255.255.0
#
user-interface vty 0 4
 authentication-mode aaa
 user privilege level 15
#
return
```

- Configuration file of VS2

```
#
sysname vs2
#
aaa
 local-user vs2_user password irreversible-cipher
$1a$ei="7CZ;f1$JDrmPpbRC%|oYf%JfjqI3i`=J)`,)6,+kU0;,<.T$
 local-user vs2_user service-type telnet
 local-user vs2_user level 3
#
interface MEth0/0/0
 ip address 10.1.1.20 255.255.255.0
#
interface 10GE1/0/25
 undo portswitch
 ip address 10.10.10.2 255.255.255.0
#
user-interface vty 0 4
 authentication-mode aaa
 user privilege level 15
#
return
```