

Computer Networks

Lab Guide

Version: 1.0



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1 Basic Operations of Huawei VRP

1.1 Introduction to the Experiment

1.1.1 About this experiment

This lab configures Huawei devices to learn about and get familiar with the basic operations of Huawei VRP.

1.1.2 Purpose

- Understand the meaning of the command line view and the methods of entering and leaving the command line view.
- Master some common commands
- Learn how to revoke an order
- How to use the shortcut keys of the command line

1.1.3 Introduction to the Experiment Networking



Figure 1-1 Be familiar with the VRP operating system experiment topology.

1.1.4 Experimental Background

As shown in the networking diagram, the Router is a new router without configuration. You need to initialize the Router.

1.2 Lab Task Configuration

1.2.1 Configuration Roadmap

1. Complete basic configurations, such as device naming and router interface IP addresses.
2. Save the device configuration.
3. Restart the device.

1.2.2 Configuration Procedure

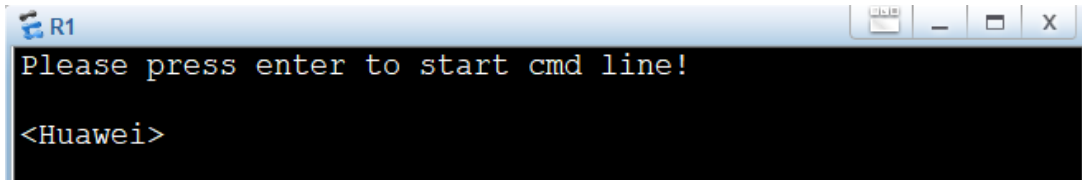
Step 1 Right-click R1, and then click Start to start the device.

When R1 turns light blue, the startup is successful. (The figure shows that the router is started successfully.)



R1

Double-click R1. When # stops and <Huawei> is displayed, you can configure the router.



Step 2 Viewing Basic Device Information

Display the device version information.

```
<Huawei>display version
Huawei Versatile Routing Platform Software
VRP (R) software, Version 5.160 (AR651C V300R019C00SPC100)
Copyright (C) 2011-2016 HUAWEI TECH CO., LTD
Huawei AR651C Router uptime is 0 week, 0 day, 0 hour, 53 minutes
BKP 0 version information:
1. PCB Version: AR01BAK2C VER.B
2. If Supporting PoE: No
3. Board Type: AR651C
4. MPU Slot Quantity: 1
5. LPU Slot Quantity: 1
```

Step 3 Complete basic device configuration.

Change the router name to R1.

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]
```

The device enters the system view from the user view.

```
[Huawei]sysname R1
[R1]
```

The device name has been changed to R1.

Huawei devices provide various functions and various configuration and query commands. To facilitate the use of these commands, Huawei devices register the commands in different command views based on their functions. Before configuring a function, enter the command line view and run the corresponding commands.

Enter the interface and configure the IP address of the interface.

[R1]inter	//Enter the TAB complete command.
[R1]interface	// "interface" is the only optional keyword.
[R1]interface g	//Enter the TAB complete command.
[R1]interface GigabitEthernet	//GigabitEthernet is the only optional keyword.
[R1]interface GigabitEthernet 0/0/1	// Manual Complement Command

Input the first few letters of a keyword of a command and press <tab> to display the complete keyword. The prerequisite is that these letters can uniquely identify the

keyword. Otherwise, press <tab> continuously to display different keywords. You can select the required keywords, such as:

"inter"+TAB: Because the command starting with inter in the current view only contains interface, the command is directly completed as interface. If you press TAB for multiple times, the command does not change.

```
[R1-GigabitEthernet0/0/1]
```

The view of GigabitEthernet0/0/1 is displayed.

```
[R1-GigabitEthernet0/0/1]i?
```

```
icmp    <Group> icmp command group
igmp    Specify parameters for IGMP
ip      <Group> ip command group
ipsec   Specify IPSec(IP Security) configuration information
ipv6    <Group> ipv6 command group
isis    Configure interface parameters for ISIS
```

If you remember only one or more characters at the beginning of a command keyword when you enter a command, you can use the partial help to obtain the prompts of all keywords starting with the string. For example:

In the GigabitEthernet 0/0/1 interface view, enter i +?, the options of all commands starting with i in the current view are displayed. You can press TAB to complete the options or manually complete the options. Where, "icmp" and "igmp" are keywords, and "<Group> icmp command group" and "Specify parameters for IGMP" are keyword descriptions.

```
[R1-GigabitEthernet0/0/1]ip ?
```

```
accounting    <Group> accounting command group
address       <Group> address command group
binding       Enable binding of an interface with a VPN instance
fast-forwarding Enable fast forwarding
forward-broadcast Specify IP directed broadcast information
netstream     IP netstream feature
verify        IP verify
```

Type part of a command keyword followed by a space-separated "? If the position is a keyword, all the keywords and their brief description are listed. For example: "ip" + space + "?", all commands with ip as the keyword and corresponding explanations are displayed.

```
[R1-GigabitEthernet0/0/1]ip address ?
```

```
IP_ADDR<X.X.X.X>    IP address
bootp-alloc         IP address allocated by BOOTP
dhcp-alloc          IP address allocated by DHCP
unnumbered          Share an address with another interface
```

```
[R1-GigabitEthernet0/0/1]ip address 192.168.1.1 ?
```

```
INTEGER<0-32>       Length of IP address mask
IP_ADDR<X.X.X.X>    IP address mask
```

```
[R1-GigabitEthernet0/0/1]ip address 192.168.1.1 24 ?
```

```
sub                Indicate a subordinate address
<cr>               Please press ENTER to execute command
```

<cr> indicates that there is no keyword or parameter in this position. You can directly press Enter.

```
[R1-GigabitEthernet0/0/1]dis this
```

```
#
```

```
interface GigabitEthernet0/0/1
ip address 192.168.1.1 255.255.255.0
#
```

The **display this** command displays the running configuration in the current view. Some effective configuration parameters will not be displayed if they are the same as the default working parameters. Some parameters are not displayed if the commands for which the parameters are configured are not submitted successfully. This command is used to check the configuration.

The device supports incomplete keyword input. That is, if the entered character matches a unique keyword in the current view, you do not need to enter complete keywords. This function provides a quick input mode to improve operation efficiency. For example:

After the **dis this** command is run on an interface, all commands can be executed normally because only the **display this** command matches the **dis this** command in the current view. Similarly, "**dis cu**" and "**d cu**" are equivalent to "**display current-configuration**".

```
[R1-GigabitEthernet0/0/1]quit
```

Using the **quit** command, you can return from the current view to a lower-level view. If the user view is used, you can exit the system.

The IP address of the interface is incorrectly configured. Configure the IP address to interface GigabitEthernet 0/0/2.

```
[R1]interface GigabitEthernet 0/0/1
[R1-GigabitEthernet0/0/1]undo ip address
```

Delete the IP address configuration of GigabitEthernet0/0/1. Otherwise, an IP address conflict occurs.

Add the **undo** keyword before the command to obtain the undo command. The undo command is used to restore the default configuration, disable a function, or delete a configuration. Almost every configuration command has an undo command.

```
[R1]interface GigabitEthernet 0/0/2
[R1-GigabitEthernet0/0/2]ip address 192.168.1.1 24
[R1-GigabitEthernet0/0/2]quit
```

Display the current device configuration.

```
[R1]display current-configuration
[V200R003C00]
#
 sysname R1
#
 snmp-agent local-engineid 800007DB0300000000000000
 snmp-agent
#
 clock timezone China-Standard-Time minus 08:00:00
#
 portal local-server load portalpage.zip
#
 drop illegal-mac alarm
#
```

```

set cpu-usage threshold 80 restore 75
#
aaa
authentication-scheme default
authorization-scheme default
accounting-scheme default
domain default
domain default_admin
local-user admin password cipher %$%$K8m.Nt84DZ}e#<0`8bmE3Uw}%$%$
local-user admin service-type http
#
---- More ----

```

After a command is executed, if the information displayed exceeds one page, the system automatically stops outputting the information. At the bottom of the displayed information, "--More ----" is displayed. You can run the following command:

1. Type <Ctrl+C> or <Ctrl+Z> to stop the display or command execution.
2. Press the space bar to display the information on the next page.
3. Press Enter to display the next line of information.

Step 4 Save the current device configuration.

Return to the user view.

```

[R1]quit
<R1>

```

In addition to the quit command, you can also run the following command:

1. The return command can be used to return to the user view in any view.
2. Press Ctrl+Z to return to the user view in any view.

#Save the configuration.

```

<R1>save
The current configuration will be written to the device.
Are you sure to continue? (y/n)[n]:y // You need to enter y to confirm the operation.
It will take several minutes to save configuration file, please wait.....
Configuration file had been saved successfully
Note: The configuration file will take effect after being activated
The current configuration has been saved successfully.

```

You can run commands to modify the current configurations of a device. If the configurations are not saved, you need to save the current configurations to the configuration file before restarting the device. You can run the save command to save the configuration to the default path and overwrite the original configuration file. You can also run the save configuration-file command to save the current configuration to a specified file on the storage device. Generally, this command does not affect the current startup configuration file of the system.

Compare the current configuration with the configuration used for the next startup.

```

<R1>compare configuration
The current configuration is the same as the next startup configuration file.

```

The current configuration is the same as the configuration file for next startup.

Step 5 Operating the File System of the Device

Display the file list in the current directory.

```
<R1>dir
Directory of flash:/

Idx Attr Size(Byte) Date Time(LMT) FileName
0 -rw-126,538,240 Jul 04 2016 17:57:22 ar651c-v300r019c00Sspc100.cc
1 -rw-22,622 Feb 20 2020 10:35:18 mon_file.txt
2 -rw-737 Feb 20 2020 10:38:36 vrpcfg.zip
3 drw-- Jul 04 2016 18:51:04 CPM_ENCRYPTED_FOLDER
4 -rw-783 Jul 10 2018 14:46:16 default_local.cer
5 -rw-0 Sep 11 2017 00:00:54 brdxpon_snmp_cfg.efs
6 drw-- Sep 11 2017 00:01:22 update
7 drw-- Sep 11 2017 00:01:48 shelldir
8 drw-- Sep 21 2019 17:14:24 localuser
9 drw-- Sep 15 2017 04:35:52 dhcp
10 -rw-509 Feb 20 2020 10:38:40 private-data.txt
11 -rw-2,686 Dec 19 2019 15:05:18 mon_lpu_file.txt
12 -rw-3,072 Dec 18 2019 18:15:54 Boot_LogFile

510,484 KB total available (386, 456 KB free)
```

vrpcfg.zip: configuration file. The configuration file must have a .cfg or .zip extension.
ar651c-v300r019c00Sspc100.cc: system software. The system software must have a .cc extension.

Save the current configuration and name it test.cfg.

```
<R1>save test.cfg
Are you sure to save the configuration to test.cfg? (y/n)[n]:y // You need to enter y for confirmation.
It will take several minutes to save configuration file, please wait.....
Configuration file had been saved successfully
Note: The configuration file will take effect after being activated
```

View the file list in the current directory again.

```
<R1>dir
Directory of flash:/

Idx Attr Size(Byte) Date Time(LMT) FileName
0 -rw-126,538,240 Jul 04 2016 17:57:22 ar651c-v300r019c00Sspc100.cc
1 -rw-22,622 Feb 20 2020 10:35:18 mon_file.txt
2 -rw-737 Feb 20 2020 10:38:36 vrpcfg.zip
3 drw-- Jul 04 2016 18:51:04 CPM_ENCRYPTED_FOLDER
4 -rw-783 Jul 10 2018 14:46:16 default_local.cer
5 -rw-0 Sep 11 2017 00:00:54 brdxpon_snmp_cfg.efs
6 drw-- Sep 11 2017 00:01:22 update
7 drw-- Sep 11 2017 00:01:48 shelldir
8 drw-- Sep 21 2019 17:14:24 localuser
9 drw-- Sep 15 2017 04:35:52 dhcp
10 -rw-1,404 Feb 20 2020 11:55:17 test.cfg
```



```
11 -rw-509 Feb 20 2020 11:55:18 private-data.txt
12 -rw-2,686 Dec 19 2019 15:05:18 mon_lpu_file.txt
13 -rw-3,072 Dec 18 2019 18:15:54 Boot_LogFile
```

510,484 KB total available (386, 452 KB free)

Configuration file saved successfully.

Set this file to the configuration file used for the next startup.

```
<R1>startup saved-configuration test.cfg
This operation will take several minutes, please wait.....
Info: Succeeded in setting the file for booting system
```

Display the file used for the next startup.

```
<R1>display startup
MainBoard:
Startup system software: flash:/ ar651c-v300r019c00Sspc100.cc
Next startup system software: flash:/ ar651c-v300r019c00Sspc100.cc
Backup system software for next startup: null
Startup saved-configuration file: flash:/vrpcfg.zip
Next startup saved-configuration file: flash:/test.cfg
Startup license file: null
Next startup license file: null
Startup patch package: null
Next startup patch package: null
Startup voice-files: null
Next startup voice-files: null
```

The display startup command displays the system software, backup system software, configuration file, license file, patch file, and voice file related to the current and next startup of the device.

Clear the configuration file.

```
<R1>reset saved-configuration
This will delete the configuration in the flash memory.
The device configuration
ns will be erased to reconfigure.
Are you sure? (y/n)[n]:y // needs to be confirmed by entering y.
Clear the configuration in the device successfully.
```

Step 6 Restart the device.

```
<R1>reboot
Info: The system is comparing the configuration, please wait.
System will reboot! Continue? [y/n]:y // You need to enter y to confirm the operation.
Info: system is rebooting ,please wait...
```

The system restarts.

```
<R1>
```

Device restart completed

1.3 Questions and Additional Contents

In step 5, the reset saved-configuration command is used to clear the configuration. Why is the configuration still retained after the switch is restarted?

1.4 Appendix

Function Keys	function
<Ctrl+A>	Moves the cursor to the beginning of the current line
<Ctrl+B>	Moves the cursor one character to the left
<Ctrl+C>	Stop the currently executing function
<Ctrl+D>	Deletes the character at the current cursor position.
<Ctrl+E>	Move the cursor to the end of the last line
<Ctrl+F>	Moves the cursor one character to the right
<Ctrl+H>	Deletes one character to the left of the cursor
<Ctrl+K>	Terminate outgoing connections during connection establishment phase
<Ctrl+N> or "Cusor"	Displays the next command in the history command buffer.
<Ctrl+P> or arrow cursor	Displays the previous command in the history command buffer.
<Ctrl+T>	Enter the question mark "?"
<Ctrl+W>	Deletes a string (word) to the left of the cursor
<Ctrl+X>	Deletes all characters to the left of the cursor
<Ctrl+Y>	Deletes the cursor position and all characters to its right.
<Ctrl+Z>	Return to User View
<Ctrl+J>	Terminating an Incoming Connection or Redirect Connection
<Esc+B>	Moves the cursor one string (word) to the left

<Esc+D>	Deletes a string (word) to the right of the cursor
<Esc+F>	Moves the cursor one string (word) to the right

表1-1 System function keys

2 VLAN Technology Experiment

2.1 Introduction to the Experiment

2.1.1 About this Experiment

The VLAN technology divides a LAN into multiple logical VLANs. Each VLAN is a broadcast domain. The communication between hosts in a VLAN is the same as that in a LAN. However, the communication between VLANs cannot be directly exchanged. In this case, broadcast packets are restricted to one VLAN.

This experiment describes how to configure Huawei switches to learn about VLAN configurations.

2.1.2 Purpose

- Master the method of creating a VLAN.
- Master the methods of configuring Access, Trunk, and Hybrid interfaces.
- Configure interface-based VLAN division.
- Configure MAC address-based VLAN division.
- How to view the MAC address table and VLAN information

2.1.3 Introduction to the Experiment Networking

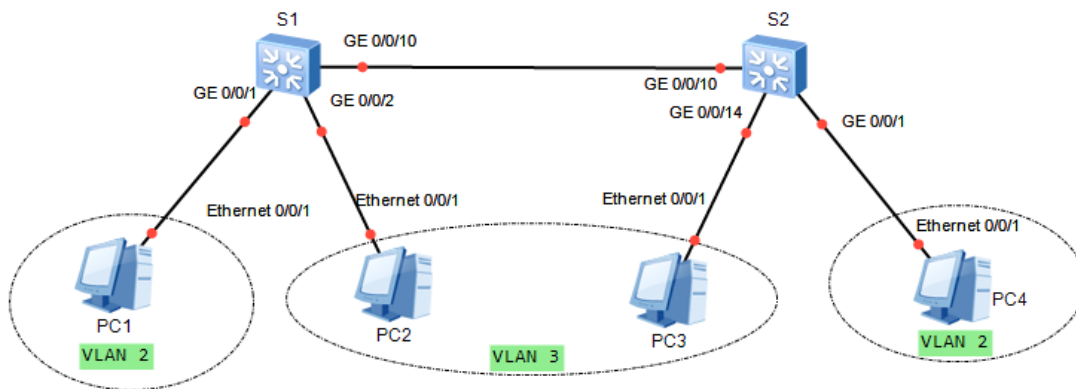


Figure 2-1 VLAN Configuration Experiment Topology

2.1.4 Experimental Background

According to service requirements, a company needs to divide VLANs for its Layer 2 network.

As shown in the topology diagram, you can configure interface-based VLAN assignment on S1 and S2 to assign the interfaces connected to the same user service to the same VLAN.

2.2 Lab Task Configuration

2.2.1 Configuration Roadmap

1. Create a VLAN.
2. Configure VLAN division based on interfaces on switches.

2.2.2 Configuration Procedure

Step 1 Start the devices.

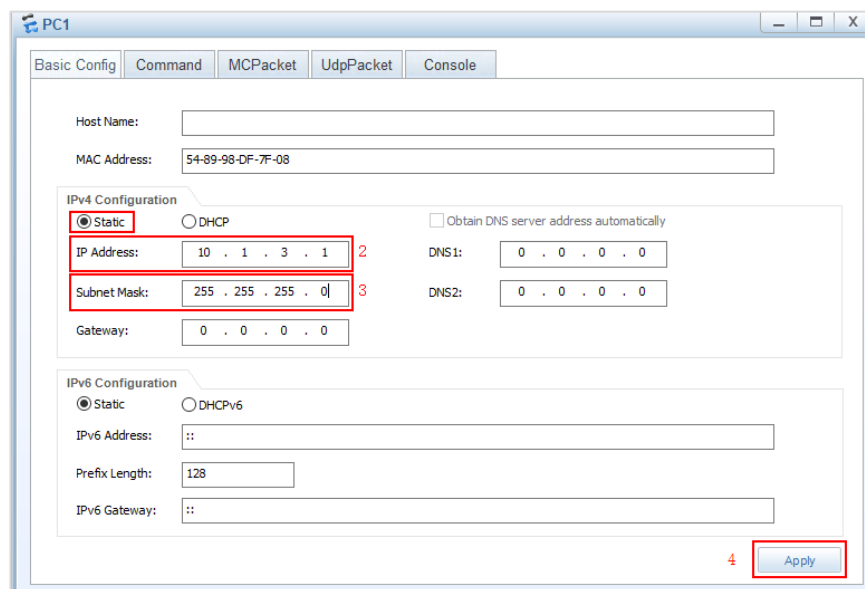
Step 2 Configure S1 and S2 device names.

Step 3 Configuring Host IP Addresses

Configure IP addresses for PC1, PC2, PC3, and PC4.

PC	IP Address/Mask
PC1	10.1.3.1/24
PC2	10.1.3.2/24
PC3	10.1.3.3/24
PC4	10.1.3.4/24

Take PC1 as an example. Right-click PC1 and choose Settings from the shortcut menu. On the Basic Configuration page, configure the IP address. After the configuration is complete, click Apply.



The screenshot shows the PC1 configuration window with the following details:

- Host Name:** (empty field)
- MAC Address:** 54-89-98-DF-7F-08
- IPv4 Configuration:**
 - ☒ Static (highlighted with a red box)
 - ☐ DHCP
 - ☐ Obtain DNS server address automatically
 - IP Address:** 10 . 1 . 3 . 1 (highlighted with a red box and labeled 2)
 - Subnet Mask:** 255 . 255 . 255 . 0 (highlighted with a red box and labeled 3)
 - Gateway:** 0 . 0 . 0 . 0
 - DNS1:** 0 . 0 . 0 . 0
 - DNS2:** 0 . 0 . 0 . 0
- IPv6 Configuration:**
 - ☒ Static
 - ☐ DHCPv6
 - IPv6 Address:** ::
 - Prefix Length:** 128
 - IPv6 Gateway:** ::
- Apply Button:** (highlighted with a red box and labeled 4)

Step 4 Creating VLANs

Create VLANs 2 and 3 on S1 and S2.

```
[S1]vlan batch 2 to 3
```

Info: This operation may take a few seconds. Please wait for a moment...done.

VLANs 2 and 3 are successfully created.

Using the `vlan vlan-id` command, you can create a VLAN and enter the VLAN view. If a VLAN already exists, you can directly enter the VLAN view. Using the `vlan batch {vlan-id1 [to vlan-id2]}` command, you can create VLANs in batches.

```
[S2]vlan batch 2 to 3
```

Step 5 Configuring Interface-based VLAN Classification

Configure the interfaces connecting S1 and S2 to terminals as access interfaces and add the interfaces to VLANs.

```
[S1]interface GigabitEthernet0/0/1  
[S1-GigabitEthernet0/0/1]port link-type access
```

The `port link-type {access | hybrid | trunk}` command configures a link type for an interface. You can set the interface type to Access, Trunk, or Hybrid.

```
[S1-GigabitEthernet0/0/1]port default vlan 2
```

The `port default vlan vlan-id` command configures a default VLAN on an interface and adds the interface to the VLAN.

```
[S1-GigabitEthernet0/0/1]quit  
[S1]interface GigabitEthernet0/0/2  
[S1-GigabitEthernet0/0/2]port link-type access  
[S1-GigabitEthernet0/0/2]port default vlan 3  
[S1-GigabitEthernet0/0/2]quit
```

```
[S2]interface GigabitEthernet0/0/1  
[S2-GigabitEthernet0/0/14]port link-type access  
[S2-GigabitEthernet0/0/14]port default vlan 2  
[S2-GigabitEthernet0/0/14]quit
```

Configure the interconnection interface between S1 and S2 as a trunk interface and allow only VLANs 2 and 3 to pass through.

```
[S1]interface GigabitEthernet0/0/10  
[S1-GigabitEthernet0/0/10]port link-type trunk  
[S1-GigabitEthernet0/0/10]port trunk allow-pass vlan 2 3
```

The `port trunk allow-pass vlan` command adds a trunk interface to a VLAN.

```
[S1-GigabitEthernet0/0/10]undo port trunk allow-pass vlan 1
```

The `undo port trunk allow-pass vlan` command deletes the VLAN to which a trunk interface is added.

VLAN 1 is in the allowed list by default. If it has no actual service usage, you need to delete it for security purposes.

```
[S2]interface GigabitEthernet0/0/10  
[S2-GigabitEthernet0/0/10]port link-type trunk  
[S2-GigabitEthernet0/0/10]port trunk allow-pass vlan 2 3  
[S2-GigabitEthernet0/0/10]undo port trunk allow-pass vlan 1
```

Step 6 Viewing Configuration Information

Display VLAN information on the switch.

```
[S1]display vlan
```

The display vlan command displays VLAN information.

Using the display vlan verbose command, you can view detailed information about a specified VLAN, including the VLAN ID, type, description, status, status, status of statistics collection, interfaces included in the VLAN, and adding modes of the interfaces.

```
The total number of vlans is: 4
```

```
-----
U: Up; D: Down; TG: Tagged; UT: Untagged;
MP: Vlan-mapping; ST: Vlan-stacking;
#: ProtocolTransparent-vlan; *: Management-vlan;
-----
```

```
VID Type Ports
```

```
-----
1 common UT:GE0/0/2(D) GE0/0/3(D) GE0/0/4(D) GE0/0/5(D)
GE0/0/6(D) GE0/0/7(D) GE0/0/8(D) GE0/0/9(D)
GE0/0/11(D) GE0/0/12(D) GE0/0/14(D) GE0/0/15(D)
GE0/0/16(D) GE0/0/17(D) GE0/0/18(D) GE0/0/19(D)
GE0/0/20(D) GE0/0/21(D) GE0/0/22(D) GE0/0/23(D)
GE0/0/24(D)
2 common UT:GE0/0/1(U)
TG:GE0/0/10(U)
3 common UT:GE0/0/2(U)
TG:GE0/0/10(U)
VID Status Property MAC-LRN Statistics Description
-----
```

```
1 enable default enable disable VLAN 0001
2 enable default enable disable VLAN 0002
3 enable default enable disable VLAN 0003
```

```
[S2]display vlan
```

```
The total number of vlans is: 4
```

```
-----
U: Up; D: Down; TG: Tagged; UT: Untagged;
MP: Vlan-mapping; ST: Vlan-stacking;
#: ProtocolTransparent-vlan; *: Management-vlan;
-----
```

```
VID Type Ports
```

```
-----
1 common UT:GE0/0/1(U) GE0/0/2(D) GE0/0/3(D) GE0/0/4(D)
GE0/0/5(D) GE0/0/6(D) GE0/0/7(D) GE0/0/8(D)
GE0/0/9(D) GE0/0/11(D) GE0/0/12(D) GE0/0/13(D)
GE0/0/15(D) GE0/0/16(D) GE0/0/17(D) GE0/0/18(D)
GE0/0/19(D) GE0/0/20(D) GE0/0/21(D) GE0/0/22(D)
GE0/0/23(D) GE0/0/24(D)
2 common TG:GE0/0/10(U)
```

```
3 common UT:GE0/0/14(U)
TG:GE0/0/10(U)
```

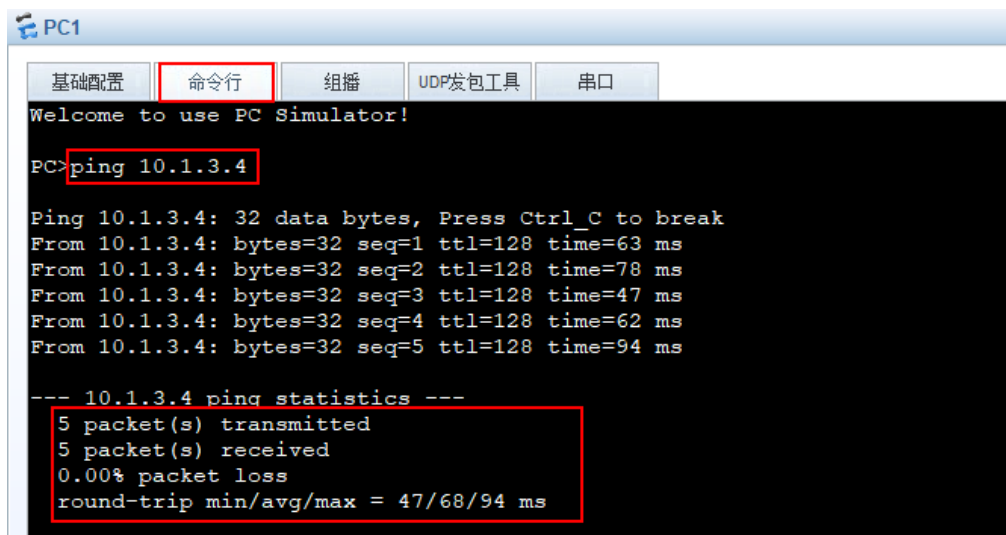
VID Status Property MAC-LRN Statistics Description

```
1 enable default enable disable VLAN 0001
2 enable default enable disable VLAN 0002
3 enable default enable disable VLAN 0003
```

2.2.3 Result verification

Check the connectivity of the device and verify the VLAN configuration. Double-click the PC and run the Ping command on the CLI.

- 1) Run the ping command on PC1 to verify that PC1 can ping PC4.



```
PC1
基础配置 命令行 组播 UDP发包工具 串口
Welcome to use PC Simulator!
PC>ping 10.1.3.4

Ping 10.1.3.4: 32 data bytes, Press Ctrl_C to break
From 10.1.3.4: bytes=32 seq=1 ttl=128 time=63 ms
From 10.1.3.4: bytes=32 seq=2 ttl=128 time=78 ms
From 10.1.3.4: bytes=32 seq=3 ttl=128 time=47 ms
From 10.1.3.4: bytes=32 seq=4 ttl=128 time=62 ms
From 10.1.3.4: bytes=32 seq=5 ttl=128 time=94 ms

--- 10.1.3.4 ping statistics ---
5 packet(s) transmitted
5 packet(s) received
0.00% packet loss
round-trip min/avg/max = 47/68/94 ms
```

- 2) Run the ping command on PC2 to verify that PC2 can ping PC3.
- 3) Run the ping command on PC1 to verify that PC1 cannot ping PC3.
- 4) Run the display mac-address verbose command on S1 and S2 to check the MAC address table of the switch.

2.2.4 Configuration Reference

Configuration of S1

```
sysname S1
#
vlan batch 2 to 3
#
interface GigabitEthernet0/0/1
port link-type access
port default vlan 2
#
interface GigabitEthernet0/0/2
port link-type access
port default vlan 3
#
```



```
interface GigabitEthernet0/0/10
port link-type trunk
undo port trunk allow-pass vlan 1
port trunk allow-pass vlan 2 to 3
#
```

Configuration of S2

```
sysname S2
#
vlan batch 2 to 3
#
interface GigabitEthernet0/0/1
port link-type access
port default vlan 2
#
interface GigabitEthernet0/0/10
port link-type trunk
undo port trunk allow-pass vlan 1
port trunk allow-pass vlan 2 to 3
#
interface GigabitEthernet0/0/14
port link-type access
port default vlan 3
#
```