

Huawei Security Certification Training

HCIA-Security

Lab Guide

Version: 4.0



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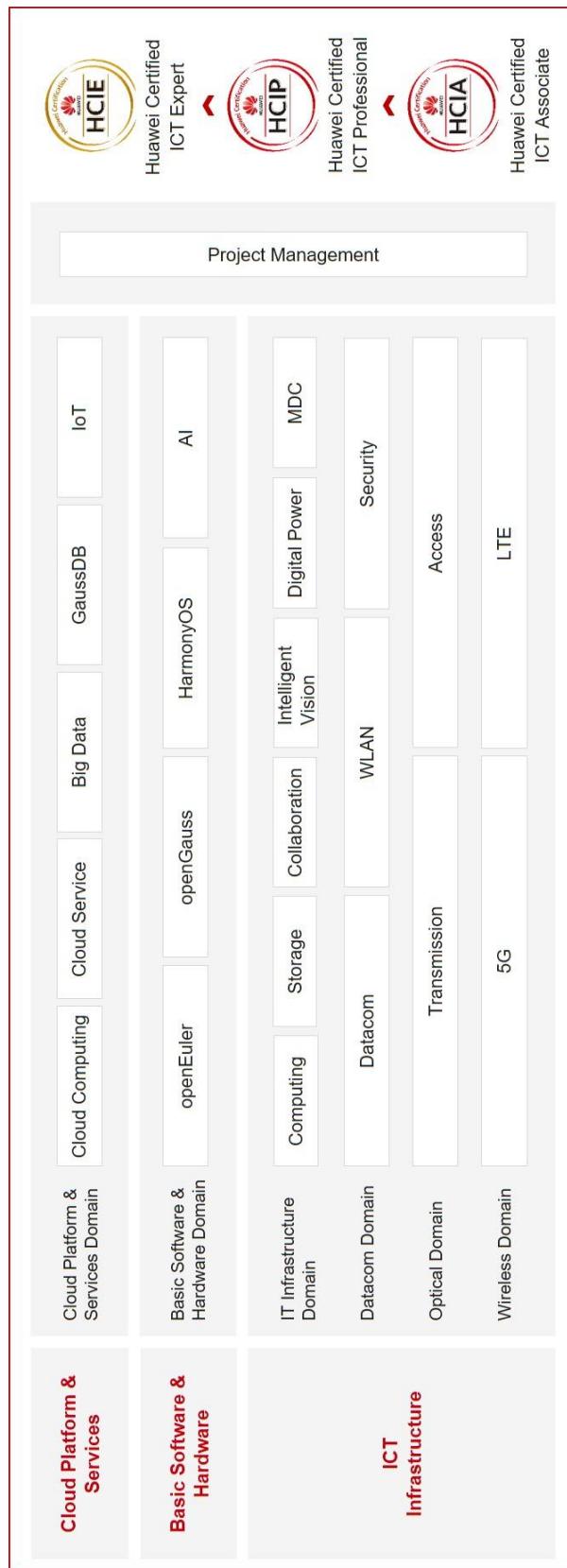
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About This Document

Introduction

This document is an HCIA-Security certification training course and is intended for trainees who are going to take the HCIA-Security exam or readers want to understand the information security concepts and specifications, common cyber security threats and prevention, basic knowledge of cyber security, firewall network security prevention technology, user management technology, encryption and decryption principles, as well as application of encryption technology.

Description

This document covers seven labs. Starting from basic device operation configuration, it describes the basic operations of logging in to the firewall, security policy, NAT, hot standby, user management, IPSec VPN, and SSL VPN.

- Lab 1: firewall login. By introducing the common methods of logging in to the firewall, this lab helps readers to master the firewall management mode and the basic debugging skills.
- Lab 2: firewall security policy. Through basic networking configurations, this lab helps readers to master the key technologies such as firewall security zones and interzone forwarding control logic.
- Lab 3: NAT Server and Source NAT. Focusing on the source NAT and destination NAT technologies, this lab helps readers to master the firewall debugging method in NAT scenarios and to get familiar with the application scenarios of firewalls functioning as egress devices.
- Lab 4: firewall hot standby. This lab helps readers to master technologies such as how to use firewalls to implement service redundancy and how to ensure stable service operation when a single firewall is faulty.
- Lab 5: site-to-site IPSec VPN. This lab helps readers to master the basic methods of communication between different networks over the Internet.
- Lab 6: SSL VPN. This lab enables mobile office users to access the enterprise intranet at any time on the Internet, helping readers to understand the SSL VPN principle and configuration.

Background Knowledge Required

This course is for Huawei's basic certification. To better understand this course, familiarize yourself with the following requirements:

- Have basic understanding of cyber security, and be familiar with Huawei security devices and basic security knowledge.

Symbol Conventions



Firewall



Switch



Ethernet cable



PC



Server



Serial cable

Lab Environment

Network Description

This lab environment is intended for cyber security engineers who are preparing for the HCIA-Security exam. Each lab environment consists of two firewalls, two switches, and four PCs. In the lab environment, 4 trainees can perform hands-on labs at the same time.

Device Requirements

To meet the HCIA-Security lab requirements, it is recommended that each lab environment adopt the following configurations.

Mapping between device names, models, and versions

Device Name	Device Model	Software Version
Switch	S5735	V200R010C00SPC600
Firewall	USG6525F	V600R022C00SPC100

Note: The port information, output, and configuration information of all devices in this guide are provided based on the device models in the recommended topology. The actual information may vary according to the lab environment.

Preparing the Lab Environment

Checking Devices

Ensure that all items required in the labs are available. The following table lists the specific items.

Item	Quantity	Remarks
Switch (S5735)	2 for each group	
Firewall (USG6525F)	2 for each group	
Laptop or desktop	4 for each group	
Twisted pair	8 for each group	Length: at least 2 m
Console cable	1 for each group	

Clearing the Firewall Configuration

To avoid the residual configurations from impacting the lab, trainees are required to clear the configuration saved on the devices after the lab is complete and before the devices are shut down. Before starting the labs, ensure that the devices start from empty configurations. Otherwise, clear all configurations and restart the devices.

The user name and password for logging in to the firewall are **admin** and **Admin@123**, respectively. The operation methods on switches are the same. The following uses the firewall as an example:

```

Login authentication
Username:admin
Password:
<FW> reset saved-configuration
This will delete the configuration in the flash memory.
The device configurations will be erased to reconfigure.
Are you sure? (y/n)[n]:y
Clear the configuration in the device successfully.
    
```

To restart the firewall, run the following command:

```

<FW> reboot
Info: The system is comparing the configuration, please wait.
Warning: All the configuration will be saved to the next startup configuration.
Continue ? [y/n]:n
System will reboot! Continue ? [y/n]:y
Info: system is rebooting ,please wait...
    
```

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1

Firewall Login

1.1 Logging In to a Device Through the Console Port (PuTTY)

1.1.1 Introduction

1.1.1.1 About This Lab

In this lab, you will be familiar with the management and configuration of the device by logging in to an unconfigured firewall from a PC through the console port.

1.1.1.2 Objectives

- Learn how to log in to and manage a device from a PC through the console port.
- Learn common CLI-based configurations.
- Learn how to use the CLI online help.
- Learn how to undo a command.
- Learn how to use the CLI shortcut keys.

1.1.1.3 Networking Topology

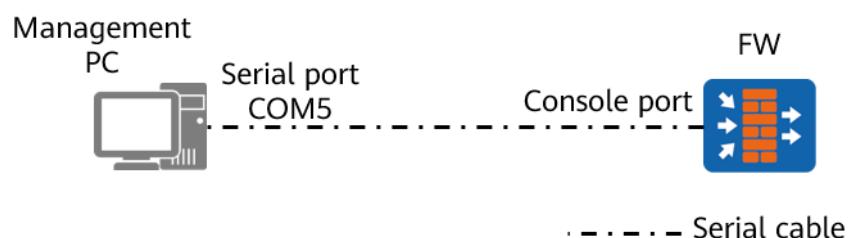


Figure 1-1 Topology for logging in to the device through the console port

1.1.1.4 Background

As shown in the networking diagram, the FW is a new firewall without any configurations. The PC is connected to the console port of the FW through a serial cable, so you need to perform initialization on the FW.

1.1.1.5 Lab Planning

The management PC uses a serial cable to connect to the console port of the device, and uses PuTTY to log in to the device.

Table 1-1 Device ports and parameters

Device	Port	Port Type	Description
Management PC	COM5	Serial port	The serial cable uses a USB port or serial port to connect to the management PC. You need to install a driver on the PC to check and use the corresponding port.
Firewall	Console	Console port	The console port on the device panel has a console port identifier.

1.1.2 Lab Configuration

1.1.2.1 Configuration Roadmap

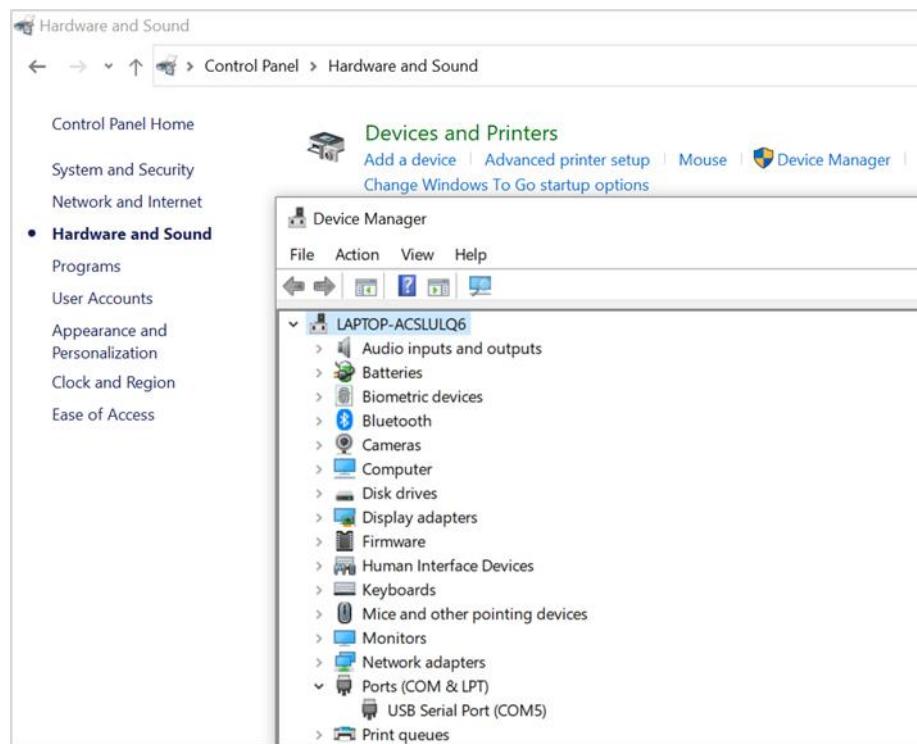
1. Use a serial cable to connect the serial port (or USB port) on the management PC and the console port on the device.
2. Set connection parameters in PuTTY on the management PC and log in to the device.

1.1.2.2 Configuration Procedure

Step 1 Establish the connection, power on all devices, and ensure that they run properly.

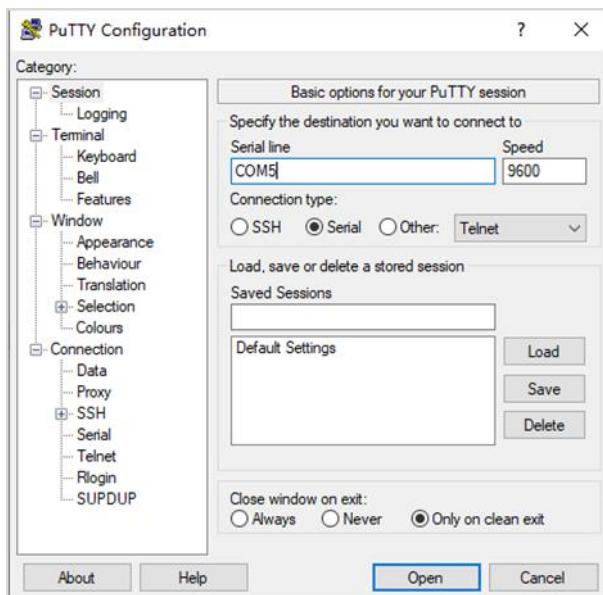
Step 2 Check the serial COM port number used by the management PC to connect to the device.

Choose **Control Panel > Hardware and Sound > Devices and Printers > Device Manager > Ports** and check the serial port number.



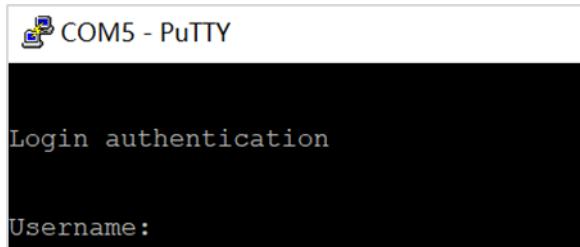
Step 3 Run PuTTY on the management PC and set parameters.

Click **Session**, set **Connection type** to **Serial**, set **Serial line** to **COM5** queried in the previous step, and set other parameters as shown in the following figure.



1.1.3 Verification

Press **Enter**. If the following information is displayed in PuTTY, the login to the device through the console port is successful.



```
COM5 - PuTTY

Login authentication

Username:
```

1.1.4 Quiz

After the console cable is connected to the management PC, the serial port number is not displayed on the management PC by choosing **Control Panel > Hardware and Sound > Devices and Printers > Device Manager > Ports**. What are the possible causes? What corresponding solutions are there?

Reference Answer:

1. The console cable driver is not installed on the management PC. Scan and install the driver. Note that the driver that needs to be installed may vary according to console cable. You are advised to rule out driver installation problems first.
2. The console cable is faulty. Replace the console cable with another functioning one.
3. The PC port is in poor contact. Remove and insert the cable again or replace the cable with a new one.

1.2 Getting Familiar with Commands (PuTTY)

1.2.1 Introduction

1.2.1.1 About This Lab

You can use a PC to log in to a device that uses factory default settings through the console port and perform basic operations on the CLI.

1.2.1.2 Objectives

- Through this lab, you will be familiar with the basic operations of the CLI.

1.2.1.3 Networking Topology

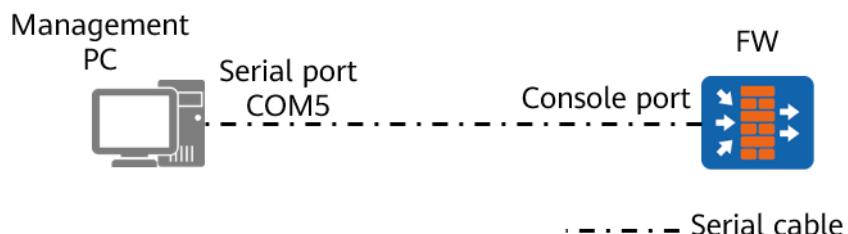


Figure 1-2 Topology for logging in to the device through the console port

1.2.1.4 Background

As shown in the networking diagram, the FW is a brand-new firewall without configuration. The network administrator needs to debug the firewall and learns the CLI operations of the firewall. Therefore, the network administrator needs to use a PC to connect to the console port of the firewall through a serial cable, then uses the PuTTY software to log in to the device, and performs initialization operations on the firewall.

1.2.1.5 Lab Planning

The management PC uses a serial cable to connect to the console port of the device, and uses PuTTY to log in to the device.

Table 1-2 Device ports and parameters

Device	Port	Port Type	Description
Management PC	COM5	Ethernet port	The serial cable uses a USB port or serial port to connect to the management PC. You need to install a driver on the PC to check and use the corresponding port.
Firewall	Console	Console port	The console port on the device panel has a console port identifier.

1.2.2 Lab Configuration

1.2.2.1 Configuration Roadmap

1. Log in to the device through the console port.
2. Perform basic command line configurations on the device.

1.2.2.2 Configuration Procedure

Step 1 Log in to the device through the console port.

Step 2 Enter the system view.

The CLI is divided into multiple command views. Every command is registered with one or multiple views, so a command can be run only in the specified view (or views). After a connection to a firewall is set up, you need to enter the user name and the initial password, and change the initial password. Most commands need to be configured in the system view, so you need to enter the system view from the user view before configuration. The commands are as follows:

Press ENTER to get started.
Login authentication

```
Username:admin
Password:
The password needs to be changed. Change now? [Y/N]: Y
Please enter old password:
Please enter new password:
Please confirm new password:

Info: Your password has been changed. Save the change to survive a reboot.
*****
*          Copyright (C) 2014-2020 Huawei Technologies Co., Ltd.      *
*          All rights reserved.                                *
*          Without the owner's prior written consent,           *
*          no decompiling or reverse-engineering shall be allowed.  *
*****
<FW> system
[FW]
```

Step 3 Enter the interface view.

In the system view, you can run configuration commands to enter the views of protocols, interfaces, etc. To enter the view of an interface, run the following command:

```
[FW] interface GigabitEthernet 0/0/1
[FW-GigabitEthernet0/0/1]
```

Step 4 Get online help.

A question mark (?) is one of the online help methods provided by the VRP. If you enter a question mark (?) in the system view, the system will list the command parameters that can be configured in the system view. You can also type a space after a parameter and then enter a question mark (?) to obtain the list of parameters that can be used after this particular parameter. If you type a character string followed by a question mark (?), the system will list all the commands starting with this character string. For example:

```
[FW] interface ?
  Cellular          Cellular interface
  Dialer            Dialer interface
  Eth-Trunk         Ethernet-Trunk interface
  GigabitEthernet   GigabitEthernet interface
  LoopBack          LoopBack interface
  NULL              NULL interface
  Nve               Nve interface
  Tunnel            Tunnel interface
  Vbdif             Vbdif interface
  Virtual-Template Virtual-Template interface
```

The **Tab** key is another online help method provided by the VRP. If you enter the first few letters of a command keyword and press **Tab**, the complete keyword is displayed. You can switch between all the commands that have this keyword.

```
[FW] inter //Press Tab.
[FW] interface
```

Step 5 Quit the current view (go back to the previous view).

To go back to the previous view, run the **quit** command. For example, to quit the current interface view, run the following command:

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

Step 6 Return to the user view.

To return to the user view from another view, run the **return** command. For example:

```
[FW-GigabitEthernet0/0/1] return  
<FW>
```

Step 7 Display the device version.

In any view, run the **display version** command to display the device version. For example:

```
<FW> display version  
Huawei Versatile Routing Platform Software  
VRP (R) Software, Version 5.170 (USG6500 V600R007C20)  
Copyright (C) 2014-2020 Huawei Technologies Co., Ltd.
```

Step 8 Save configurations.

To save all the configurations of the device, run the **save** command in the user view.

```
<FW> save  
The current configuration will be written to hda1:/fw2.zip.  
Are you sure to continue?[Y/N]Y  
Now saving the current configuration to the slot 0..  
Jan 19 2022 10:13:19 FW %%01CFM/4/SAVE(s)[0]:The user chose Y when deciding whether to save  
the configuration to the device.....  
Save the configuration successfully.
```

Step 9 Display configurations.

In the current view, run the **display this** command to display the configuration of the view. An interface view is used as an example:

```
[FW-GigabitEthernet0/0/0] display this  
#  
interface GigabitEthernet0/0/0  
undo shutdown  
ip address 192.168.0.1 255.255.255.0  
#  
Return
```

Run the following command in any view to display all the current configurations, including the configurations that have not been saved:

```
[FW] display current-configuration
```

Run the following command in any view to display the configurations that have been saved:

```
[FW] display saved-configuration
```

1.2.3 Quiz

After logging in to the device through PuTTY, garbled characters occasionally appear during the command configuration process. What should I do?

Reference Answer:

Check whether PuTTY uses UTF-8. If not, configure PuTTY to use UTF-8.

1.3 Logging In to a Device Through Telnet

1.3.1 Introduction

1.3.1.1 About This Lab

During network maintenance, network administrators often need to log in to multiple devices. It is difficult to log in to each device through the console port. The remote login function can be configured on the device to enable administrators to remotely log in to the device through Telnet. This facilitates device maintenance and commissioning.

1.3.1.2 Objectives

- Through this lab, you can get familiar with the basic method of configuring the Telnet-based remote login function.

1.3.1.3 Networking Topology



Figure 1-3 Topology for logging in to the device through Telnet

1.3.1.4 Lab Planning

The management PC uses a common Ethernet cable to connect to GE0/0/1 of the device, and uses PuTTY to remotely log in to the device.

Table 1-3 Device ports and parameters

Device	Port	Port Type	Address
Management PC	Ethernet port	Ethernet port	10.1.2.100/24
Firewall	GE0/0/1	Ethernet port	10.1.2.1/24

1.3.2 Lab Configuration

1.3.2.1 Configuration Roadmap

1. Log in to the device, for example, through the console port.
2. Configure Telnet on the device.
3. Log in to the device from the management PC through Telnet.

1.3.2.2 Configuration Procedure on the CLI

Step 1 Log in to the device through other methods. (For example, log in to the device through the console port. For details, see section 1.1 Logging In to a Device Through the Console Port (PuTTY).)

Step 2 Enable Telnet on the device.

```
<FW> system-view
[FW] telnet server enable
```

Step 3 Configure the port through which a Telnet user can log in to the device.

Configure the IP address of the port.

```
[FW] interface GigabitEthernet 0/0/1
[FW-GigabitEthernet0/0/1] ip address 10.1.2.1 24
```

Configure access control for the port.

```
[FW-GigabitEthernet0/0/1] service-manage enable
[FW-GigabitEthernet0/0/1] service-manage telnet permit
[FW-GigabitEthernet0/0/1] quit
```

Add the port to a security zone.

```
[FW] firewall zone trust
[FW-zone-trust] add interface GigabitEthernet0/0/1
[FW-zone-trust] quit
```

Configure a security policy to allow the management PC to access GE0/0/1 of the firewall.

```
[FW] security-policy
[FW-policy-security] rule name trust-local
[FW-policy-security-rule-trust-local] source-zone trust
```

```
[FW-policy-security-rule-trust-local] destination-zone local  
[FW-policy-security-rule-trust-local] action permit
```

Note: If the MGMT port of the firewall is used for remote login, skip this step.

Step 4 Configure an administrator.

```
# Set the VTY administrator authentication mode to AAA.
```

```
[FW] user-interface vty 0 4  
[FW-ui-vty0-4] authentication-mode aaa  
[FW-ui-vty0-4] protocol inbound telnet  
[FW-ui-vty0-4] user privilege level 3  
[FW-ui-vty0-4] quit
```

```
# Configure a Telnet administrator.
```

```
[FW] aaa  
[FW-aaa] manager-user telnetuser  
[FW-aaa-manager-use-telnetuser] password cipher (Enter password)  
[FW-aaa-manager-use-telnetuser] service-type telnet  
[FW-aaa-manager-use-telnetuser] level 3  
[FW-aaa-manager-use-telnetuser] quit
```

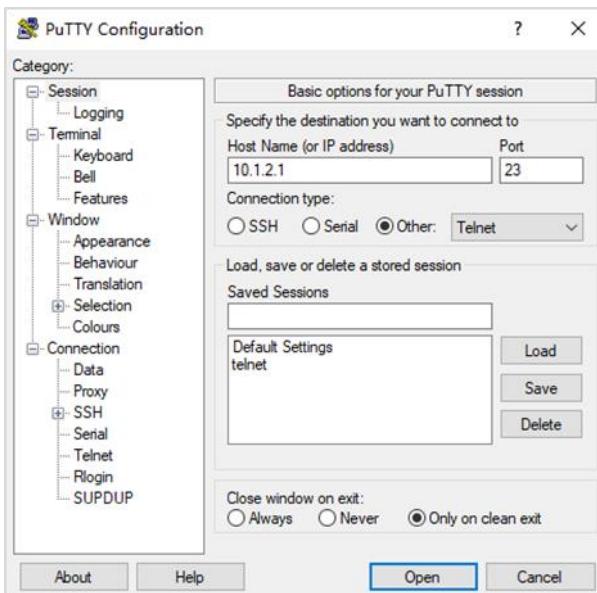
```
# Bind a role to the administrator (optional, supported only by firewalls).
```

```
[FW-aaa] bind manager-user telnetuser role system-admin
```

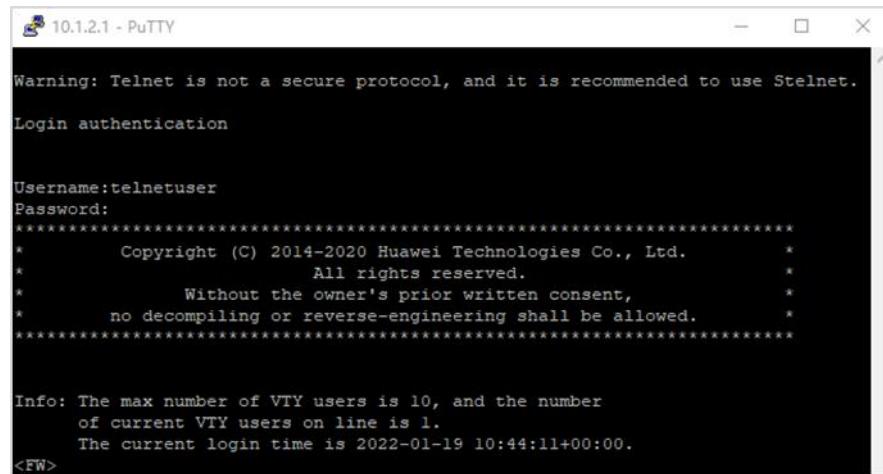
Step 5 Log in to the device.

```
# On the management PC, set the address to 10.1.2.100/24, run PuTTY, set Telnet parameters, and log in to the device.
```

```
# Click Session, set Connection type to Telnet and Host Name (or IP address) to 10.1.2.1, and set other parameters as shown in the following figure.
```



Click **Open** to establish a connection. If the following information is displayed, you have successfully logged in to the device by using Telnet.



```
10.1.2.1 - PuTTY

Warning: Telnet is not a secure protocol, and it is recommended to use Stelnet.

Login authentication

Username:telnetuser
Password:
*****
* Copyright (C) 2014-2020 Huawei Technologies Co., Ltd. *
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* Without the owner's prior written consent, *
* no decompiling or reverse-engineering shall be allowed. *
*****
Info: The max number of VTY users is 10, and the number
      of current VTY users on line is 1.
      The current login time is 2022-01-19 10:44:11+00:00.

<FW>
```

1.3.2.3 Configuration Procedure on the Web UI (Supported only by Firewalls)

Step 1 Use the default web UI to log in to the device. For details, see section 1.5 "Logging In to the Device Through the Default Web UI."

Step 2 Enable the Telnet service.

Choose **System > Administrator > Service Settings** and select the **Enable** check box of **Telnet Service**.

Step 3 Configure the login port.

Configure the port through which a Telnet user logs in to the device. Choose **Network > Interface** and click the **Edit** button on the line of GE0/0/1.

Configure the IP address, security zone, and access control functions of the port.

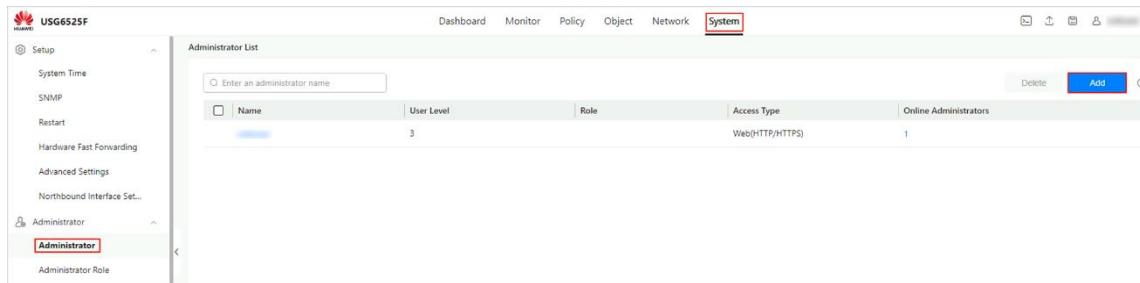
Modify GE Interface

Interface Name	GEO/0/1
Description	
Virtual System	public
VPN Instance	public
Zone	untrust
Mode	<input checked="" type="radio"/> Routing <input type="radio"/> Switching <input type="radio"/> Bypass <input type="radio"/> Interface Pair
<input checked="" type="radio"/> IPv4 <input type="radio"/> IPv6	
Connection Type	<input checked="" type="radio"/> Static IP <input type="radio"/> DHCP
IP Address	10.1.2.1/255.255.255.0
Enter each IP address on a separate line. For example: "10.1.1.1/255.255.255.0" "10.1.1.1/24".	
Default Gateway	
Interface Bandwidth	
Ingress Bandwidth	<input type="text"/> kbit/s <input type="button" value="▼"/> <60-1000000> Overload Protection Threshold <input type="text"/> %
Egress Bandwidth	<input type="text"/> kbit/s <input type="button" value="▼"/> <60-1000000> Overload Protection Threshold <input type="text"/> %
Access Management	
<input checked="" type="checkbox"/> HTTP <input checked="" type="checkbox"/> HTTPS <input checked="" type="checkbox"/> Ping <input checked="" type="checkbox"/> SSH <input checked="" type="checkbox"/> Telnet <input checked="" type="checkbox"/> NETCONF <input checked="" type="checkbox"/> SNMP	
Advanced	
Negotiation	<input checked="" type="checkbox"/>
IPv4 MTU	<input type="text"/> 1500 <46-9550>bytes
IPv6 MTU	<input type="text"/> 1500 <1280-9550>bytes
Strict ARP Learning	<input checked="" type="checkbox"/>
<input type="button" value="Cancel"/> <input type="button" value="OK"/>	

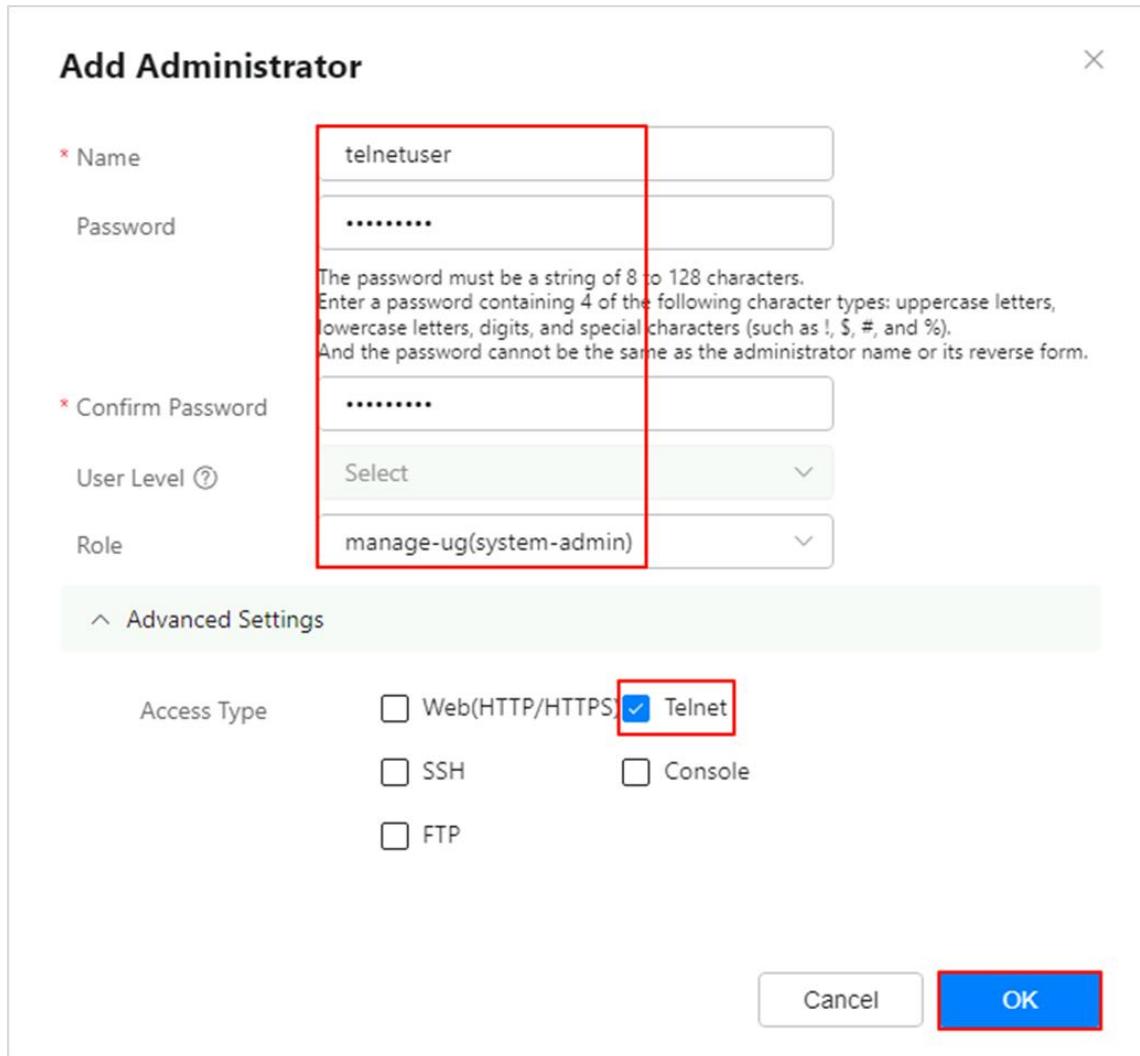
Note: If the MGMT port of the firewall is used for remote login, skip this step.

Step 4 Configure an administrator.

Choose **System > Administrator > Administrator** and click **Add**.



Set the Telnet user name to **telnetuser**, password to **Admin@123**, administrator role to **system-admin**, and service type to **Telnet**.



* Name	telnetuser
Password	*****
The password must be a string of 8 to 128 characters. Enter a password containing 4 of the following character types: uppercase letters, lowercase letters, digits, and special characters (such as !, \$, #, and %). And the password cannot be the same as the administrator name or its reverse form.	
* Confirm Password	*****
User Level ②	Select
Role	manage-ug(system-admin)

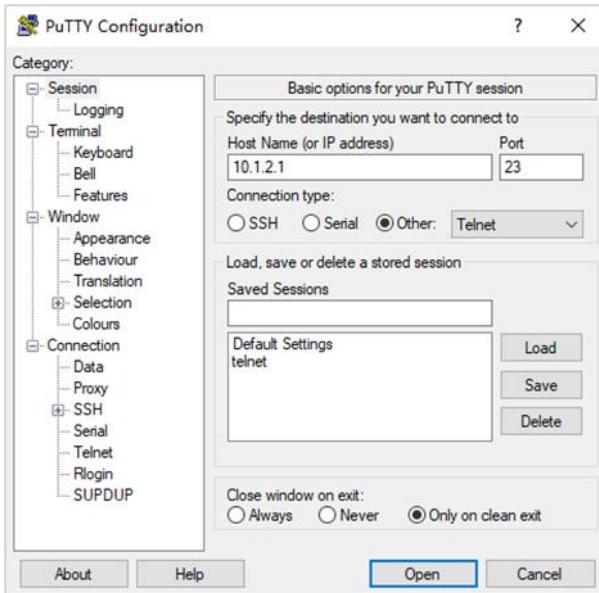
Advanced Settings

Access Type	<input type="checkbox"/> Web(HTTP/HTTPS) <input checked="" type="checkbox"/> Telnet
	<input type="checkbox"/> SSH <input type="checkbox"/> Console
	<input type="checkbox"/> FTP

Step 5 Log in to the device.

On the management PC, set the address to **10.1.2.100/24**, run PuTTY, set Telnet parameters, and log in to the device.

Click **Session**, set **Connection type** to **Telnet** and **Host Name (or IP address)** to **10.1.2.1**, and set other parameters as shown in the following figure.



1.3.3 Verification

Click **Open** in Step 5, press **Enter**, and enter the user name **telnetuser** and the password **Admin@123**. If the following information is displayed in PuTTY, the Telnet login is successful.

```
10.1.2.1 - PuTTY

Warning: Telnet is not a secure protocol, and it is recommended to use Stelnet.

Login authentication

Username:telnetuser
Password:
*****
* Copyright (C) 2014-2020 Huawei Technologies Co., Ltd.
* All rights reserved.
* Without the owner's prior written consent,
* no decompiling or reverse-engineering shall be allowed.
****

Info: The max number of VTY users is 10, and the number
      of current VTY users on line is 1.
      The current login time is 2022-01-19 10:44:11+00:00.
<FW>
```

1.3.4 Quiz

TCP port 23 is used to log in to the device through Telnet. Can I change it to another port number? If so, what is the corresponding command? After the change, which command can I use to check the current port number for setting up a Telnet connection?

Reference Answer:

1. Run the **telnet server port port-number** command to set the listening port number of the Telnet server.
2. After the Telnet listening port number is changed, you can run the **display telnet server status** command to check the listening port number currently used by the Telnet server.

1.4 Logging In to the Device Through SSH

1.4.1 Introduction

1.4.1.1 About This Lab

During network maintenance, network administrators often need to log in to multiple devices. It is difficult to log in to each device through the console port. In addition, the Telnet remote login packets are in plain text. To enhance security, configure the SSH function on the device to enable administrators to remotely log in to the device through SSH for management.

1.4.1.2 Objectives

- Through this lab, you can get familiar with the basic method of configuring the SSH-based remote login function.

1.4.1.3 Networking Topology



Figure 1-4 Topology for logging in to a device through SSH

1.4.1.4 Lab Planning

The management PC uses a common Ethernet cable to connect to GE0/0/1 of the device, and uses PuTTY to remotely log in to the device.

Table 1-4 Device ports and parameters

Device	Port	Port Type	Address
Management PC	Computer network port	Ethernet port	10.1.2.100/24
Firewall	GE0/0/1	Ethernet port	10.1.2.1/24

1.4.2 Lab Configuration

1.4.2.1 Configuration Roadmap

- Log in to the device, for example, through the console port.
- Configure the SSH function on the device.
- Log in to the device from the management PC through SSH.

1.4.2.2 Configuration Procedure on the CLI

Step 1 Log in to the device through other methods. (For example, log in to the device through the console port. For details, see section1.1 "Logging In to a Device Through the Console Port (PuTTY").)

Step 2 Enable SSH on the device.

```
<FW> system-view  
[FW] stelnet server enable
```

Step 3 Configure the login port.

Configure the IP address of the port for login.

```
[FW] interface GigabitEthernet 0/0/1  
[FW-GigabitEthernet0/0/1] ip address 10.1.2.1 24
```

Configure access control for the port.

```
[FW-GigabitEthernet0/0/1] service-manage enable  
[FW-GigabitEthernet0/0/1] service-manage ssh permit  
[FW-GigabitEthernet0/0/1] quit
```

Add the port to a security zone.

```
[FW] firewall zone trust  
[FW-zone-trust] add interface GigabitEthernet0/0/1  
[FW-zone-trust] quit
```

Configure a security policy to allow the management PC to access GE0/0/1 of the firewall.

```
[FW] security-policy  
[FW-policy-security] rule name trust-local  
[FW-policy-security-rule-trust-local] source-zone trust  
[FW-policy-security-rule-trust-local] destination-zone local  
[FW-policy-security-rule-trust-local] action permit  
[FW-policy-security-rule-trust-local] quit
```

Note: If the MGMT port of the firewall is used for remote login, skip this step.

Step 4 Configure an administrator.

Set the VTY administrator authentication mode to AAA.

```
[FW] user-interface vty 0 4  
[FW-ui-vty0-4] authentication-mode aaa  
[FW-ui-vty0-4] protocol inbound ssh  
[FW-ui-vty0-4] user privilege level 3  
[FW-ui-vty0-4] quit
```

Create an SSH administrator account **sshuser**, and set the authentication method to **password**, password to **Admin@123**, and service mode to **SSH**.

```
[FW] aaa  
[FW-aaa] manager-user sshuser  
[FW-aaa-manager-use-sshuser] password cipher (Enter password)  
[FW-aaa-manager-use-sshuser] service-type ssh  
[FW-aaa-manager-use-sshuser] level 3  
[FW-aaa-manager-use-sshuser] quit
```

Bind a role to the administrator (optional, supported only by firewalls).

```
[FW-aaa] bind manager-user sshuser role system-admin
```

Configure an SSH user.

```
[FW] ssh user sshuser  
[FW] ssh user sshuser authentication-type password  
[FW] ssh user sshuser service-type stelnet
```

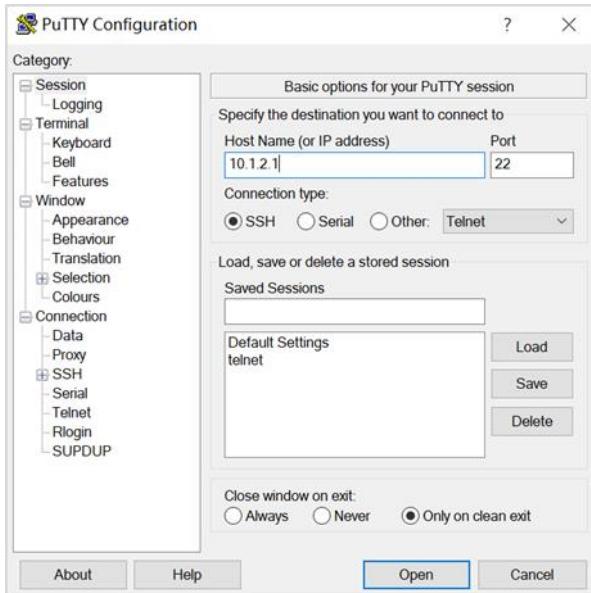
Step 5 Generate a local key pair.

```
[FW] rsa local-key-pair create  
The key name will be: FW_Host  
The range of public key size is (512 ~ 2048).  
NOTES: A key shorter than 1024 bits may cause security risks.  
The generation of a key longer than 512 bits may take several minutes.  
Input the bits in the modulus[default = 2048]:  
Generating keys...  
.....+.....  
.....+.....  
.....+.....+.....  
.....+.....
```

Step 6 Log in to the device.

On the management PC, set the address to **10.1.2.100/24**, run PuTTY, set SSH parameters, and log in to the device.

Click **Session**, set **Connection type** to **SSH** and **Host Name (or IP address)** to **10.1.2.1**, and set other parameters as shown in the following figure.



1.4.3 Verification

Click **Open** in Step 6, press **Enter**, and enter the user name **sshuser** and the password **Admin@123**. If the following information is displayed in PuTTY, the SSH login is successful.

```

10.1.2.1 - PuTTY
login as: sshuser
Keyboard-interactive authentication prompts from server:
| User Authentication
| Password:
End of keyboard-interactive prompts from server

*****
* Copyright (C) 2014-2020 Huawei Technologies Co., Ltd.
* All rights reserved.
* Without the owner's prior written consent,
* no decompiling or reverse-engineering shall be allowed.
*****

Info: The max number of VTY users is 10, and the number
of current VTY users on line is 1.
The current login time is 2022-01-19 14:47:57+00:00.
<FW>

```

1.4.4 Quiz

What type of security verification mode does SSH login use in this lab? Is there any other SSH method for secure login? If so, please give examples and list the key verification steps for secure login.

Reference Answer:

1. This lab uses SSH password-based security verification.
2. SSH security verification falls into password-based security verification and key-based security verification.
3. Login procedure of password-based SSH security verification:
 - a. A user initiates a login request.

- b. The remote host returns its public key to the requesting host.
 - c. The requesting host uses the public key to encrypt the password entered by the user.
 - d. The requesting host sends the encrypted password to the remote host.
 - e. The remote host decrypts the password using the private key.
 - f. The remote host checks whether the decrypted password is the same as the user password. If so, the login is successful.
4. Login procedure of key-based SSH security verification:
 - a. A user host generates a key pair and imports the public key to the remote host.
 - b. The user initiates a login request.
 - c. The remote host returns a random character string to the user.
 - d. The host where the user is located uses the private key to encrypt the random character string and returns the encrypted random string to the remote host.
 - e. The remote host uses the imported public key to decrypt the encrypted random string. If the decryption succeeds, the user's login information is correct and the login is allowed.

1.5 Logging In to the Device Through the Default Web UI

1.5.1 Introduction

1.5.1.1 About This Lab

Engineers can commission new firewalls on the web UI. In the factory default settings, a PC can log in to the device through the MGMT port of the firewall, implementing device management and configuration.

1.5.1.2 Objectives

- Through this lab, you will be able to use a PC to log in to the firewall through the default web UI.

1.5.1.3 Networking Topology

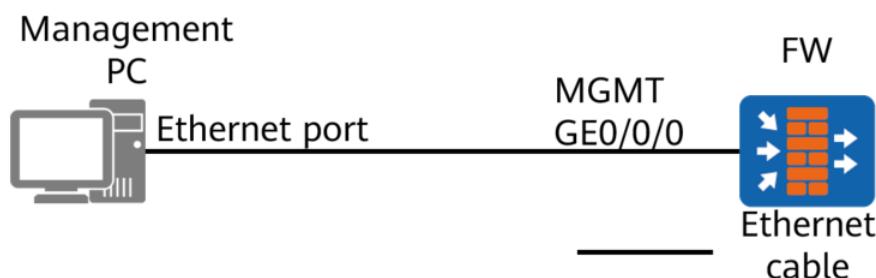


Figure 1-5 Topology for logging in to the device through the default web UI

1.5.1.4 Lab Planning

The PC uses an Ethernet cable to connect to the MGMT port of the device, and uses a web browser to log in to the device.

Table 1-5 Device ports and parameters

Device	Port	Port Type	IP Address
Management PC	Computer network port	Ethernet port	192.168.0.2/24
Firewall	GigabitEthernet0/0/0	Ethernet port	192.168.0.1/24

1.5.2 Lab Configuration

1.5.2.1 Configuration Roadmap

1. Use twisted pairs to connect the Ethernet port on the management PC to the MGMT port on the device.
2. Use a browser to access the firewall from the management PC.

1.5.2.2 Configuration Procedure

- Step 1 Use an Ethernet cable to connect the network interface of the administrator PC to the management interface (MEth 0/0/0) of the device, either directly or via a Layer 2 switch. For the USG6510F-D, USG6510F-DL, USG6510F-DPL, USG6530F-D, USG6530F-DL, USG6530F-DPL, GE0/0/0 is used as the management interface.
- Step 2 Set the IP address of the administrator PC to be on the same network segment as the IP address of the management interface on the device.
- Step 3 The default IP address of the management interface on the device is 192.168.0.1, so set the IP address of the administrator PC to an address in the range of 192.168.0.2 to 192.168.0.254.
- Step 4 Enter <https://ip-address:8443> in the address box of the browser.
- Step 5 ip-address is the IP address of the management interface on the device. If the browser displays a message indicating that the certificate is insecure, select to continue browsing.
- Step 6 The browser cannot verify the default certificate provided by the device, and a security warning is displayed. After login, you can replace the device certificate to clear the alarm.
- Step 7 In the case of the first device login, the page for creating an administrator account is displayed. Enter the user name, password, and confirm password, and click Create.

Create Account

admin

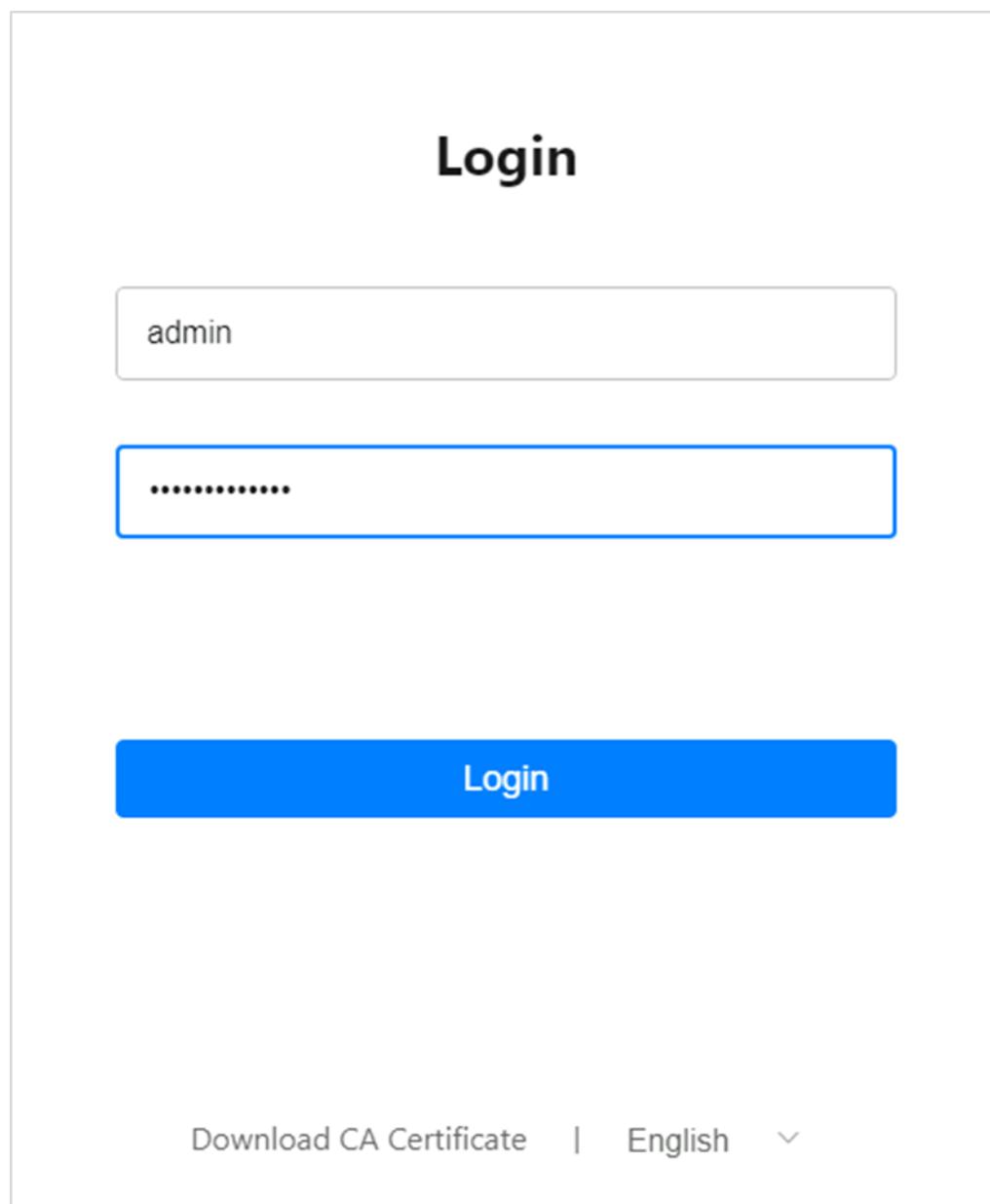
.....

.....

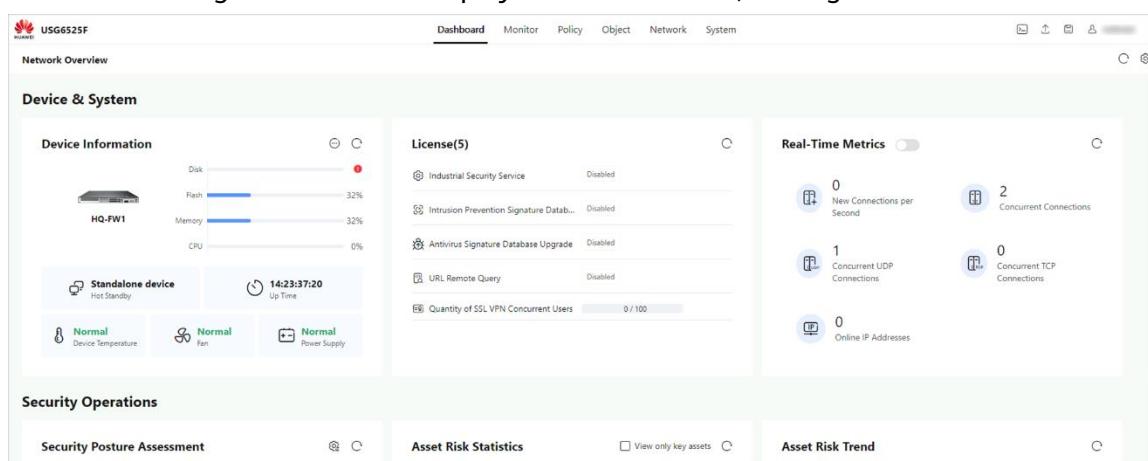
Create

1.5.3 Verification

Enter the user name **admin** and its password **Admin@123**, and click **Login**.



If the following information is displayed in the browser, the login succeeds.



The screenshot shows the USG6525F Dashboard with the following sections:

- Network Overview:** Shows a summary of network components and their status.
- Device & System:**
 - Device Information:** Monitors Disk, Flash, Memory, and CPU usage.
 - License(5):** Lists Industrial Security Service, Intrusion Prevention Signature Database, Antivirus Signature Database Upgrade, URL Remote Query, and Quantity of SSL VPN Concurrent Users.
 - Real-Time Metrics:** Displays New Connections per Second (0), Concurrent Connections (2), Concurrent UDP Connections (1), Concurrent TCP Connections (0), and Online IP Addresses (0).
- Security Operations:** Includes Security Posture Assessment, Asset Risk Statistics, and Asset Risk Trend.

1.5.4 Quiz

By default, which interface is used for logging in to the device through the default web UI? Do you need to manually start the web service through the CLI?

Reference Answer:

By default, the interface for login through the web UI is GigabitEthernet0/0/0. You do not need to manually enable the web service or configure a security policy to allow traffic to pass through.

1.6 Logging In to the Device Through the Web UI

1.6.1 Introduction

1.6.1.1 About This Lab

After the firewall is added to the network, engineers want to log in to firewall management page through the management PC. In this case, the MGMT port is not connected to the network. The PC can log in to the device using the firewall service port through the web UI to manage and configure the device.

1.6.1.2 Objectives

- Through this lab, you will be able to use a PC to log in to the firewall through the web UI.

1.6.1.3 Networking Topology



Figure 1-6 Topology for logging in to a device through the web UI

1.6.1.4 Lab Planning

The PC uses an Ethernet cable to connect to GE0/0/1 of the device, and uses the web UI to log in to the device.

Table 1-6 Device ports and parameters

Device	Port	Port Type	IP Address	Description
Management PC	Network port	Ethernet port	10.1.2.100/24	

Firewall	GE0/0/1	Ethernet port	10.1.2.1/24	By default, the service port of the device does not support web login. Therefore, you need to enable the web function and configure the account and password for web login.
----------	---------	---------------	-------------	---

1.6.2 Lab Configuration

1.6.2.1 Configuration Roadmap

1. Use twisted pairs to connect the Ethernet port on the management PC to the service port on the device.
2. Configure the web login function of the device.
3. Log in to the device from the management PC through the web UI.

1.6.2.2 Configuration Procedure on the CLI

- Step 1 Establish the connection, power on all devices, and ensure that they run properly.
- Step 2 Log in to the device through other methods, for example, console, Telnet, and SSH. For details, see 1.1 Logging In to a Device Through the Console Port (PuTTY), 1.2 Getting Familiar with Commands (PuTTY), and 1.3 Logging In to a Device Through Telnet.
- Step 3 Check whether the web server function is enabled. If not, run the following command to enable it:

```
[FW] web-manager security enable
```

Note: The **web-manager security enable** command enables HTTPS device management. If the **web-manager enable** command is used, HTTP device management is enabled. Do not use the same port for HTTPS and HTTP device management. Otherwise, port conflicts may occur.

- Step 4 Configure the login port.

```
# Configure an IP address and the access control function for the port.
```

```
[FW] interface GigabitEthernet 0/0/1
[FW-GigabitEthernet0/0/1] ip address 10.1.2.1 24
[FW-GigabitEthernet0/0/1] service-manage enable
[FW-GigabitEthernet0/0/1] service-manage https permit
[FW-GigabitEthernet0/0/1] quit
```

```
# Add the port to a security zone.
```

```
[FW] firewall zone trust
[FW-zone-trust] add interface GigabitEthernet 0/0/1
[FW-zone-trust] quit
```

```
# Configure a security policy to allow the management PC to access GE0/0/1 of the firewall.
```

```
[FW] security-policy  
[FW-policy-security] rule name trust-local  
[FW-policy-security-rule-trust-local] source-zone trust  
[FW-policy-security-rule-trust-local] destination-zone local  
[FW-policy-security-rule-trust-local] action permit
```

Step 5 Configure an administrator.

```
[FW] aaa  
[FW-aaa] manager-user webuser  
[FW-aaa-manager-use-webuser] password cipher (Enter password)  
[FW-aaa-manager-use-webuser] level 3  
[FW-aaa-manager-use-webuser] service-type web  
[FW-aaa-manager-use-webuser] quit
```

```
# Bind a role to the administrator (optional, supported only by firewalls).
```

```
[FW-aaa] bind manager-user webuser role service-admin
```

Step 6 Set the IP address of the PC to 10.1.2.100/24. Visit https://10.1.2.1:8443 in the browser of the PC.

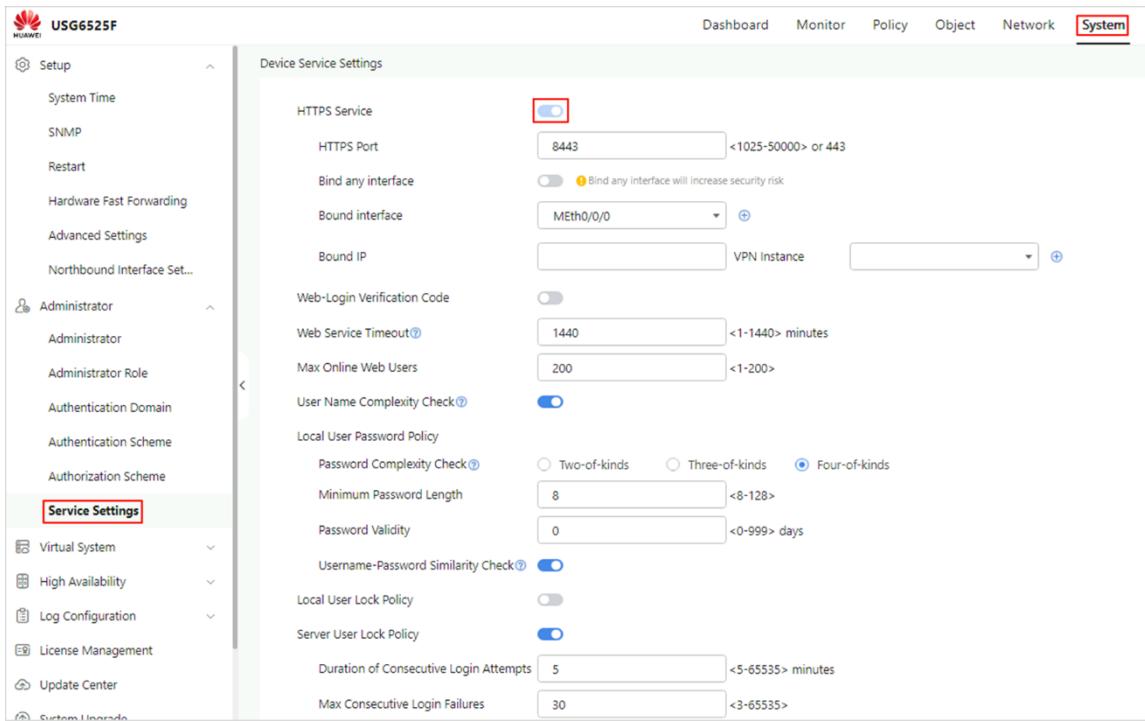
1.6.2.3 Configuration Procedure on the Web UI

Step 1 Establish the connection, power on all devices, and ensure that they run properly.

Step 2 Log in to the device in the default web mode. (For details, see 1.5 "Logging In to the Device Through the Default Web UI.")

Step 3 Enable the HTTPS service.

```
# Choose System > Administrator > Settings and check whether the check box of the HTTPS service is enabled.
```



Device Service Settings

HTTPS Service (Toggle switch is **ON**)
Port: 8443 (Range: 1025-50000 or 443)

Bind any interface (Toggle switch is **OFF**)
Bind any interface will increase security risk.

Bound interface: MEth0/0/0

Bound IP: VPN Instance:

Web-Login Verification Code (Toggle switch is **OFF**)

Web Service Timeout: 1440 (Range: 1-1440 minutes)

Max Online Web Users: 200 (Range: 1-200)

User Name Complexity Check (Toggle switch is **ON**)

Local User Password Policy

- Password Complexity Check** (Radio buttons: Two-of-kinds, Three-of-kinds, **Four-of-kinds**)
- Minimum Password Length**: 8 (Range: 8-128)
- Password Validity**: 0 (Range: 0-999 days)
- Username+Password Similarity Check** (Toggle switch is **ON**)
- Local User Lock Policy** (Toggle switch is **OFF**)
- Server User Lock Policy** (Toggle switch is **ON**)
- Duration of Consecutive Login Attempts**: 5 (Range: 5-65535 minutes)
- Max Consecutive Login Failures**: 30 (Range: 3-65535)

Configure the port used for login. Choose Network > Interface and click Edit on the line of GE0/0/1 to configure the IP address, security zone, and access control for the port.

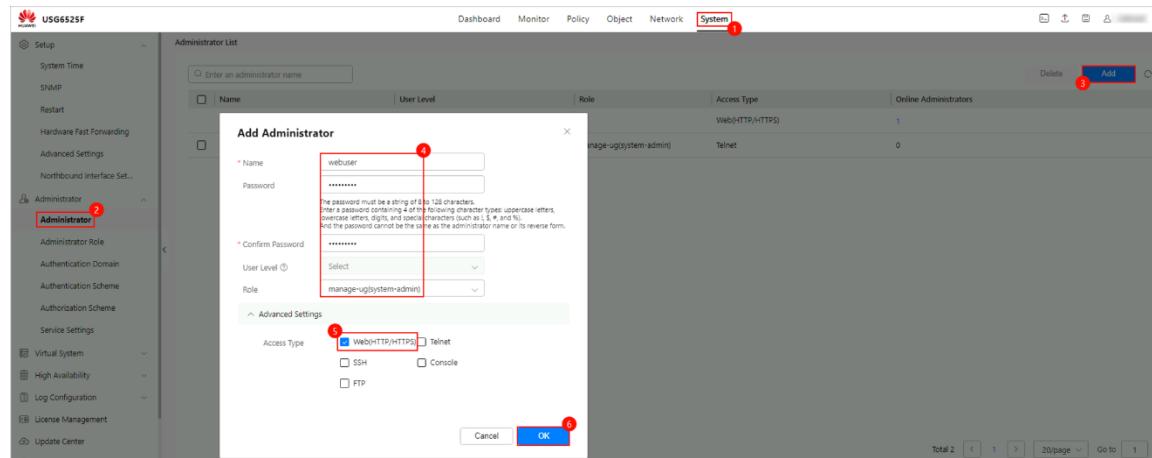
Modify GE Interface

Interface Name	GE0/0/1			
Description				
Virtual System	public			
VPN Instance	public			
Zone	untrust			
Mode	<input checked="" type="radio"/> Routing <input type="radio"/> Switching <input type="radio"/> Bypass <input type="radio"/> Interface Pair			
<input checked="" type="radio"/> IPv4 <input type="radio"/> IPv6				
Connection Type	<input checked="" type="radio"/> Static IP <input type="radio"/> DHCP			
IP Address	10.1.2.1/24			
Enter each IP address on a separate line. For example: "10.1.1.1/255.255.255.0" "10.1.1.1/24".				
Default Gateway				
Interface Bandwidth				
Ingress Bandwidth	<input type="text"/> kbit/s <60-1000000>	Overload Protection Threshold	<input type="text"/>	%
Egress Bandwidth	<input type="text"/> kbit/s <60-1000000>	Overload Protection Threshold	<input type="text"/>	%
Access Management	<input checked="" type="checkbox"/> HTTP <input checked="" type="checkbox"/> HTTPS <input type="checkbox"/> Ping <input type="checkbox"/> SSH <input type="checkbox"/> Telnet <input type="checkbox"/> NETCONF <input type="checkbox"/> SNMP			
<input type="checkbox"/> Advanced				
			<input type="button" value="Cancel"/>	<input type="button" value="OK"/>

Configure an administrator.

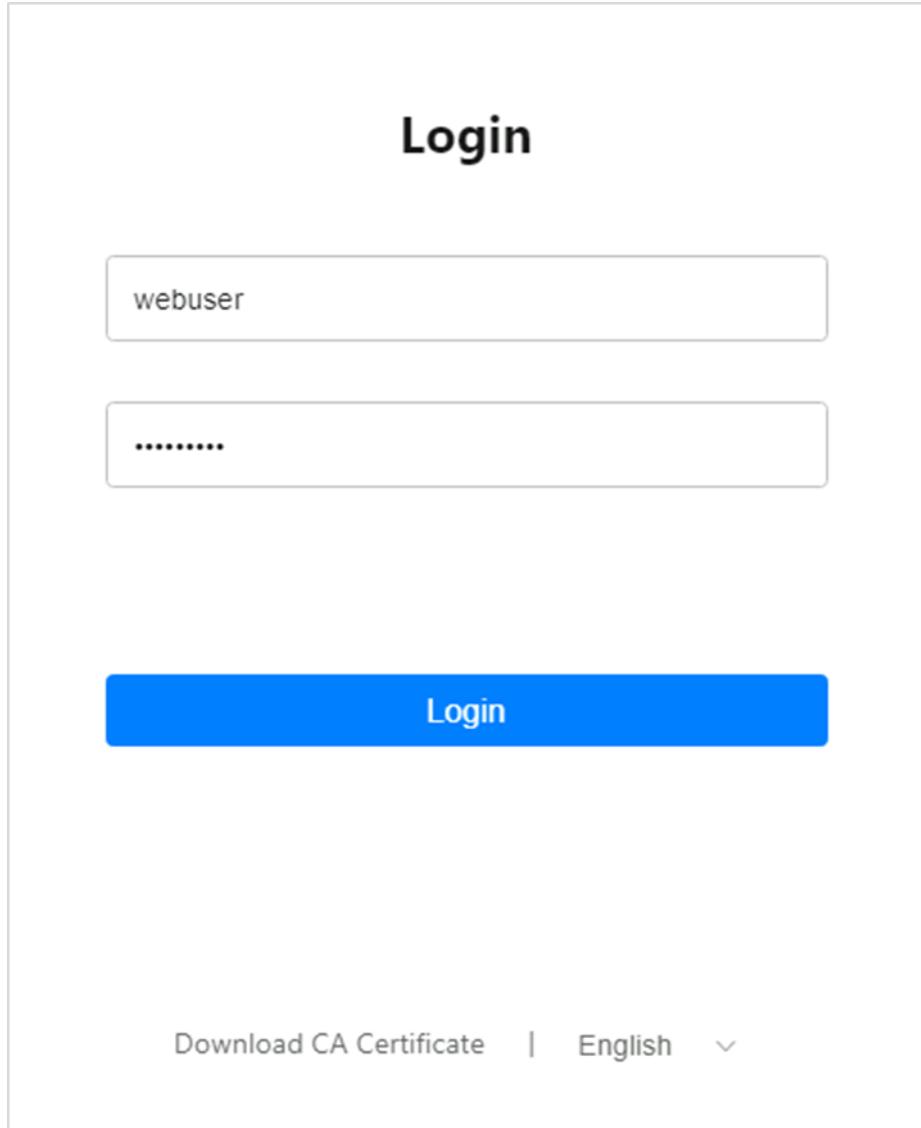
Choose **System > Administrator > Administrator** and click **Add**.

Set the web user name to **webuser**, password to **Admin@123**, and role to **system-admin**.

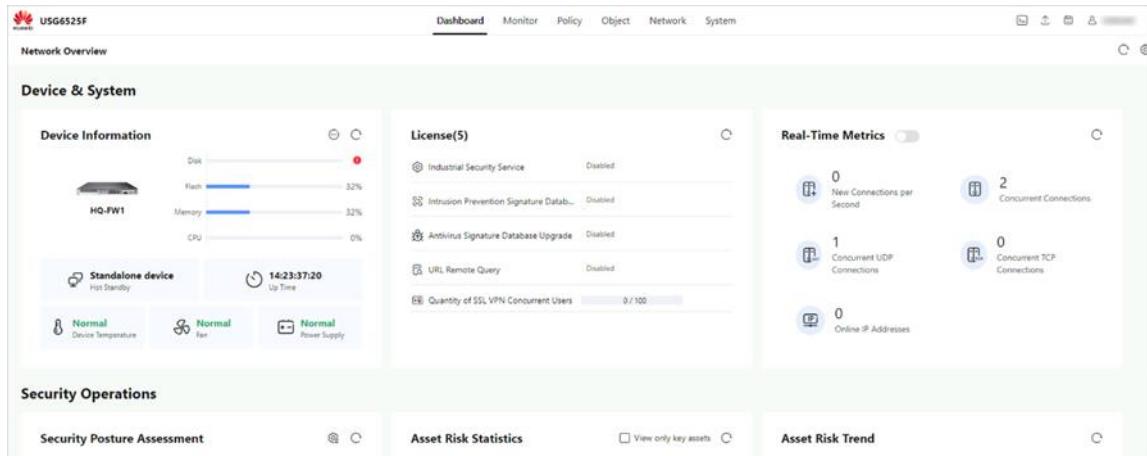


1.6.3 Verification

Access <https://10.1.2.1> in the browser on the PC, enter the user name **webuser** and password **Admin@123**, and click **Login**.



If the following information is displayed in the browser, the login succeeds.



1.6.4 Quiz

Which of the following key configurations are required for logging in to the device's web page through a non-management port?

Reference Answer:

1. The HTTPS access service must be enabled for the port.
2. The traffic policy needs to permit traffic from the security zone to which the port belongs to the local zone.
3. The HTTPS service needs to be enabled globally.

2 Firewall Security Policy

2.1 Introduction

2.1.1 About This Lab

During network deployment and maintenance, firewalls are required to protect the network. This lab introduces key concepts such as security zones and security policies. In this lab, security policies are deployed on firewalls to ensure that hosts in the trust zone can proactively access hosts in the untrust zone.

2.1.2 Objectives

- Understand the principles of security policies.
- Understand the relationship between different security zones.
- Configure firewall security policies using the CLI and web UI.

2.1.3 Networking Topology

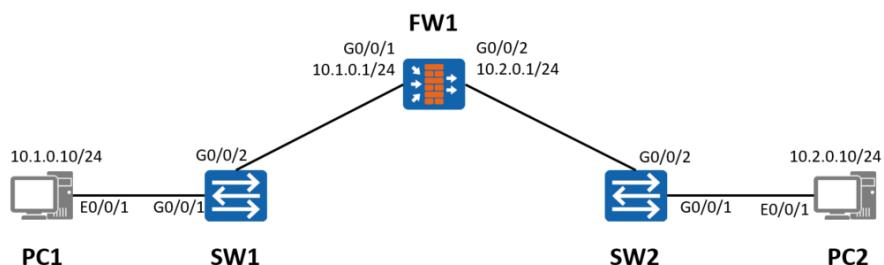


Figure 2-1 Topology for configuring firewall security policies

2.1.4 Lab Planning

FW1 is deployed between two networks. The upstream and downstream devices are switches, and the upstream and downstream service interfaces of FW1 work at Layer 3.

Table 2-1 Port address and zone planning

Device	Interface	IP Address	Security Zone
FW1	GigabitEthernet0/0/1	10.1.0.1/24	trust
	GigabitEthernet0/0/2	10.2.0.1/24	untrust
PC1	Eth0/0/1	10.1.0.10/24	trust

Device	Interface	IP Address	Security Zone
PC2	Eth0/0/1	10.2.0.10/24	untrust

2.2 Lab Configuration

2.2.1 Configuration Roadmap

1. Configure basic IP addresses and security zones.
2. Configure an interzone security policy.
3. Configure the gateways of PC1 and PC2 to use IP addresses that are on the same network segment as those of the corresponding interfaces on the firewall.

2.2.2 Configuration Procedure on the CLI

Step 1 Complete the configurations of the upstream and downstream interfaces of FW1.
Configure the IP addresses for interfaces and add them to security zones.

```
[FW1] interface G0/0/1
[FW1-GigabitEthernet0/0/1] ip address 10.1.0.1 255.255.255.0
[FW1-GigabitEthernet0/0/1] quit
[FW1] interface G0/0/2
[FW1-GigabitEthernet0/0/2] ip address 10.2.0.1 255.255.255.0
[FW1-GigabitEthernet0/0/2] quit
[FW1] firewall zone trust
[FW1-zone-trust] add interface G0/0/1
[FW1-zone-trust] quit
[FW1] firewall zone untrust
[FW1-zone-untrust] add interface G0/0/2
[FW1-zone-untrust] quit
```

Step 2 Configure a forwarding policy between the Trust zone and the Untrust zone.

```
[FW1] security-policy
[FW1-policy-security] rule name policy_sec
[FW1-policy-security-rule-policy_sec] source-zone trust
[FW1-policy-security-rule-policy_sec] destination-zone untrust
[FW1-policy-security-rule-policy_sec] action permit
[FW1-policy-security-rule-policy_sec] quit
```

Step 3 Configure the switch.

Add two interfaces of each switch to the default VLAN. For details, see the related switch document.

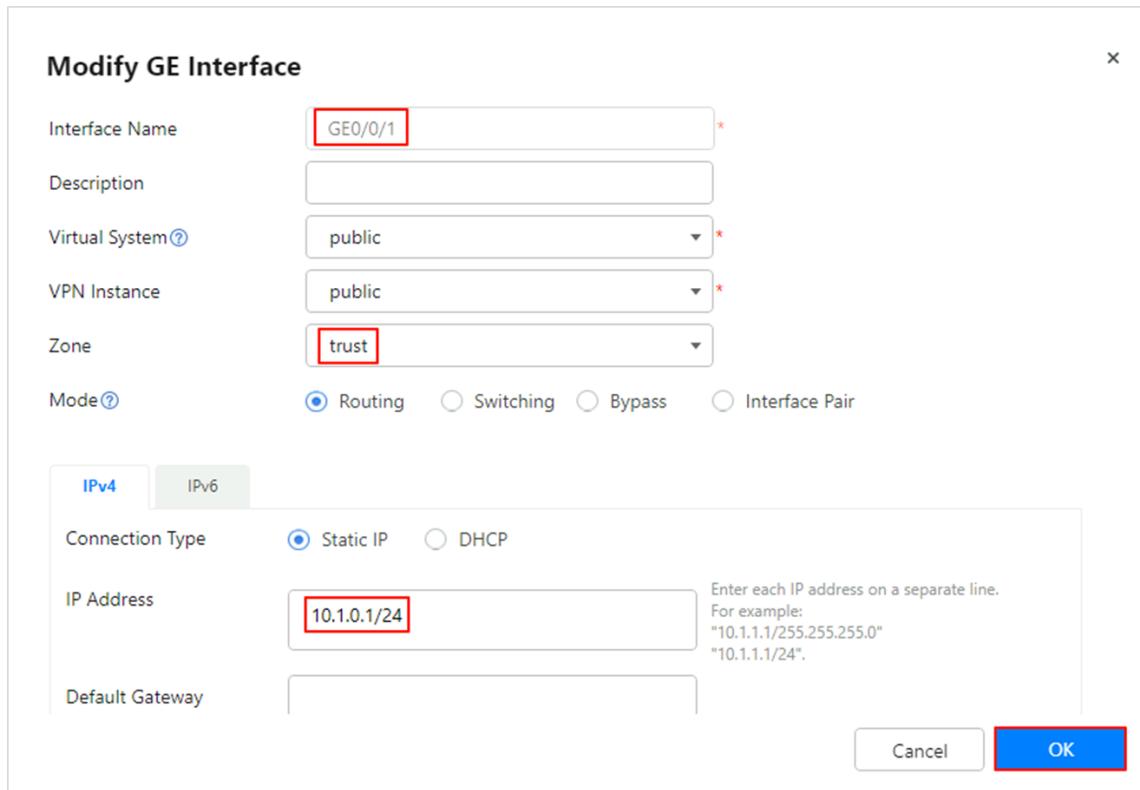
Step 4 Configure the PC.

Set the IP address of PC1 to **10.1.0.10/24** and that of the gateway to **10.1.0.1**. Set the IP address of PC2 to **10.2.0.10/24** and that of the gateway to **10.2.0.1**.

2.2.3 Configuration Procedure on the Web UI

Step 1 Complete the interface configuration on FW1.

Choose **Network > Interface**, and click the  button next to the interface to be configured. Select or set parameters and click **OK**. Configure the interface GigabitEthernet0/0/1, as shown in the following figure.



The screenshot shows the 'Modify GE Interface' dialog box. The 'Interface Name' field contains 'GEO/0/1'. The 'Zone' field contains 'trust'. Under the 'IPv4' tab, 'Connection Type' is set to 'Static IP' and the 'IP Address' field contains '10.1.0.1/24'. The 'OK' button at the bottom right is highlighted with a red border.

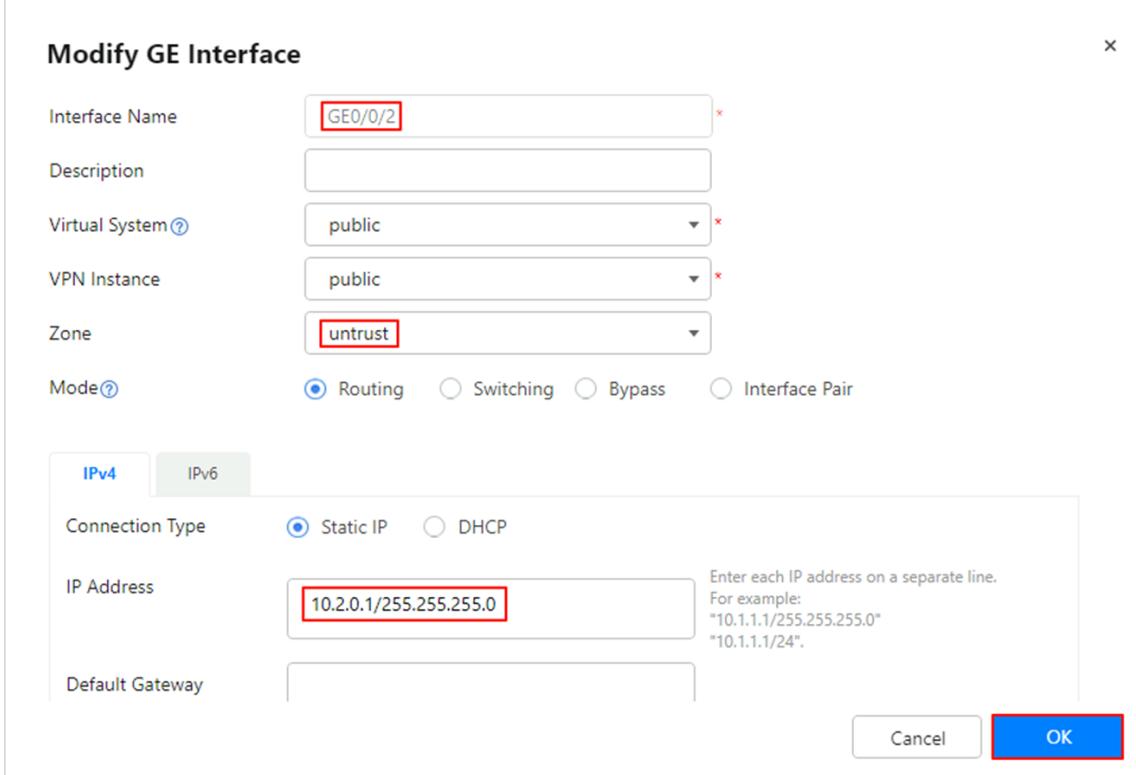
Choose **Network > Interface**, and click the  button next to the interface to be configured. Select or set parameters and click **OK**. Configure the interface GigabitEthernet0/0/2, as shown in the following figure.

Modify GE Interface

Interface Name	GEO/0/2
Description	
Virtual System	public
VPN Instance	public
Zone	untrust
Mode	<input checked="" type="radio"/> Routing <input type="radio"/> Switching <input type="radio"/> Bypass <input type="radio"/> Interface Pair
IPv4 IPv6	
Connection Type	<input checked="" type="radio"/> Static IP <input type="radio"/> DHCP
IP Address	10.2.0.1/255.255.255.0
Default Gateway	

Enter each IP address on a separate line.
For example:
"10.1.1.1/255.255.255.0"
"10.1.1.1/24".

Cancel **OK**



Step 2 Configure an interzone forwarding policy on FW1.

Forwarding policy between **trust** and **untrust**: Choose **Policy > Security Policy > Security Policy**. In **Security Policy List**, click **Add**. Set or select each parameter in sequence. Click **OK**. The following figure shows the forwarding policy between the Trust and Untrust zones.

Add Security Policy

General Settings

- * Name: policy_sec (highlighted with a red box)
- Description: (empty)
- Policy Group: -- NONE --

Condition

The geolocation database is not loaded. To configure a region, [load the geolocation database](#).

Source

- Zone: trust (highlighted with a red box)
- IP Address/Region: any

Destination

- Destination Type: Zone (highlighted with a red box)
- Zone: untrust (highlighted with a red box)
- IP Address/Region: any

Service

- Protocol: Select a service
- More: Application/User/UCL Group/Schedule/VLAN ID

Action

- Action: Permit (highlighted with a green box)
- Deny

Content Security: Antivirus/Intrusion Prevention/URL Filtering/Data Filtering

Buttons: Cancel, Command Preview, OK (highlighted with a red box)

2.3 Verification

Ping 10.2.0.10 on the CLI from PC1 to check whether PC1 can ping PC2.

```
PC> ping 10.2.0.10
Ping 10.2.0.10: 32 data bytes, Press Ctrl_C to break
From 10.2.0.10: bytes=32 seq=1 ttl=127 time=16 ms
```

```
From 10.2.0.10: bytes=32 seq=2 ttl=127 time=16 ms
From 10.2.0.10: bytes=32 seq=3 ttl=127 time=15 ms
From 10.2.0.10: bytes=32 seq=4 ttl=127 time<1 ms
From 10.2.0.10: bytes=32 seq=5 ttl=127 time=16 ms
--- 10.2.0.10 ping statistics ---
5 packet(s) transmitted
5 packet(s) received
0.00% packet loss
round-trip min/avg/max = 0/12/16 ms
```

Run the **display firewall session table** command to view the session table of the firewall.

```
[FW1] display firewall session table
Current Total Sessions : 1
icmp  VPN: public --> public  10.1.0.10:49569 --> 10.2.0.10:2048
```

2.4 Quiz

Based on the lab, ping PC1 from PC2, and explain why the ping operation fails.

Reference Answer:

The security policy in this lab only permits traffic from PC1 to PC2, but not from PC2 to PC1. Therefore, if PC2 initiates access to PC1, the packets will be discarded by the firewall's default security policy.

3 Firewall NAT Server and Source NAT

3.1 Introduction

3.1.1 About This Lab

An enterprise uses a firewall as the egress device. Employees in the enterprise need to access the Internet through the firewall, and one server in the enterprise network provides services for Internet users.

After NAT is configured on the egress firewall, multiple users on the intranet can access the Internet using a small number of public IP addresses, and extranet users can access the intranet server using specified IP addresses.

3.1.2 Objectives

- Understand the application scenarios and principles of Source NAT.
- Understand the application scenarios and principles of the NAT Server.
- Configure NAT Server and Source NAT commands through the CLI and web UI.

3.1.3 Networking Topology

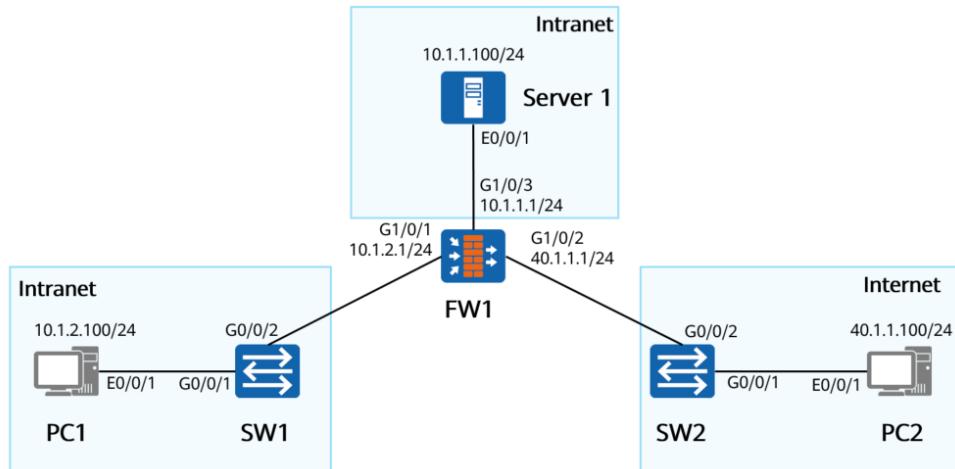


Figure 3-1 Topology for configuring the NAT Server and Source NAT for a firewall

3.1.4 Lab Planning

FW1 is deployed at the egress of the network. The upstream and downstream devices are switches.

Table 3-1 Port address and zone planning

Device	Interface	IP Address	Security Zone
FW1	GigabitEthernet0/0/1	10.1.2.1/24	trust
	GigabitEthernet0/0/2	40.1.1.1/24	untrust
	GigabitEthernet0/0/3	10.1.1.1/24	dmz
PC1	Eth0/0/1	10.1.2.100/24	trust
PC2	Eth0/0/1	40.1.1.100/24	untrust
Server 1	Eth0/0/1	10.1.1.100/24	dmz

3.2 Lab Configuration (Source NAT)

3.2.1 Configuration Roadmap

1. Configure basic IP addresses, security zones, and security policies.
2. Configure a NAT address pool.
3. Configure a NAT policy.

3.2.2 Configuration Procedure on the CLI

Step 1 Configure the upstream and downstream service interfaces of FW1. Configure the IP addresses for interfaces and add them to security zones.

```
# Configure IP addresses for the upstream and downstream service interfaces of FW1.
```

```
<FW1> system-view
[FW1] interface G0/0/1
[FW1-GigabitEthernet0/0/1] ip address 10.1.2.1 255.255.255.0
[FW1-GigabitEthernet0/0/1] quit
[FW1] interface G0/0/2
[FW1-GigabitEthernet0/0/2] ip address 40.1.1.1 255.255.255.0
[FW1-GigabitEthernet0/0/2] quit
[FW1] interface G0/0/3
[FW1-GigabitEthernet0/0/3] ip address 10.1.1.1 255.255.255.0
[FW1-GigabitEthernet0/0/3] quit
```

```
# Add the interfaces of FW1 to the corresponding security zones.
```

```
[FW1] firewall zone trust
[FW1-zone-trust] add interface G0/0/1
[FW1-zone-trust] quit
[FW1] firewall zone untrust
[FW1-zone-untrust] add interface G0/0/2
[FW1-zone-untrust] quit
[FW1] firewall zone dmz
```

```
[FW1-zone-dmz] add interface G0/0/3  
[FW1-zone-dmz] quit
```

Step 2 Configure a forwarding policy between the Trust and Untrust zones.

```
[FW1] security-policy  
[FW1-policy-security] rule name policy_sec  
[FW1-policy-security-rule-policy_sec] source-zone trust  
[FW1-policy-security-rule-policy_sec] destination-zone untrust  
[FW1-policy-security-rule-policy_sec] action permit  
[FW1-policy-security-rule-policy_sec] quit
```

Step 3 Configure a NAT address pool and set the public IP address range from 2.2.2.2 to 2.2.2.5.

```
[FW1] nat address-group natpool  
[FW1-address-group-natpool] section 2.2.2.2 2.2.2.5
```

Step 4 Configure a NAT policy.

```
[FW1] nat-policy  
[FW1-policy-nat] rule name source_nat  
[FW1-policy-nat-rule-source_nat] destination-zone untrust  
[FW1-policy-nat-rule-source_nat] source-zone trust  
[FW1-policy-nat-rule-source_nat] action source-nat address-group natpool
```

Step 5 Configure the switches.

Add two interfaces of each switch to the default VLAN. For details, see the related switch document.

3.2.3 Configuration Procedure on the Web UI

Step 1 Configure interfaces on FW1.

Choose **Network > Interface**, and click the  button next to the interface to be configured. Select or set parameters and click **OK**. Configure the interface GigabitEthernet0/0/1, as shown in the following figure.

Modify GE Interface

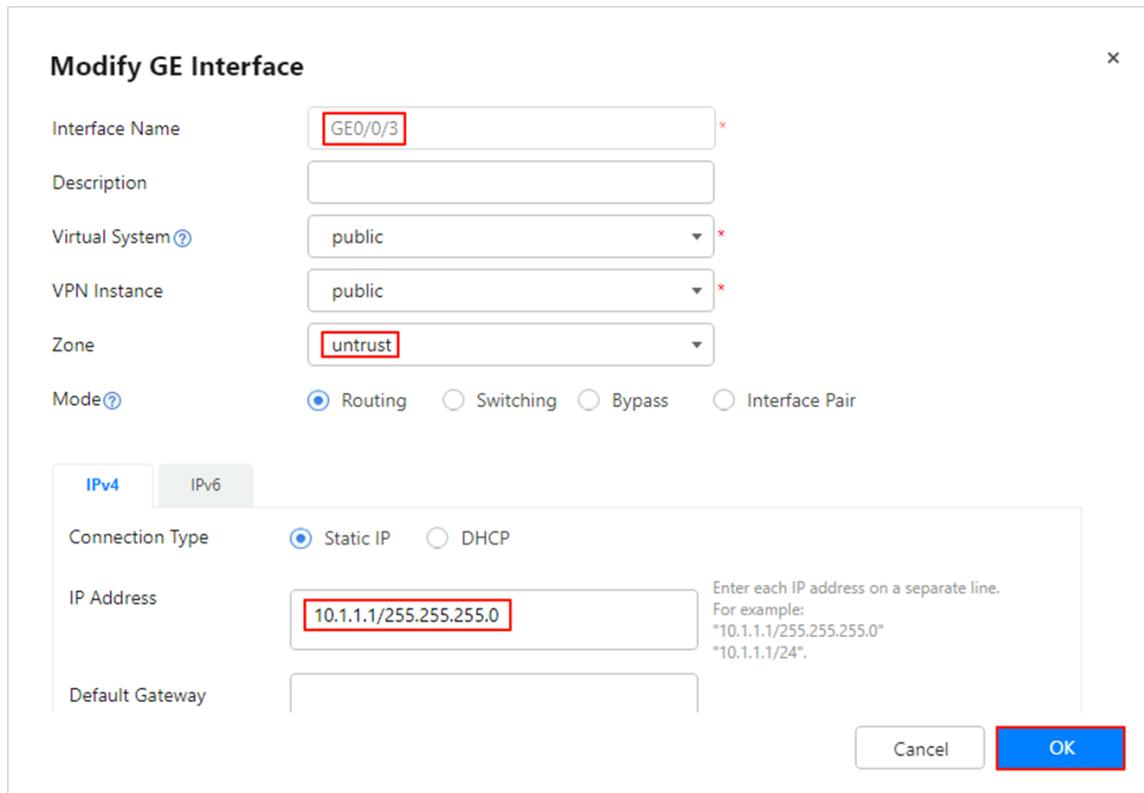
Interface Name	GE0/0/1
Description	
Virtual System	public
VPN Instance	public
Zone	trust
Mode	<input checked="" type="radio"/> Routing <input type="radio"/> Switching <input type="radio"/> Bypass <input type="radio"/> Interface Pair
<input checked="" type="radio"/> IPv4 <input type="radio"/> IPv6 Connection Type: <input checked="" type="radio"/> Static IP <input type="radio"/> DHCP IP Address: 10.1.2.1/255.255.255.0 Default Gateway: Enter each IP address on a separate line. For example: "10.1.1.1/255.255.255.0" "10.1.1.1/24".	
<input type="button" value="Cancel"/> <input style="border: 2px solid red;" type="button" value="OK"/>	

Choose **Network > Interface**, and click the  button next to the interface to be configured. Select or set parameters and click **OK**. Configure the interface GigabitEthernet0/0/2, as shown in the following figure.

Modify GE Interface

Interface Name	GE0/0/2
Description	
Virtual System	public
VPN Instance	public
Zone	untrust
Mode	<input checked="" type="radio"/> Routing <input type="radio"/> Switching <input type="radio"/> Bypass <input type="radio"/> Interface Pair
<input checked="" type="radio"/> IPv4 <input type="radio"/> IPv6 Connection Type: <input checked="" type="radio"/> Static IP <input type="radio"/> DHCP IP Address: 40.1.1.1/255.255.255.0 Default Gateway: Enter each IP address on a separate line. For example: "10.1.1.1/255.255.255.0" "10.1.1.1/24".	
<input type="button" value="Cancel"/> <input style="border: 2px solid red;" type="button" value="OK"/>	

Choose **Network > Interface**, and click the  button next to the interface to be configured. Select or set parameters and click **OK**. Configure the interface GigabitEthernet0/0/3, as shown in the following figure.



Step 2 Configure an interzone forwarding policy for FW1.

Choose **Policy > Security Policy > Security Policy**. In the **Security Policy List** area, click **Add**, set or select parameters, and click **OK**. Configure the interzone forwarding policy between the Trust and Untrust zones, as shown in the following figure.

Add Security Policy

General Settings

- Name: policy_sec (highlighted with a red box)
- Description: (empty)
- Policy Group: -- NONE --

Condition

The geolocation database is not loaded. To configure a region, [load the geolocation database](#).

Source

- Zone: trust (highlighted with a red box)
- IP Address/Region: any

Destination

- Destination Type: Zone (selected) (highlighted with a red box)
- Zone: untrust (highlighted with a red box)
- IP Address/Region: any

Service

- Protocol: Select a service
- More: Application/User/UCL Group/Schedule/VLAN ID

Action

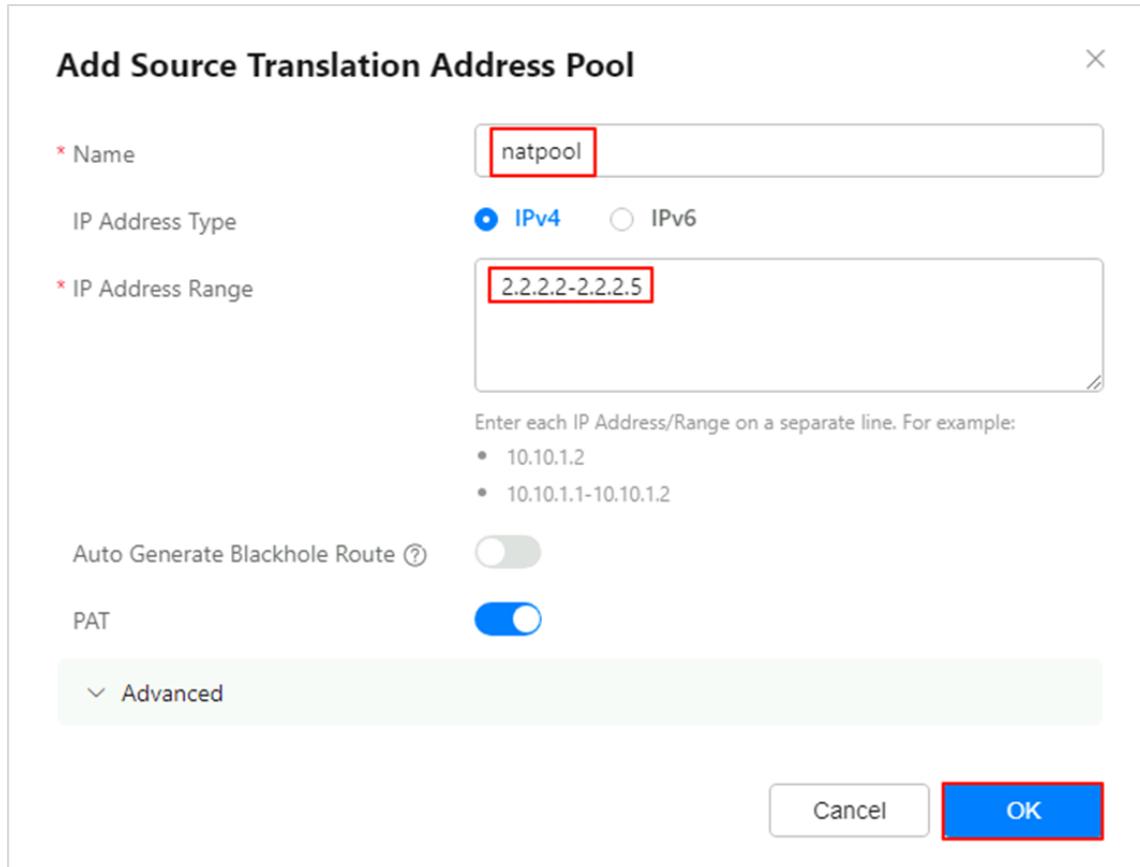
- Action: Permit (highlighted with a green box)
- Deny

Content Security: Antivirus/Intrusion Prevention/URL Filtering/Data Filtering

Buttons: Cancel, Command Preview, OK (highlighted with a red box)

Step 3 Configure a NAT address pool. The public IP addresses range from 2.2.2.2 to 2.2.2.5.

Choose **Policy > NAT Policy**. Click the **Source Translation Address Pool** tab. In **Source Translation Address Pool**, click  and create an address pool. Then, click **OK**. The following figure shows the detailed configurations.



Step 4 Configure a NAT policy.

Choose **Policy > NAT Policy**. Click the **NAT Policy** tab. In the **NAT Policy List** area, click  and create a NAT policy. Then, click **OK**. The following figure shows the detailed configurations.

Add NAT Policy

[Show Overview]

Name	source_nat *
Description	
NAT Type	<input checked="" type="radio"/> NAT <input type="radio"/> NAT64 <input type="radio"/> NAT66
NAT Mode	Source address translation
Schedule	Select a time range

Original Data Packet

Source Zone	trust [Multiple]
Destination Type	<input checked="" type="radio"/> Destination Zone <input type="radio"/> Outbound Interface
	untrust [Multiple]
Source Address ?	Select or enter an address
Destination Address ?	Select or enter an address
Service ?	Select or enter a service

Translated Data Packet

Source Address Translated To	<input checked="" type="radio"/> Address in the IP address pool <input type="radio"/> Outbound interface
Source Translation Address Pool	natpool * [Configure]

Note: To ensure that the device can properly forward NAT service traffic, configure a security policy.
To view NAT logs, enable traffic logs and session logs in the security policy. [Add Security Policy]

Cancel OK

3.2.4 Verification

Ping PC2 from PC1.

```
PC> ping 40.1.1.100

Ping 40.1.1.100: 32 data bytes, Press Ctrl_C to break
From 40.1.1.100: bytes=32 seq=1 ttl=127 time=16 ms
From 40.1.1.100: bytes=32 seq=2 ttl=127 time=16 ms
From 40.1.1.100: bytes=32 seq=3 ttl=127 time<1 ms
From 40.1.1.100: bytes=32 seq=4 ttl=127 time=15 ms
From 40.1.1.100: bytes=32 seq=5 ttl=127 time=16 ms

--- 40.1.1.100 ping statistics ---
5 packet(s) transmitted
5 packet(s) received
0.00% packet loss
round-trip min/avg/max = 0/12/16 ms
```

Run the **display firewall session table** command on FW1 to check the session table.

```
[FW1] display firewall session table
Current Total Sessions : 5
icmp  VPN: public --> public  10.1.2.100:56279[2.2.2.5:2057] -->40.1.1.100:2048
icmp  VPN: public --> public  10.1.2.100:55255[2.2.2.5:2053] -->40.1.1.100:2048
icmp  VPN: public --> public  10.1.2.100:56023[2.2.2.5:2056] -->40.1.1.100:2048
icmp  VPN: public --> public  10.1.2.100:55767[2.2.2.5:2055] -->40.1.1.100:2048
icmp  VPN: public --> public  10.1.2.100:55511[2.2.2.5:2054] -->40.1.1.100:2048
```

You can see that the firewall translates the source address 10.1.2.100 into 2.2.2.5 in the NAT address pool to communicate with PC2.

3.2.5 Quiz

What are the differences between NAPT and NAT No-PAT in Source NAT? Which scenarios are they applicable to?

Reference Answer:

NAPT translates both IP addresses and ports. It enables multiple private IP addresses to share one or more public IP addresses to access the public network resources. NAPT applies to scenarios where only a small number of public addresses are available for many private network users to access the Internet.

NAT No-PAT translates only IP addresses but not ports. It translates private IP addresses to public IP addresses in a one-to-one relationship. NAT No-PAT applies to scenarios where there are a small number of Internet access users and the number of public IP addresses is the same as the number of concurrent Internet access users.

3.3 Lab Configuration (NAT Server and Source NAT)

3.3.1 Configuration Roadmap

1. Configure basic IP addresses, security zones, and security policies.
2. Configure a NAT server.
3. Configure a NAT address pool.
4. Configure a NAT policy.

3.3.2 Configuration Procedure on the CLI

Step 1 Configure the upstream and downstream service interfaces of FW1. Configure the IP addresses for interfaces and add them to security zones.

Configure IP addresses for the upstream and downstream service interfaces of FW1.

```
<FW1> system-view
[FW1] interface G0/0/1
[FW1-GigabitEthernet0/0/1] ip address 10.1.2.1 255.255.255.0
[FW1-GigabitEthernet0/0/1] quit
```

```
[FW1] interface G0/0/2
[FW1-GigabitEthernet0/0/2] ip address 40.1.1.1 255.255.255.0
[FW1-GigabitEthernet0/0/2] quit
[FW1] interface G0/0/3
[FW1-GigabitEthernet0/0/3] ip address 10.1.1.1 255.255.255.0
[FW1-GigabitEthernet0/0/3] quit
```

Step 2 Configure a forwarding policy between the Untrust and DMZ zones.

```
[FW1] security-policy
[FW1-policy-security] rule name bidirectional_nat
[FW1-policy-security-rule-policy_sec] source-zone untrust
[FW1-policy-security-rule-policy_sec] destination-zone dmz
[FW1-policy-security-rule-policy_sec] action permit
[FW1-policy-security-rule-policy_sec] service ftp
[FW1-policy-security-rule-policy_sec] quit
```

Step 3 Configure a NAT server.

```
[FW1] nat server ftpserver protocol tcp global 40.1.1.2 ftp inside 10.1.1.100 ftp
```

Step 4 Configure a NAT address pool.

```
[FW1] nat address-group natpool2
[FW1-address-group-natpool] section 10.1.1.10 10.1.1.20
```

Step 5 Apply the NAT ALG function between the DMZ and Untrust zones, so that the server can provide the FTP service for external systems properly. By default, NAT ALG is enabled globally. You can skip this step.

```
[FW1] firewall interzone dmz untrust
[FW1-interzone-dmz-untrust] detect ftp
[FW1-interzone-dmz-untrust] quit
```

Step 6 Create the NAT policy between the DMZ and Untrust zones, define the range of source IP addresses for NAT, and bind the NAT policy to natpool2.

```
[FW1] nat-policy
[FW1-policy-nat] rule name source_nat
[FW1-policy-nat-rule-source_nat] destination-zone dmz
[FW1-policy-nat-rule-source_nat] source-zone untrust
[FW1-policy-nat-rule-source_nat] source-address 40.1.1.0 24
[FW1-policy-nat-rule-source_nat] action nat address-group natpool2
```

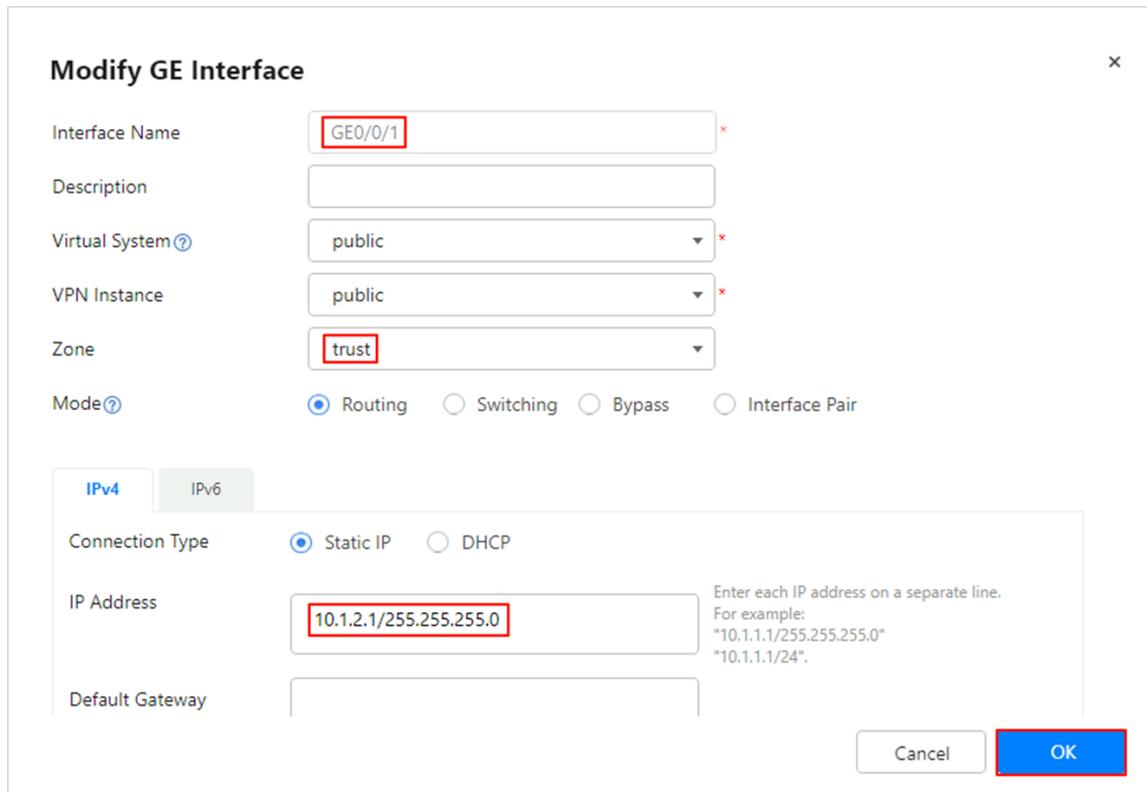
Step 7 Configure the switches.

Add two interfaces of each switch to the default VLAN. For details, see the related switch document.

3.3.3 Configuration Procedure on the Web UI

Step 1 Configure interfaces on FW1.

Choose **Network > Interface**, and click the  button next to the interface to be configured. Select or set parameters and click **OK**. Configure the interface GigabitEthernet0/0/1, as shown in the following figure.



The screenshot shows the 'Modify GE Interface' dialog box. The 'Interface Name' is set to 'GE0/0/1'. The 'Virtual System' is 'public'. The 'Zone' is 'trust'. Under 'Mode', 'Routing' is selected. In the 'IPv4' tab, 'Static IP' is chosen as the connection type, and the IP address is '10.1.2.1/255.255.255.0'. The 'OK' button is highlighted with a red border.

Choose **Network > Interface**, and click the  button next to the interface to be configured. Select or set parameters and click **OK**. Configure the interface GigabitEthernet0/0/2, as shown in the following figure.

Modify GE Interface

Interface Name	GEO/0/2
Description	
Virtual System	public
VPN Instance	public
Zone	untrust
Mode	<input checked="" type="radio"/> Routing <input type="radio"/> Switching <input type="radio"/> Bypass <input type="radio"/> Interface Pair
<input checked="" type="radio"/> IPv4 <input type="radio"/> IPv6	
Connection Type	<input checked="" type="radio"/> Static IP <input type="radio"/> DHCP
IP Address	40.1.1.1/255.255.255.0
Enter each IP address on a separate line. For example: "10.1.1.1/255.255.255.0" "10.1.1.1/24".	
Default Gateway	
<input type="button" value="Cancel"/> <input checked="" type="button" value="OK"/>	

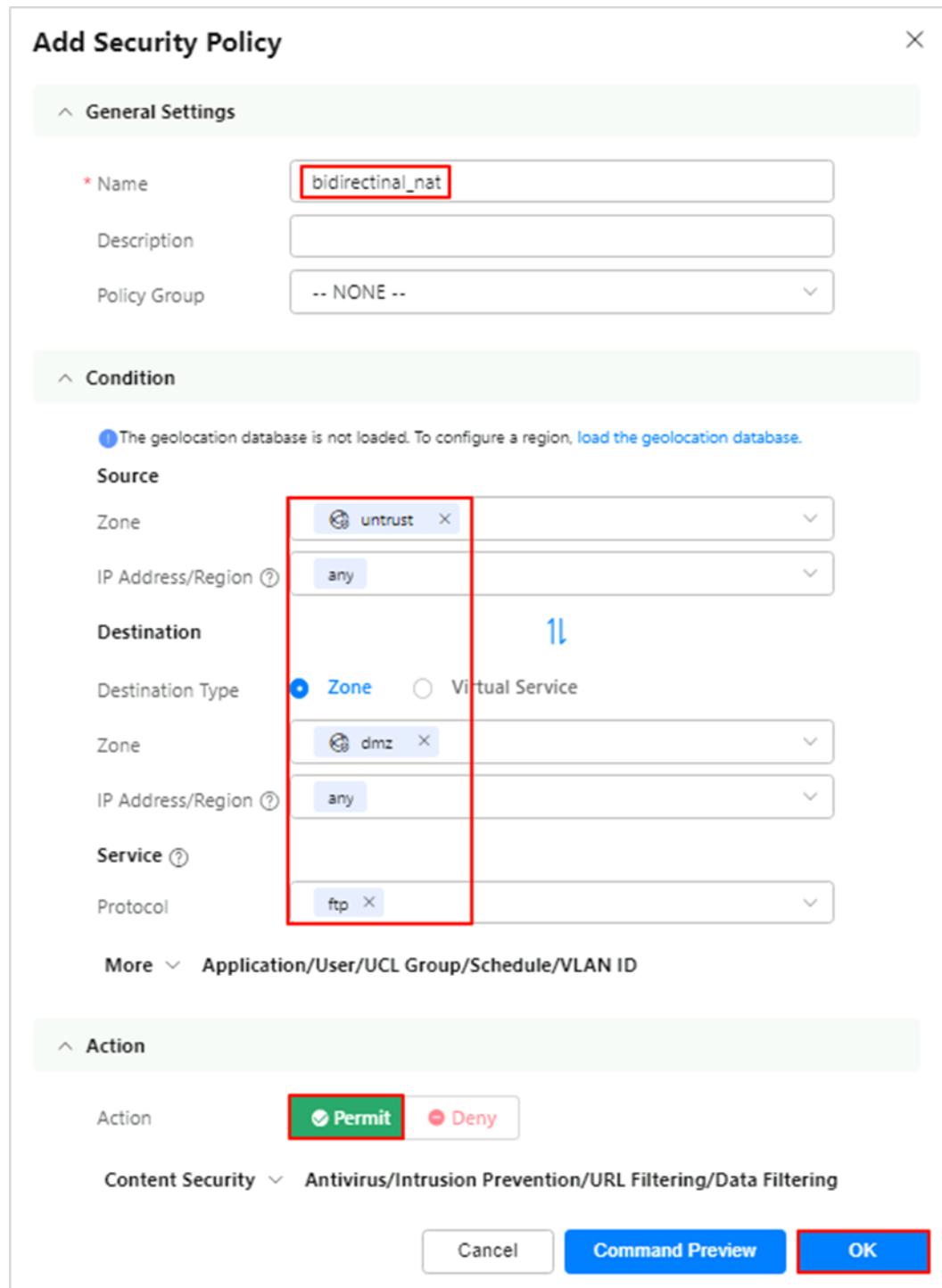
Choose **Network > Interface**, and click the  button next to the interface to be configured. Select or set parameters and click **OK**. Configure the interface GigabitEthernet0/0/3, as shown in the following figure.

Modify GE Interface

Interface Name	GEO/0/3
Description	
Virtual System	public
VPN Instance	public
Zone	dmz
Mode	<input checked="" type="radio"/> Routing <input type="radio"/> Switching <input type="radio"/> Bypass <input type="radio"/> Interface Pair
<input checked="" type="radio"/> IPv4 <input type="radio"/> IPv6	
Connection Type	<input checked="" type="radio"/> Static IP <input type="radio"/> DHCP
IP Address	10.1.1.2/255.255.255.0
Enter each IP address on a separate line. For example: "10.1.1.1/255.255.255.0" "10.1.1.1/24".	
Default Gateway	
<input type="button" value="Cancel"/> <input checked="" type="button" value="OK"/>	

Step 2 Configure an interzone forwarding policy of FW1.

Choose Policy > Security Policy > Security Policy. In Security Policy List, click Add. Set or select each parameter in sequence. Click OK. Configure the forwarding policy between the Untrust and DMZ zones, as shown in the following figure.



Step 3 Configure a NAT server.

Choose Policy > NAT Policy > Server Mapping. In Server Mapping List, click  and configure a NAT server. Then, click OK. The following figure shows the detailed configurations.

Add Server Mapping

[Show Overview]

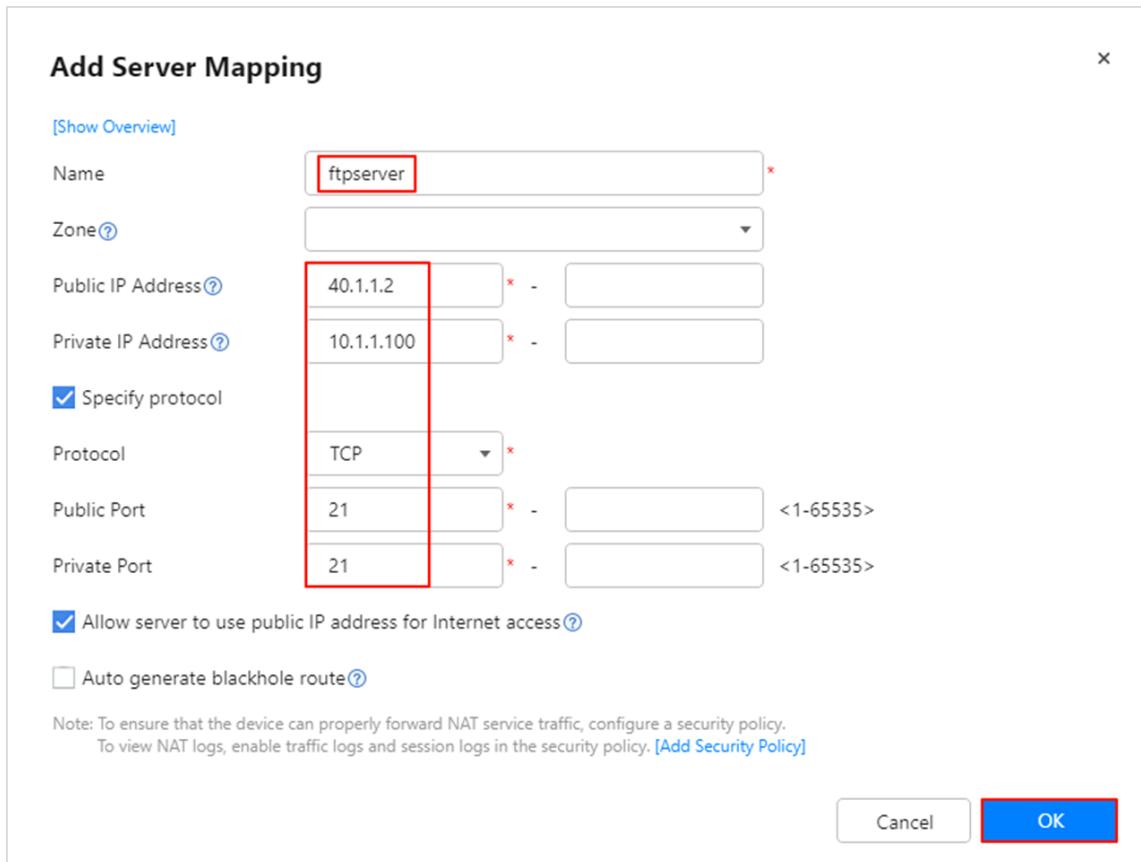
Name	ftpserver
Zone	
Public IP Address	40.1.1.2
Private IP Address	10.1.1.100
<input checked="" type="checkbox"/> Specify protocol	
Protocol	TCP
Public Port	21
Private Port	21

Allow server to use public IP address for Internet access

Auto generate blackhole route

Note: To ensure that the device can properly forward NAT service traffic, configure a security policy.
To view NAT logs, enable traffic logs and session logs in the security policy. [Add Security Policy]

Cancel **OK**



Step 4 Configure a NAT address pool.

Choose **Policy > NAT Policy**. Click the **Source Translation Address Pool** tab. In **Source Translation Address Pool**, click  and create an address pool. Then, click **OK**. The following figure shows the detailed configurations.

Add Source Translation Address Pool

* Name: natpool2

IP Address Type: IPv4 (selected)

* IP Address Range: 10.1.1.10-10.1.1.20

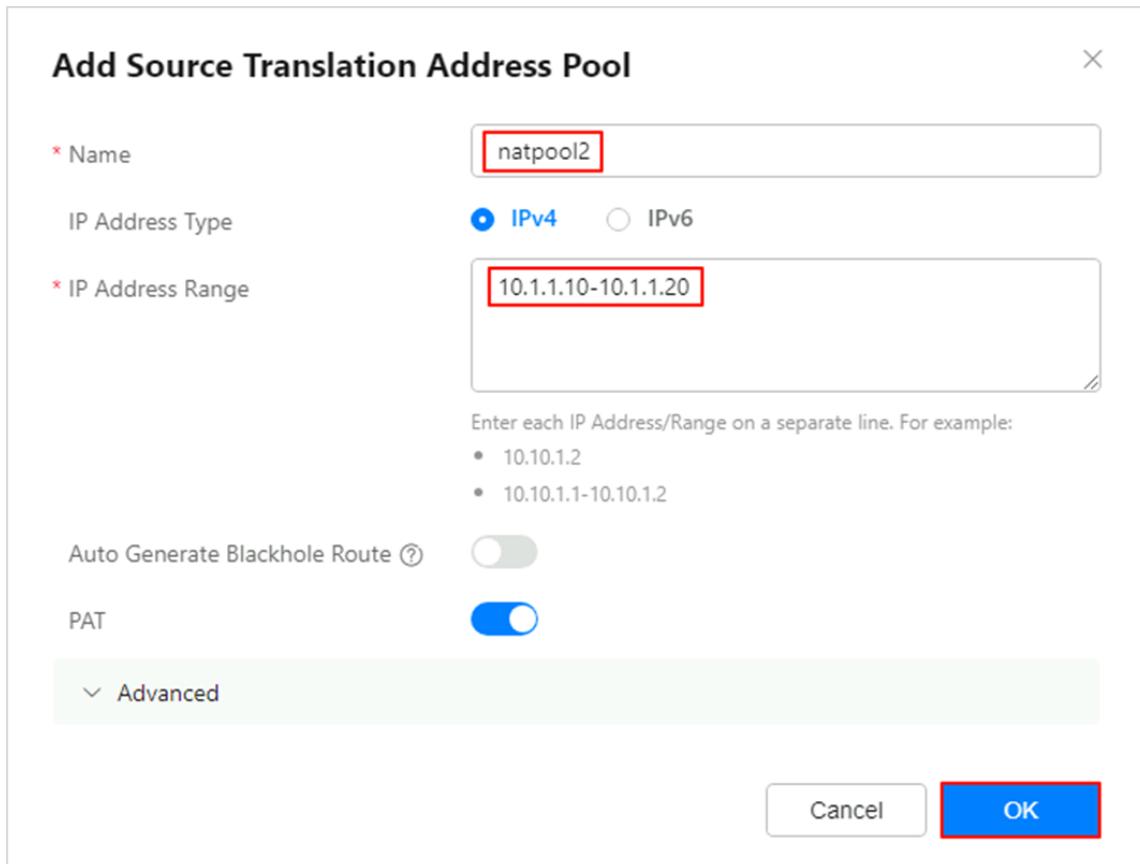
Enter each IP Address/Range on a separate line. For example:
• 10.10.1.2
• 10.10.1.1-10.10.1.2

Auto Generate Blackhole Route: Off

PAT: On

Advanced

Cancel OK



Step 5 Configure a NAT policy.

Choose **Policy > NAT Policy**. Click the **NAT Policy** tab. In **NAT Policy List**, click  and create a NAT policy. Then, click **OK**. The following figure shows the detailed configurations.

Add NAT Policy

[Show Overview]

Name	source_nat2
Description	
NAT Type	<input checked="" type="radio"/> NAT <input type="radio"/> NAT64 <input type="radio"/> NAT66
NAT Mode	Source address translation
Schedule	Select a time range

Original Data Packet

Source Zone	untrust	[Multiple]
Destination Type	<input checked="" type="radio"/> Destination Zone <input type="radio"/> Outbound Interface	
	dmz	[Multiple]
Source Address	40.1.1.0/24 X	
Destination Address	Select or enter an address	
Service	ftp X	

Translated Data Packet

Source Address Translated To	<input checked="" type="radio"/> Address in the IP address pool <input type="radio"/> Outbound interface
Source Translation Address Pool	natpool2 * [Configure]

Note: To ensure that the device can properly forward NAT service traffic, configure a security policy.
To view NAT logs, enable traffic logs and session logs in the security policy. [\[Add Security Policy\]](#)

Cancel OK

3.3.4 Verification

Check related information on the firewall.

```
[FW1] display nat server
Server in private network information:
  Total 1 NAT server(s)
  server name : ftpserver
  id          : 0           zone      : ---
  global-start-addr : 40.1.1.2       global-end-addr : 40.1.1.2
  inside-start-addr : 10.1.1.100     inside-end-addr : 10.1.1.100
  global-start-port : 21(ftp)       global-end-port  : 21
  inside-start-port : 21(ftp)       inside-end-port : 21
  globalvpn : public           insidevpn   : public
  vsys      : public           protocol    : tcp
  vrrp      : ---             no-revers   : 0
  interface : ---           vrrp-bind-interface: ---
  unr-route : 1              description  : ---
  nat-disable : 0
```

3.3.5 Quiz

When an external network user accesses the intranet server through a specific IP address, what are the processing steps for packets reaching the firewall?

Reference Answer:

1. The first packet arrives at the firewall.
2. The NAT server configuration is matched, and destination address translation is performed.
3. The routing table is searched.
4. The security policy is matched.
5. A session is created.

4 Firewall Hot Standby

4.1 Introduction

4.1.1 About This Lab

An enterprise needs to provide uninterrupted services. To avoid line interruption caused by network devices or other external factors, the enterprise wants to implement redundancy at the network egress to increase network reliability.

In this lab, two firewalls are deployed as gateways at the network egress to ensure smooth communication between the internal network and the external network in the case of a single-node fault.

4.1.2 Objectives

- Understand the basic principles of hot standby.
- Understand the VGMP and HRP protocols.
- Master the configuration of firewall hot standby using the CLI and web UI.

4.1.3 Networking Topology

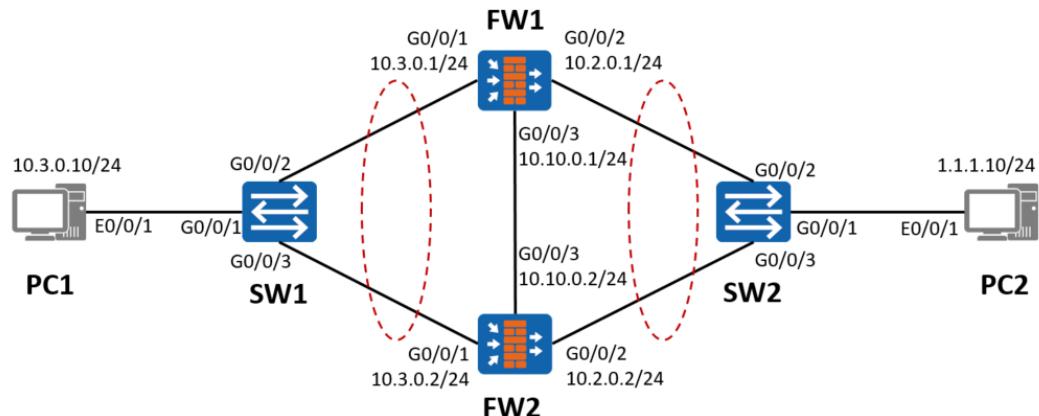


Figure 4-1 Networking topology for configuring firewall hot standby

4.1.4 Lab Planning

The firewalls are deployed as security devices at the network egress. The upstream and downstream devices are switches. FW1 and FW2 work in active/standby mode.

Table 4-1 Port address and zone planning

Device	Interface	IP Address	Security Zone
FW1	GigabitEthernet0/0/1	10.3.0.1/24	trust
	GigabitEthernet0/0/2	10.2.0.1/24	untrust
	GigabitEthernet0/0/3	10.10.0.1/24	dmz
FW2	GigabitEthernet0/0/1	10.3.0.2/24	trust
	GigabitEthernet0/0/2	10.2.0.2/24	untrust
	GigabitEthernet0/0/3	10.10.0.2/24	dmz
PC1	Eth0/0/1	10.3.0.10/24	trust
PC2	Eth0/0/1	1.1.1.10/24	untrust
SW1	GigabitEthernet0/0/1	Access	PVID: VLAN 10
	GigabitEthernet0/0/2		
	GigabitEthernet0/0/3		
SW2	GigabitEthernet0/0/1	Access	PVID: VLAN 10
	GigabitEthernet0/0/2		
	GigabitEthernet0/0/3		

4.2 Lab Configuration

4.2.1 Configuration Roadmap

1. Configure the basic IP addresses and security zones on FW1 and FW2, and apply the relevant security policies.
2. Configure the hot standby. FW1 functions as the active node and FW2 functions as the standby node.

4.2.2 Configuration Procedure on the CLI

Step 1 Configure the upstream and downstream service interfaces of FW1 and FW2.
 Configure the IP addresses for interfaces and add them to security zones.

Configure IP addresses for the upstream and downstream service interfaces of FW1.

```
<FW1> system-view
[FW1] interface GigabitEthernet0/0/1
[FW1-GigabitEthernet0/0/1] ip address 10.3.0.1 255.255.255.0
[FW1-GigabitEthernet0/0/1] quit
[FW1] interface GigabitEthernet0/0/2
[FW1-GigabitEthernet0/0/2] ip address 10.2.0.1 255.255.255.0
```

```
[FW1-GigabitEthernet0/0/2] quit
```

Configure VRRP group 1 on GigabitEthernet0/0/1 of FW1 and add it to the VGMP group in the **Active** state.

```
[FW1] interface GigabitEthernet0/0/1
[FW1-GigabitEthernet0/0/1] vrrp vrid 1 virtual-ip 10.3.0.3 255.255.255.0 active
[FW1-GigabitEthernet0/0/1] quit
```

Configure VRRP group 2 on GigabitEthernet0/0/2 of FW1 and add it to the VGMP group in the **Active** state.

```
[FW1] interface GigabitEthernet0/0/2
[FW1-GigabitEthernet0/0/2] vrrp vrid 2 virtual-ip 1.1.1.1 255.255.255.0 active
[FW1-GigabitEthernet0/0/2] quit
```

Add the upstream and downstream service interfaces of FW1 to security zones.

```
[FW1] firewall zone trust
[FW1-zone-trust] add interface GigabitEthernet0/0/1
[FW1-zone-trust] quit
[FW1] firewall zone untrust
[FW1-zone-untrust] add interface GigabitEthernet0/0/2
[FW1-zone-untrust] quit
```

Configure the upstream and downstream service interfaces of FW2.

```
<FW2> system-view
[FW2] interface GigabitEthernet0/0/1
[FW2-GigabitEthernet0/0/1] ip address 10.3.0.2 255.255.255.0
[FW2-GigabitEthernet0/0/1] quit
[FW2] interface GigabitEthernet0/0/2
[FW2-GigabitEthernet0/0/2] ip address 10.2.0.2 255.255.255.0
[FW2-GigabitEthernet0/0/2] quit
```

Configure VRRP group 1 on GigabitEthernet0/0/1 of FW2 and add it to the VGMP group in the **Standby** state.

```
[FW2] interface GigabitEthernet0/0/1
[FW2-GigabitEthernet0/0/1] vrrp vrid 1 virtual-ip 10.3.0.3 255.255.255.0 standby
[FW2-GigabitEthernet0/0/1] quit
```

Configure VRRP group 2 on GigabitEthernet0/0/2 of FW2 and add it to the VGMP group in the **Standby** state.

```
[FW2] interface GigabitEthernet0/0/2
[FW2-GigabitEthernet0/0/2] vrrp vrid 2 virtual-ip 1.1.1.1 255.255.255.0 standby
[FW2-GigabitEthernet0/0/2] quit
```

Add the upstream and downstream service interfaces of FW2 to security zones.

```
[FW2] firewall zone trust
```

```
[FW2-zone-trust] add interface GigabitEthernet 0/0/1  
[FW2-zone-trust] quit  
[FW2] firewall zone untrust  
[FW2-zone-untrust] add interface GigabitEthernet 0/0/2  
[FW2-zone-untrust] quit
```

Step 2 Configure the heartbeat cables for FW1 and FW2.

Configure an IP address for the heartbeat interface GigabitEthernet0/0/3 of FW1.

```
[FW1] interface GigabitEthernet0/0/3  
[FW1-GigabitEthernet0/0/3] ip address 10.10.0.1 255.255.255.0  
[FW1-GigabitEthernet0/0/3] quit
```

Configure an IP address for the heartbeat interface GigabitEthernet0/0/3 of FW2.

```
[FW2] interface GigabitEthernet0/0/3  
[FW2-GigabitEthernet0/0/3] ip address 10.10.0.2 255.255.255.0  
[FW2-GigabitEthernet0/0/3] quit
```

Add the heartbeat interface GigabitEthernet0/0/3 of FW1 to the DMZ.

```
[FW1] firewall zone dmz  
[FW1-zone-dmz] add interface GigabitEthernet0/0/3  
[FW1-zone-dmz] quit
```

Add the heartbeat interface GigabitEthernet0/0/3 of FW2 to the DMZ.

```
[FW2] firewall zone dmz  
[FW2-zone-dmz] add interface GigabitEthernet0/0/3  
[FW2-zone-dmz] quit
```

Configure the authentication key for the heartbeat interface of FW1 and enable the hot standby function.

```
[FW1] hrp interface GigabitEthernet0/0/3 remote 10.10.0.2  
[FW1] hrp authentication-key Admin@123  
[FW1] hrp enable
```

Configure the authentication key for the heartbeat interface of FW2 and enable the hot standby function.

```
[FW2] hrp interface GigabitEthernet0/0/3 remote 10.10.0.1  
[FW2] hrp authentication-key Admin@123  
[FW2] hrp enable
```

Step 3 Configure a security policy on FW1 to allow service packets to pass through. After hot standby is enabled, the security policy configured on FW1 will be automatically synchronized to FW2.

Configure a forwarding policy between the Trust and Untrust zones on FW1.

```
HRP_M[FW1] security-policy
HRP_M[FW1-policy-security] rule name trust_to_untrust
HRP_M[FW1-policy-security-rule-trust_to_untrust] source-zone trust
HRP_M[FW1-policy-security-rule-trust_to_untrust] destination-zone untrust
HRP_M[FW1-policy-security-rule-trust_to_untrust] source-address 10.3.0.0 24
HRP_M[FW1-policy-security-rule-trust_to_untrust] action permit
HRP_M[FW1-policy-security-rule-trust_to_untrust] quit
HRP_M[FW1-policy-security] quit
```

Step 4 Configure a NAT policy on FW1. After hot standby is enabled, the NAT policy configured on FW1 will be automatically synchronized to FW2.

Configure a NAT policy to translate source addresses on subnet 10.3.0.0/24 to IP addresses in the NAT address pool (1.1.1.2 to 1.1.1.5) when intranet users access the Internet.

```
HRP_M[FW1] nat address-group group1
HRP_M[FW1-address-group-group1] section 0 1.1.1.2 1.1.1.5
HRP_M[FW1-address-group-group1] quit
HRP_M[FW1] nat-policy
HRP_M[FW1-policy-nat] rule name policy_nat1
HRP_M[FW1-policy-nat-rule-policy_nat1] source-zone trust
HRP_M[FW1-policy-nat-rule-policy_nat1] destination-zone untrust
HRP_M[FW1-policy-nat-rule-policy_nat1] source-address 10.3.0.0 24
HRP_M[FW1-policy-nat-rule-policy_nat1] action source-nat address-group group1
```

Step 5 Configure the switches.

Add the three interfaces of SW1 and SW2 to VLAN 10. For details, see the related switch document.

4.2.3 Configuration Procedure on the Web UI

Step 1 Configure the upstream and downstream service interfaces of FW1 and FW2. Configure the IP addresses for interfaces and add them to security zones.

Configure the interfaces on FW1. Choose **Network > Interface** and click the  button next to the interface to be configured. Set parameters, and then click **OK**. The following figure shows the configuration of the GigabitEthernet0/0/1 interface.

Modify GE Interface

Interface Name	GE0/0/1
Description	
Virtual System	public
VPN Instance	public
Zone	trust
Mode	<input checked="" type="radio"/> Routing <input type="radio"/> Switching <input type="radio"/> Bypass <input type="radio"/> Interface Pair
<input checked="" type="radio"/> IPv4 <input type="radio"/> IPv6 Connection Type <input checked="" type="radio"/> Static IP <input type="radio"/> DHCP IP Address 10.3.0.1/255.255.255.0 Default Gateway <small>Enter each IP address on a separate line. For example: "10.1.1.1/255.255.255.0" "10.1.1.1/24".</small>	
<input type="button" value="Cancel"/> <input checked="" type="button" value="OK"/>	

The configurations of GigabitEthernet0/0/2 and GigabitEthernet0/0/3 on FW1 and GigabitEthernet0/0/1, GigabitEthernet0/0/2, and GigabitEthernet0/0/3 on FW2 are similar.

Step 2 Configure the heartbeat cables for FW1 and FW2.

Modify GE Interface

Interface Name	GE0/0/3
Description	
Virtual System	public
VPN Instance	public
Zone	dmz
Mode	<input checked="" type="radio"/> Routing <input type="radio"/> Switching <input type="radio"/> Bypass <input type="radio"/> Interface Pair
<input checked="" type="radio"/> IPv4 <input type="radio"/> IPv6 Connection Type <input checked="" type="radio"/> Static IP <input type="radio"/> DHCP IP Address 10.10.0.1/255.255.255.0 Default Gateway <small>Enter each IP address on a separate line. For example: "10.1.1.1/255.255.255.0" "10.1.1.1/24".</small>	
<input type="button" value="Cancel"/> <input checked="" type="button" value="OK"/>	

The configuration of GigabitEthernet0/0/3 on FW2 is similar.

Step 3 Configure hot standby on FW1 and FW2.

FW1:

Configure Hot Standby

Hot Standby	<input checked="" type="checkbox"/>																		
Authentication Key ?	<input type="text" value="....."/> <8-16> characters																		
Operating Mode ?	<input checked="" type="radio"/> Active/Standby Backup <input type="radio"/> Load Balancing																		
Default Status ?	<input checked="" type="radio"/> Active <input type="radio"/> Standby																		
Info: The firewall packet-filter basic-protocol enable command controls the protocol packets for hot standby. By default, a security policy needs to be configured to allow protocol packets to pass through.																			
Heartbeat Interface ?	<input type="text" value="GE0/0/3"/> <input type="button" value="Edit"/> IP Address <input type="text" value="10.10.0.1"/> * Peer IP Address <input type="text" value="10.10.0.2"/> *																		
Proactive Preemption ?	<input checked="" type="checkbox"/>																		
Automatic Static Route Backup ?	<input type="checkbox"/>																		
Automatic PBR Backup ?	<input type="checkbox"/>																		
Hello Packet Interval ?	<input type="text" value="1000"/> <500-60000>ms																		
Configure Monitored Objects ?																			
<input type="button" value="Interface Monitoring"/> VRRP Monitoring <input type="button" value="Health Check Monitoring"/> <input type="button" value="BFD Monitoring"/>																			
Configure a VRRP group if the service interface works at Layer 3 and is connected to a switch.																			
<input type="button" value="Add"/> <input type="button" value="Delete"/> 																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding: 2px;">VRID</th> <th style="text-align: left; padding: 2px;">Interface</th> <th style="text-align: left; padding: 2px;">Interface IP Address/Mask</th> <th style="text-align: left; padding: 2px;">Virtual IP Address/Mask (Optional)</th> <th style="text-align: left; padding: 2px;">State</th> <th style="text-align: left; padding: 2px;">Edit</th> </tr> </thead> <tbody> <tr> <td style="text-align: left; padding: 2px;"><input type="checkbox"/> 1</td> <td style="text-align: left; padding: 2px;">GE0/0/1</td> <td style="text-align: left; padding: 2px;">10.3.0.1/24</td> <td style="text-align: left; padding: 2px;">10.3.0.3/24</td> <td style="text-align: left; padding: 2px;">Active</td> <td style="text-align: left; padding: 2px;"></td> </tr> <tr> <td style="text-align: left; padding: 2px;"><input type="checkbox"/> 2</td> <td style="text-align: left; padding: 2px;">GE0/0/2</td> <td style="text-align: left; padding: 2px;">10.2.0.1/24</td> <td style="text-align: left; padding: 2px;">1.1.1.1/24</td> <td style="text-align: left; padding: 2px;">Active</td> <td style="text-align: left; padding: 2px;"></td> </tr> </tbody> </table>		VRID	Interface	Interface IP Address/Mask	Virtual IP Address/Mask (Optional)	State	Edit	<input type="checkbox"/> 1	GE0/0/1	10.3.0.1/24	10.3.0.3/24	Active		<input type="checkbox"/> 2	GE0/0/2	10.2.0.1/24	1.1.1.1/24	Active	
VRID	Interface	Interface IP Address/Mask	Virtual IP Address/Mask (Optional)	State	Edit														
<input type="checkbox"/> 1	GE0/0/1	10.3.0.1/24	10.3.0.3/24	Active															
<input type="checkbox"/> 2	GE0/0/2	10.2.0.1/24	1.1.1.1/24	Active															
Total 2 <input type="button" value="<"/> <input type="button" value="1"/> <input type="button" value=">"/> <input type="button" value="50/page"/> Go to <input type="text" value="1"/>																			
<input type="button" value="Cancel"/> <input type="button" value="OK"/>																			

FW2:

Configure Hot Standby

Hot Standby Read the restrictions and precautions before enabling hot standby.

Authentication Key <8-16> characters

Operating Mode Active/Standby Backup Load Balancing

Default Status Active Standby

Info: The firewall packet-filter basic-protocol enable command controls the protocol packets for hot standby. By default, a security policy needs to be configured to allow protocol packets to pass through.

Heartbeat Interface GE0/0/3 [Edit] IP Address 10.10.0.2 * Peer IP Address 10.10.0.1 * +

Proactive Preemption

Automatic Static Route Backup

Automatic PBR Backup

Hello Packet Interval 1000 <500-60000>ms

Configure Monitored Objects

Interface Monitoring VRRP Monitoring Health Check Monitoring BFD Monitoring

Configure a VRRP group if the service interface works at Layer 3 and is connected to a switch.

Add Delete

VRID	Interface	Interface IP Address/Mask	Virtual IP Address/Mask (Optional)	State	Edit
1	GE0/0/1	10.3.0.2/24	10.3.0.3/24	Standby	<small>edit</small>
2	GE0/0/2	10.2.0.2/24	1.1.1.1/24	Standby	<small>edit</small>

Total 2 < > 1 50/page Go to 1

Cancel OK

Step 4 On the Dual-System Hot Standby page, view the hot standby status.

Hot standby status of FW1:

USG6525F Active

System Hot Standby BFD Link-Group Log Configuration License Management

Dashboard Monitor Policy Object Network System

Hot Standby

Monitored Item Current Status Details

Current Running Mode	Active/Standby Backup
Current Working Role	active (the stable running time: 0 days, 0 hours, 4 mins)
Current HeartBeat Interface	GE0/0/3
Proactive Preemption	Enabled
Configuration Consistency	Initialization(0000/00 00:00:00)

Interface Monitoring Interface | VLAN Details Comparison Synchronize Configuration

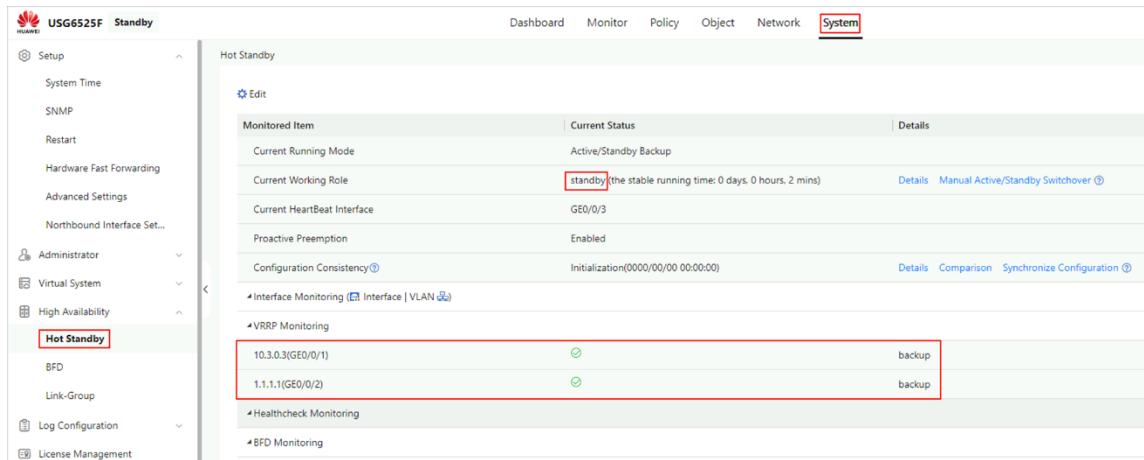
VRRP Monitoring

10.3.0.3(GE0/0/1)	<small>green circle</small>	master
1.1.1.1(GE0/0/2)	<small>green circle</small>	master

Healthcheck Monitoring Details Comparison Synchronize Configuration

BFD Monitoring

Hot standby status of FW2:



The screenshot shows the device configuration interface for the USG6525F Standby. The left sidebar has sections like Setup, Administrator, Virtual System, High Availability, and Hot Standby (which is selected). The main area is titled 'Hot Standby' and contains a table of monitored items. One item, 'Current Working Role', is highlighted with a red box and shows 'standby'. Below it, two VRRP monitoring entries are shown, also with red boxes around them:

Monitored Item	Current Status	
Current Working Role	standby (the stable running time: 0 days, 0 hours, 2 mins)	Details Manual Active/Standby Switchover
10.3.0.3(GE0/0/1)	backup	
1.1.1.1(GE0/0/2)	backup	

Step 5 Configure an interzone forwarding policy for FW1 and FW2.

Configure a security policy on FW1 to allow service packets to pass through. After hot standby is enabled, the security policy configured on FW1 will be automatically synchronized to FW2.

Choose **Policy > Security Policy > Security Policy**. Click **Add** in **Security Policy List**, set or select parameters, and click **OK**. Configure a forwarding policy between the Trust and Untrust zones, as shown in the following figure.

Modify Security Policy

General Settings

- * Name: trust_to_untrust
- Description: (empty)
- Policy Group: -- NONE --

Condition

The geolocation database is not loaded. To configure a region, [load the geolocation database](#).

Source

- Zone: trust
- IP Address/Region: 10.3.0.0/255....

Destination

- Destination Type: Zone (selected)
- Zone: untrust
- IP Address/Region: any

Service

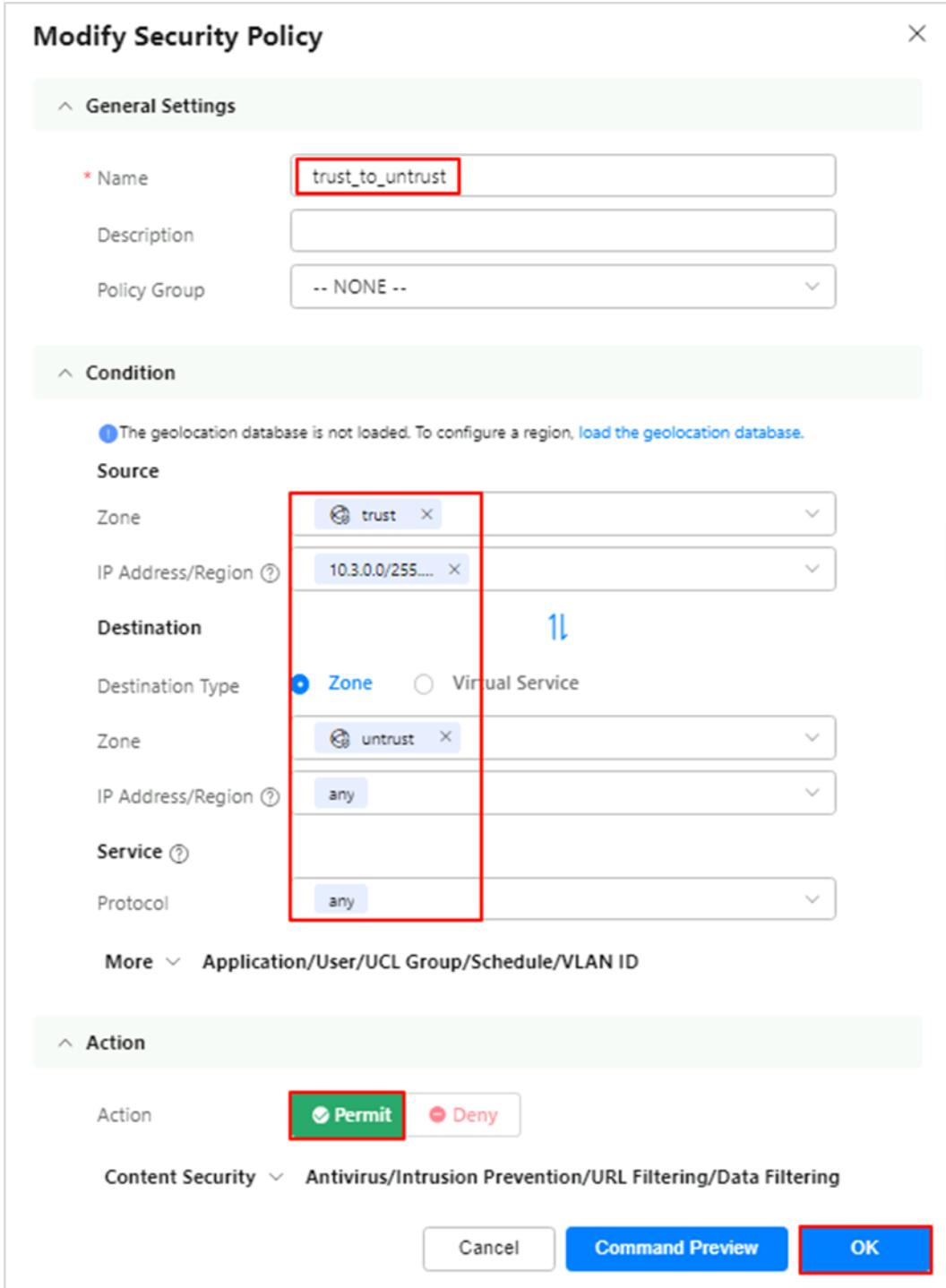
- Protocol: any

Action

Action: Permit Deny

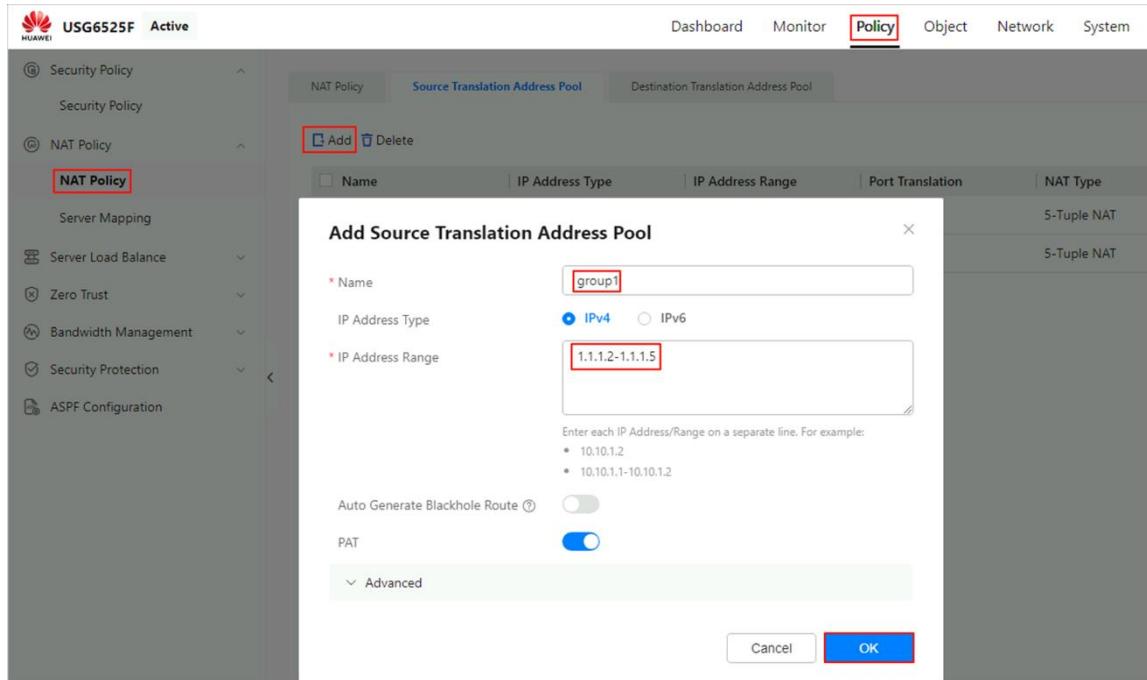
Content Security: Antivirus/Intrusion Prevention/URL Filtering/Data Filtering

Buttons: Cancel, Command Preview, OK



Step 6 Configure a NAT policy on FW1. After hot standby is enabled, the NAT policy configured on FW1 will be automatically synchronized to FW2.

Choose **Policy > NAT Policy > NAT Policy > Source Translation Address Pool** and click **Add** to configure a NAT address pool.



Choose **Policy > NAT Policy > NAT Policy** and click **Add** to configure a NAT policy.
When intranet users access the Internet, the source IP addresses on 10.3.0.0/24 will be translated into addresses in the address pool (1.1.1.2 to 1.1.1.5).

Add NAT Policy

[Show Overview]

Name	policy_nat1 *
Description	
NAT Type	<input checked="" type="radio"/> NAT <input type="radio"/> NAT64 <input type="radio"/> NAT66
NAT Mode	Source address translation
Schedule	Select a time range

Original Data Packet

Source Zone	trust [Multiple]
Destination Type	<input type="radio"/> Destination Zone <input checked="" type="radio"/> Outbound Interface Select an interface [Multiple]
Source Address	10.3.0.0/24 X
Destination Address	Select or enter an address
Service	Select or enter a service

Translated Data Packet

Source Address Translated To	<input checked="" type="radio"/> Address in the IP address pool <input type="radio"/> Outbound interface
Source Translation Address Pool	group1 * [Configure]

Note: To ensure that the device can properly forward NAT service traffic, configure a security policy.
To view NAT logs, enable traffic logs and session logs in the security policy. [\[Add Security Policy\]](#)

Cancel OK

Step 7 Configure the switches.

```
# Add the three interfaces of SW1 and SW2 to VLAN 10. For details, see the related
switch document.
```

4.3 Verification

```
# Run the display vrrp command on FW1 to check the status of interfaces in the VRRP
group.
```

```
HRP_M<FW1> display vrrp
GigabitEthernet0/0/1 | Virtual Router 1
State : Master
Virtual IP : 10.3.0.3
Master IP : 10.3.0.1
PriorityRun : 120
PriorityConfig : 100
MasterPriority : 120
```

```
Preempt : YES    Delay Time : 0 s
TimerRun : 60 s
TimerConfig : 60 s
Auth type : NONE
Virtual MAC : 0000-5e00-0101
Check TTL : YES
Config type : vgmp-vrrp
Backup-forward : disabled
```

```
GigabitEthernet0/0/2 | Virtual Router 2
State : Master
Virtual IP : 1.1.1.1
Master IP : 10.2.0.1
PriorityRun : 120
PriorityConfig : 100
MasterPriority : 120
Preempt : YES    Delay Time : 0 s
TimerRun : 60 s
TimerConfig : 60 s
Auth type : NONE
Virtual MAC : 0000-5e00-0102
Check TTL : YES
Config type : vgmp-vrrp
Backup-forward : disabled
```

Run the **display vrrp** command on FW2 to check the status of interfaces in the VRRP group.

```
HRP_S<FW2>display vrrp
GigabitEthernet0/0/1 | Virtual Router 1
State : Backup
Virtual IP : 10.3.0.3
Master IP : 10.3.0.1
PriorityRun : 120
PriorityConfig : 100
MasterPriority : 120
Preempt : YES    Delay Time : 0 s
TimerRun : 60 s
TimerConfig : 60 s
Auth type : NONE
Virtual MAC : 0000-5e00-0101
Check TTL : YES
Config type : vgmp-vrrp
Backup-forward : disabled
```

```
GigabitEthernet0/0/2 | Virtual Router 2
State : Backup
Virtual IP : 1.1.1.1
Master IP : 0.0.0.0
PriorityRun : 120
PriorityConfig : 100
MasterPriority : 0
Preempt : YES    Delay Time : 0 s
TimerRun : 60 s
```

```
TimerConfig : 60 s
Auth type : NONE
Virtual MAC : 0000-5e00-0102
Check TTL : YES
Config type : vgmp-vrrp
Backup-forward : disabled
```

Run the **display hrp state verbose** command on FW1 to check the current status of the VGMP group.

```
HRP_M<FW1>display hrp state verbose
Role: active, peer: standby
Running priority: 45000, peer: 45000
Backup channel usage: 0.00%
Stable time: 0 days, 0 hours, 46 minutes
Last state change information: 17:18:08 HRP core state changed, old_state = abnormal(active),
new_state = normal, local_priority = 45000, peer_priority = 45000.

Configuration:
hello interval: 1000ms
preempt: 60s
mirror configuration: off
mirror session: off
track trunk member: on
auto-sync configuration: on
auto-sync connection-status: on
adjust ospf-cost: on
adjust ospfv3-cost: on
adjust bgp-cost: on
nat resource: off

Detail information:
GigabitEthernet0/0/1 vrrp vrid 1: active
GigabitEthernet0/0/2 vrrp vrid 2: active
          ospf-cost: +0
          ospfv3-cost: +0
          bgp-cost: +0
```

Run the **display hrp state verbose** command on FW2 to check the current status of the VGMP group.

```
HRP_S<FW2>display hrp state verbose
Role: standby, peer: active
Running priority: 45000, peer: 45000
Backup channel usage: 0.00%
Stable time: 0 days, 0 hours, 41 minutes
Last state change information: 17:18:08 HRP core state changed, old_state = abnormal(standby),
new_state = normal, local_priority = 45000, peer_priority = 45000.

Configuration:
hello interval: 1000ms
preempt: 60s
mirror configuration: off
mirror session: off
```

```
track trunk member:          on
auto-sync configuration:    on
auto-sync connection-status: on
adjust ospf-cost:           on
adjust ospfv3-cost:         on
adjust bgp-cost:            on
nat resource:               off
```

Detail information:

```
GigabitEthernet0/0/1 vrrp vrid 1: standby
GigabitEthernet0/0/2 vrrp vrid 2: standby
          ospf-cost: +65500
          ospfv3-cost: +65500
          bgp-cost: +100
```

Ping PC2 in the Untrust zone from PC1 in the Trust zone. Run the **display firewall session table** command on FW1 and FW2 to check sessions.

```
HRP_M<FW1> display firewall session table
Current Total Sessions : 1
icmp  VPN: public --> public  10.3.0.10:53419[1.1.1.4:2049] --> 1.1.1.10:2048
```

```
HRP_S<FW2> display firewall session table
Current Total Sessions : 1
icmp  VPN: public --> public  10.3.0.10:53419[1.1.1.4:2049] --> 1.1.1.10:2048
```

4.4 Configuration Reference

4.4.1 Configuration of FW1

```
#
sysname FW1
#
hrp enable
hrp interface GigabitEthernet0/0/3 remote 10.10.0.2
hrp authentication-key Admin@123
#
interface GigabitEthernet0/0/1
ip address 10.3.0.1 255.255.255.0
vrrp vrid 1 virtual-ip 10.3.0.3 255.255.255.0 active
#
interface GigabitEthernet0/0/2
ip address 10.2.0.1 255.255.255.0
vrrp vrid 2 virtual-ip 1.1.1.1 255.255.255.0 active
#
interface GigabitEthernet0/0/3
ip address 10.10.0.1 255.255.255.0
#
firewall zone trust
```

```
set priority 85
add interface GigabitEthernet0/0/1
#
firewall zone untrust
set priority 5
add interface GigabitEthernet0/0/2
#
firewall zone dmz
set priority 50
add interface GigabitEthernet0/0/3
#
ip route-static 0.0.0.0 0.0.0.0 1.1.1.10
#
nat address-group group1
section 0 1.1.1.2 1.1.1.5
#
security-policy
rule name trust_to_untrust
source-zone trust
destination-zone untrust
source-address 10.3.0.0 24
action permit
#
nat-policy
rule name policy_nat1
source-zone trust
destination-zone untrust
source-address 10.3.0.0 24
action source-nat address-group group1
#
```

4.4.2 Configuration of FW2

```
#
sysname FW2
#
hrp enable
hrp interface GigabitEthernet0/0/3 remote 10.10.0.1
hrp authentication-key Admin@123
#
interface GigabitEthernet0/0/1
ip address 10.3.0.2 255.255.255.0
vrrp vrid 1 virtual-ip 10.3.0.3 255.255.255.0 standby
#
interface GigabitEthernet0/0/2
ip address 10.2.0.2 255.255.255.0
vrrp vrid 2 virtual-ip 1.1.1.1 255.255.255.0 standby
#
interface GigabitEthernet0/0/3
ip address 10.10.0.2 255.255.255.0
#
firewall zone trust
set priority 85
add interface GigabitEthernet0/0/1
```

```
#  
firewall zone untrust  
    set priority 5  
    add interface GigabitEthernet0/0/2  
#  
firewall zone dmz  
    set priority 50  
    add interface GigabitEthernet0/0/3  
#  
    ip route-static 0.0.0.0 0.0.0.0 1.1.1.10  
#  
    nat address-group group1  
        section 0 1.1.1.2 1.1.1.5  
#  
    security-policy  
        rule name trust_to_untrust  
            source-zone trust  
            destination-zone untrust  
            source-address 10.3.0.0 24  
            action permit  
#  
nat-policy  
    rule name policy_nat1  
        source-zone trust  
        destination-zone untrust  
        source-address 10.3.0.0 24  
        action source-nat address-group group1  
#
```

4.5 Quiz

Are HRP packets exchanged between the heartbeat interfaces controlled by security policies?

Reference Answer:

Whether HRP packets exchanged between heartbeat interfaces are controlled by security policies depends on the device model and version. In this lab environment, the HRP packets exchanged between heartbeat interfaces are not controlled by security policies.

In other versions, whether HRP packets are controlled by security policies depends on the configuration of the **firewall packet-filter basic-protocol enable** command. By default, the **firewall packet-filter basic-protocol enable** command is configured. That is, HRP packets are controlled by a security policy. In this case, you need to configure a security policy between the security zone where the heartbeat interface resides and the local zone to allow HRP packets to pass through.

5 Site-to-Site IPSec VPN

5.1 Introduction

5.1.1 About This Lab

Enterprise A and enterprise B need to access services of each other over the Internet. The confidentiality of the enterprises' secrets needs to be guaranteed.

In this lab, network A and network B are used to simulate enterprise A and enterprise B. Network A and network B are connected to the Internet through FW1 and FW2, respectively. An IPSec tunnel in IKE mode is established between FW1 and FW2. Users on network A and network B can access each other through the IPSec tunnel. During the access, packets on the Internet are encrypted by the IPSec VPN to meet confidentiality requirements.

5.1.2 Objectives

- Understand the basic principles of IPSec VPN.
- Master the application scenario of the site-to-site IPSec VPN.

5.1.3 Networking Topology

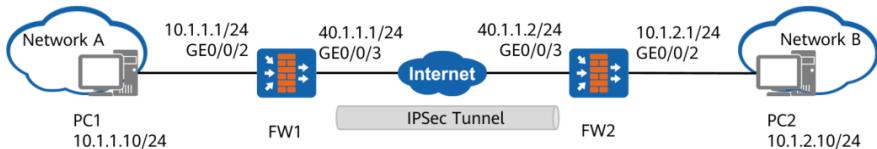


Figure 5-1 Networking topology for configuring site-to-site IPSec VPN

5.1.4 Lab Planning

Network A belongs to subnet **10.1.1.0/24**, PC1 is a host on network A, and FW1 is the gateway of network A.

Network B belongs to subnet **10.1.2.0/24**, PC2 is a host on network B, and FW2 is the gateway of network B.

FW1 and FW2 are connected to the Internet, have reachable routes to each other, and have established an IPSec tunnel between them.

Table 5-1 Port address and zone planning

Device	Interface	IP Address	Security Zone
--------	-----------	------------	---------------

FW1	GigabitEthernet0/0/3	40.1.1.1/24	untrust
	GigabitEthernet0/0/2	10.1.1.1/24	trust
FW2	GigabitEthernet0/0/3	40.1.1.2/24	untrust
	GigabitEthernet0/0/2	10.1.2.1/24	trust
PC1	Eth0/0/1	10.1.1.10/24	trust
PC2	Eth0/0/1	10.1.2.10/24	trust

5.2 Lab Configuration

5.2.1 Configuration Roadmap

1. Configure IP addresses for interfaces.
2. Configure an interzone security policy.
3. Configure an IPsec/IKE proposal.
4. Configure and apply an IPSec policy.

5.2.2 Configuration Procedure on the Web UI

Step 1 Configure IP addresses for interfaces.

Configure IP addresses for interfaces on the firewalls, and add the interfaces to security zones. FW1 is used as an example. The configuration of FW2 is similar to that of FW1.

On FW1, choose **Network > Interface**, click  next to GigabitEthernet 0/0/2 and GigabitEthernet 0/0/3, and set the parameters.

Modify GE Interface

Interface Name	<input type="text" value="GE0/0/2"/>
Description	<input type="text"/>
Virtual System	<input type="text" value="public"/>
VPN Instance	<input type="text" value="public"/>
Zone	<input type="text" value="trust"/>
Mode	<input checked="" type="radio"/> Routing <input type="radio"/> Switching <input type="radio"/> Bypass <input type="radio"/> Interface Pair
IPv4 <input type="radio"/> IPv6 Connection Type <input checked="" type="radio"/> Static IP <input type="radio"/> DHCP	
IP Address	<input type="text" value="10.1.1.1/255.255.255.0"/>
<small>Enter each IP address on a separate line. For example: "10.1.1.1/255.255.255.0" "10.1.1.1/24".</small>	
Default Gateway Cancel <input style="background-color: #0072bc; color: white; border: 1px solid #0072bc; border-radius: 5px; padding: 5px; margin-left: 10px;" type="button" value="OK"/>	

Modify GE Interface

Interface Name	<input type="text" value="GE0/0/3"/>
Description	<input type="text"/>
Virtual System	<input type="text" value="public"/>
VPN Instance	<input type="text" value="public"/>
Zone	<input type="text" value="untrust"/>
Mode	<input checked="" type="radio"/> Routing <input type="radio"/> Switching <input type="radio"/> Bypass <input type="radio"/> Interface Pair
IPv4 <input type="radio"/> IPv6 Connection Type <input checked="" type="radio"/> Static IP <input type="radio"/> DHCP	
IP Address	<input type="text" value="40.1.1.1/255.255.255.0"/>
<small>Enter each IP address on a separate line. For example: "10.1.1.1/255.255.255.0" "10.1.1.1/24".</small>	
Default Gateway Cancel <input style="background-color: #0072bc; color: white; border: 1px solid #0072bc; border-radius: 5px; padding: 5px; margin-left: 10px;" type="button" value="OK"/>	

Step 2 Configure security policies on FW1 and FW2.

Configure security policies on the firewall to allow mutual access between network segments A and B and permit IPSec negotiation flows. The configuration on FW1 is used

as an example. The configuration on FW2 is similar to that on FW1, and is not provided here.

On FW1, choose **Policy > Security Policy > Security Policy**, and click **Add** to add a security policy that allows traffic between network segments 10.1.1.0/24 and 10.1.2.0/24.

Modify Security Policy

General Settings

Name: ipsec
Description:
Policy Group: -- NONE --

Condition

The geolocation database is not loaded. To configure a region, [load the geolocation database](#).

Source

Zone: trust, untrust
IP Address/Region: 10.1.1.0/255..., 10.1.2.0/255...

Destination

Destination Type: Zone (selected)
Zone: trust, untrust
IP Address/Region: 10.1.1.0/255..., 10.1.2.0/255...

Service

Protocol: any

Action

Action: Permit, Deny

Content Security

Antivirus/Intrusion Prevention/URL Filtering/Data Filtering

Cancel, Command Preview, OK

Modify Security Policy

General Settings

Name	untrust_local
Description	
Policy Group	-- NONE --

Condition

The geolocation database is not loaded. To configure a region, [load the geolocation database](#).

Source

Zone	local <input type="button" value="X"/> untrust <input type="button" value="X"/>
IP Address/Region	any <input type="button" value="?"/>

Destination

Destination Type	<input checked="" type="radio"/> Zone <input type="radio"/> Virtual Service
Zone	local <input type="button" value="X"/> untrust <input type="button" value="X"/>
IP Address/Region	any <input type="button" value="?"/>

Service

Protocol	any <input type="button" value="?"/>
----------	--------------------------------------

More ▾ Application/User/UCL Group/Schedule/VLAN ID

Action

Action	<input checked="" type="radio"/> Permit <input type="radio"/> Deny
--------	--

Content Security ▾ Antivirus/Intrusion Prevention/URL Filtering/Data Filtering

Content Security ▾ Antivirus/Intrusion Prevention/URL Filtering/Data Filtering

Cancel **Command Preview** **OK**

Step 3 Configure an IPSec policy.

On FW1, choose **Network > IPSec > IPSec**, click **Add**, and set **Scenario** to **Site-to-site**. In the **Basic Configuration** area, set IPSec parameters, including the pre-shared key **Test!123** and the local and peer IP addresses.

USG6525F

Network

Add IPSec Policy

Scenario Option > Basic Configuration > Define Data Flow > IKE/IPSec Proposal

IPSes

Site-to-site

Next

USG6525F

Network

Virtual System: public

Policy Name: 1

Local Interface: GE0/0/3

Local Address: 40.1.1.1

Peer Address: 40.1.1.2

Authentication Type: Pre-shared key

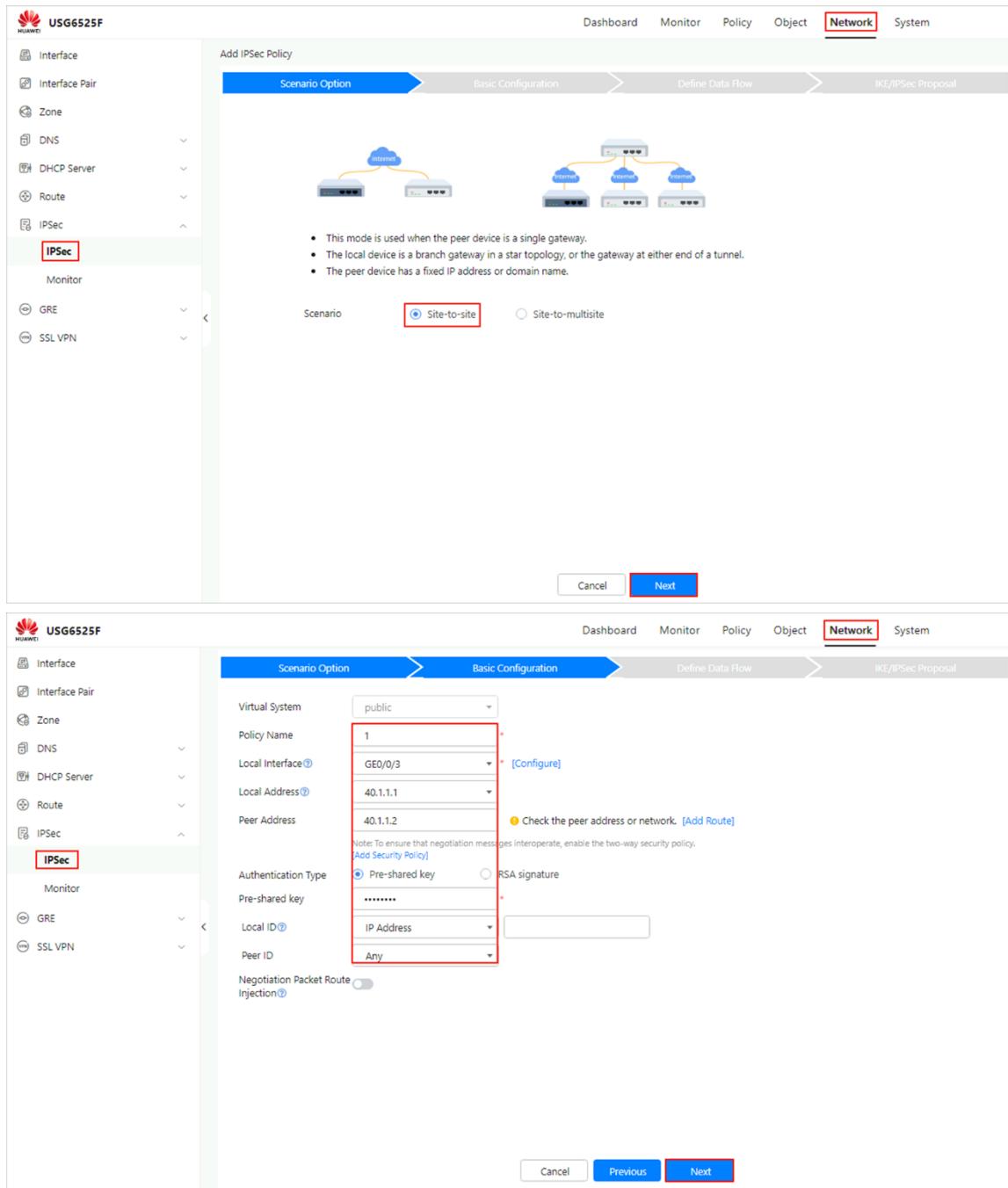
Pre-shared key: *****

Local ID: IP Address

Peer ID: Any

Negotiation Packet Route Injection

Cancel Previous Next



USG6525F

Network > Define Data Flow > Data Flow to Encrypt

Add Data Flow

Define packets on which to implement IPSec encryption. [Show Example]

Source Address	10.1.1.0/24
Destination Address	10.1.2.0/24
Protocol	any
Action	Encrypt

Note: To ensure data flow service interoperability, enable a two-way security policy. [Add Security Policy]

Cancel OK

USG6525F

Network > Define Data Flow > Data Flow to Encrypt

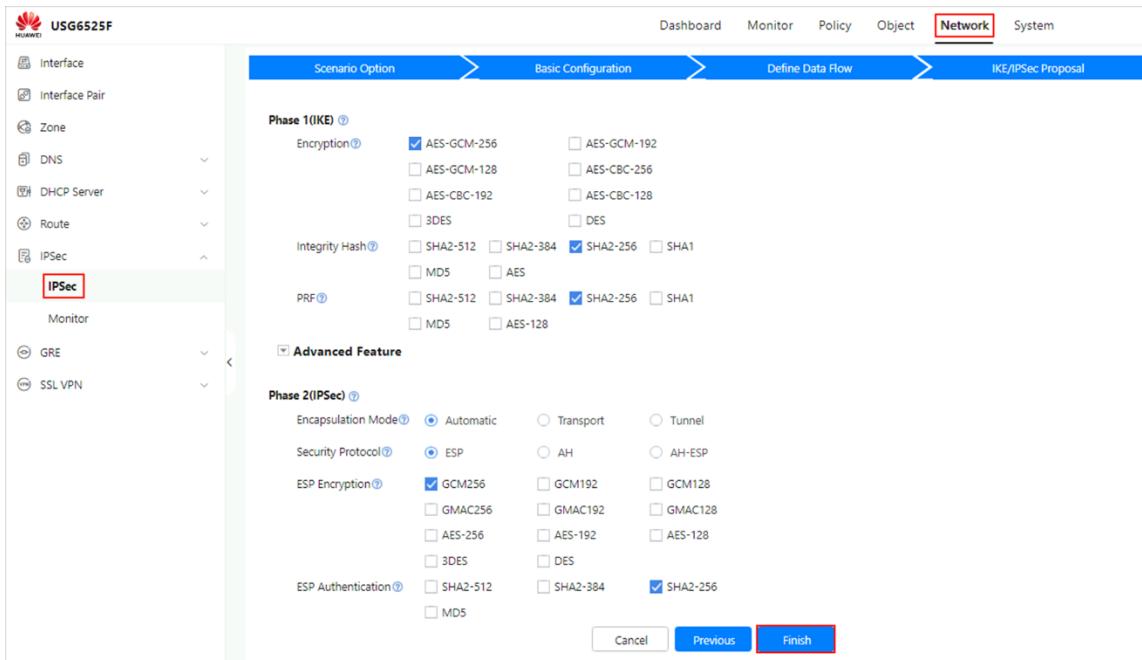
Data Flow to Encrypt

Source Address	Destination Address	Prot...	Source Port	Destin...	Action	Edit
10.1.1.0/255.255.255.0	10.1.2.0/255.255.255.0	any	any	any	Encrypt	<input checked="" type="checkbox"/>

Total 1

Reverse Route Injection

Cancel Previous Next



Perform the same operations on FW2. Note that the configuration of the interested flow must be mutually mirrored with that on FW1.

5.3 Verification

Run the **ping** command on PC1 to test the connectivity of PC2.

```
C:\Users\admin>ping 10.1.1.10
Pinging 10.1.1.10 with 32 bytes of data:
Reply from 10.1.1.10: bytes=32 time=2ms TTL=126
Reply from 10.1.1.10: bytes=32 time<1ms TTL=126
Reply from 10.1.1.10: bytes=32 time<1ms TTL=126
Reply from 10.1.1.10: bytes=32 time<1ms TTL=126
Ping statistics for 10.1.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms
```

5.4 Configuration Reference

5.4.1 Configuration of FW1

```
# 
acl number 3000
rule 5 permit ip source 10.1.1.0 0.0.0.255 destination 10.1.2.0 0.0.0.255
#
ipsec proposal prop16217151963
encapsulation-mode auto
esp authentication-algorithm sha2-256
```

```
esp encryption-algorithm aes-256
#
ike proposal 1
    encryption-algorithm aes-256
    dh group14
    authentication-algorithm sha2-256
    authentication-method pre-share
    integrity-algorithm hmac-sha2-256
    prf hmac-sha2-256
#
ike peer ike162171519631
    exchange-mode auto
    pre-shared-key %^%#Tw^J,\TJzTtF8tRRu6K#DD"zU-1`OI*(Em%lTb[%^%#
    ike-proposal 1
    remote-id-type none
    dpd type periodic
    remote-address 40.1.1.2
    rsa encryption-padding oaep
    rsa signature-padding pss
    local-id-preference certificate enable
    ikev2 authentication sign-hash sha2-256
#
ipsec policy ipsec1621715194 1 isakmp
    security acl 3000
    ike-peer ike162171519631
    proposal prop16217151963
    tunnel local applied-interface
    alias 1
    sa trigger-mode auto
    sa duration traffic-based 5242880
    sa duration time-based 3600
#
interface GigabitEthernet0/0/3
    undo shutdown
    ip address 40.1.1.1 255.255.255.0
    ipsec policy ipsec1621715194
#
interface GigabitEthernet0/0/2
    undo shutdown
    ip address 10.1.1.1 255.255.255.0
#
firewall zone trust
    set priority 85
    add interface GigabitEthernet0/0/2
#
firewall zone untrust
    set priority 5
    add interface GigabitEthernet0/0/3
#
ip route-static 0.0.0.0 0.0.0.0 40.1.1.2
#
ip address-set 10.1.1.0/24 type object
    description Address segment of network A
    address 0 10.1.1.0 mask 24
#
```

```
ip address-set 10.1.2.0/24 type object
description Address segment of network B
address 0 10.1.2.0 mask 24
#
security-policy
rule name ipsec1
description Network A-Network B
source-zone trust
destination-zone untrust
source-address address-set 10.1.1.0/24
destination-address address-set 10.1.2.0/24
action permit
rule name ipsec2
description Network B-Network A
source-zone untrust
destination-zone trust
source-address address-set 10.1.2.0/24
destination-address address-set 10.1.1.0/24
action permit
#
```

5.4.2 Configuration of FW2

```
#
acl number 3000
rule 5 permit ip source 10.1.2.0 0.0.0.255 destination 10.1.1.0 0.0.0.255
#
ipsec proposal prop16217202185
encapsulation-mode auto
esp authentication-algorithm sha2-256
esp encryption-algorithm aes-256
#
ike proposal 1
encryption-algorithm aes-256
dh group14
authentication-algorithm sha2-256
authentication-method pre-share
integrity-algorithm hmac-sha2-256
prf hmac-sha2-256
#
ike peer ike162172021857
exchange-mode auto
pre-shared-key %^%#-"i1,QFGvWsErbOB@ph98G-PW*QI_1W-{Z~58>0.%^%#
ike-proposal 1
remote-id-type none
dpd type periodic
remote-address 40.1.1.1
rsa encryption-padding oaep
rsa signature-padding pss
local-id-preference certificate enable
ikev2 authentication sign-hash sha2-256
#
ipsec policy ipsec1621720216 1 isakmp
    security acl 3000
```

```
ike-peer ike162172021857
proposal prop16217202185
tunnel local applied-interface
alias 1
sa trigger-mode auto
sa duration traffic-based 5242880
sa duration time-based 3600
#
interface GigabitEthernet0/0/3
undo shutdown
ip address 40.1.1.2 255.255.255.0
ipsec policy ipsec1621720216
#
interface GigabitEthernet0/0/2
undo shutdown
ip address 10.1.2.1 255.255.255.0
#
firewall zone trust
set priority 85
add interface GigabitEthernet0/0/2
#
firewall zone untrust
set priority 5
add interface GigabitEthernet0/0/3
#
ip route-static 0.0.0.0 0.0.0.0 40.1.1.1
#
ip address-set 10.1.1.0/24 type object
description Address segment of network A
address 0 10.1.1.0 mask 24
#
ip address-set 10.1.2.0/24 type object
description Address segment of network B
address 0 10.1.2.0 mask 24
#
security-policy
rule name ipsec1
description Network A-Network B
source-zone trust
destination-zone untrust
source-address address-set 10.1.1.0/24
destination-address address-set 10.1.2.0/24
action permit
rule name ipsec2
description Network B-Network A
source-zone untrust
destination-zone trust
source-address address-set 10.1.2.0/24
destination-address address-set 10.1.1.0/24
action permit
#
```

5.5 Quiz

If the employees of enterprise A and enterprise B need to access the Internet, what precautions should be taken when configuring NAT on the firewall egress?

Reference Answer:

For traffic between enterprise A and enterprise B, the firewall searches for the route to determine the outbound interface. In this case, packets are matched against NAT first and then IPSec on the outbound interface. If NAT is configured on the WAN interfaces of firewalls, ensure that NAT is not performed on the traffic exchanged between enterprise A and enterprise B.

6 SSL VPN

6.1 Introduction

6.1.1 About This Lab

An enterprise wants to use local authentication to authenticate all employees on the firewall. Employees who pass the authentication can access the enterprise intranet, while those who do not pass the authentication cannot access the enterprise intranet.

The enterprise wants mobile office users in a certain group (group1) to be able to obtain an intranet IP address when they are on business trip and can access various intranet resources as if they were on a LAN. To enhance security, local authentication on both the user name and password is required for mobile office users.

6.1.2 Objectives

- Master the method of configuring an SSL VPN virtual gateway.
- Understand the SSL VPN application scenarios and network planning.

6.1.3 Networking Topology

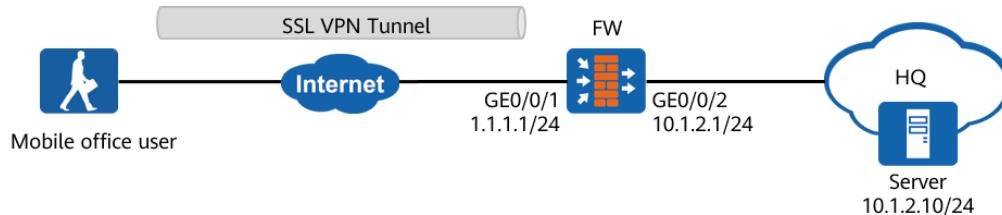


Figure 6-1 Networking topology for configuring SSL VPN

6.1.4 Lab Planning

Table 6-1 Port address and zone planning

Device	Interface	IP Address	Security Zone
FW	GigabitEthernet0/0/1	1.1.1.1/24	untrust
	GigabitEthernet0/0/2	10.1.2.1/24	trust
Server	Eth0/0/1	10.1.2.10/24	trust
Mobile office	Eth0/0/1	Addresses that can	untrust

Device	Interface	IP Address	Security Zone
users		be used to access the public network	

6.2 Lab Configuration

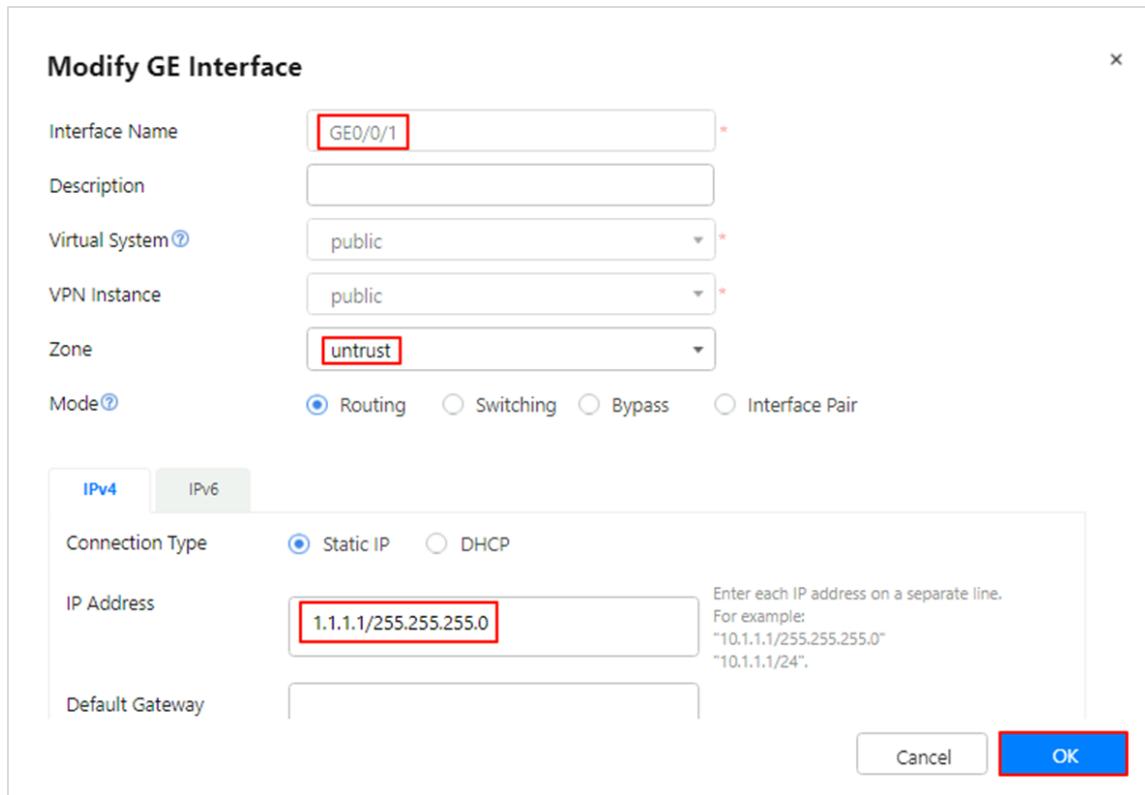
6.2.1 Configuration Roadmap

1. Configure IP addresses for interfaces and add the interfaces to security zones.
2. Configure users and authentication.
3. Configure the SSL VPN gateway.
4. Configure the SSL protocol and other parameters.
5. Configure the security policies.

6.2.2 Configuration Procedure on the Web UI

Step 1 Configure interfaces.

On the FW, choose Network > Interface, click  next to GigabitEthernet 0/0/1, and set the parameters as follows.



Modify GE Interface

Interface Name: GE0/0/1

Description:

Virtual System: public

VPN Instance: public

Zone: untrust

Mode: Routing

IPv4 tab (selected): Connection Type: Static IP, IP Address: 1.1.1.1/255.255.255.0

IPv6 tab (disabled):

Cancel OK

On the FW, choose Network > Interface, click  next to GigabitEthernet 0/0/2, and set the parameters as follows.

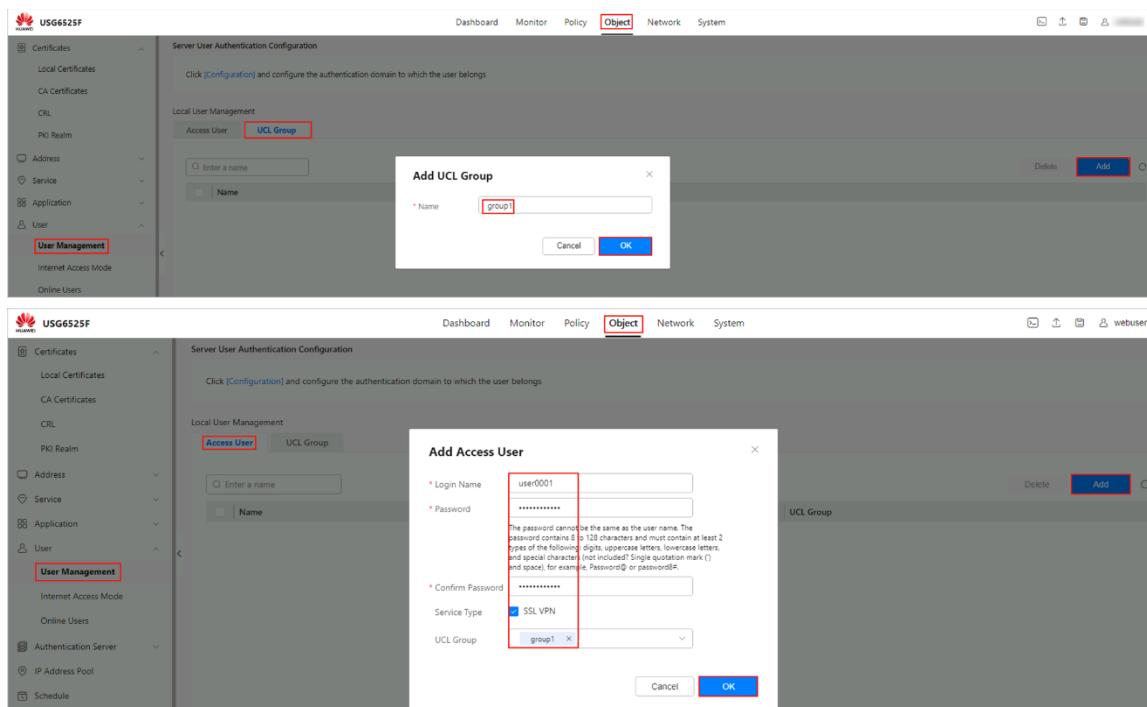
Modify GE Interface

Interface Name	GE0/0/2
Description	
Virtual System	public
VPN Instance	public
Zone	trust
Mode	<input checked="" type="radio"/> Routing <input type="radio"/> Switching <input type="radio"/> Bypass <input type="radio"/> Interface Pair
IPv4 IPv6	
Connection Type	<input checked="" type="radio"/> Static IP <input type="radio"/> DHCP
IP Address	10.1.2.1/255.255.255.0
Enter each IP address on a separate line. For example: "10.1.1.1/255.255.255.0" "10.1.1.1/24".	
Default Gateway	
<input type="button" value="Cancel"/> <input style="border: 2px solid red; background-color: #0072bc; color: white; border-radius: 5px; padding: 2px 10px; font-weight: bold; margin-left: 10px;" type="button" value="OK"/>	

Step 2 Configure user objects and authentication.

Choose Object > User > default and set the parameters as follows:

Set User Group of user0001 to /default/group1, Source to local, and Password to Password@123. (Note: You need to create the user group /default/group1 before creating the user user0001. In this way, you can select the created user group when creating the user.) Click Apply.



The figure consists of two screenshots of the USG6525F device's configuration interface. Both screenshots show the 'Object' tab selected in the top navigation bar.

Screenshot 1: Add UCL Group

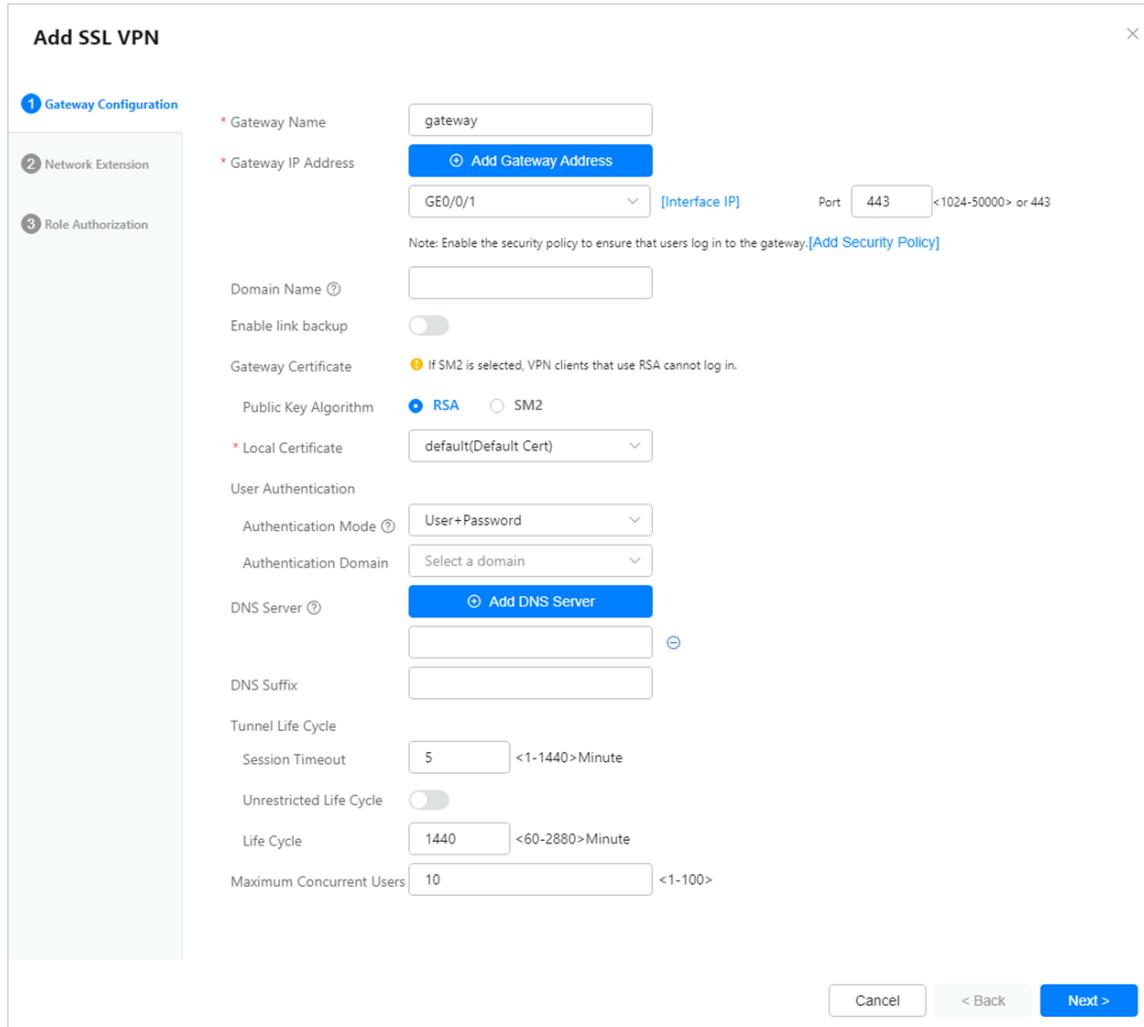
- The left sidebar shows 'User Management' under 'User'.
- The main area shows 'Server User Authentication Configuration' with 'UCL Group' selected.
- A modal window titled 'Add UCL Group' is open, with the 'Name' field containing 'group1'.
- The 'OK' button in the modal is highlighted with a red border.

Screenshot 2: Add Access User

- The left sidebar shows 'User Management' under 'User'.
- The main area shows 'Server User Authentication Configuration' with 'Access User' selected.
- A modal window titled 'Add Access User' is open, with the following fields filled:
 - 'Login Name': user0001
 - 'Password': (redacted)
 - 'Confirm Password': (redacted)
 - 'Service Type': SSL VPN
 - 'UCL Group': group1
- The 'OK' button in the modal is highlighted with a red border.

Step 3 Configure an SSL VPN gateway.

Choose **Network > SSL VPN > SSL VPN**, click **Add**, set parameters as follows, and click **Next>**.



1 Gateway Configuration

* Gateway Name: gateway

* Gateway IP Address: GE0/0/1 [Interface IP] Port: 443 <1024-50000> or 443

Note: Enable the security policy to ensure that users log in to the gateway. [\[Add Security Policy\]](#)

Domain Name:

Enable link backup:

Gateway Certificate: ⓘ If SM2 is selected, VPN clients that use RSA cannot log in.

Public Key Algorithm: RSA SM2

* Local Certificate: default(Default Cert)

User Authentication:

Authentication Mode: User+Password

Authentication Domain: Select a domain

DNS Server:

DNS Suffix:

Tunnel Life Cycle:

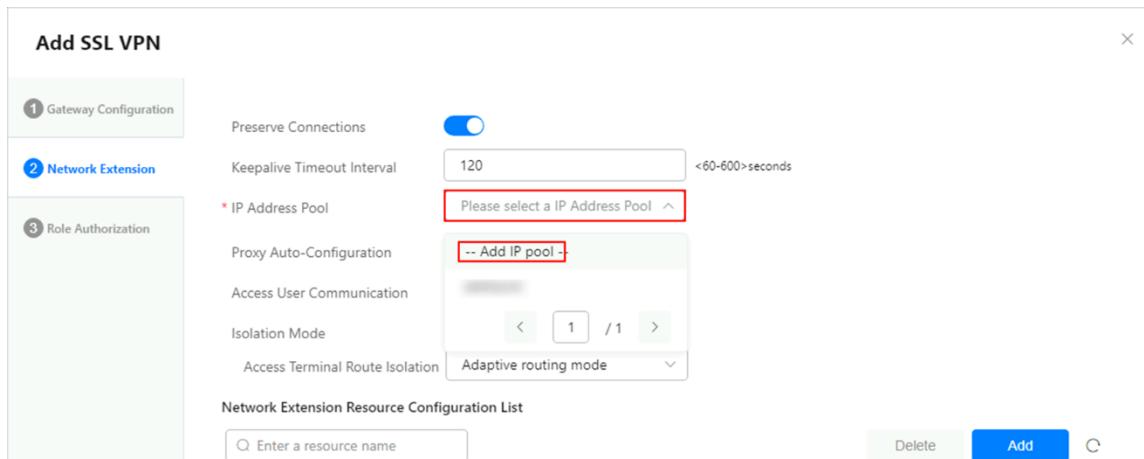
Session Timeout: 5 <1-1440> Minute

Unrestricted Life Cycle:

Life Cycle: 1440 <60-2880> Minute

Maximum Concurrent Users: 10 <1-100>

Create an address pool in the Network Extension module to assign intranet addresses to remote access users and click **Next>**.



1 Gateway Configuration

Preserve Connections:

Keepalive Timeout Interval: 120 <60-600> seconds

2 Network Extension

* IP Address Pool: Please select a IP Address Pool

Proxy Auto-Configuration: -- Add IP pool --

Access User Communication: 1 / 1

Isolation Mode: Adaptive routing mode

Network Extension Resource Configuration List

Enter a resource name	Delete	Add	Edit
-----------------------	--------	-----	------

Add IP Address Pool

Name	addrpool *
Pool Range	172.16.1.1-172.16.1.10

Enter each IP address or IP address range on a separate line.
For example:
10.10.1.2
10.10.1.2-10.10.1.10

Extended Network Attributes

Primary DNS Server	
Secondary DNS Server	
Primary NBNS Server	
Secondary NBNS Server	

Buttons: Cancel OK

Continue to create intranet resources that SSL VPN remote access users can access.

Add SSL VPN

1 Gateway Configuration

Preserve Connections

2 Network Extension

Keepalive Timer

* IP Address Pool

Proxy Auto-Config

Access User Control

Isolation Mode

Access Terminal

Network Extension Resources

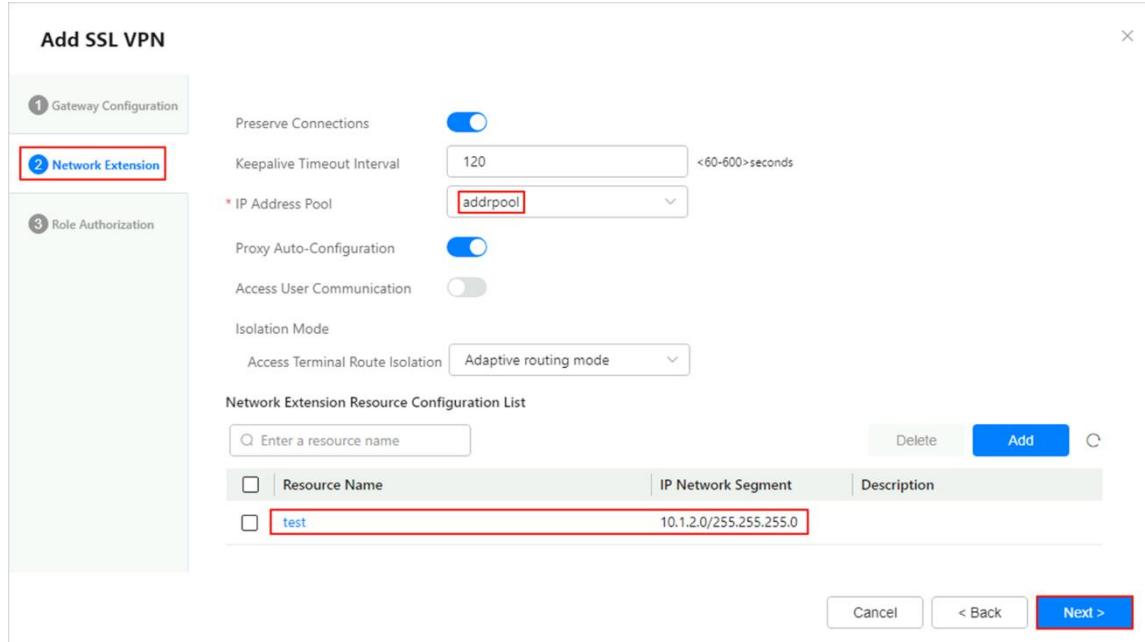
Enter a resource name:

Resource Name

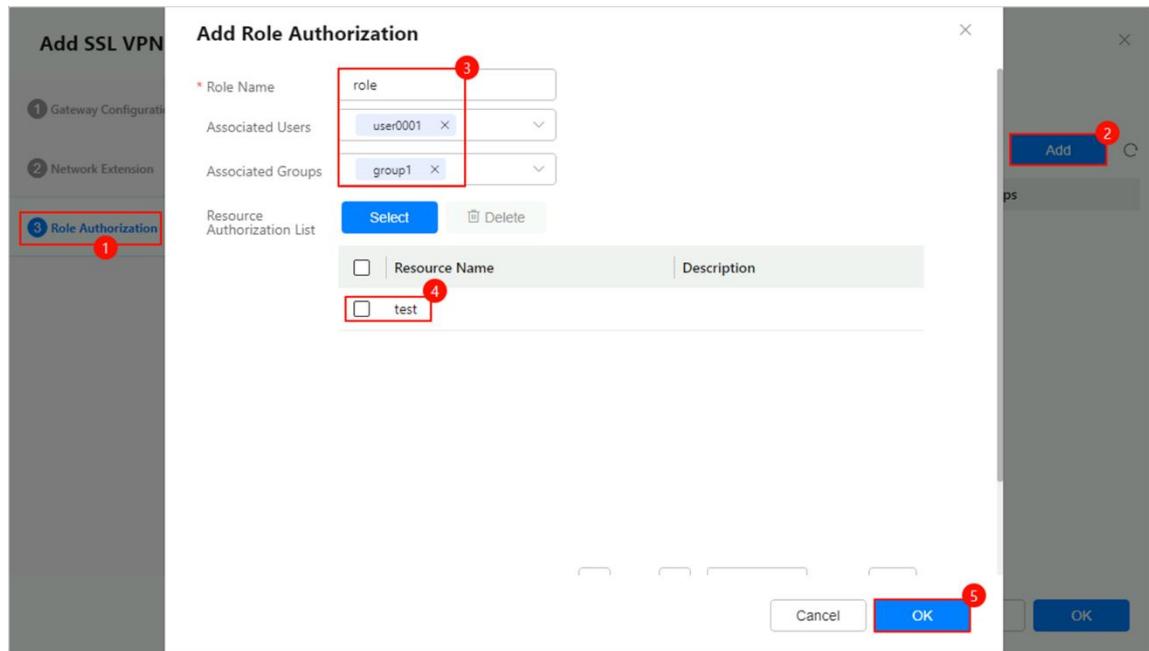
Add Network Extension Resources

* Resource Name	test *
* IP Network Segment	10.1.2.0
* Subnet Mask	255.255.255.0
Description	

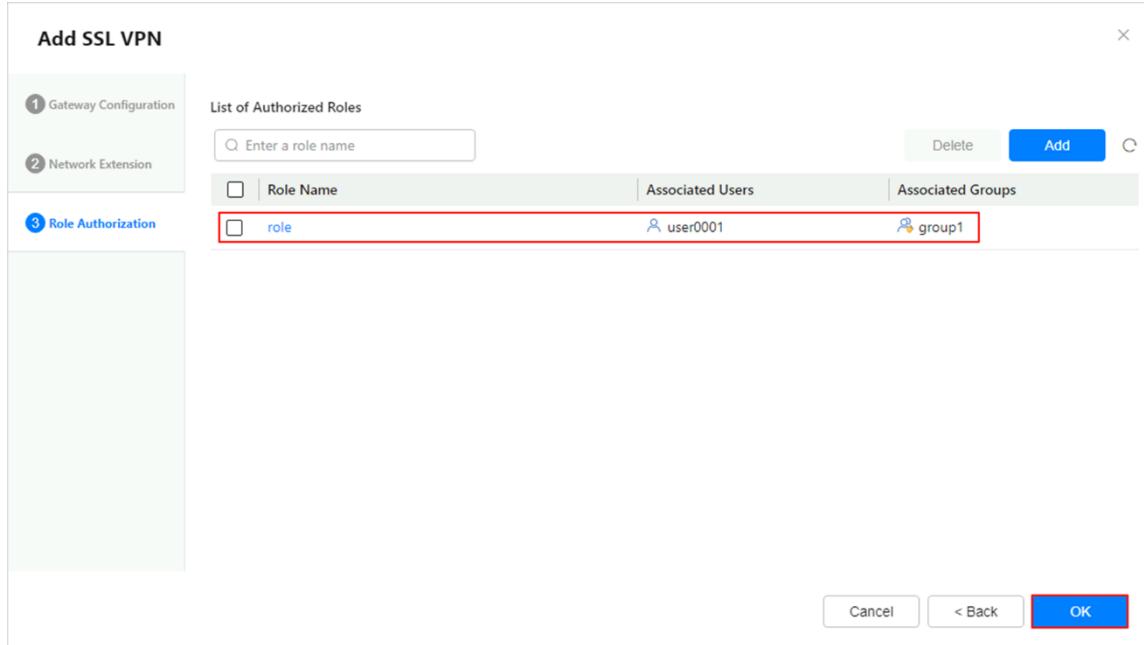
Buttons: Delete Add OK



Configure SSL VPN role authorization/users. In **Role Authorization List**, click **Add**, and set the role authorization parameters as shown in the following figure. Click **OK**.



Return to the **Role Authorization/User** page, and click **OK**.



Step 4 Configure security policies.

Configure a security policy for traffic from the Internet to the firewall to allow employees on business trips to log in to the SSL VPN gateway. Choose **Policy > Security Policy > Security Policy**. Click **Add Security Policy** and configure security policy **policy01**, as shown in the following figure.

Modify Security Policy

General Settings

* Name	policy01
Description	
Policy Group	-- NONE --

Condition

The geolocation database is not loaded. To configure a region, [load the geolocation database](#).

Source

Zone	untrust
IP Address/Region	any

Destination

Destination Type	<input checked="" type="radio"/> Zone <input type="radio"/> Virtual Service
Zone	local
IP Address/Region	1.1.1.1/255.2...

Service

Protocol	any
----------	-----

Action

Action	<input checked="" type="checkbox"/> Permit <input type="checkbox"/> Deny
--------	--

Content Security Antivirus/Intrusion Prevention/URL Filtering/Data Filtering

Other

Cancel Command Preview OK

Configure a security policy for traffic from the firewall to the intranet to allow employees on business trip to access resources of HQ. Choose **Policy > Security Policy > Security Policy**. Click **Add Security Policy** and configure security policy **policy02**, as shown in the following figure.

Modify Security Policy

General Settings

* Name	policy02
Description	
Policy Group	-- NONE --

Condition

The geolocation database is not loaded. To configure a region, [load the geolocation database](#).

Source

Zone	untrust
IP Address/Region	172.16.1.0/2...

Destination

Destination Type	<input checked="" type="radio"/> Zone <input type="radio"/> Virtual Service
Zone	trust
IP Address/Region	10.1.2.0/255....

Service

Protocol	any
----------	-----

Action

Action	<input checked="" type="radio"/> Permit <input type="radio"/> Deny
--------	--

Content Security Antivirus/Intrusion Prevention/URL Filtering/Data Filtering

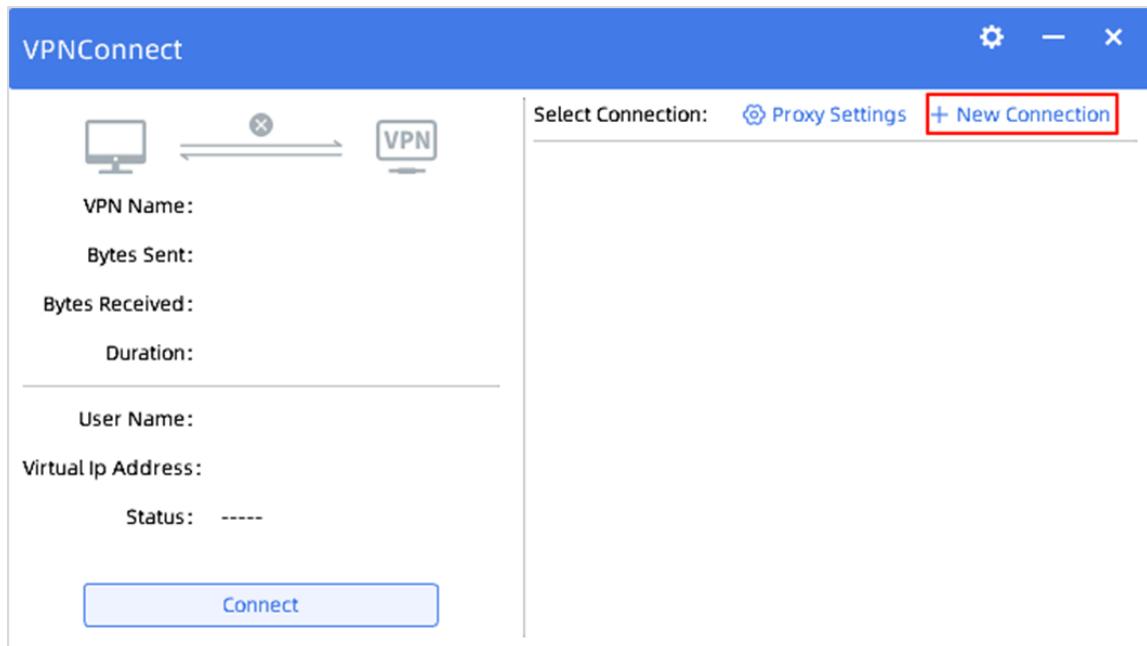
Other

Cancel Command Preview OK

The IP address of the HQ server is **10.1.2.10/24** and that of the gateway is **10.1.2.1**. Detailed configurations are not provided.

6.3 Verification

Start the **UniVPN** client on the PC and perform SSL VPN access operations, as shown in the following figure.



New Connection

SSL VPN

L2TP/IPSec

Import

Connection Name: *

Description:

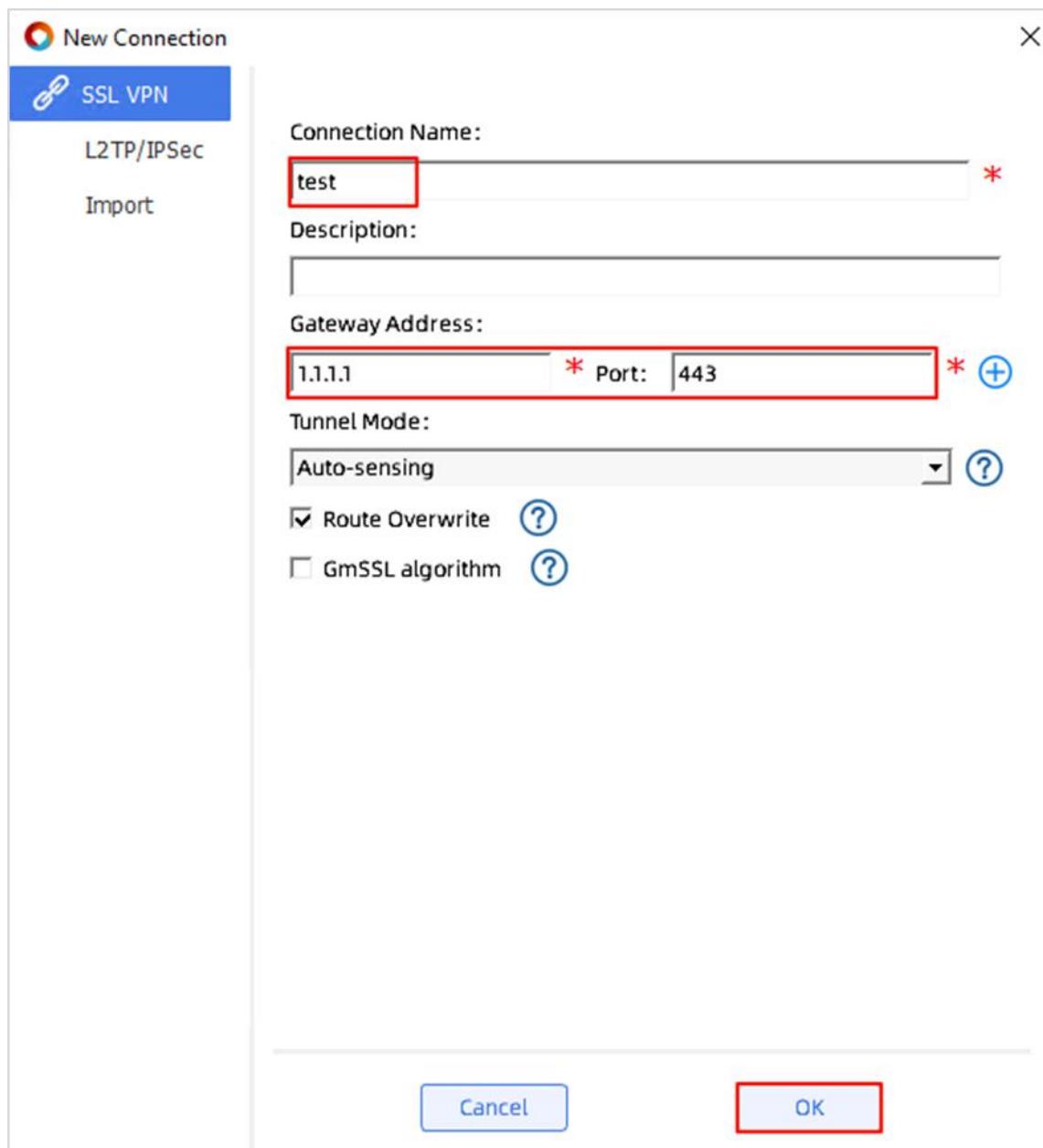
Gateway Address: * Port: * +

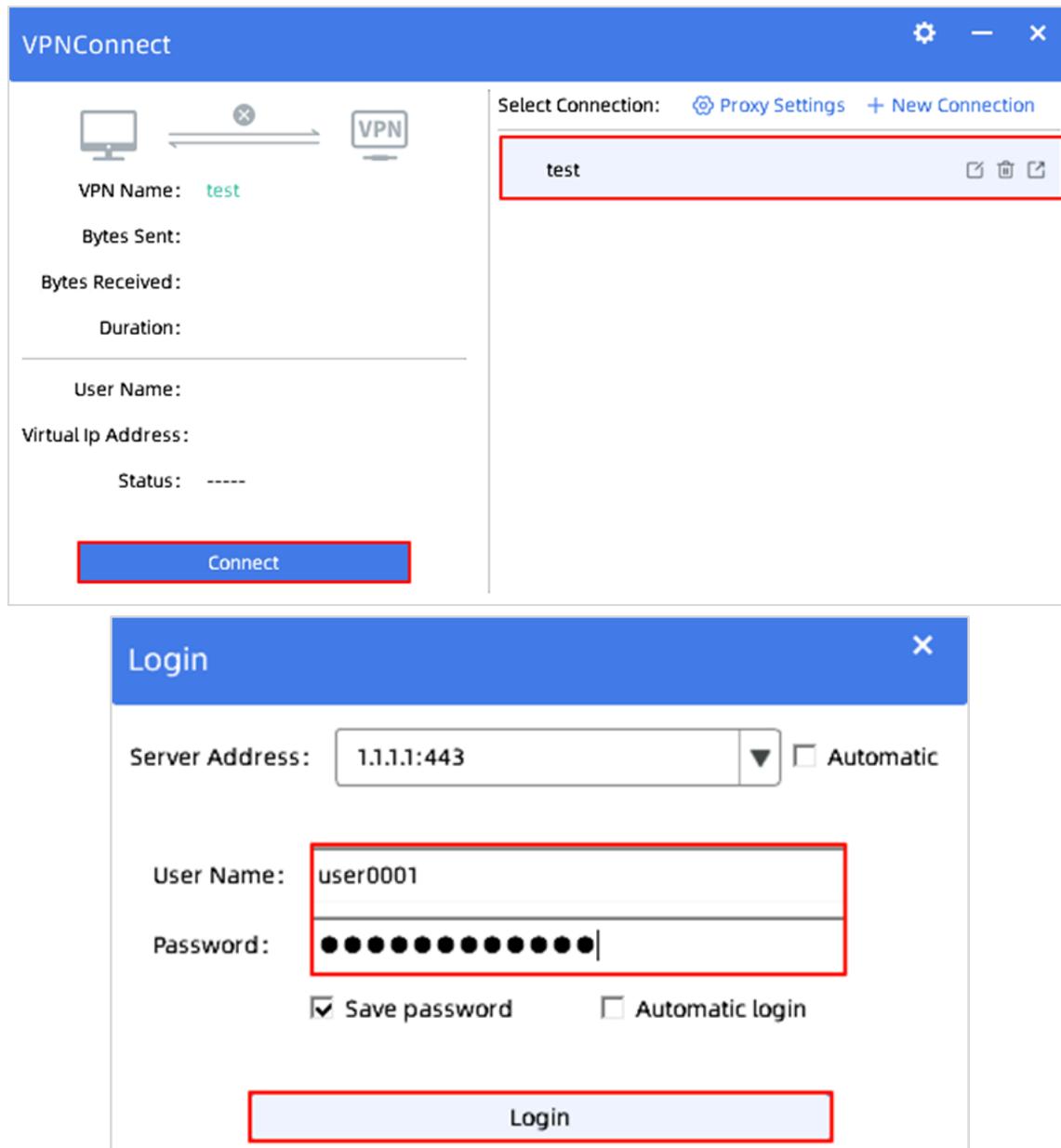
Tunnel Mode: ?

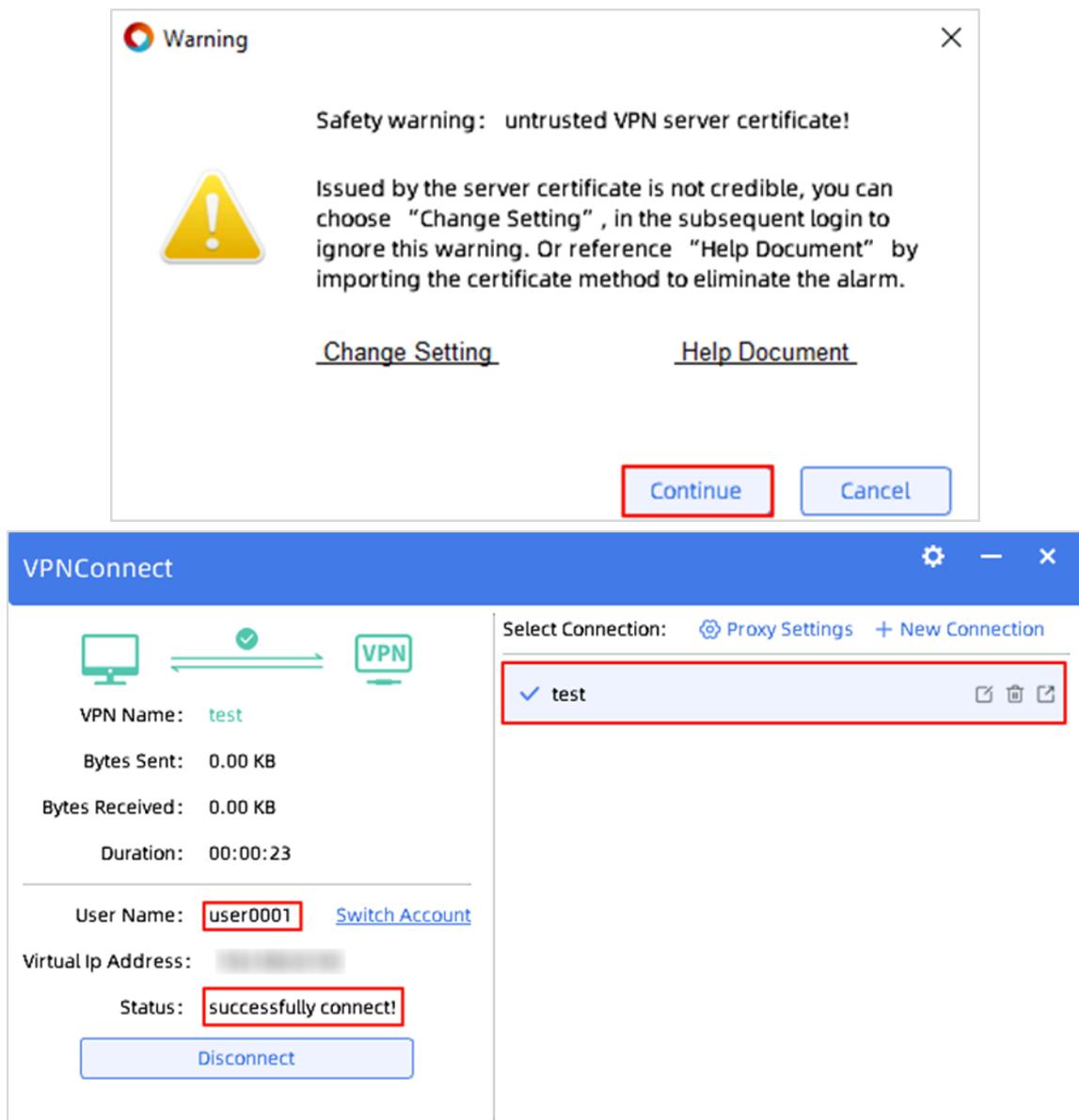
Route Overwrite ?

GmSSL algorithm ?

Cancel OK







6.4 Configuration Reference

6.4.1 Firewall Configuration

```
#  
aaa  
authentication-scheme default  
authorization-scheme default  
accounting-scheme default  
domain default  
service-type ssl-vpn  
internet-access mode password  
reference user current-domain  
#
```

```
interface GigabitEthernet0/0/1
undo shutdown
ip address 1.1.1.1 255.255.255.0
#
interface GigabitEthernet0/0/2
undo shutdown
ip address 10.1.2.1 255.255.255.0
#
firewall zone trust
set priority 85
add interface GigabitEthernet0/0/2
#
firewall zone untrust
set priority 5
add interface GigabitEthernet0/0/1
#
v-gateway gateway interface GigabitEthernet0/0/1 private
v-gateway gateway alias gateway
#
#****BEGIN***gateway**1****#
v-gateway gateway
basic
ssl version tlsv12
ssl timeout 5
ssl lifecycle 1440
ssl public-key algorithm rsa
ssl ciphersuit custom aes256-sha non-des-cbc3-sha aes128-sha
service
network-extension enable
network-extension keep-alive enable
network-extension keep-alive interval 120
network-extension netpool 172.16.1.1 172.16.1.10 255.255.255.0
netpool 172.16.1.1 default
network-extension mode manual
network-extension manual-route 10.1.2.0 255.255.255.0
security
policy-default-action permit vt-src-ip
certification cert-anonymous cert-field user-filter subject cn group-filter subject cn
certification cert-anonymous filter-policy permit-all
certification cert-challenge cert-field user-filter subject cn
certification user-cert-filter key-usage any
undo public-user enable
hostchecker
cachecleaner
vpndb
group /default
group /default/group1
role
role default
role default condition all
role role
role role condition all
role role network-extension enable
#****END****
#
```

```
ip address-set 10.1.1.0/24 type object
  address 0 10.1.1.0 mask 24
#
ip address-set 10.1.2.0/24 type object
  address 0 10.1.1.0 mask 24
#
ip address-set 1.1.1.1/24 type object
  address 0 1.1.1.0 mask 24
#
ip address-set 172.16.1.0/24 type object
  address 0 172.16.1.0 mask 24
#
security-policy
  default action permit
  rule name policy01
    source-zone untrust
    destination-zone local
    destination-address address-set 1.1.1.1/24
    service https
    action permit
  rule name policy02
    source-zone untrust
    destination-zone trust
    source-address address-set 172.16.1.0/24
    destination-address address-set 10.1.2.0/24
    action permit
  rule name pass
    action permit
#
```

6.5 Quiz

During the verification, when you click **Start** under **Network Extension**, what will happen to the routing entries and IP address?

Reference Answer:

Run the **route print** command to view the IPv4 routing table. You can see the route destined to **10.1.2.0/24**.

Run the **ipconfig** command to view the information about the local NIC. You can see that the local NIC is assigned an IP address in the range from **172.16.1.1/24** to **172.16.1.10/24**.