H3C SecPath Series Firewalls

Configuration Examples

Hangzhou H3C Technologies Co., Ltd.
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About This Manual

Organization

H3C SecPath Series Firewalls Configuration Examples is organized as follows:

- SecPath Series Firewalls Configuration Maintenance Example
- SecPath Series Firewalls ARP Attack Protection Configuration Example
- SecPath Series Firewalls IPsec Configuration Examples
- SecPath Series Firewalls DHCP Configuration Examples
- SecPath Series Firewalls NAT Configuration Examples
- SecPath Series Firewalls Layer 2 and Layer 3 Forwarding Configuration Examples
- SecPath Series Firewalls Attack Protection Configuration Example
- SecPath Series Firewalls Interzone Policy Configuration Example
- SecPath Series Firewalls Link Aggregation Configuration Examples
- SecPath Series Firewalls Log Management and SecCenter Configuration Example
- SecPath Series Firewalls Virtual Firewall Configuration Examples
- SecPath Series Firewalls Connection Limit Configuration Examples
- SecPath Series Firewalls Virtual Device and Security Zone Configuration Examples

Conventions

The manual uses the following conventions:

Command conventions

Convention	Description
Boldface	The keywords of a command line are in **Boldface**.
italic	Command arguments are in *italic*.
[ ]	Items (keywords or arguments) in square brackets [ ] are optional.
{ x | y | ... }	Alternative items are grouped in braces and separated by vertical bars. One is selected.
[x | y | ...]	Optional alternative items are grouped in square brackets and separated by vertical bars. One or none is selected.
{ x | y | ... } *	Alternative items are grouped in braces and separated by vertical bars. A minimum of one or a maximum of all can be selected.
[x | y | ...] *	Optional alternative items are grouped in square brackets and separated by vertical bars. Many or none can be selected.
&<1-n>	The argument(s) before the ampersand (&) sign can be entered 1 to n times.
#	A line starting with the # sign is comments.

GUI conventions

Convention	Description
Boldface	Window names, button names, field names, and menu items are in Boldface. For example, the **New User** window appears; click **OK**.

Convention	Description
>	Multi-level menus are separated by angle brackets. For example, **File** > **Create** > **Folder**.

Symbols

Convention	Description
Warning	Means reader be extremely careful. Improper operation may cause bodily injury.
Caution	Means reader be careful. Improper operation may cause data loss or damage to equipment.
Note	Means a complementary description.

Related Documentation

In addition to this manual, each SecPath series firewalls documentation set includes the following:

Manual	Description
H3C SecPath F1000-E Firewall Installation Manual	Describes the H3C SecPath firewall products F1000-E and F1000-S-EI overview, software and hardware maintenance, troubleshooting, installation, installation preparations, interface cards and modules.
H3C SecPath F5000-A5 Firewall Installation Manual	Describes the H3C firewall F5000-A5 overview, software and hardware maintenance, troubleshooting, installation, installation preparations, interface cards and modules.
H3C SecPath Series Security Products User Manual (R3201)	Describes features, working principles, and configuration guides of the H3C SecPath series security products; guides you to perform configurations for the H3C SecPath firewalls on the web interface; describes how to configure some auxiliary functions of the H3C SecPath firewalls on the command line interface.
H3C SecPath Series High-End Firewalls User Manual (F3166)	

Obtaining Documentation

You can access the most up-to-date H3C product documentation on the World Wide Web at this URL: http://www.h3c.com.

The following are the columns from which you can obtain different categories of product documentation:

[Products & Solutions]: Provides information about products and technologies.

[Technical Support & Document > Technical Documents]: Provides several categories of product documentation, such as installation and configuration.

[Technical Support & Document > Software Download]: Provides the documentation released with the software version.

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SecPath Series Firewalls Configuration Maintenance Example

Keywords: Configuration maintenance, backup

Abstract: The configuration maintenance module is used to save the configuration (with/without encryption), back up the configuration, restore the configuration, and restore the configuration to the factory defaults. You can easily implement configuration maintenance and management on the Web interface.

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Feature Overview

The configuration maintenance page has four tabs: Save, Backup, Restore, and Initialize.

Saving the configuration encrypts the saved file at the same time. The saved file is displayed in cipher text.

You can also back up and restore the configuration information on the configuration maintenance page. Besides, you can upgrade the system software and restart the system through the web interface.

Application Scenarios

Configuration maintenance is used for routine device maintenance. When the configuration is changed, you can save the configuration in case of configuration loss due to power interruption. You can also back up the configuration for future configuration restoration. To clear the configuration that you have made, you can restore the device to the factory defaults.

Configuration Guidelines

- When upgrading the software, select a time range with small traffic to avoid affecting users.
- To save the current configuration, enter the **save** command on the command line interface, or log in to the web interface, select **Device Management** > **Maintenance** from the navigation tree, click the **Save** tab, and click **Apply**. The current configuration is saved to two configuration files: startup.cfg and system.xml.
- When performing configuration file backup or restoration, back up and restore the two files, startup.cfg and system.xml, together.

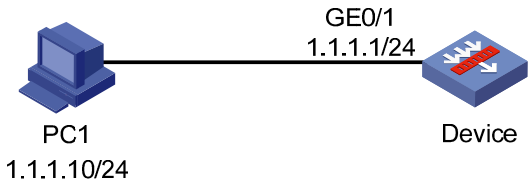
Configuration Maintenance Example

Network Requirements

Note

This configuration example is applicable to SecPath F5000-A5, SecPath F1000E, and SecPath UTM 200-A/200-M/200-S firewalls. A UTM200-S firewall is used in this configuration example for illustration.

Figure 1 Network diagram for configuration maintenance



Note

By default, the management port of Device is GigabitEthernet 0/0 and the IP address of the port is 192.168.0.1/24. You can assign an IP address that is in the same network segment as GigabitEthernet 0/0 to the network interface card (NIC) of your PC, connect the NIC to port GigabitEthernet 0/0, and then enter **http://192.168.0.1** in the address bar of the web browser to log in to the web interface of Device to perform configurations.

Configuration Considerations

Interface GigabitEthernet 0/1 in the internal network is assigned with IP address 1.1.1.1/24, and resides in the Trust zone.

Software Version Used

SecPath F1000E: V300R001B01 R3166 series and V300R001B01 F3166 series.

SecPath F5000-A5: V300R002B01 R3206 series

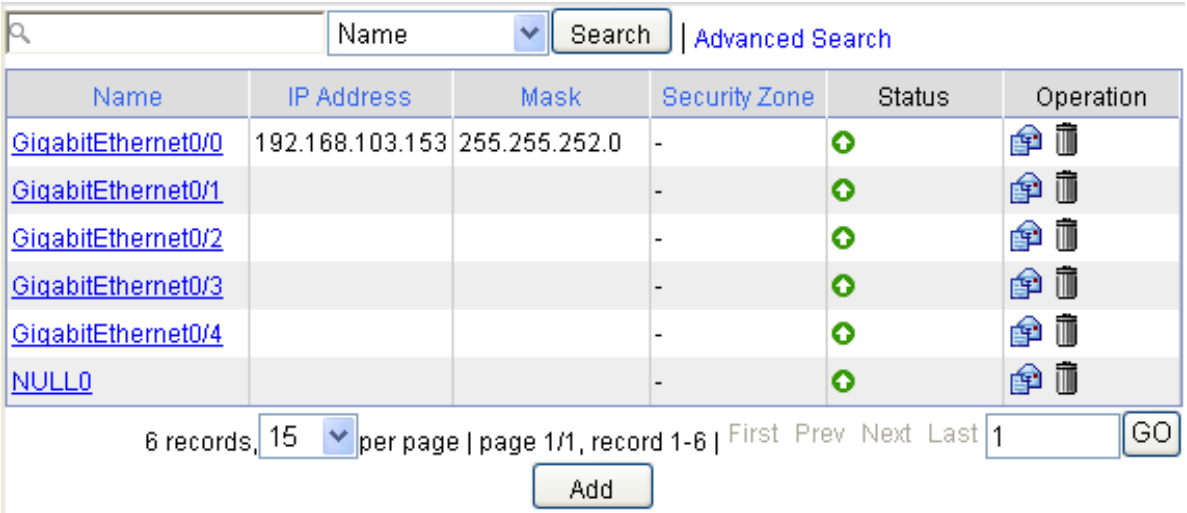
SecPath UTM 200-A/200-M/200-S: V500R001B01 R5116 series

Configuration Procedures

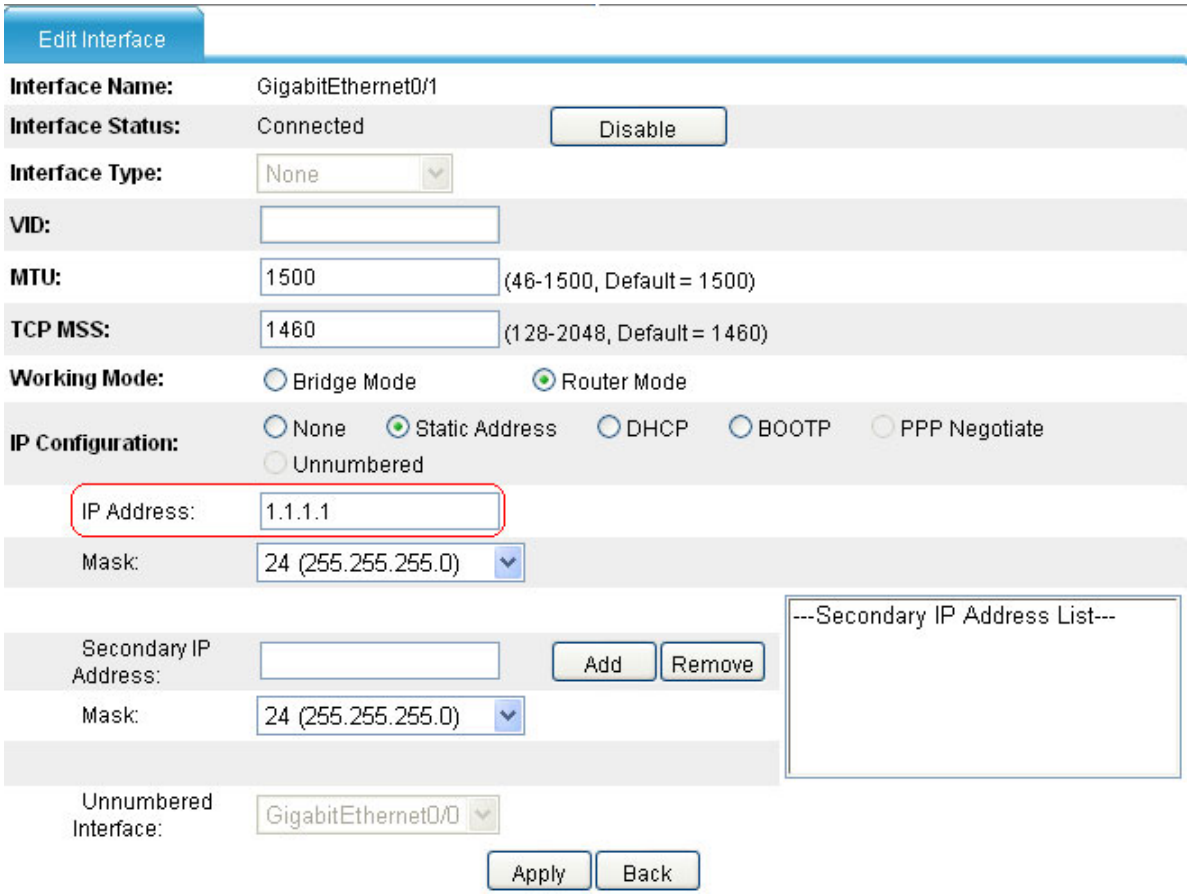
Basic Configuration

Assigning an IP address to an interface

1) Select **Device Management** > **Interface** from the navigation tree.



2) Click of GigabitEthernet 0/1 to enter the **Edit Interface** page. Configure GigabitEthernet 0/1 and click **Apply**, as shown in the following figure.



Adding GigabitEthernet 0/1 to Trust zone

1) Select **Device Management** > **Zone** from the navigation tree.

Zone ID	Zone Name	Preference	Share	Virtual Device	Operation
0	Management	100	no	--	
1	Local	100	no	Root	
2	Trust	85	no	Root	
3	DMZ	50	no	Root	
4	Untrust	5	no	Root	

Add

2) Click of Trust to enter the **Modify Zone** page. Add interface GigabitEthernet 0/1 to the Trust zone, and click **Apply** to return to the **Zone** page.

Modify Zone

Zone ID: 2

Zone Name: Trust

Preference: 85 (1-100)

Share: No

Virtual Device: Root

Interface Name: Interface Search | Advanced Search

	Interface	VLAN
☑	GigabitEthernet0/1	
☐	GigabitEthernet0/2	
☐	GigabitEthernet0/3	
☐	GigabitEthernet0/4	
☐	NULL0	

The VLANs should be separated by ',' or '-'. For example:3, 5-10

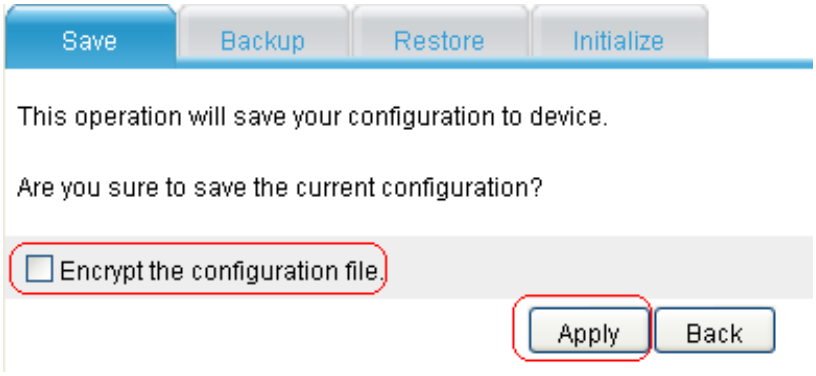
Items marked with an asterisk(*) are required

Apply Cancel

Configuration Maintenance

Saving the current configuration

1) Select **Device Management** > **Maintenance** from the navigation tree, click the **Save** tab, and click **Apply** to save the current configuration. The page displays a prompt that the system is saving the configuration.



2) To encrypt the saved configuration file, select **Encrypt the configuration file** before clicking **Apply**.

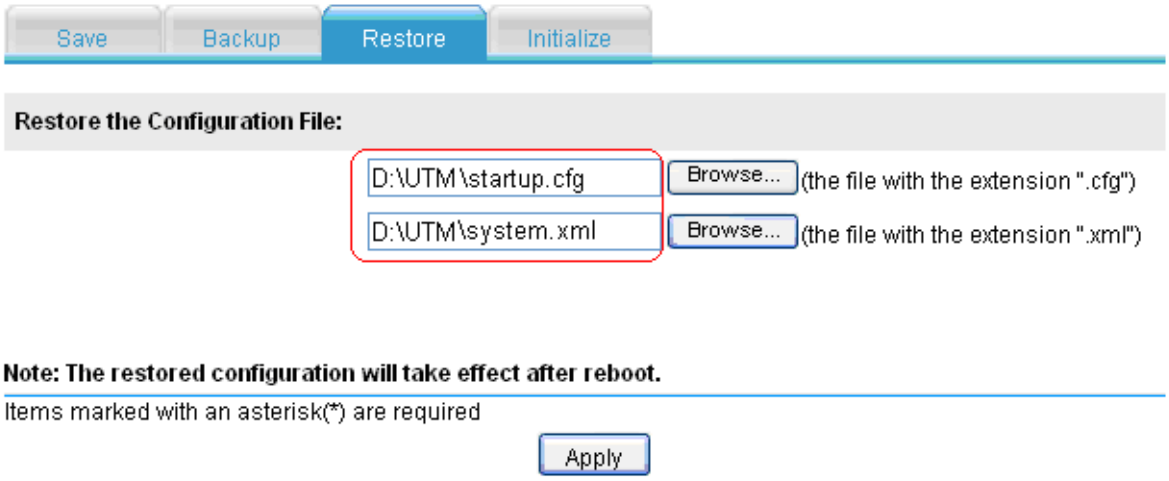
Backing up the current configuration

1) Select **Device Management** > **Maintenance** from the navigation tree, click the **Backup** tab, and then click the **Backup** button, as shown in the following figure.

2) Specify the path and file for storing the configuration on the popup dialog box, and click **Save**.

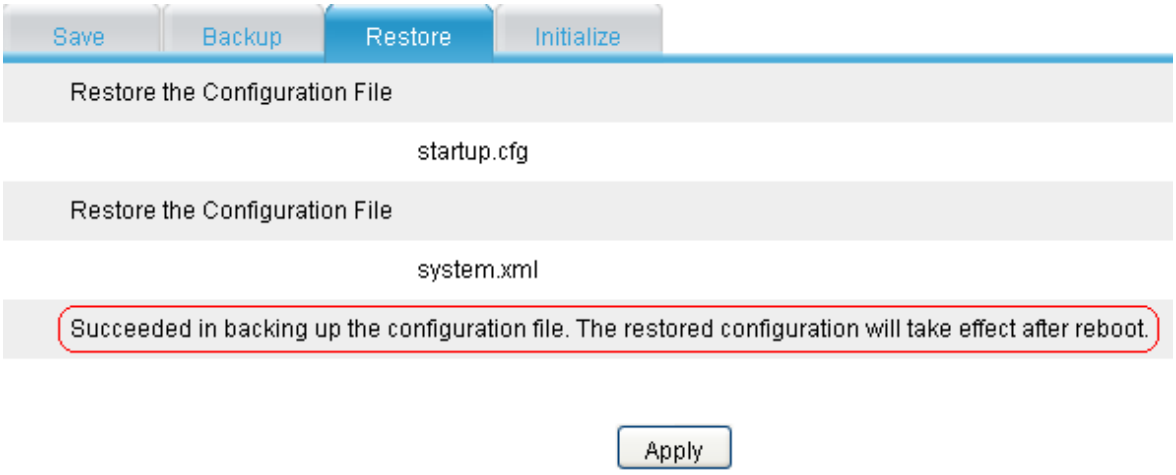
Restoring the configuration

1) Select **Device Management** > **Maintenance** from the navigation tree, click the **Restore** tab, and click the **Browse** button to specify the configuration file.



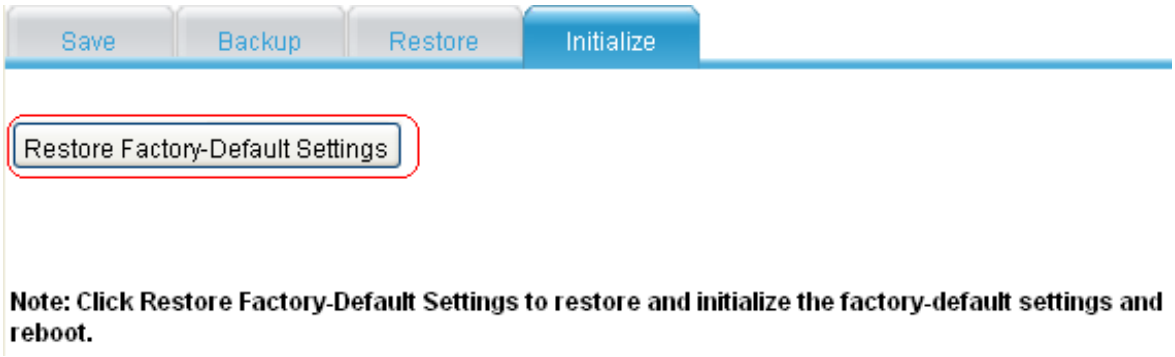
2) Click **Apply** to import the configuration file.

The page will display the following prompt after finishing the import. The restored configuration file takes effect at next startup.



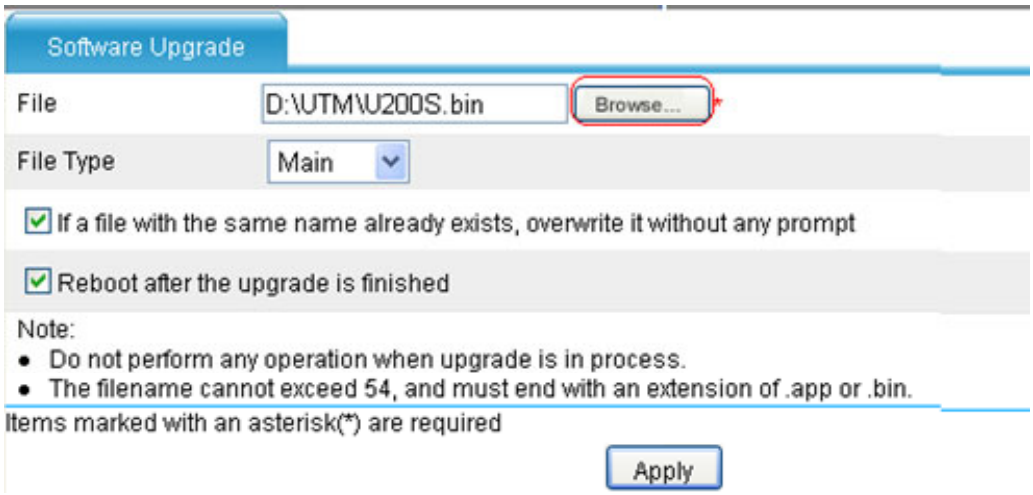
Restoring to the factory defaults

Select **Device Management** > **Maintenance** from the navigation tree, click the **Initialize** tab, and then click the **Restore Factory-Default Settings** button to restore the factory default settings and reboot the device.



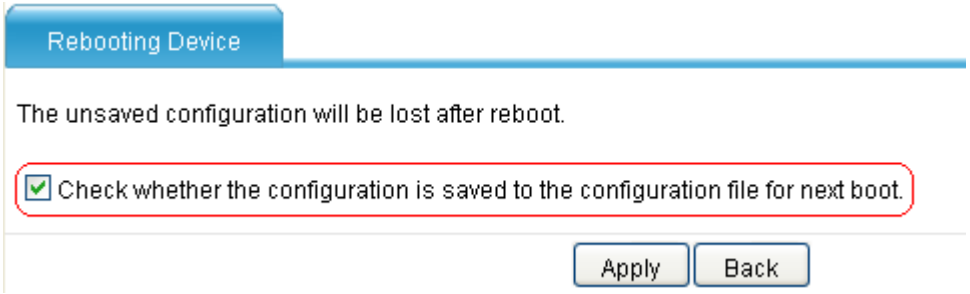
Upgrading the software

Select **Device Management** > **Software Upgrade** from the navigation tree, and click the **Browse** button. Specify the upgrade file, and click **Open**.



Rebooting the device

Select **Device Management** > **Reboot** from the navigation tree, and click **Apply**.



Verification

Verifying configuration saving

- When the current configuration is saved, the configuration information is not lost when you reboot the device.
- If the saved configuration file is encrypted, the configuration information in the file is displayed in cipher text.

Verifying configuration backup

You can back up the saved configuration file to a PC or other storage media.

Verifying configuration restoration

- After the configuration file is imported, the Web page displays success of import.
- After the device is rebooted, the configuration information and the imported configuration file are consistent.

Verifying configuration restoration to the factory defaults

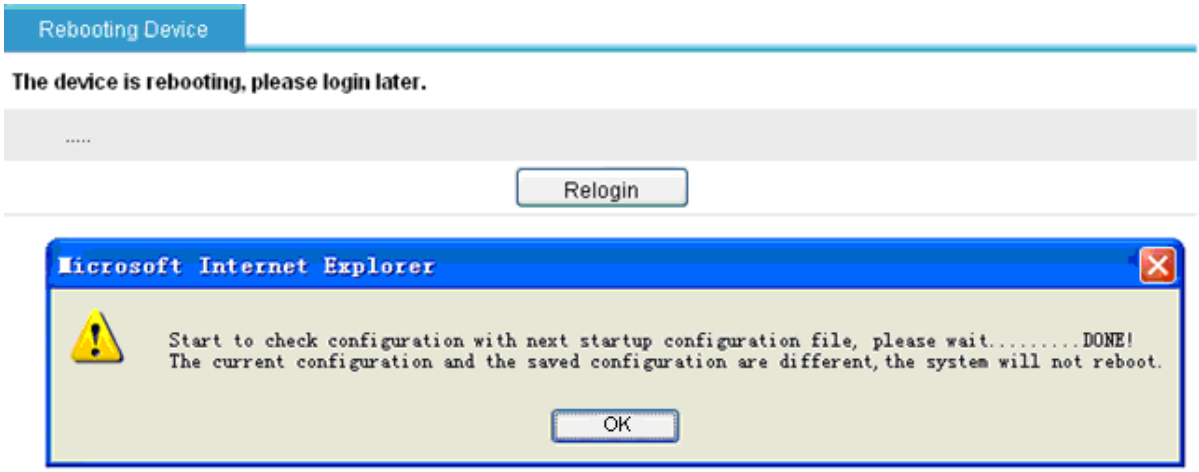
The system can automatically reboot, delete the current configuration information, and restore to the factory defaults.

Verifying software upgrade

- The system displays upgrading during the software upgrade.
- If you select **Reboot after the upgrade is finished**, the system will reboot after the upgrade finishes.
- If you do not select **Reboot after the upgrade is finished**, you need to manually reboot the device.

Verifying device reboot

- After clicking **Apply**, the device automatically reboots.
- If you select **Check whether the configuration is saved to the configuration file for next boot**, and click **Apply**, the system gives prompt in the case that the configuration is not saved, and the system does not reboot automatically.



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SecPath Series Firewalls ARP Attack Protection Configuration Example

Keywords: ARP

Abstract: ARP provides no security mechanism and thus is prone to network attacks. The device provides multiple features to detect and prevent ARP attacks. This document describes a configuration example using these features.

Acronyms:

Acronym	Full spelling
ARP	Address Resolution Protocol

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Feature Overview

Although ARP is easy to implement, it provides no security mechanism and thus is prone to network attacks. Currently, ARP attacks and viruses are threatening LAN security. The device provides multiple features to detect and prevent such attacks.

Application Scenarios

ARP attack protection is applicable to campus and enterprise networks.

Configuration Guidelines

- Sending of gratuitous ARP packets takes effect on an interface only when the link of the interface goes up and an IP address has been assigned to the interface.
- If you change the interval for sending gratuitous ARP packets, the configuration is effective at the next sending interval.
- Do not enable gratuitous ARP on an interface configured with a VRRP group.
- You are recommended not to perform other operations during an ARP automatic scan.
- Fixed ARP changes dynamic ARP entries into static only when these entries are learnt on a Layer 3 Ethernet interface, Layer 3 Ethernet subinterface, or VLAN interface.

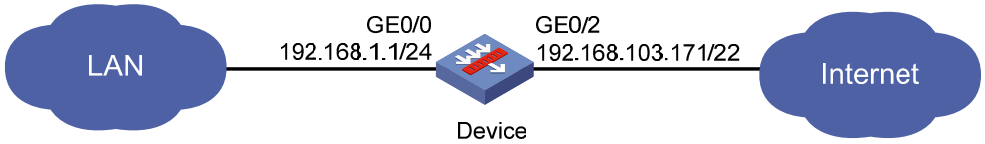
ARP Attack Protection Configuration Example

Network Requirements

Note

The U200-S is used in this configuration example. This example is applicable to SecPath F5000-A5, SecPath F1000E, and SecPath UTM 200-A/200-M/200-S firewalls.

Figure 1 Network diagram for ARP attack protection configuration example



Configuration Considerations

- Specify interface addresses.
- Add interfaces to security zones.
- Configure gratuitous ARP.
- Configure ARP automatic scanning.
- Configure fixed ARP.

Software Version Used

SecPath F1000E: V300R001B01 R3166 series and V300R001B01 F3166 series

SecPath F5000-A5: V300R002B01 R3206 series

SecPath UTM 200-A/200-M/200-S firewalls: V500R001B01 R5116 series

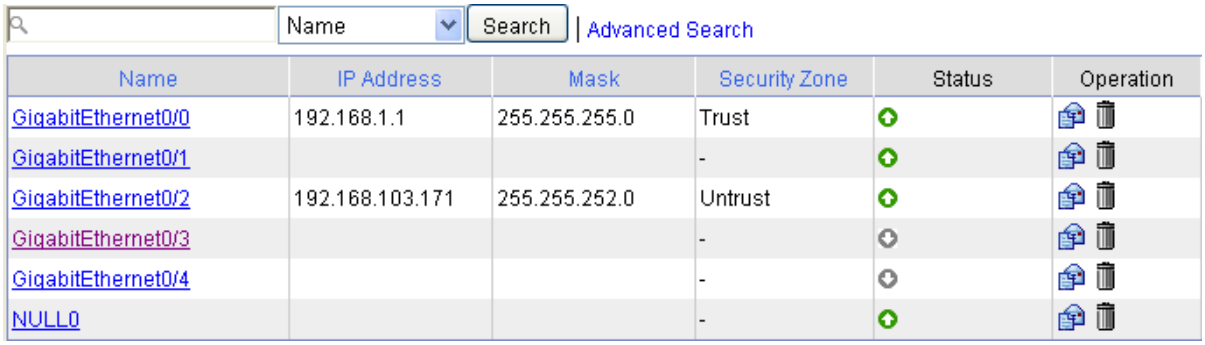
Configuration Procedures

Specifying Interface Addresses

Specify the IP address of GigabitEthernet 0/0

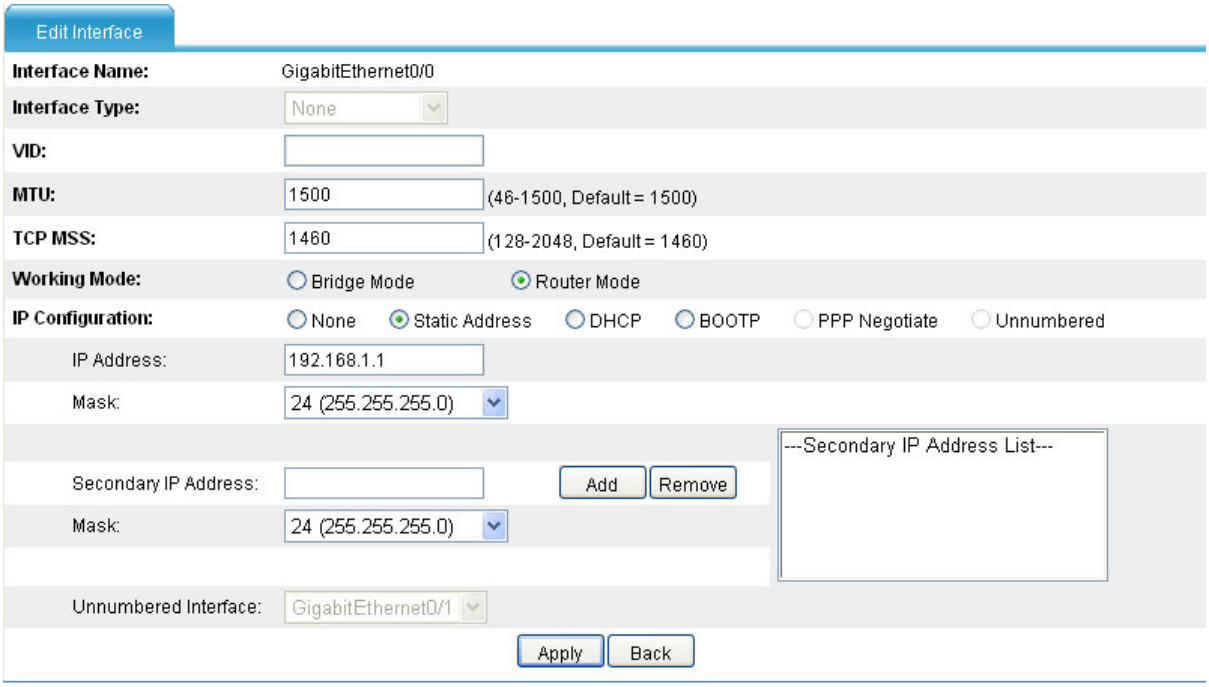
- Select **Device Management** > **Interface** from the navigation tree.

Figure 2 Interfaces



- Click the icon of GigabitEthernet 0/0 to enter the **Edit Interface** page. Configure the interface as shown in Figure 3, and then click **Apply** to return to the **Interface** page.

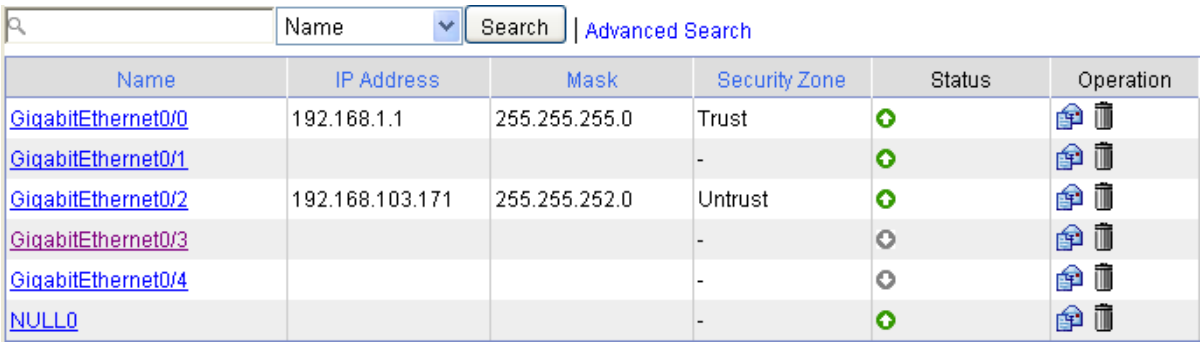
Figure 3 Edit interface GigabitEthernet 0/0



Specify the IP address of GigabitEthernet 0/2

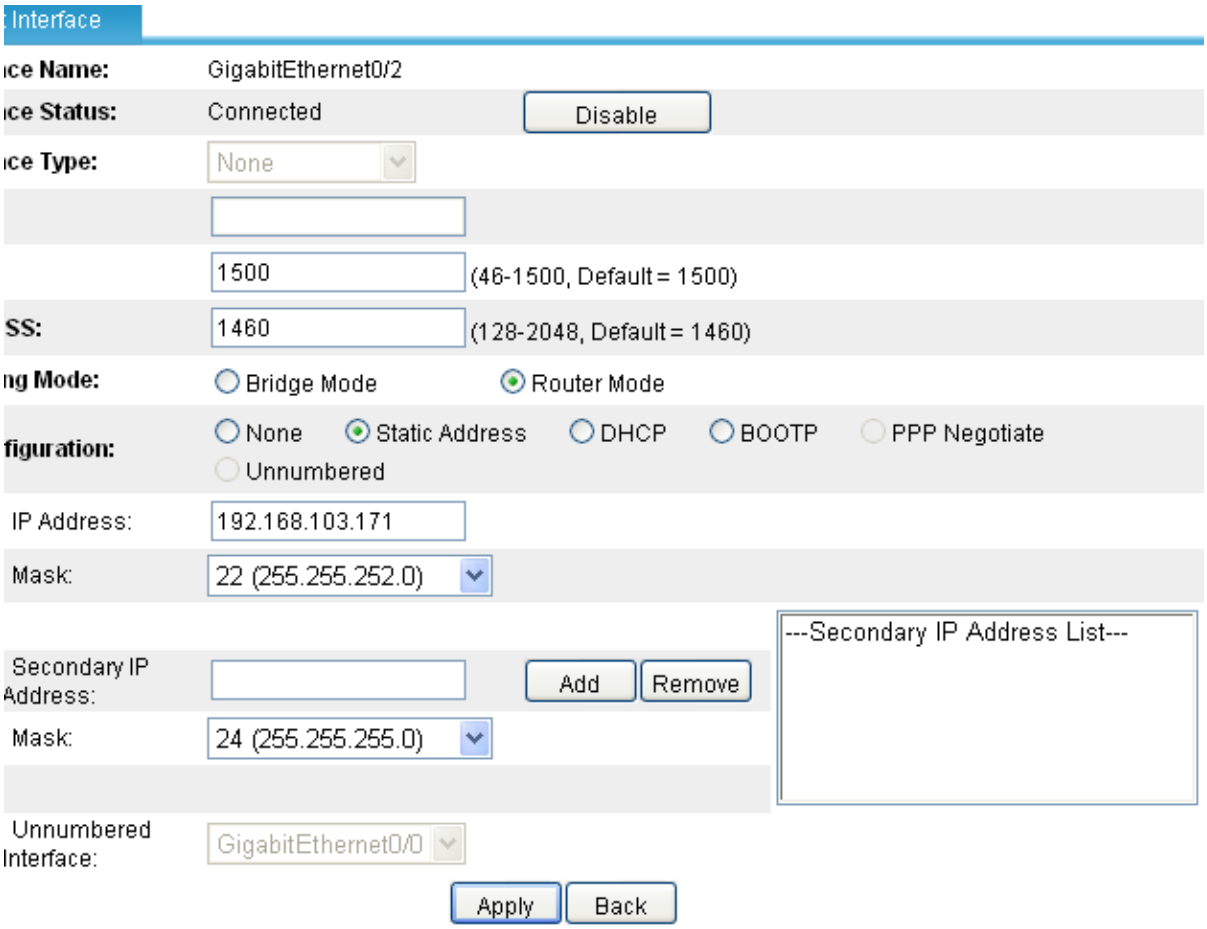
1) Select **Device Management** > **Interface** from the navigation tree.

Figure 4 Interfaces



Click the icon of GigabitEthernet 0/2 to enter the **Edit Interface** page. Configure the interface as shown in Figure 5, and then click **Apply** to return to the **Interface** page.

Figure 5 Edit interface GigabitEthernet 0/2



Adding Interfaces to Zones

Add GigabitEthernet 0/0 to the Trust zone

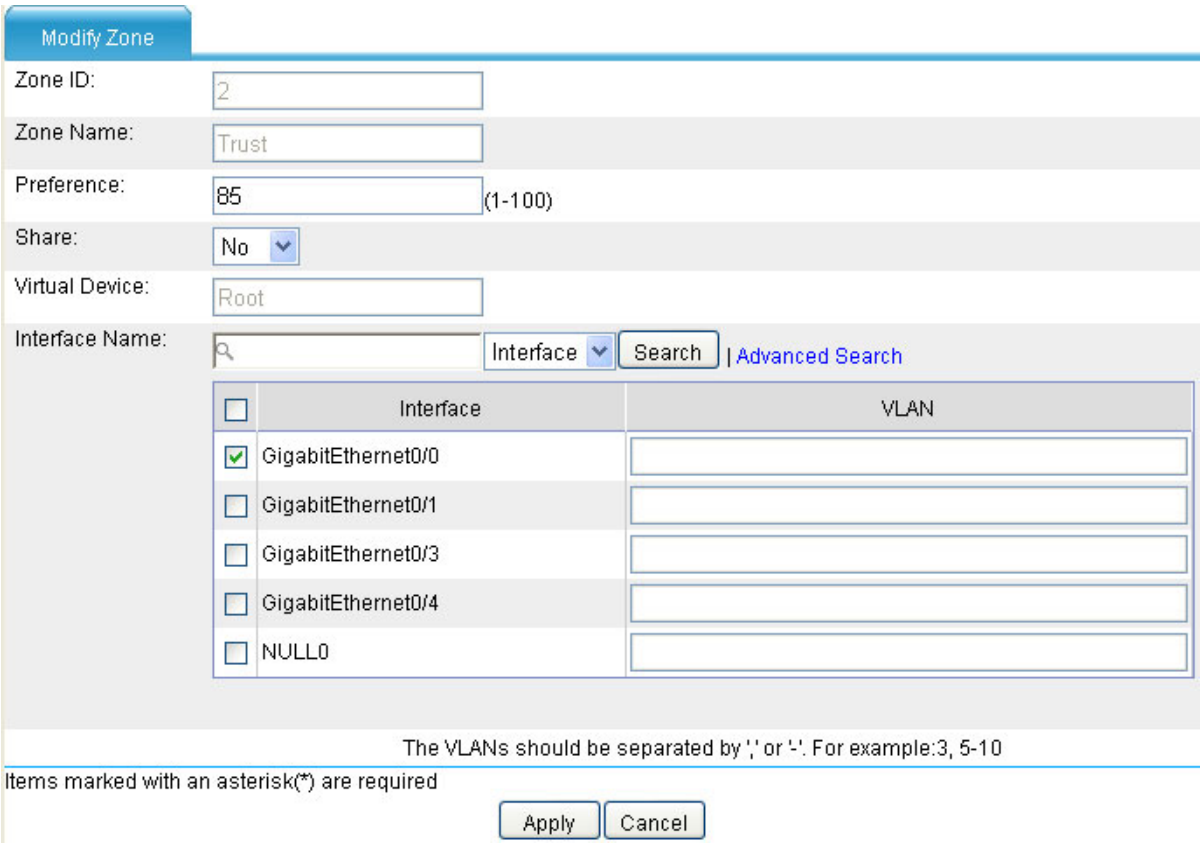
- Select **Device Management** > **Zone** from the navigation tree.

Figure 6 Security zones

Zone ID	Zone Name	Preference	Share	Virtual Device	Operation
0	Management	100	no	--	
1	Local	100	no	Root	
2	Trust	85	no	Root	
3	DMZ	50	no	Root	
4	Untrust	5	no	Root	

- Click the icon of the Trust zone to enter the **Modify Zone** page. Add GigabitEthernet 0/0 to the Trust zone as shown in Figure 7, and then click **Apply** to return to the **Zone** page.

Figure 7 Add GigabitEthernet 0/0 to the Trust zone



Add GigabitEthernet 0/2 to the Untrust zone

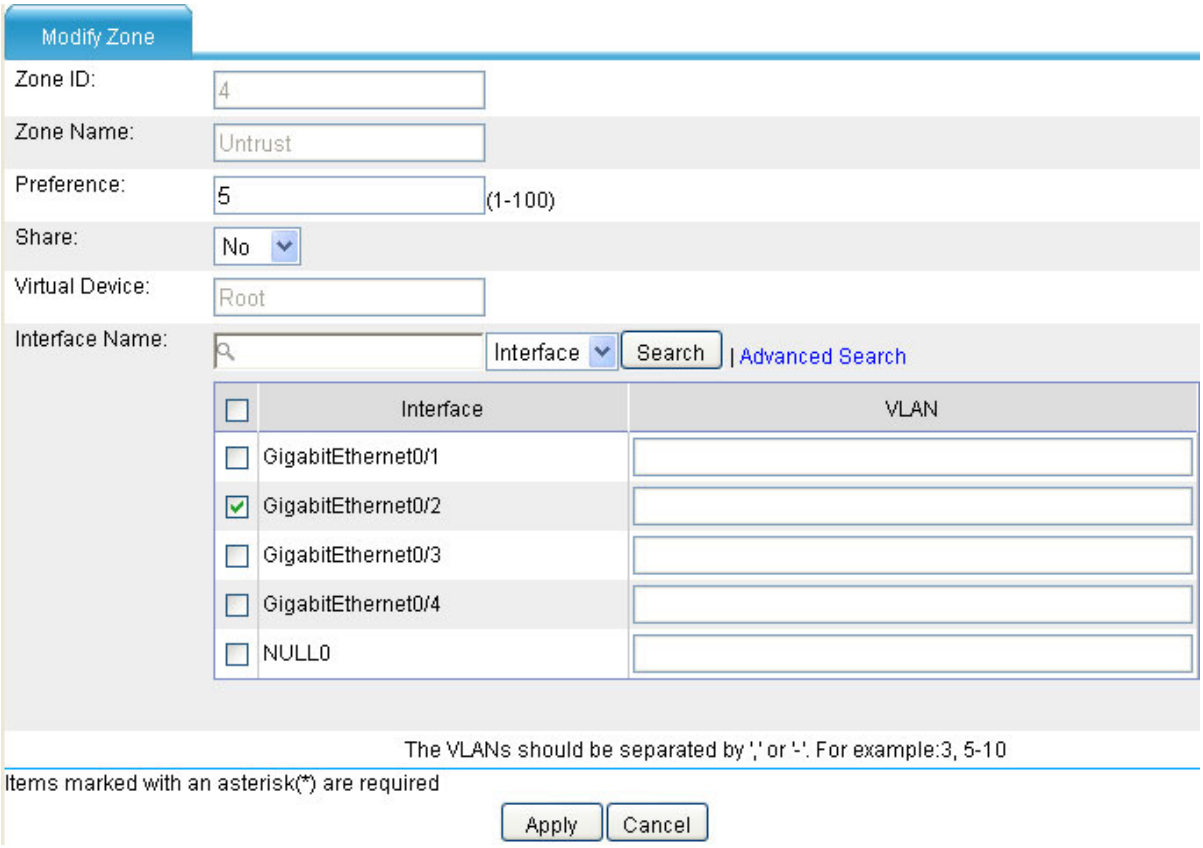
1) Select **Device Management** > **Zone** from the navigation tree.

Figure 8 Security zones

Zone ID	Zone Name	Preference	Share	Virtual Device	Operation
0	Management	100	no	--	
1	Local	100	no	Root	
2	Trust	85	no	Root	
3	DMZ	50	no	Root	
4	Untrust	5	no	Root	

2) Click the icon of the Untrust zone to enter the **Modify Zone** page. Add GigabitEthernet 0/2 to the Untrust zone as shown in Figure 9, and then click **Apply** to return to the **Zone** page.

Figure 9 Add GigabitEthernet 0/2 to the Untrust zone



Configuring Gratuitous ARP

Introduction to gratuitous ARP

In a gratuitous ARP packet, the sender IP address and the target IP address are both the IP address of the device issuing the packet, the sender MAC address is the MAC address of the device, and the target MAC address is the broadcast address ff:ff:ff:ff:ff:ff.

A device implements the following functions by sending gratuitous ARP packets:

- Determining whether its IP address is already used by another device.
- Informing other devices about the change of its MAC address so that they can update their ARP entries.

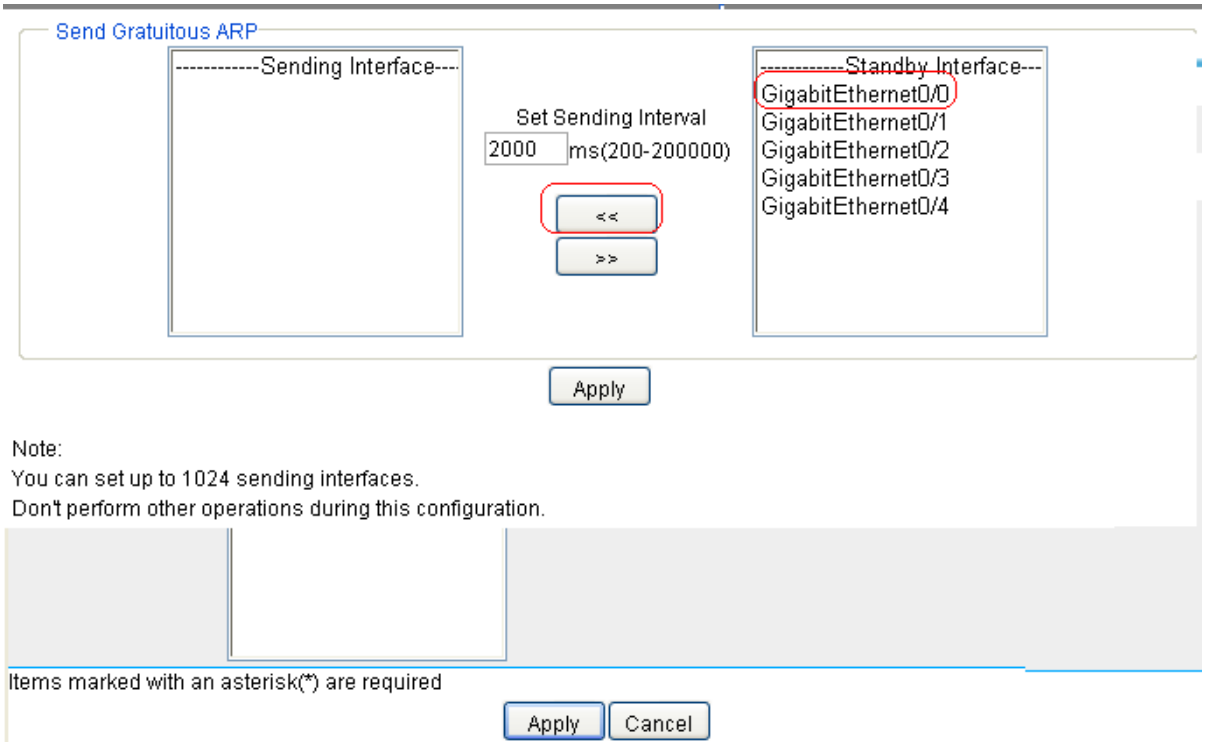
A device receiving a gratuitous ARP packet adds the information carried in the packet to its own dynamic ARP table if it finds no corresponding ARP entry exists in the cache.

Configuring sending of gratuitous ARP packets

- Select **Firewall** > **ARP Anti-Attack** > **Send Gratuitous ARP** from the navigation tree.

Select GigabitEthernet 0/0, leave the default sending interval unchanged or type a specific value, click **<<**, and then click **Apply**. After that, all devices on the internal network will record an ARP entry for the internal interface GigabitEthernet 0/0.

Figure 10 Configure sending of gratuitous ARP packets



Configuring ARP Automatic Scanning

Introduction to ARP automatic scanning

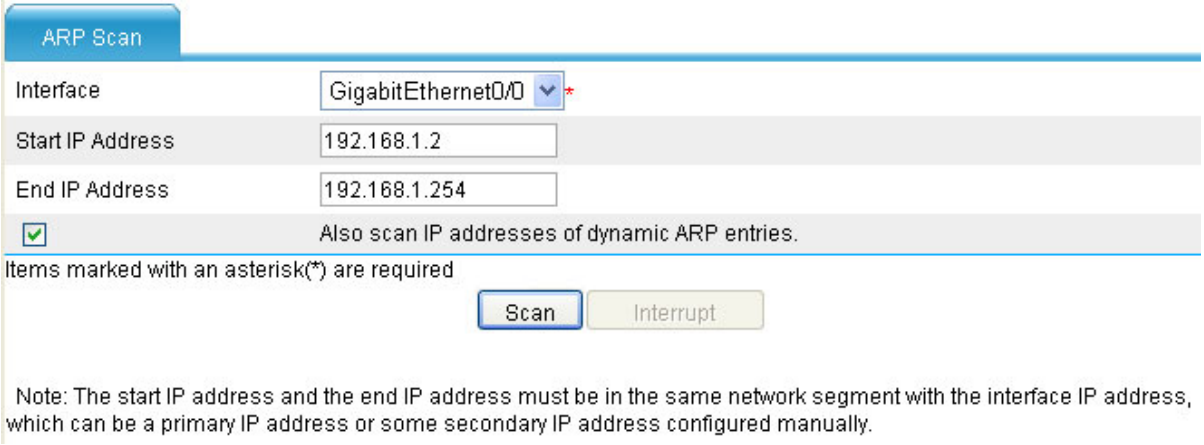
With ARP automatic scanning enabled on an interface, the device scans neighbors on the interface, requests their MAC addresses, and creates dynamic ARP entries.

Configuring ARP automatic scanning

- Select **Firewall** > **ARP Anti-Attack** > **Scan** from the navigation tree.

Select GigabitEthernet 0/0 and type the start IP address and the end IP address, as shown in the figure below. If no start IP address and end IP address are specified, the system scans the network segment according to the mask of the interface address.

Figure 11 Configure ARP scanning



Configuring Fixed ARP

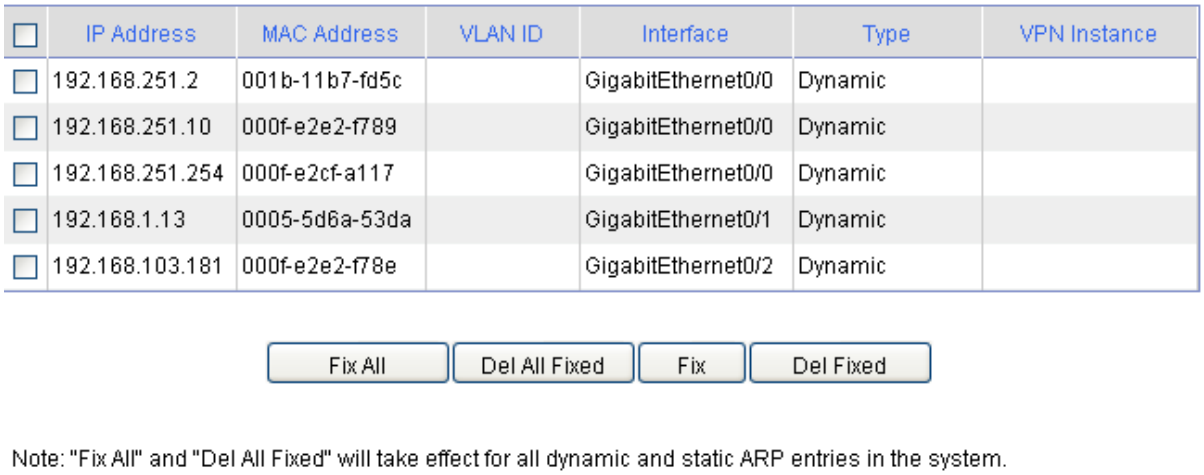
Introduction to Fixed ARP

Fixed ARP allows the device to change dynamic ARP entries (including those generated automatically) into static ARP entries, thus effectively preventing attackers from modifying ARP entries.

Configuring Fixed ARP

- Select **Firewall** > **ARP Anti-Attack** > **Fix** from the navigation tree. All dynamic and static ARP entries learnt by the firewall device are displayed, including those obtained by ARP automatic scanning.

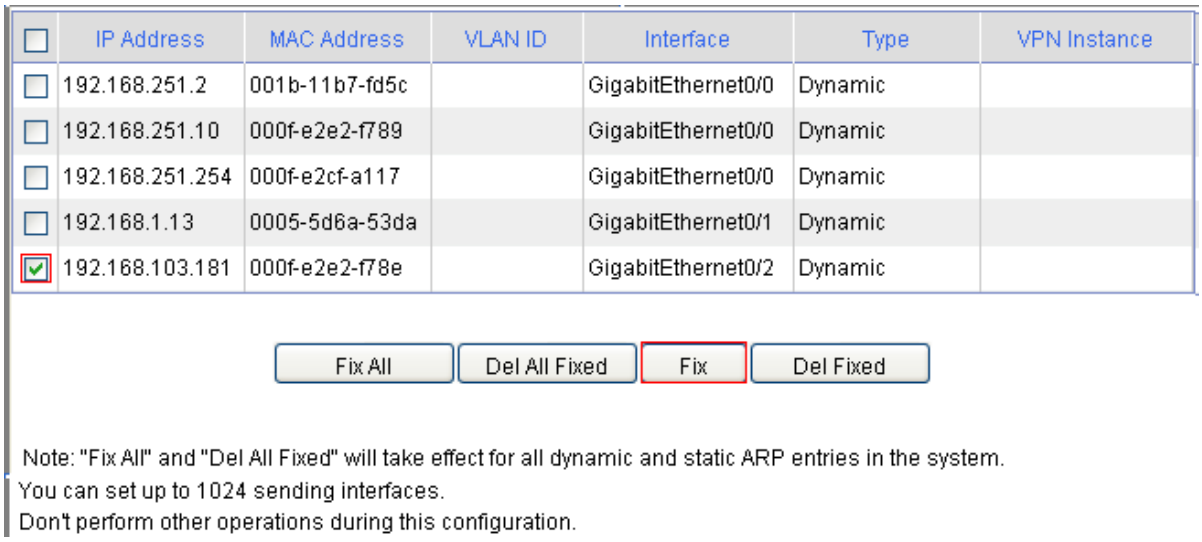
Figure 12 ARP entries



IP Address	MAC Address	VLAN ID	Interface	Type	VPN Instance
192.168.251.2	001b-11b7-fd5c		GigabitEthernet0/0	Dynamic	
192.168.251.10	000f-e2e2-f789		GigabitEthernet0/0	Dynamic	
192.168.251.254	000f-e2cf-a117		GigabitEthernet0/0	Dynamic	
192.168.1.13	0005-5d6a-53da		GigabitEthernet0/1	Dynamic	
192.168.103.181	000f-e2e2-f78e		GigabitEthernet0/2	Dynamic	

- Select one or multiple dynamic ARP entries you want to change into static, and click **Fix**.
- Select one or multiple static ARP entries you want to remove, and click **Del Fixed**.
- To change all dynamic ARP entries into static, click **Fix All**.
- To delete all static ARP entries, click **Del All Fixed**.

Figure 13 Configure fixed ARP



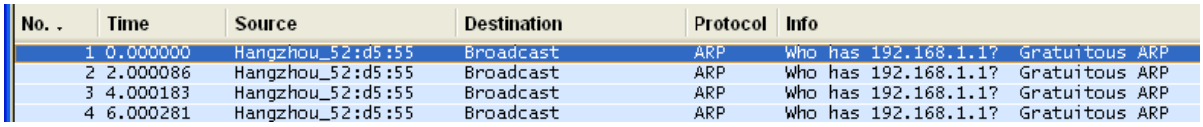
IP Address	MAC Address	VLAN ID	Interface	Type	VPN Instance
192.168.251.2	001b-11b7-fd5c		GigabitEthernet0/0	Dynamic	
192.168.251.10	000f-e2e2-f789		GigabitEthernet0/0	Dynamic	
192.168.251.254	000f-e2cf-a117		GigabitEthernet0/0	Dynamic	
192.168.1.13	0005-5d6a-53da		GigabitEthernet0/1	Dynamic	
192.168.103.181	000f-e2e2-f78e		GigabitEthernet0/2	Dynamic	

Verification

Verify gratuitous ARP

- Capture packets on the internal network 192.168.1.0/24. A gratuitous ARP packet sent from GigabitEthernet 0/0 is captured every two seconds.

Figure 14 Capture gratuitous ARP packets

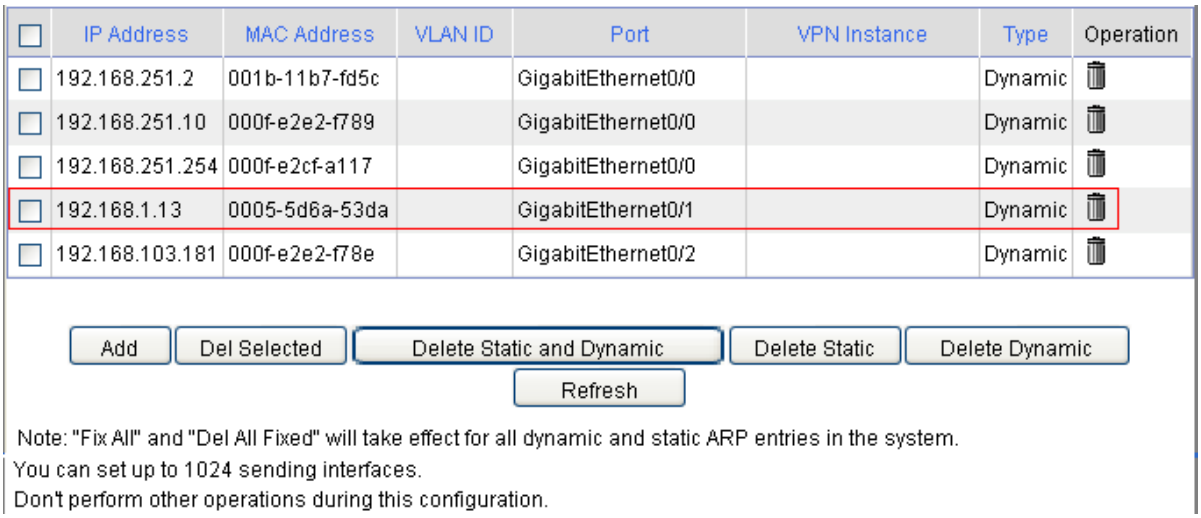


No.	Time	Source	Destination	Protocol	Info
1	0.000000	Hangzhou_52:d5:55	Broadcast	ARP	Who has 192.168.1.1? Gratuitous ARP
2	2.000086	Hangzhou_52:d5:55	Broadcast	ARP	Who has 192.168.1.1? Gratuitous ARP
3	4.000183	Hangzhou_52:d5:55	Broadcast	ARP	Who has 192.168.1.1? Gratuitous ARP
4	6.000281	Hangzhou_52:d5:55	Broadcast	ARP	Who has 192.168.1.1? Gratuitous ARP

Verfiy automatic ARP scanning

- After an automatic ARP scan is complete, all ARP entries of the internal network are displayed in the ARP table. Select **Firewall** > **ARP Anti-Attack** > **Fix** from the navigation tree to view all ARP entries. For example, you can view the ARP entries for network segment 192.168.1.0/24 as shown in the figure below:

Figure 15 ARP entries

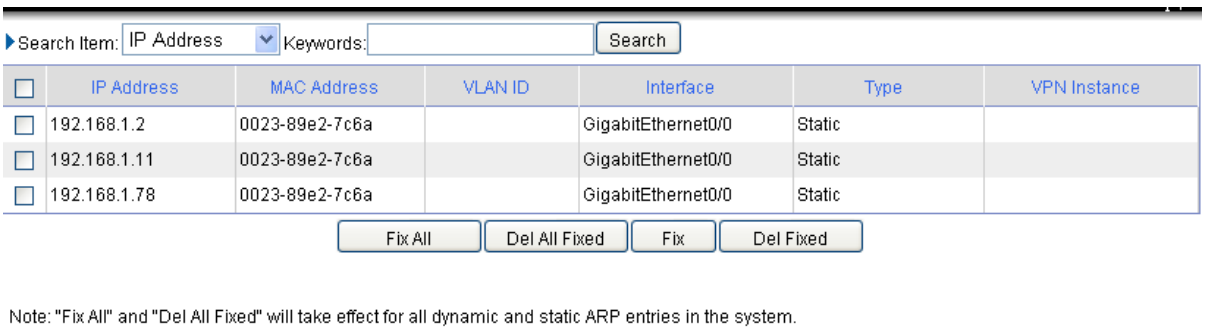


IP Address	MAC Address	VLAN ID	Port	VPN Instance	Type	Operation
192.168.251.2	001b-11b7-fd5c		GigabitEthernet0/0		Dynamic	
192.168.251.10	000f-e2e2-f789		GigabitEthernet0/0		Dynamic	
192.168.251.254	000f-e2cf-a117		GigabitEthernet0/0		Dynamic	
192.168.1.13	0005-5d6a-53da		GigabitEthernet0/1		Dynamic	
192.168.103.181	000f-e2e2-f78e		GigabitEthernet0/2		Dynamic	

Verify fixed ARP

- On the **Firewall** > **ARP Anti-Attack** > **Fix** page, select the ARP entries containing 192.168.1.2, 192.168.1.11, and 192.168.1.78, and click **Fix**. When a dynamic ARP entry is changed into static, it is displayed on the beginning of the ARP table.

Figure 16 Verify fixed ARP

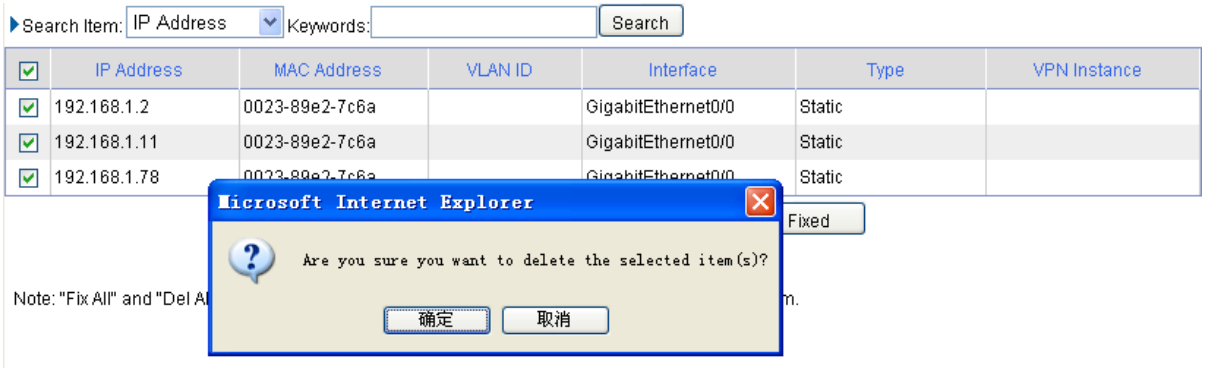


IP Address	MAC Address	VLAN ID	Interface	Type	VPN Instance
192.168.1.2	0023-89e2-7c6a		GigabitEthernet0/0	Static	
192.168.1.11	0023-89e2-7c6a		GigabitEthernet0/0	Static	
192.168.1.78	0023-89e2-7c6a		GigabitEthernet0/0	Static	

Verfiy deletion of fixed ARP entries

- On the **Firewall** > **ARP Anti-Attack** > **Fix** page, select the static ARP entries containing 192.168.1.2, 192.168.1.11, and 192.168.1.78, and click **Del Fixed**. A message box is displayed as shown in the figure below. Click **OK**. After that, the static ARP entries are removed. The entries are displayed when they are learnt again or an ARP scan is carried out on corresponding interfaces.

Figure 17 Verify deletion of fixed ARP entries



References

Protocols and Standards

- RFC 826: *An Ethernet Address Resolution Protocol*

Related Documentation

ARP Attack Protection Configuration in the Web configuration documentation set

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SecPath Series Firewalls IPsec Configuration Examples

Keywords: IKE, IPsec

Abstract: This document describes basic concepts of IKE and IPsec, and provides configuration examples for SecPath series firewalls.

Acronyms:

Acronym	Full spelling
IKE	Internet Key Exchange
IPsec	IP Security

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IPsec Configuration

IPsec Overview

IP Security (IPsec) refers to a series of protocols defined by the Internet Engineering Task Force (IETF) to provide high quality, interoperable, and cryptology-based security for IP packets. By means of facilities including encryption and data origin authentication, it delivers these security services at the IP layer:

- Confidentiality: The sender encrypts packets before transmitting them over the Internet.
- Data integrity: The receiver verifies the packets received from the sender to ensure they are not tampered during transmission.
- Data origin authentication: The receiver authenticates the legality of the sender.
- Anti-replay: The receiver examines packets and rejects outdated or repeated packets.

IPsec delivers these benefits:

- Reduced key negotiation overheads and streamlined IPsec maintenance by supporting the Internet Key Exchange (IKE) protocol, which provides automatic key negotiation and automatic IPsec security association (SA) setup and maintenance.
- Good compatibility. IPsec can be applied to all IP-based application systems and services without any modification to them.
- Encryption on a per-packet rather than per-flow basis. This allows for flexibility and greatly enhances IP security.

Implementation of IPsec

IPsec consists of a series of protocols for IP data security, including Authentication Header (AH), Encapsulating Security Payload (ESP), IKE, and algorithms for authentication and encryption. AH and ESP provides security services and IKE performs key exchange. For how IKE works, refer to *IKE Configuration*.

IPsec provides two security mechanisms: authentication and encryption. The authentication mechanism allows the receiver of an IP packet to authenticate the sender and check if the packet has been tampered. The encryption mechanism ensures data confidentiality and protects data from being eavesdropped en route.

IPsec is available with two security protocols:

- AH (protocol 51): Provides data origin authentication, data integrity, and anti-replay services. For these purposes, an AH header is added to each IP packet. AH is suitable for transmitting non-critical data, because it cannot prevent eavesdropping even though it works fine in preventing data tampering. AH supports authentication algorithms such as Message Digest (MD5) and Secure Hash Algorithm (SHA-1).
- ESP (protocol 50): Provides data encryption in addition to origin authentication, data integrity, and anti-replay services. ESP works by inserting an ESP header and an ESP tail in IP packets. Unlike AH, ESP encrypts data before it is encapsulated in the IP header to ensure data confidentiality. ESP supports the encryption algorithms including Data Encryption Standard (DES), 3DES, and Advanced Encryption Standard (AES), and authentication algorithms such as MD5 and SHA-1 algorithms.

Both AH and ESP provide authentication services. However, the authentication service provided by AH is stronger than that provided by ESP. In practice, you can choose either or both security protocols as required. When both AH and ESP are used, an IP packet is encapsulated first by ESP and then by AH.

Basic Concepts of IPsec

Security association

IPsec enables secure communication between two ends, which are called IPsec peers.

Security associations (SAs) are fundamental to IPsec. An SA is a set of elements including the protocols (AH, ESP or both), encapsulation mode (transport mode or tunnel mode), encryption algorithm (DES, 3DES, or AES), shared key used for flow protection, and key lifetime. An SA can be created with IKE.

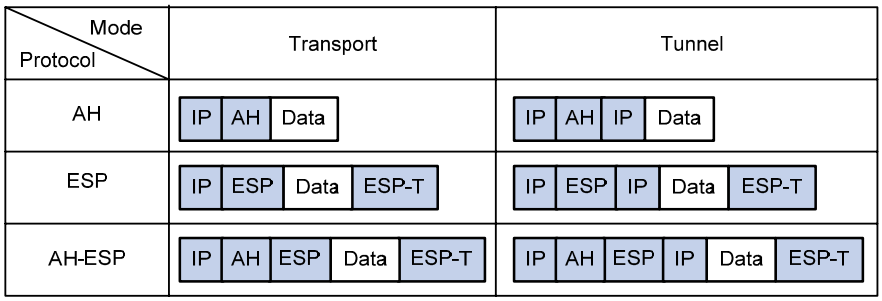
Encapsulation modes

IPsec can work in the following two modes:

- Tunnel mode: The whole IP packet is used to calculate the AH/ESP header, which will be encapsulated into a new IP packet together with the ESP-encrypted data. Generally, tunnel mode is used for communication between two security gateways.
- Transport mode: Only the transport layer data is used to calculate the AH/ESP header, which will be put after the original IP header and before the ESP-encrypted data. Generally, transport mode is used for communication between two hosts or a host and a security gateway.

Figure 1 illustrates how data are encapsulated by different security protocols in tunnel and transport modes. Here, the term data refers to the transport layer data.

Figure 1 Encapsulation by security protocols in different modes



Authentication algorithms and encryption algorithms

1) Authentication algorithms

Authentication algorithms are implemented through hash functions. A hash function takes a message of arbitrary length and generates a message digest of fixed length. IPsec peers calculate the message digests respectively. If the resulting digests are identical, the packet is considered intact and not tampered.

There are two types of IPsec authentication algorithms:

- MD5: Takes a message of arbitrary length and generates a 128-bit message digest.
- SHA-1: Takes a message less than the 64th power of 2 in bits and generates a 160-bit message digest.

Slower than MD5, SHA-1 provides higher security.

2) Encryption algorithms

Most encryption algorithms depend on symmetric key systems, which decrypt data by using the same keys for encryption. Currently, three encryption algorithms are available for IPsec on the device:

- DES: Data encryption standard, encrypts a 64-bit block of plain text with a 56-bit key.
- 3DES: Triple DES, encrypts a plain text with three 56-bit DES keys, which total up to 168 bits.
- AES: Advanced encryption standard, encrypts a plain text with a 128-bit, 192-bit, or 256-bit key.

AES, 3DES, and DES are in descending order in terms of security. Higher security means more complex implementation and lower speed. DES is enough to meet general requirements.

Application Scenarios

IPsec is a VPN technology that delivers the security services of confidentiality, data integrity, and origin authentication at the IP layer. IPsec can use IKE to update keys periodically, enhancing system security. IPsec is widely used for transmitting sensitive data in VPN networks.

Configuring IPsec

At present, the device supports IPsec tunnel setup with IPsec polices. In this approach, ACLs are used in IPsec policies to identify data flows to be protected. The use of ACLs adds flexibility to IPsec policies. IPsec policies can take effect only after they are applied to physical interfaces.

The following is the generic IPsec policy configuration procedure:

1) Configure ACLs for identifying data flows to be protected.
2) Configure IPsec proposals to specify the security protocols, authentication and encryption algorithms, and encapsulation mode.
3) Configure IPsec policies to associate data flows with IPsec proposals and specify the SA negotiation mode, peer IP addresses (namely the start and end points of the IPsec tunnel), required keys, and SA lifetime.
4) Apply the IPsec policies to interfaces to finish IPsec tunnel configuration.

Perform the tasks in Table 1 to configure IPsec.

Table 1 IPsec configuration task list

Task	Remarks
Configuring ACLs	Required One important function of ACLs is identifying traffic based on matching criteria. They are widely used in scenarios where traffic identification is desired such as QoS and IPsec. **Highlight** *This document covers only referencing ACLs in IPsec. To create ACLs, select **Firewall** > **ACL** from the navigation tree.*
Configuring IKE	Required IKE provides automatic key negotiation and SA establishment services for IPsec, simplifying the application, management, configuration and maintenance of IPsec dramatically.
Configuring an IPsec Proposal	Required An IPsec proposal defines a set of security parameters for IPsec SA negotiation, including the security protocol, encryption/authentication algorithms, and encapsulation mode. **Highlight** *Changes to an IPsec proposal affect only SAs negotiated after the changes.*
Configuring an IPsec Policy Template	Required when an IPsec policy needs to reference an IPsec policy template group. An IPsec policy template group is a collection of IPsec policy templates with the same name but different sequence numbers. In an IPsec policy template group, an IPsec policy template with a smaller sequence number has a higher priority.
Configuring an IPsec Policy	Required Configure an IPsec policy by specifying the parameters directly or by referencing a created IPsec policy template. The Web interface supports only IKE-dependent IPsec policies. An IPsec policy group is a collection of IPsec policies with the same name but different sequence numbers. In an IPsec policy group, an IPsec policy with a smaller sequence number has a higher priority. **Highlight** *An IKE-dependent IPsec policy created by referencing a template cannot be used to initiate SA negotiation, but it can be used to respond to a negotiation request. The parameters specified in the IPsec policy template must match those of the remote end, while the parameters not defined in the template are determined by the initiator.*
Applying an IPsec Policy Group	Required Apply an IPsec policy group to an interface (logical or physical) to protect certain data flows.

Task	Remarks
Viewing IPsec SAs	Optional View brief information about established IPsec SAs to verify your configuration.
Viewing Packet Statistics	Optional View packet statistics to verify your configuration.

Configuring ACLs

IPsec uses ACLs to identify data flows. Each ACL rule contains a **deny** or **permit** keyword and is regarded as a deny or permit statement. A rule with the **permit** keyword identifies a data flow to be protected by IPsec, while a rule with the **deny** keyword identifies a data flow that does not need to be protected by IPsec.

To configure ACLs, select **Firewall** > **ACL** to enter the ACL configuration page, and perform the following configurations:

1) Create an ACL.
2) Configure rules for the ACL.

Note

Ensure that all permit statements applied in the inbound direction are for IPsec protected traffic flows only. This is to avoid normal incoming packets from being dropped because of permit statement hits.

Configuring IKE

An SA can be created with IKE. This section describes how to configure IKE.

Configuring Global IKE Parameters

Select **VPN** > **IKE** > **Global** from the navigation tree to enter IKE global configuration page, as shown in Figure 2.

Figure 2 IKE global configuration

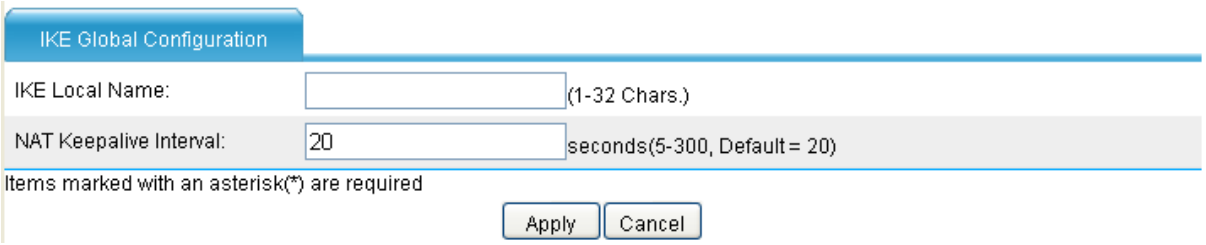


Table 2 describes the configuration items for configuring global IKE parameters.

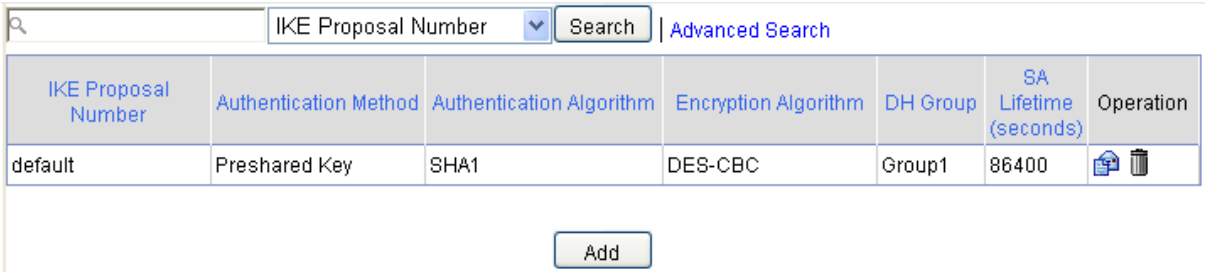
Table 2 Global IKE configuration items

Item	Description
IKE Local Name	Type a name for the local security gateway. If the local device needs to act as the IKE negotiation initiator and use the local gateway name for IKE negotiation, you need to configure this argument on the local device. Then, the local device sends its gateway name as identification to its peer and the peer uses the locally configured remote gateway name to authenticate the local device. Therefore, make sure that the local gateway name configured here is identical to the remote gateway name configured on its peer. By default, the device name is used as the local gateway name.
NAT Keepalive Interval	Set the interval at which the ISAKMP SA sends NAT keepalive packets to its peer. NAT mappings on a NAT gateway may get aged. If no packet traverses an IPsec tunnel in a certain period of time, the NAT mapping will be deleted, disabling the tunnel beyond the NAT gateway from transferring data. To prevent NAT mappings from being aged, an ISAKMP SA sends to its peer NAT keepalive packets at a certain interval to keep the NAT session alive.

Configuring an IKE Proposal

Select **VPN** > **IKE** > **Proposal** from the navigation tree to display existing IKE proposals, as shown in Figure 3. Then, click **Add** to enter the IKE proposal configuration page, as shown in Figure 4.

Figure 3 IKE proposal list



Note

Typically, IKE proposal configuration is omitted and the default IKE proposal named **default** is used.

Figure 4 Add an IKE proposal

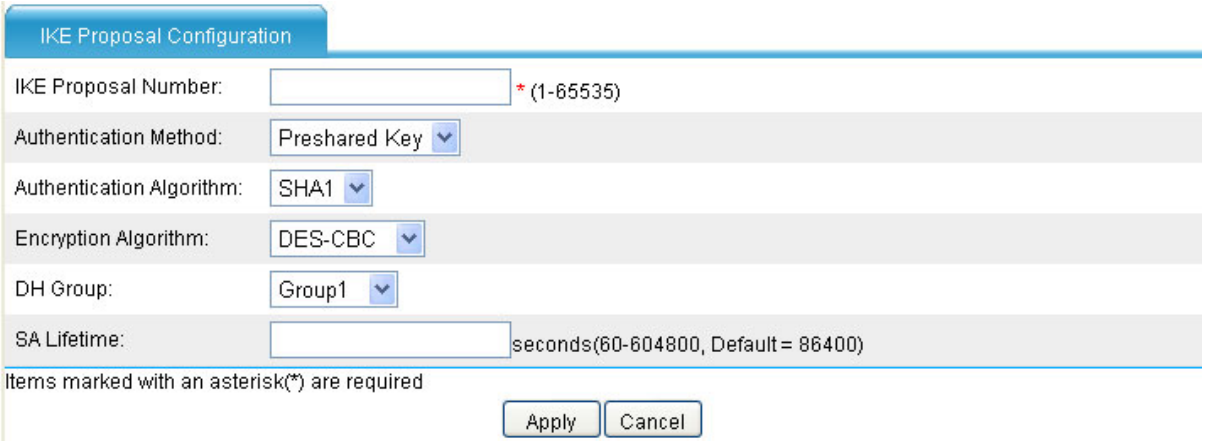


Table 3 describes the configuration items for creating an IKE proposal.

Table 3 IKE proposal configuration items

Item	Description
IKE Proposal Number	Type the IKE proposal number. The number also stands for the priority of the IKE proposal, with a smaller value meaning a higher priority. During an IKE negotiation, the system matches IKE proposals in order of proposal number, starting from the smallest one.
Authentication Method	Select the authentication method to be used by the IKE proposal. • **Preshared Key**: Uses the pre-shared key method. • **RSA Signature**: Uses the RSA digital signature method.
Authentication Algorithm	Select the authentication algorithm to be used by the IKE proposal. • **SHA1**: Uses HMAC-SHA1. • **MD5**: Uses HMAC-MD5.
Encryption Algorithm	Select the encryption algorithm to be used by the IKE proposal. • **DES-CBC**: Uses the DES algorithm in CBC mode and 56-bit keys for encryption. • **3DES-CBC**: Uses the 3DES algorithm in CBC mode and 168-bit keys for encryption. • **AES-128**: Uses the AES algorithm in CBC mode and 128-bit keys for encryption. • **AES-192**: Uses the AES algorithm in CBC mode and 192-bit keys for encryption. • **AES-256**: Uses the AES algorithm in CBC mode and 256-bit keys for encryption.
DH Group	Select the DH group to be used in key negotiation phase 1. • **Group1**: Uses the 768-bit Diffie-Hellman group. • **Group2**: Uses the 1024-bit Diffie-Hellman group. • **Group5**: Uses the 1536-bit Diffie-Hellman group. • **Group14**: Uses the 2048-bit Diffie-Hellman group.

Item	Description
SA Lifetime	Type the ISAKMP SA lifetime of the IKE proposal. Before an SA expires, IKE negotiates a new SA. As soon as set up, the new SA takes effect immediately and the old one is cleared automatically when it expires. **Highlight** *If the SA lifetime expires, the system automatically updates the ISAKMP SA. As DH calculation in IKE negotiation takes time, especially on low-end devices, it is recommended to set the lifetime greater than 10 minutes to prevent the SA update from influencing normal communication.*

Configuring an IKE Peer

Select **VPN** > **IKE** > **Peer** from the navigation tree to display existing IKE peers, as shown in Figure 5. Then, click **Add** to enter the IKE peer configuration page, as shown in Figure 6.

Figure 5 IKE peer list

Figure 6 Add an IKE peer

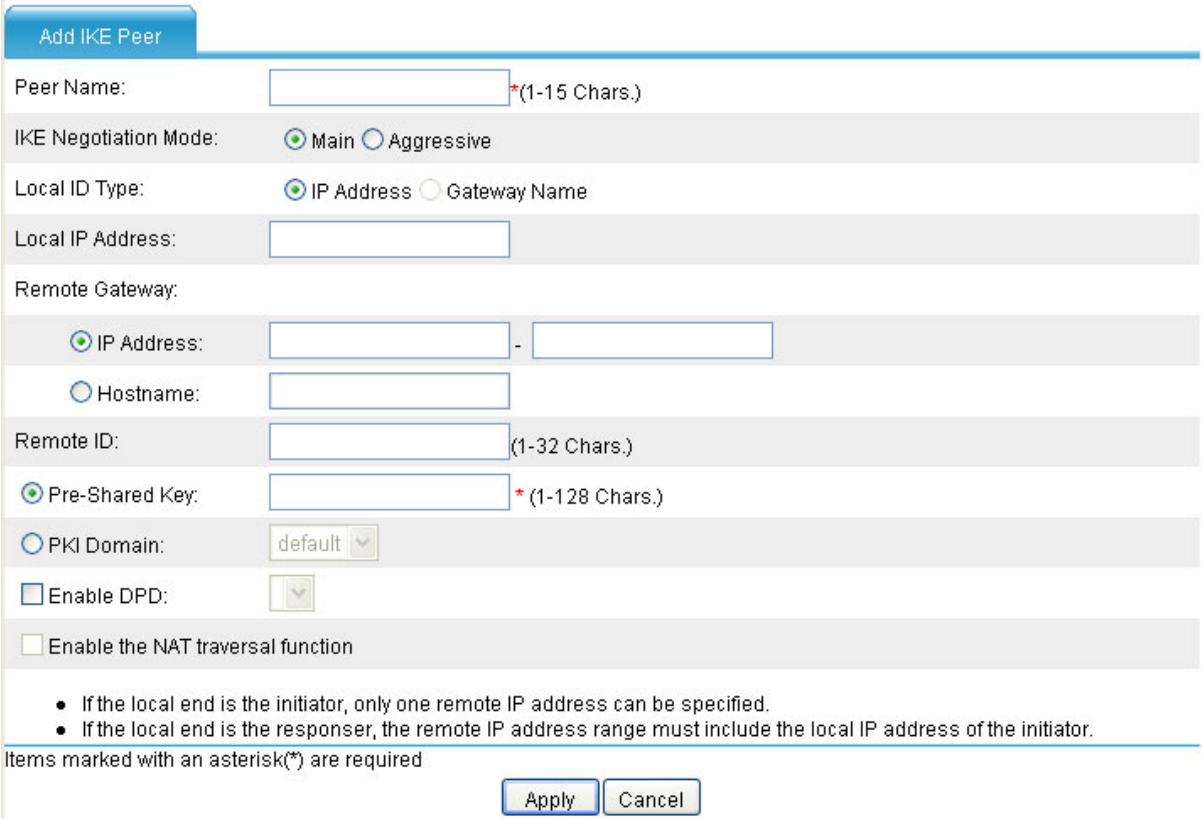


Table 4 describes the configuration items for creating an IKE peer.

Table 4 IKE peer configuration items

Item	Description
Peer Name	Type a name for the IKE peer.
IKE Negotiation Mode	Select the IKE negotiation mode for phase 1, which can be **Main** or **Aggressive**. **Highlight** • *If one end of an IPsec tunnel is configured to obtain an IP address dynamically, the IKE negotiation mode must be **Aggressive**. In this case, SAs can be established as long as the username and password are correct.* • *The specified negotiated mode is used when the local peer is the negotiation initiator. When acting as the responder, the negotiation mode of the initiator is used.*
Local ID Type	Select the local ID type for IKE negotiation phase 1. • IP Address: Uses an IP address as the ID in IKE negotiation. • Gateway Name: Uses a gateway name as the ID in IKE negotiation. **Highlight** *In main mode, only the ID type of IP address can be used in IKE negotiation and SA establishment.*

Item		Description
Local IP Address		Type the IP address of the local security gateway. By default, it is the primary IP address of the interface referencing the security policy. Configure this item when you want to specify a special address for the local security gateway. **Highlight** *Normally, you do not need to specify the local IP address. You only need to do so when you want to specify a special address, such as the loopback interface address. For the local peer to act as the initiator, you need to configure the remote security gateway name or IP address, so that the local peer can find the remote peer during the negotiation.*
Remote Gateway	IP Address	Type the IP address or host name of the remote security gateway. • You can specify an IP address or a range of IP addresses for the remote gateway. If the local end is the initiator of IKE negotiation, it can have only one remote IP address and its remote IP address must match the local IP address configured on its peer. If the local end is the responder of IKE negotiation, it can have more than one remote IP address and one of its remote IP addresses must match the local IP address configured on its peer. • The host name of the remote gateway is the only identifier of the IPsec peer in the network. The host name can be resolved into an IP address by the DNS server. If host name is used, the local end can serve as the initiator of IKE negotiation.
	Hostname	
Remote ID		Type the name of the remote security gateway. If the local ID type configured for the IKE negotiation initiator is **Gateway Name**, the initiator sends its gateway name (IKE Local Name) to the responder for identification. The responder then uses the locally configured remote gateway name (Remote ID) to authenticate the initiator. Therefore, make sure that the remote gateway name configured here is identical to the local gateway name (IKE Local Name) configured on its peer.
Pre-Shared Key		Configure one of these two items according to the authentication method: • If the authentication method is pre-shared key, select **Pre-Shared Key** and then type the pre-shared key in the following text box. • If the authentication method is RSA signature, select **PKI Domain** and then select the PKI domain to which the certificate belongs in the following drop-down box.
PKI Domain		
Enable DPD		Select the IKE DPD to be applied to the IKE peer.

Item	Description
Enable the NAT traversal function	Enable the NAT traversal function for IPsec/IKE. The NAT traversal function must be enabled if a NAT security gateway exists in an IPsec/IKE VPN tunnel. In main mode, IKE does not support NAT traversal and therefore this item is unavailable. **Highlight** *To save IP addresses, ISPs often deploy NAT gateways on public networks to allocate private IP addresses to users. In this case, one end of an IPsec/IKE tunnel may have a public address while the other end may have a private address, and therefore NAT traversal must be configured at both the private network side and public network side to set up the tunnel.*

Configuring an IPsec Proposal

Select **VPN** > **IPSec** > **Proposal** from the navigation tree to display existing IPsec proposals.

The Web interface provides two modes for configuring an IPsec proposal, suite mode and custom mode.

- Suite mode: This mode allows you to select a pre-defined encryption suite. Figure 7 shows the IPsec proposal configuration in suite mode.

Figure 7 IPsec proposal configuration in suite mode

Table 5 describes the configuration items in this mode.

Table 5 IPsec proposal configuration items in suite mode

Item	Description
Proposal Name	Type the name for the IPsec proposal.

Item	Description
Encryption Suite	Select the encryption suite for the proposal. An encryption suite specifies the IP packet encapsulation mode, security protocol, and authentication and encryption algorithms to be used. Following are the available encryption suites, of which Tunnel means that a security protocol encapsulates IP packets in tunnel mode: • **Tunnel-ESP-DES-MD5**: Uses the ESP security protocol, the DES encryption algorithm, and the MD5 authentication algorithm. • **Tunnel-ESP-3DES-MD5**: Uses the ESP security protocol, the 3DES encryption algorithm, and the MD5 authentication algorithm. • **Tunnel-AH-MD5-ESP-DES**: Uses the ESP and AH security protocols successively, making ESP use the DES encryption algorithm and perform no authentication and making AH use the MD5 authentication algorithm • **Tunnel-AH-MD5-ESP-3DES**: Uses the ESP and AH security protocols successively, making ESP use the 3DES encryption algorithm and perform no authentication, and making AH use the MD5 authentication algorithm.

- Custom mode: This mode allows you to configure IPsec proposal parameters discretionarily. Figure 8 shows the IPsec proposal configuration in custom mode.

Figure 8 IPsec proposal configuration in custom mode

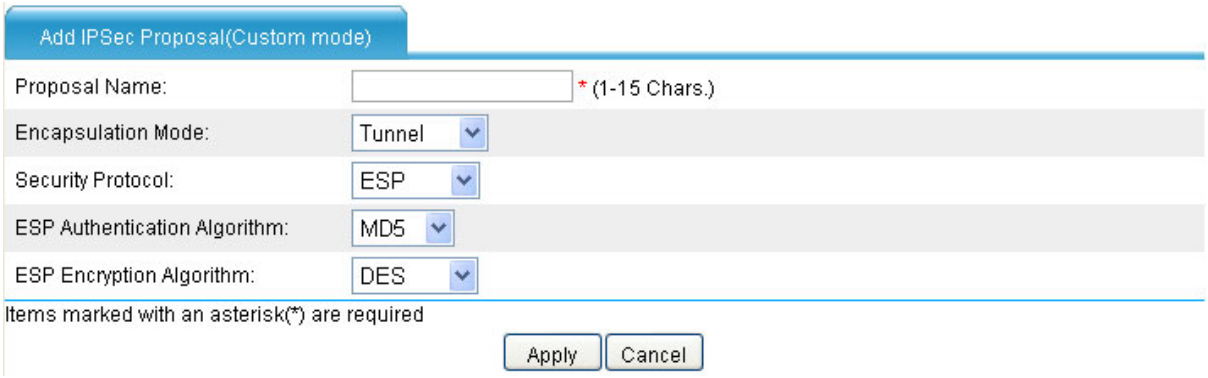


Table 6 describes the configuration items in this mode.

Table 6 IPsec proposal configuration items in custom mode

Item	Description
Proposal Name	Type the name for the IPsec proposal.
Encapsulation Mode	Select the IP packet encapsulation mode for the IPsec proposal. • **Tunnel**: Uses the tunnel mode. • **Transport**: Uses the transport mode.
Security Protocol	Select the security protocol for the proposal. • **AH**: Uses the AH protocol. • **ESP**: Uses the ESP protocol. • **AH-ESP**: Uses ESP first and then AH.

Item	Description
AH Authentication Algorithm	Select an authentication algorithm for AH when the security protocol is AH or AH-ESP. Available authentication algorithms include MD5 and SHA1.
ESP Authentication Algorithm	Select an authentication algorithm for ESP when the security protocol is ESP or AH-ESP. You can select MD5 or SHA1, or leave it null so the ESP performs no authentication. **Highlight** *The ESP authentication algorithm and ESP encryption algorithm cannot be both null.*
ESP Encryption Algorithm	Select an encryption algorithm for ESP when the security protocol is ESP or AH-ESP. • **DES**: Uses the DES algorithm and 56-bit keys for encryption. • **3DES**: Uses the 3DES algorithm and 168-bit keys for encryption. • **AES128**: Uses the AES algorithm and 128-bit keys for encryption. • **AES192**: Uses the AES algorithm and 192-bit keys for encryption. • **AES256**: Uses the AES algorithm and 256-bit keys for encryption. • Leave it null so the ESP performs no encryption. **Highlight** • *Higher security means more complex implementation and lower speed. DES is enough to meet general requirements. Use 3DES when there are very high confidentiality and security requirements.* • *The ESP authentication algorithm and ESP encryption algorithm cannot be both null.*

Configuring an IPsec Policy Template

Select **VPN** > **IPSec** > **Policy-Template** from the navigation tree to display existing IPsec policy templates, as shown in Figure 9. Then, click **Add** to enter the IPsec policy template configuration page, as shown in Figure 10.

Figure 9 IPsec policy template list

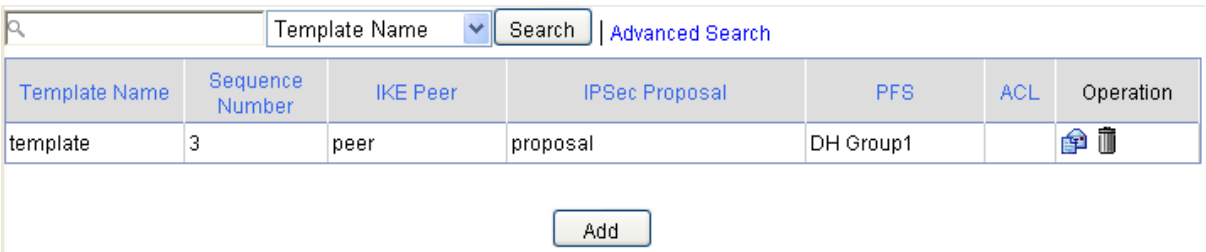


Figure 10 IPsec policy template configuration page

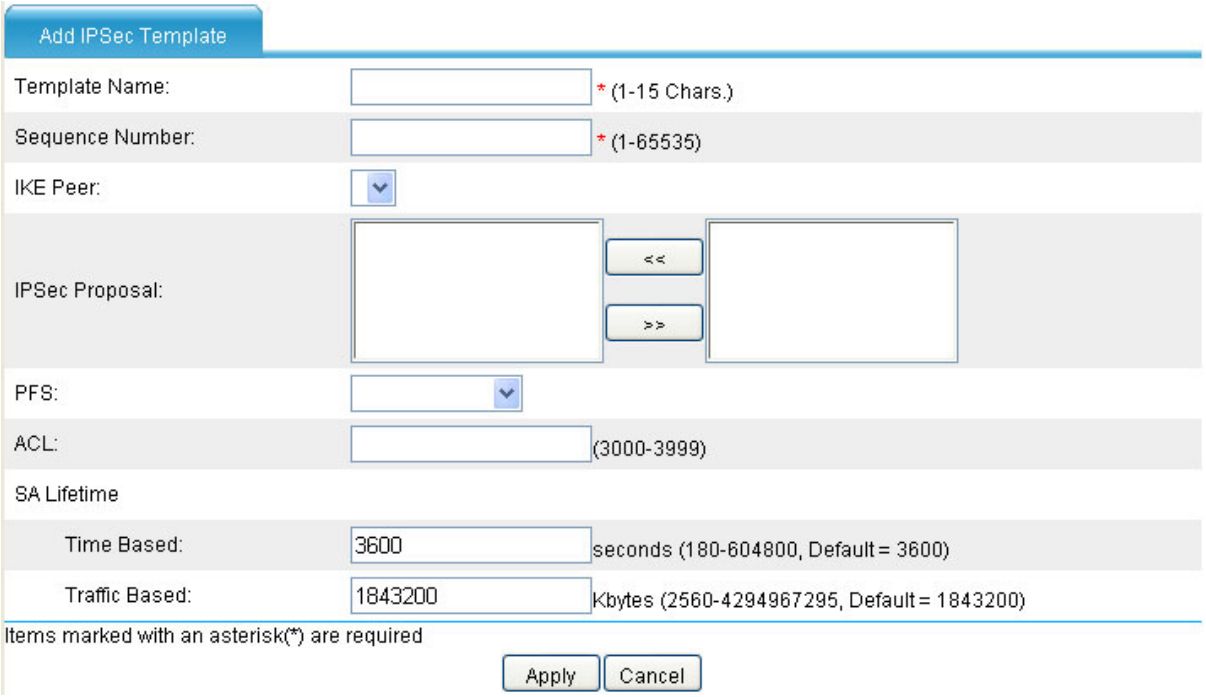


Table 7 describes the configuration items for creating an IPsec policy template.

Table 7 Configuration items for an IPsec policy template

Item	Description
Template Name	Type the name for the IPsec policy template.
Sequence Number	Type the sequence number for the IPsec policy template. In an IPsec policy template group, an IPsec policy template with a smaller sequence number has a higher priority.
IKE Peer	Select the IKE peer for the IPsec policy template to reference. Available IKE peers are those configured by selecting **VPN** > **IKE** > **Peer** from the navigation tree.
IPSec Proposal	Select up to six IPsec proposals for the IPsec policy template to reference. The IKE negotiation process will search for and use the exactly matching IPsec proposal. If no matching IPsec proposal is found, the expected SAs cannot be established and the packets that need to be protected will be discarded.

Item		Description
PFS		Enable and configure the Perfect Forward Secrecy (PFS) feature or disable the feature. • **dh-group1**: Uses the 768-bit Diffie-Hellman group. • **dh-group2**: Uses the 1024-bit Diffie-Hellman group. • **dh-group5**: Uses the 1536-bit Diffie-Hellman group. • **dh-group14**: Uses the 2048-bit Diffie-Hellman group. **Highlight** • *dh-group14, dh-group5, dh-group2, and dh-group1 are in the descending order of security and calculation time.* • *When IPsec uses an IPsec policy configured with PFS to initiate negotiation, an additional key exchange is performed in phase 2 for higher security.* • *Two peers must use the same Diffie-Hellman. Otherwise, negotiation will fail.*
ACL		Select the ACL for the IPsec policy template to reference. The specified ACL must be created already and contains at least one rule. ACL configuration supports VPN multi-instance.
SA Lifetime	Time Based	Type the SA lifetime, which can be time-based or traffic-based. **Highlight** *When negotiating to set up IPsec SAs, IKE uses the smaller one between the lifetime set locally and the lifetime proposed by the peer.*
	Traffic Based	

Configuring an IPsec Policy

Select **VPN** > **IPSec** > **Policy** from the navigation tree to display existing IPsec policies, as shown in Figure 11. Then, click **Add** to enter the IPsec policy configuration page, as shown in Figure 12.

Figure 11 IPsec policy list

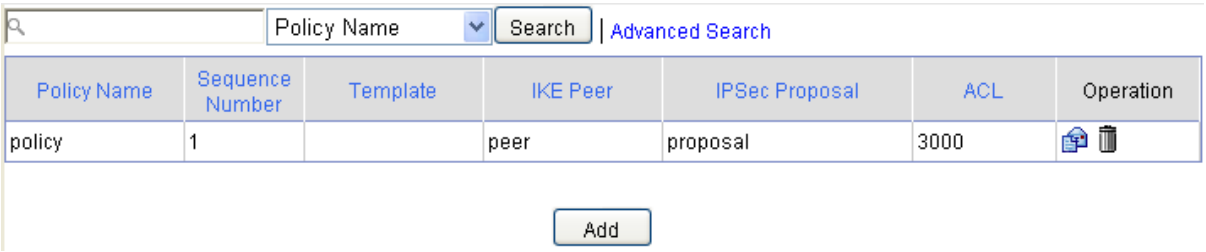


Figure 12 IPsec policy configuration page

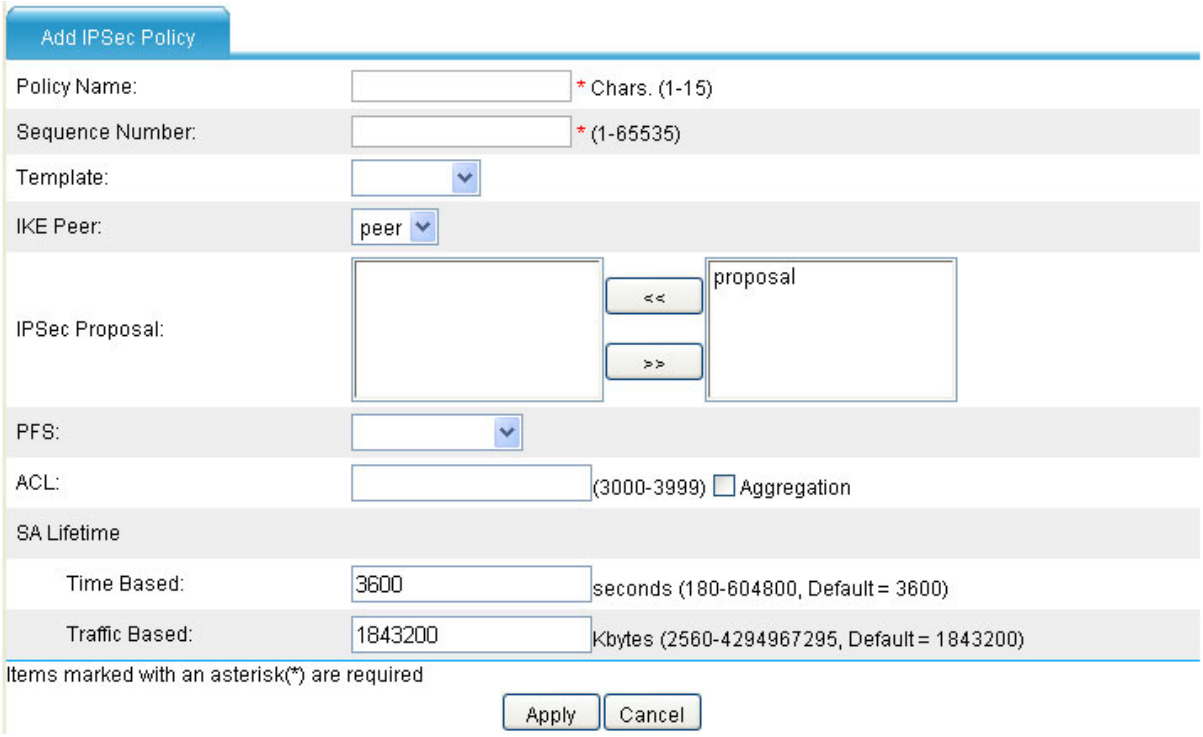


Table 8 describes the configuration items for creating an IPsec policy.

Table 8 IPsec policy configuration items

Item	Description
Policy Name	Type the name for the IPsec policy.
Sequence Number	Type the sequence number for the IPsec policy. In an IPsec policy group, an IPsec policy with a smaller sequence number has a higher priority.
Template	Select the IPsec policy template to be referenced. **Highlight** *If you select an IPsec policy template, all subsequent configuration items are unavailable but the aggregation setting.*
IKE Peer	Select the IKE peer for the IPsec policy to reference. Available IKE peers are those configured by selecting **VPN** > **IKE** > **Peer** from the navigation tree.
IPSec Proposal	Select up to six IPsec proposals for the IPsec policy to reference. The IKE negotiation process will search for and use the exactly matched IPsec proposal. If no IPsec proposal is found exactly matched, the expected SAs cannot be established and the packets that need to be protected will be discarded.

Item		Description
PFS		Enable and configure the Perfect Forward Secrecy (PFS) feature or disable the feature. • **dh-group1**: Uses the 768-bit Diffie-Hellman group. • **dh-group2**: Uses the 1024-bit Diffie-Hellman group. • **dh-group5**: Uses the 1536-bit Diffie-Hellman group. • **dh-group14**: Uses the 2048-bit Diffie-Hellman group. **Highlight** • *dh-group14, dh-group5, dh-group2, and dh-group1 are in the descending order of security and calculation time.* • *When IPsec uses an IPsec policy configured with PFS to initiate negotiation, an additional key exchange is performed in phase 2 for higher security.* • *Two peers must use the same Diffie-Hellman. Otherwise, negotiation will fail.*
ACL		Select the ACL for the IPsec policy to reference. The specified ACL must be created already and contains at least one rule. ACL configuration supports VPN multi-instance.
Aggregation		Select this check box to specify to protect traffic in aggregation mode. If you do not select check box, the standard mode is used. This setting takes effect only when you specify an ACL for the IPsec policy to reference. **Highlight** *When configuring devices supporting both the standard mode and aggregation mode, be sure to configure the two ends of a tunnel to work in the same mode.*
SA Lifetime	Time Based	Type the SA lifetime, which can be time-based or traffic-based. **Highlight** *When negotiating to set up IPsec SAs, IKE uses the smaller one between the lifetime set locally and the lifetime proposed by the peer.*
	Traffic Based	

Applying an IPsec Policy Group

Select **VPN** > **IPSec** > **IPSec Application** from the navigation tree to display the IPsec policy application situation, as shown in Figure 13. Find the interface to which you want to apply an IPsec policy group and then click the corresponding icon to enter the IPsec policy application page, as shown in Figure 14.

Figure 13 IPsec policy application

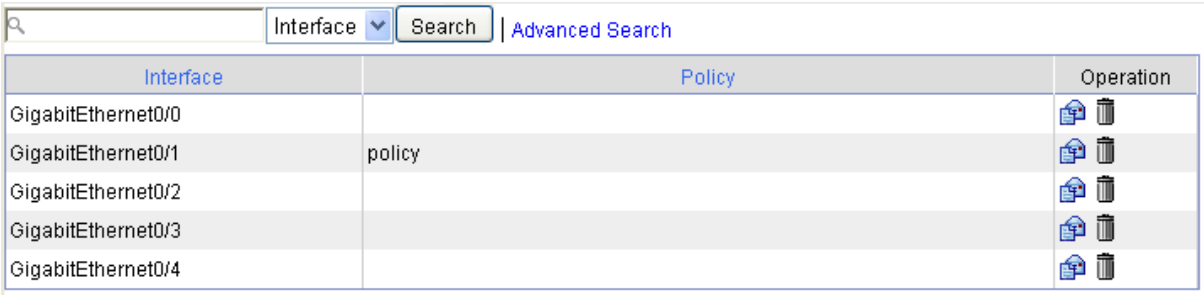


Figure 14 IPsec policy application page

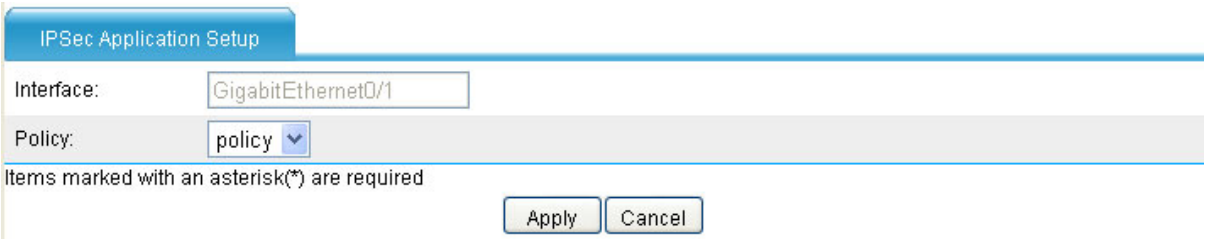


Table 9 describes the configuration items for applying an IPsec policy group.

Table 9 Configuration items for IPsec policy group application

Item	Description
Interface	Displays the interface to which you want to apply an IPsec policy group.
Policy	Select the IPsec policy group to be applied.

Note

Only one IPsec policy group can be applied to an interface. To apply another IPsec policy group to the interface, remove the original application and then apply the new one to the interface. An IPsec policy group can be applied to more than one interface.

IPsec Configuration Example 1: Basic Application

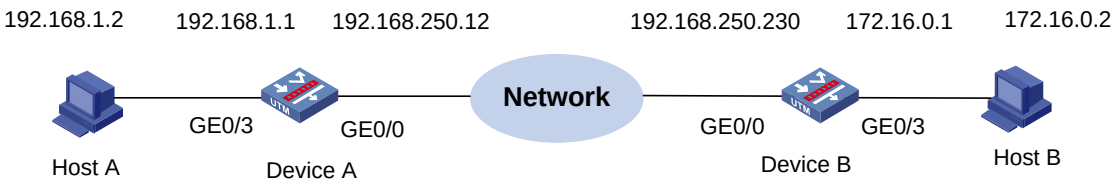
Network Requirements

Note

This configuration example is applicable to SecPath F5000-A5, SecPath F1000E, and SecPath UTM 200-A/200-M/200-S firewalls. A UTM device is used in this configuration example for illustration.

- As shown in Figure 15, an IPsec tunnel is established between Device A and Device B to protect traffic between subnet 192.168.1.0/24 (where Host A resides) and subnet 172.16.0.0/24 (where Host B resides).
- The security protocol to be used is ESP, encryption algorithm is DES, and authentication algorithm is MD5.

Figure 15 Network diagram for IPsec configuration



Software Version Used

Secpath F1000E: V300R001B01 R3166 series and V300R001B01 F3166 series

Secpath F5000-A5: V300R002B01 R3206 series

SecPath UTM 200-A/200-M/200-S firewall: V500R001B01 R5116 series

Configuration Procedures

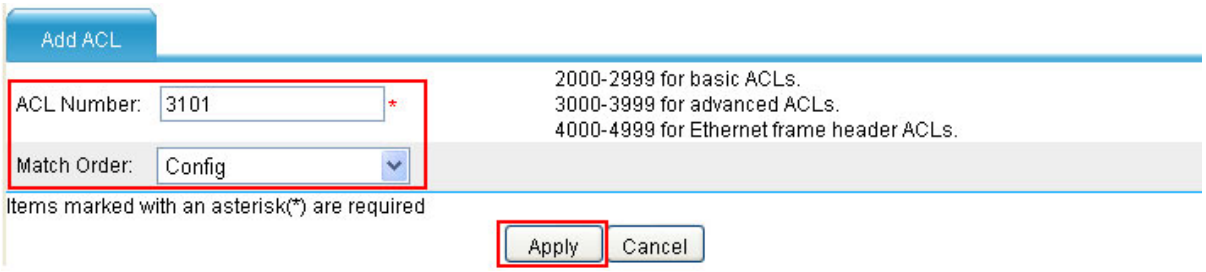
Configuring Device A

Assign IP addresses to the interfaces and add them to their target zones. (Omitted)

Define ACL 3101 to identify packets from subnet 192.168.1.0/24 to subnet 172.16.0.0/24.

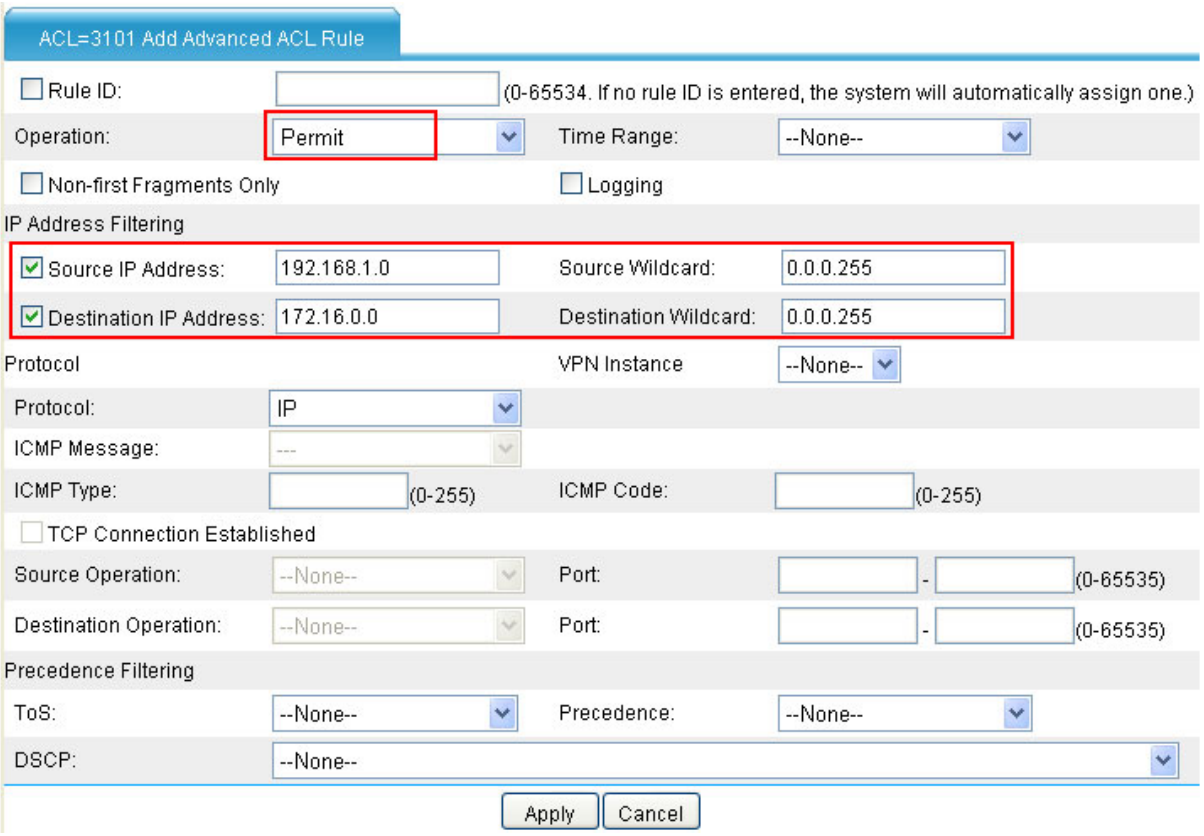
- Select **Firewall** > **ACL** from the navigation tree, and then click **Add**. Configure the ACL as shown in Figure 16.

Figure 16 Create ACL 3101



- Type **3101** as the ACL number.
- Select the match order of **Config**.
- Click **Apply**.
- From the ACL list, select ACL 3101 and click the corresponding icon. Then, click **Add** to enter the ACL rule configuration page. Create an ACL rule as shown in Figure 17.

Figure 17 Configure a rule to permit packets from 192.168.1.0/24 to 172.16.0.0/24



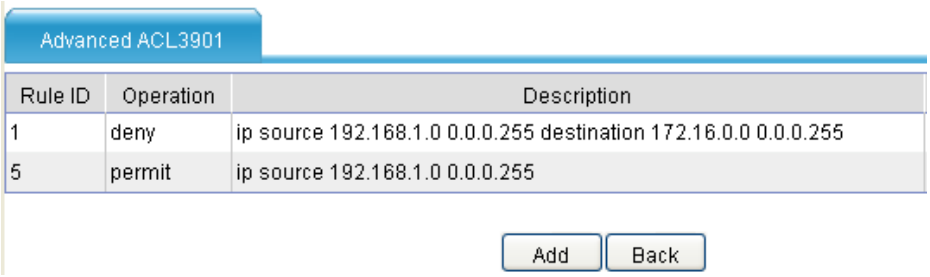
- Select **Permit** from the **Operation** drop-down box.
- Select the **Source IP Address** check box and type **192.168.1.0** and **0.0.0.255** respectively in the following text boxes.
- Select the **Destination IP Address** check box and type **172.16.0.0** and **0.0.0.255** respectively in the following text boxes.
- Click **Apply**.

Note

If you configure NAT for internal addresses on an outbound interface with IPsec configured (GigabitEthernet 0/0 in this example), the target traffic is translated first and therefore cannot be IPsec protected. To solve this problem, add an additional rule to the ACL so that the NAT module does not translate the source addresses of the target traffic.

For example, if ACL 3901 has only rule 5, which identifies traffic sourced from 192.168.1.0/24, you must add another rule (rule 1) to ACL 3901 as shown in Figure 18 so that traffic from 192.168.1.0/24 to 172.16.0.0/24 is not translated and can be protected by IPsec.

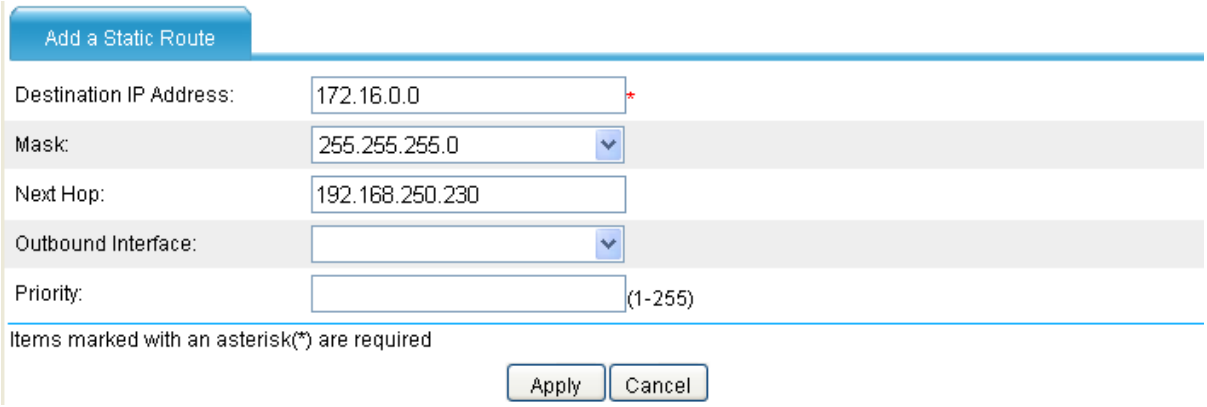
Figure 18 Add an ACL rule



Configure a static route to Host B.

- Select **Network** > **Routing Management** > **Static Routing** from the navigation tree, and then click **Add**. Create a static route as shown in Figure 19.

Figure 19 Configure a static route to Host B

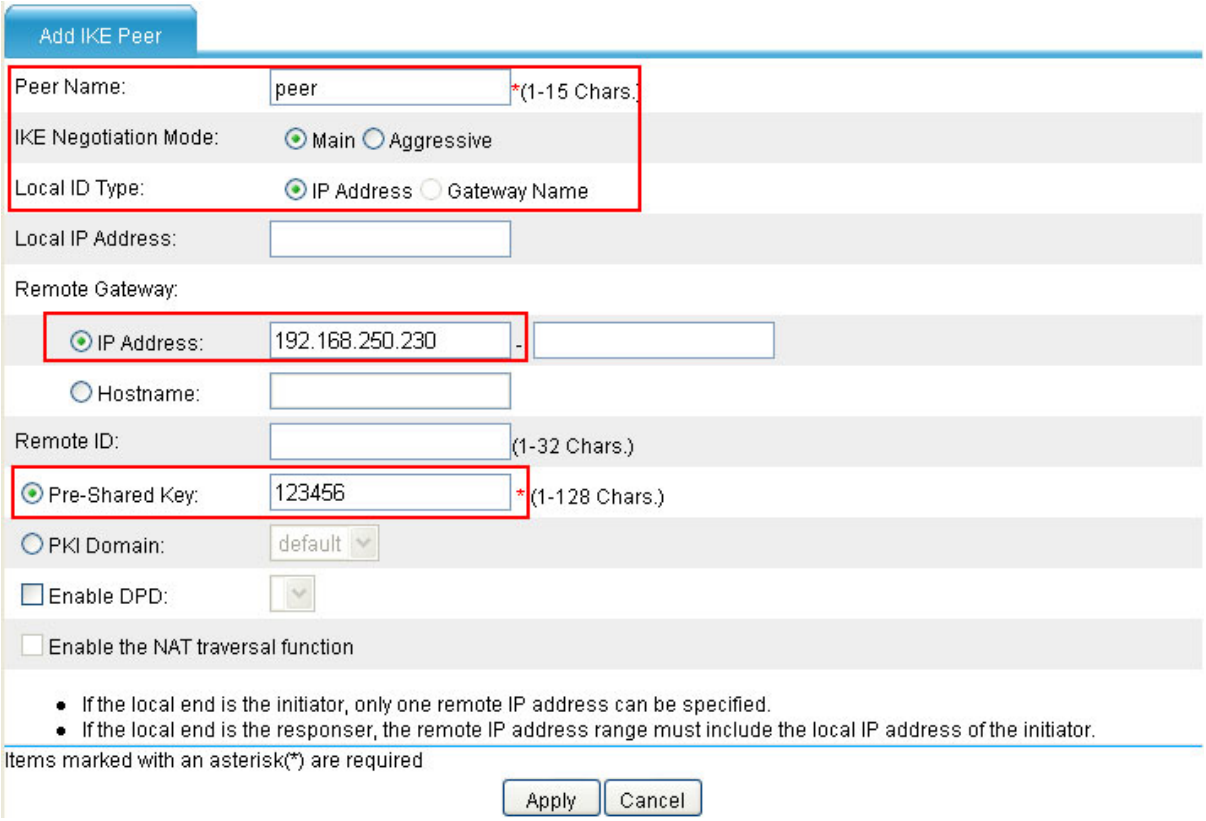


- Type **172.16.0.0** as the destination IP address.
- Type **255.255.255.0** as the mask.
- Type **192.168.250.230** as the next hop.
- Select **GigabitEthernet0/1** as the outbound interface.
- Click **Apply**.

Configure the IKE peer.

- Select **VPN** > **IKE** > **Peer** from the navigation tree and then click **Add**. Perform the configurations shown in Figure 20.

Figure 20 Configure an IKE peer



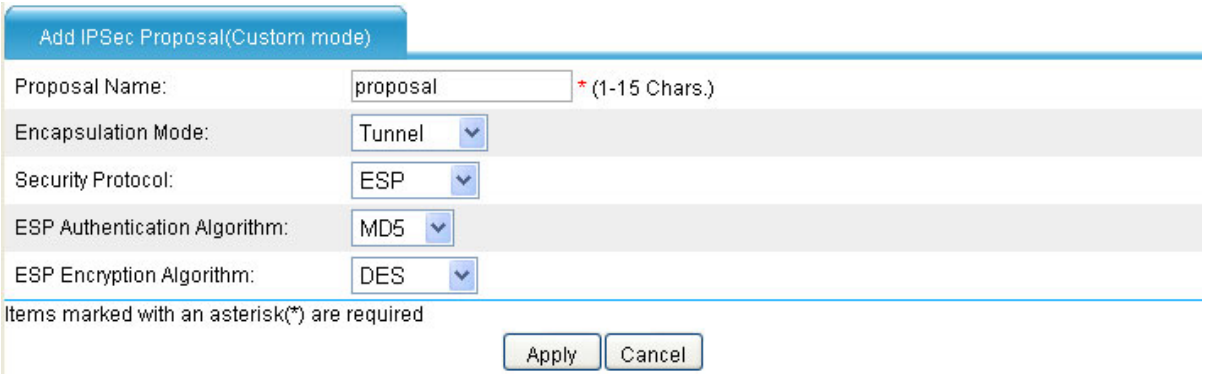
- Type **peer** as the peer name.
- Select **Main** as the negotiation mode.
- Type **192.168.250.230** as the IP address of the remote gateway.
- Select **Pre-Shared Key** and type **123456** as the pre-shared key.
- Click **Apply**.

The default IKE proposal is used.

Configure an IPsec proposal named **proposal** as follows:

- Select **VPN** > **IPSec** > **Proposal** from the navigation tree and then click **Add**.
- Select **Custom mode** from the **IPSec Proposal Configuration Wizard** page. Make the configuration as shown in Figure 21.

Figure 21 Configure an IPsec proposal

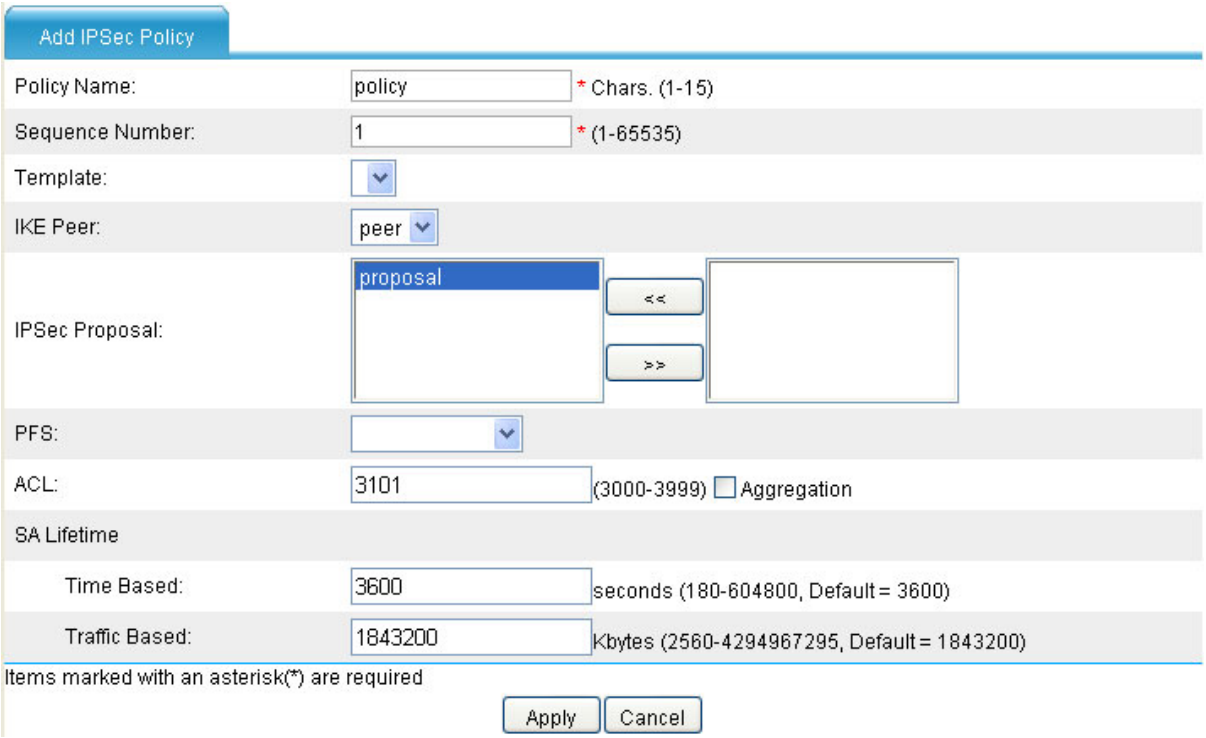


- Type **proposal** as the name of the IPsec proposal.
- Select **Tunnel** as the packet encapsulation mode.
- Select **ESP** as the security protocol.
- Select **MD5** as the ESP authentication algorithm.
- Select **DES** as the ESP encryption algorithm.
- Click **Apply**.

Configure an IPsec policy.

- Select **VPN** > **IPSec** > **Policy** from the navigation tree and then click **Add**. Perform the configurations shown in Figure 22.

Figure 22 Configure an IPsec policy



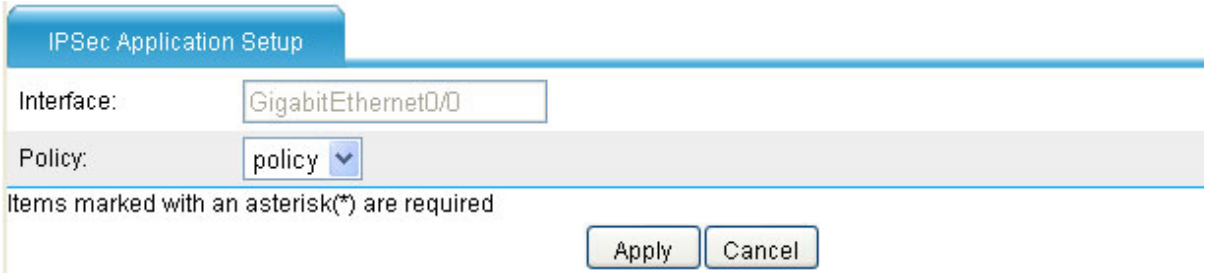
- Type **policy** as the policy name.
- Type **1** as the sequence number.

- Select the IKE peer of **peer**.
- Select the IPsec proposal of **proposal** and click **<<**.
- Type **3101** as the ACL.
- Click **Apply**.

Apply the IPsec policy to interface GigabitEthernet 0/0.

- Select **VPN** > **IPSec** > **IPSec Application** from the navigation tree, and then click the icon of interface GigabitEthernet 0/0. Perform the configurations shown in Figure 23.

Figure 23 Apply the IPsec policy to interface GigabitEthernet 0/0



- Select the policy of **policy**.
- Click **Apply**.

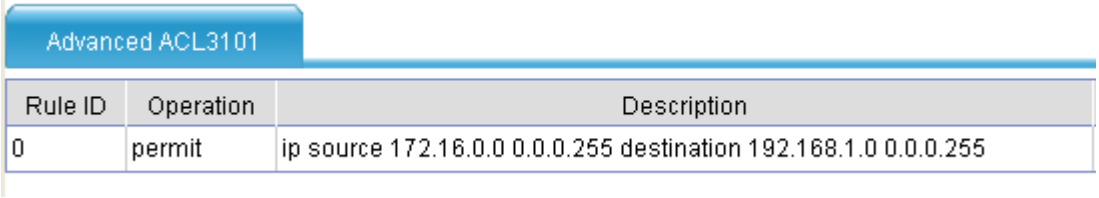
Configure Device B

Assign IP addresses to the interfaces and then add them to their target zones. (Omitted)

Define an ACL to permit traffic from subnet 172.16.0.0/24 to subnet 192.168.1.0/24.

- Select **Firewall** > **ACL** from the navigation tree, and then click **Add**.
- Type **3101** as the ACL number.
- Select the match order of **Config**.
- Click **Apply**.
- From the ACL list, select ACL 3101 and click the corresponding icon. Then, click **Add** to enter the ACL rule configuration page. Configure a rule for ACL 3101 as shown in the following figure.

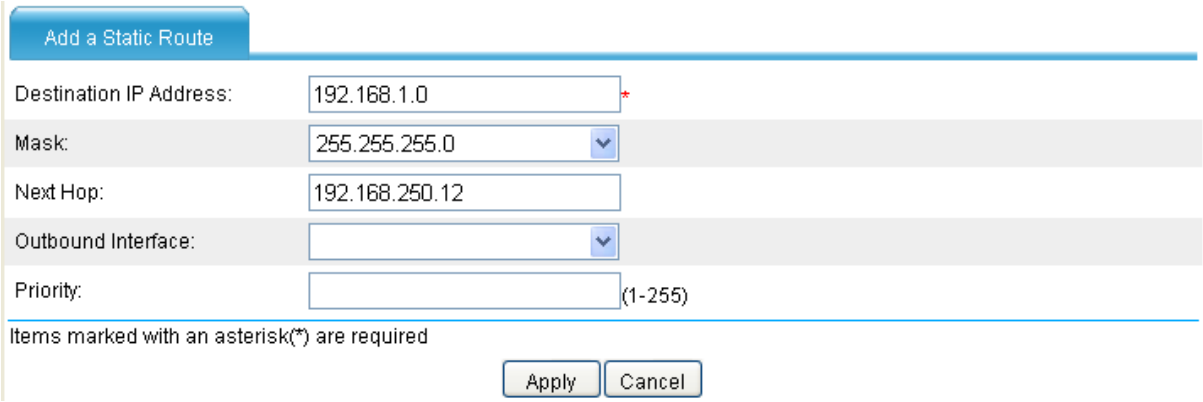
Figure 24 Configure a rule for ACL 3101



Configure a static route to Host A.

- Select **Network** > **Routing Management** > **Static Routing** from the navigation tree, and then click **Add**. Perform the configurations shown in Figure 25.

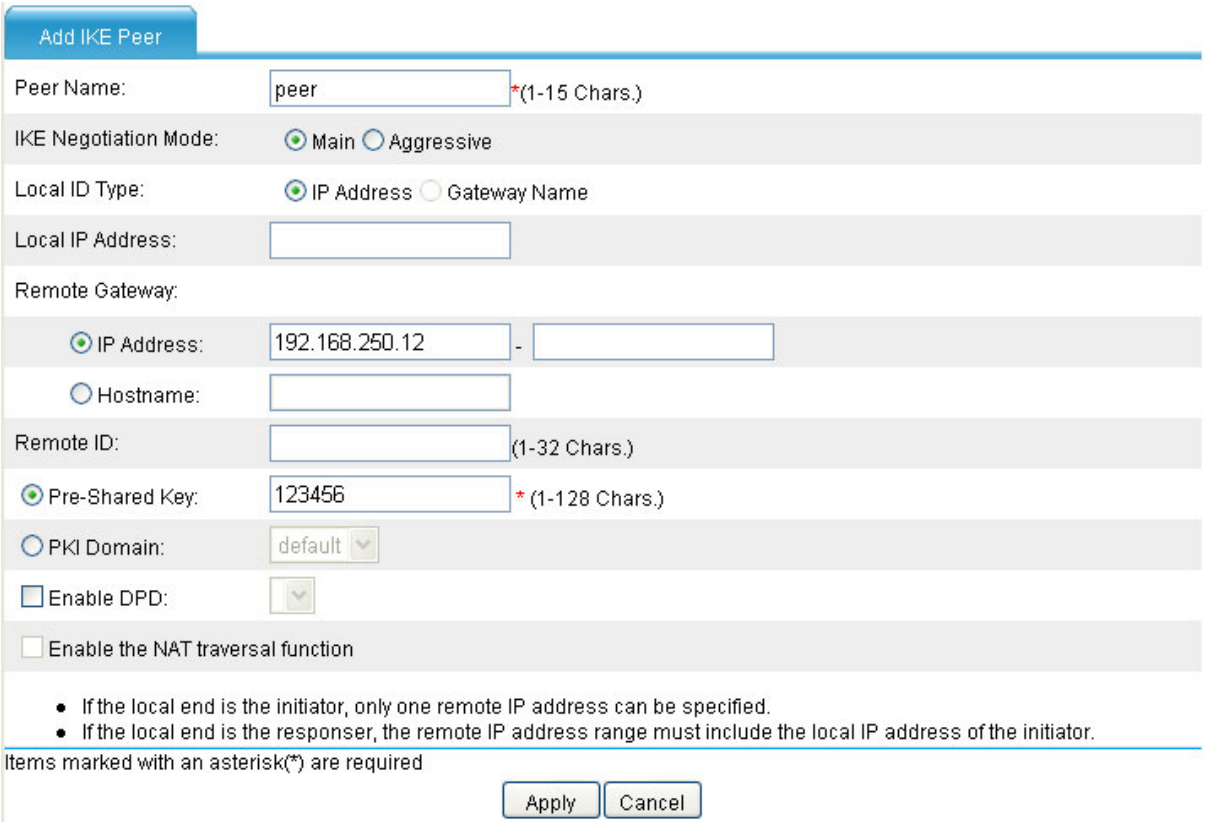
Figure 25 Configure a static route to Host A



Configure IKE peer **peer**.

- Select **VPN** > **IKE** > **Peer** from the navigation tree and then click **Add**. Perform the configurations shown in Figure 26.

Figure 26 Configure an IKE peer



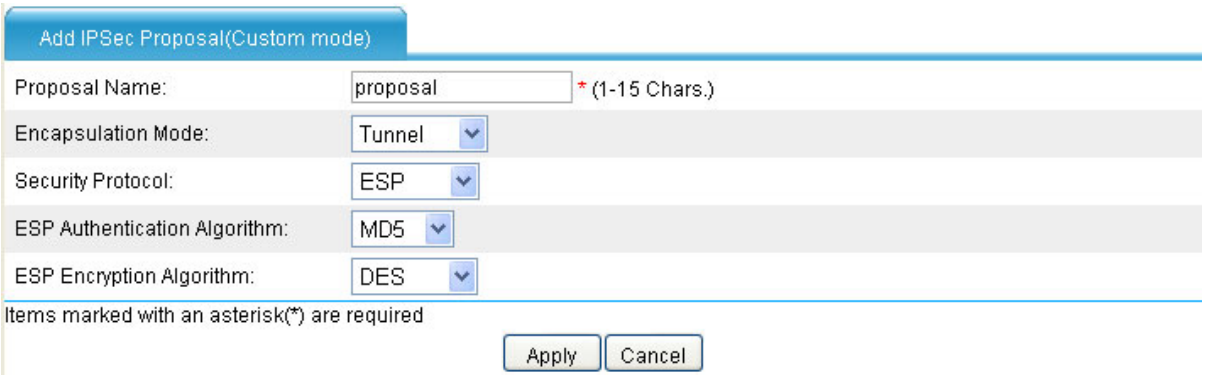
- Type **peer** as the peer name.
- Select **Main** as the negotiation mode.
- Type **192.168.250.12** as the IP address of the remote gateway.
- Select **Pre-Shared Key** and type **123456** as the pre-shared key.
- Click **Apply**.

The default IKE proposal is used.

Configure an IPsec proposal.

- Select **VPN** > **IPSec** > **Proposal** from the navigation tree and then click **Add**.
- Select **Custom mode** from the **IPSec Proposal Configuration Wizard** page. Perform the configurations shown in Figure 27.

Figure 27 Configure an IPsec proposal

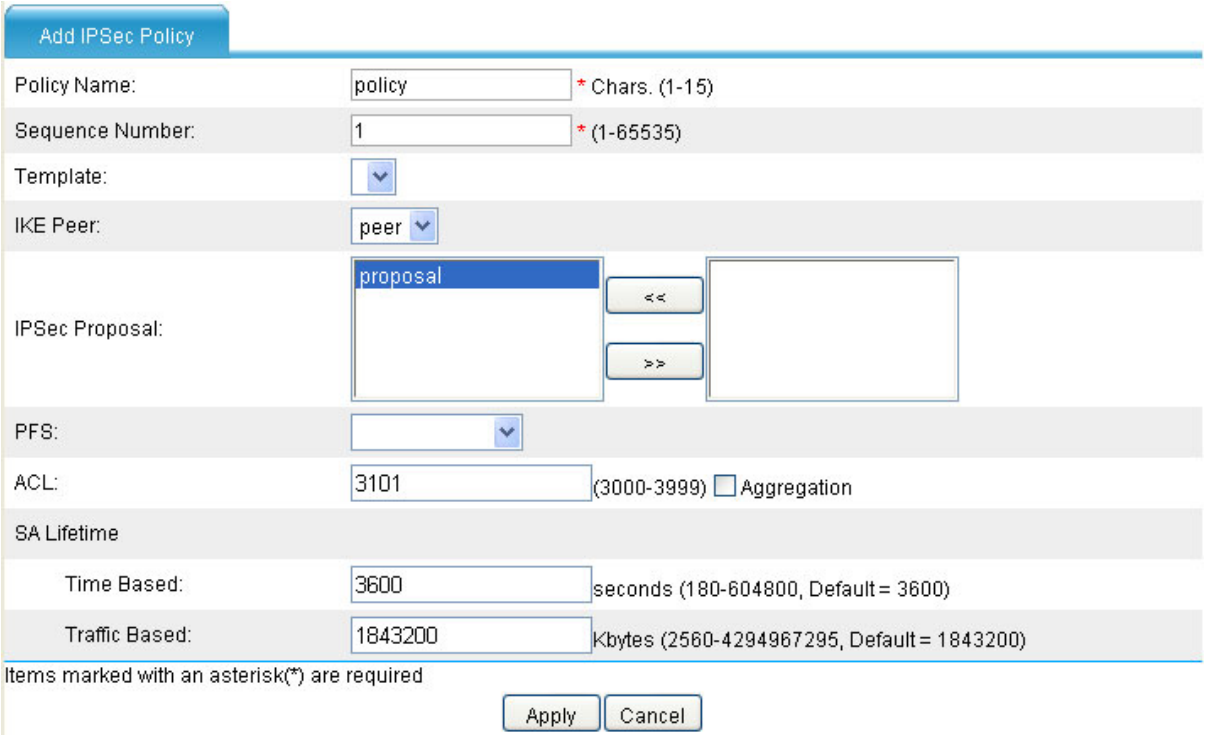


- Type **proposal** as the name of the IPsec proposal.
- Select **Tunnel** as the packet encapsulation mode.
- Select **ESP** as the security protocol.
- Select **MD5** as the ESP authentication algorithm.
- Select **DES** as the ESP encryption algorithm.
- Click **Apply**.

Configure IPsec policy **policy**.

- Select **VPN** > **IPSec** > **Policy** from the navigation tree and then click **Add**. Perform the configurations shown in Figure 28.

Figure 28 Configure an IPsec policy

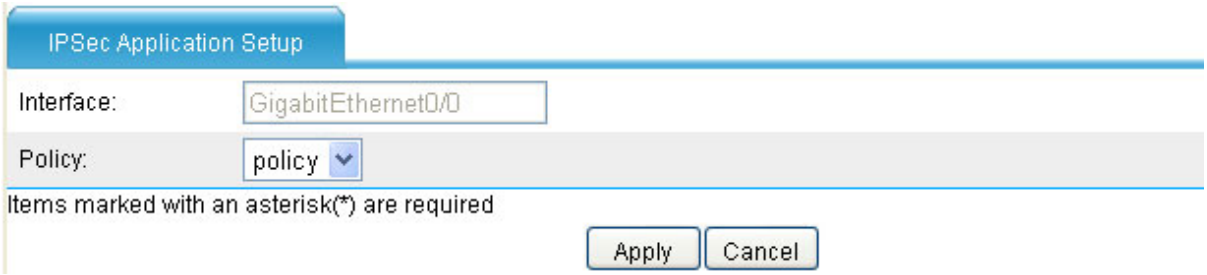


- Type **policy** as the policy name.
- Type **1** as the sequence number.
- Select the IKE peer of **peer**.
- Select the IPsec proposal of **proposal** and click **<<**.
- Type **3101** as the ACL.
- Click **Apply**.

Apply IPsec policy **policy** to GigabitEthernet 0/0.

- Select **VPN** > **IPSec** > **IPSec Application** from the navigation tree, and then click the icon of interface GigabitEthernet 0/0.
- Select the policy of **policy**.
- Click **Apply**.

Figure 29 Apply the IPsec policy to GigabitEthernet 0/0



Verification

After configuration, packets to be exchanged between subnet 192.168.1.0/24 and subnet 172.16.0.0/24 will trigger the negotiation of SAs by IKE. After IKE negotiation succeeds and the IPsec SAs are established, traffic between subnet 192.168.1.0/24 and subnet 172.16.0.0/24 will be protected by IPsec.

Viewing IPsec SAs

Select **VPN** > **IPSec** > **IPSec SA** from the navigation tree to display brief information about established IPsec SAs, as shown in Figure 30.

Figure 30 IPsec SAs

Local IP | Search | Advanced Search

Local IP	Remote IP	SPI	Security Protocol	Authentication Algorithm	Encryption Algorithm
192.168.250.12	192.168.250.230	1105559047	ESP	HMAC-MD5-96	DES
192.168.250.230	192.168.250.12	4067445650	ESP	HMAC-MD5-96	DES

Viewing Packet Statistics

Select **VPN** > **IPSec** > **Statistics** from the navigation tree to view packet statistics, as shown in Figure 31.

Figure 31 Packet statistics

Statistic Item	Statistic Value
IPSec protected packets(inbound/outbound)	4/4
IPSec protected bytes(inbound/outbound)	336/336
IPSec protected packets discarded by device (inbound/outbound)	0/0
Dropped packets(lack of memory)	0
Dropped packets(no SA)	0
Dropped packets(full queues)	0
Dropped packets(failed authentication)	0
Dropped packets(wrong packet length)	0
Replayed packets	0
Dropped packets(excessive packet length)	0
Dropped packets(improper SA)	0

Refresh | Reset All

IPsec Configuration Example 2: Working with NAT

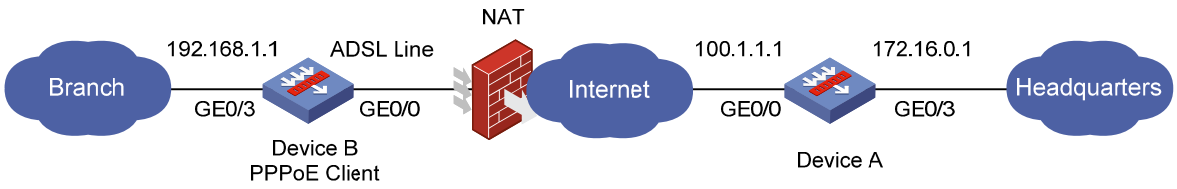
Network Requirements

See Figure 32. Deploy IPsec tunnels between Device A and Device B to protect traffic between the branch and its headquarters. Use IKE to maintain the IPsec tunnels.

Device A and Device B provides network access for the headquarters and the branch.

Device B connects to the public network through an ADSL line and acts as the PPPoE client. The interface connecting to the public network uses a private address dynamically assigned by the ISP.

Figure 32 Network diagram for configuring IPsec to work with NAT



Configuration Considerations

The IKE negotiation mode must be aggressive, because Device B uses a dynamic IP address.

Configure NAT traversal at both ends of the IPsec tunnel, because one end of the tunnel uses a public IP address while the other end uses a private IP address.

In addition, you must configure the local peer to use the gateway name as the ID type.

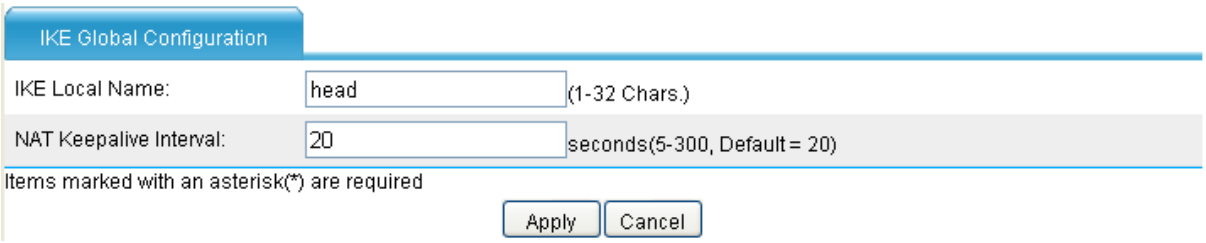
Configuration Procedures

Configuring DeviceA

Assign IP addresses to the interfaces and add the interfaces to their target zones. (Omitted)

Configure the IKE local name as **head**.

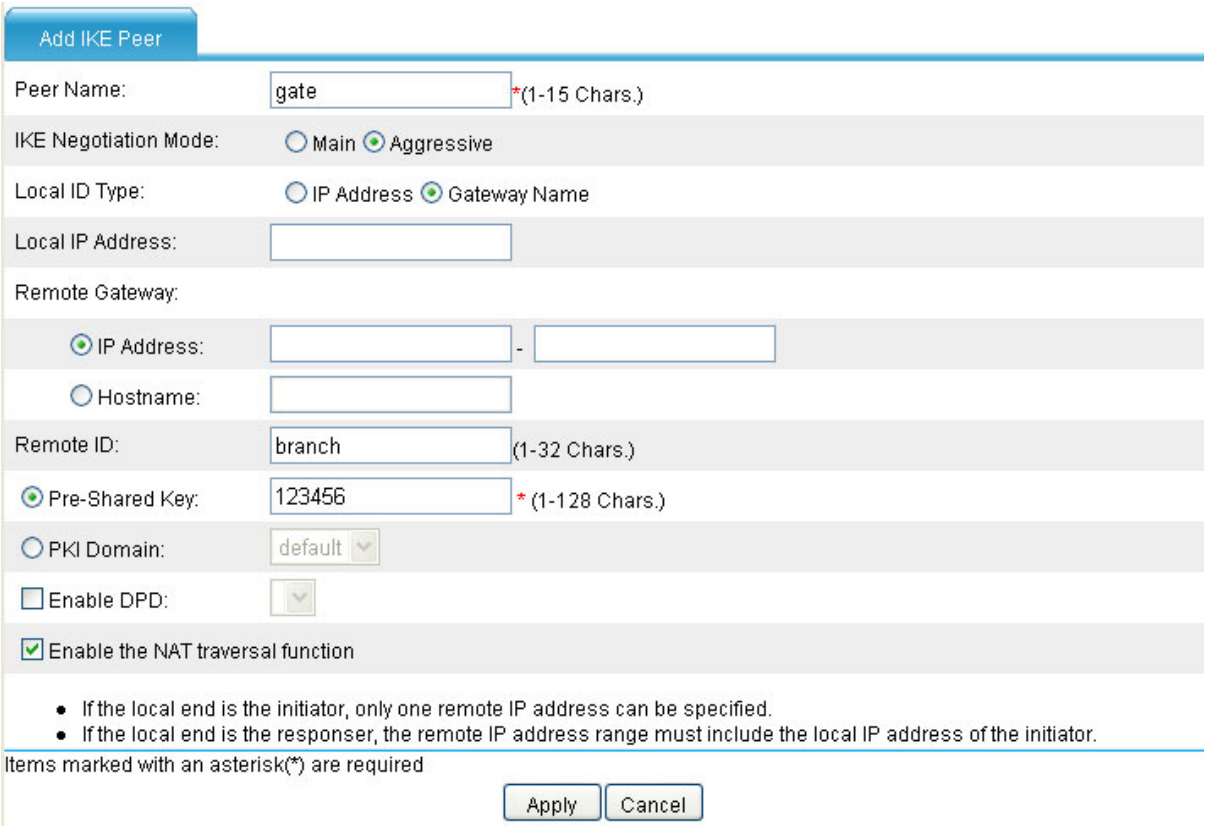
Figure 33 IKE global configuration



Configure the IKE peer.

- Select **VPN** > **IKE** > **Peer** from the navigation tree and then click **Add**.
- Type **gate** as the peer name.
- Select **Aggressive** as the negotiation mode.
- Type **branch** as the host name of the remote gateway.
- Select **Pre-Shared Key** and type **123456** as the pre-shared key.
- Select the **Enable NAT traversal function** check box.
- Click **Apply**.

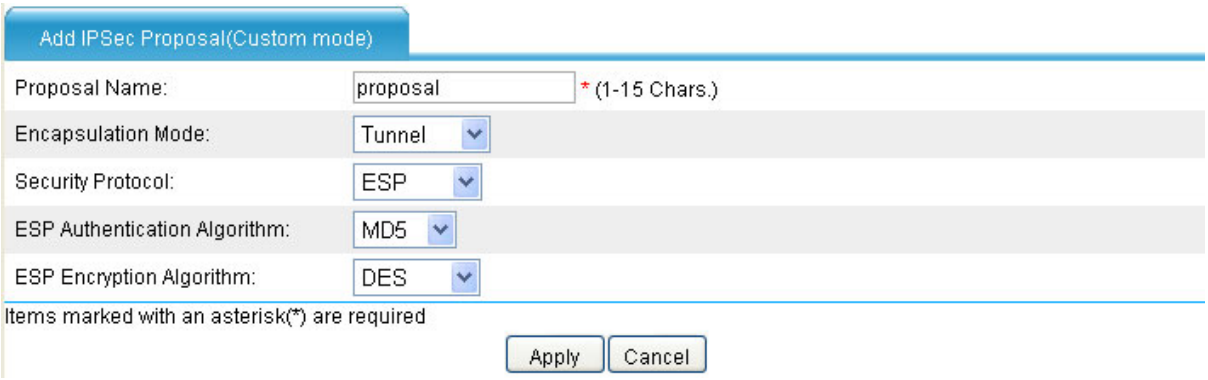
Figure 34 Configure an IKE peer



Configure an IPsec proposal named **proposal**.

- Select **VPN** > **IPSec** > **Proposal** from the navigation tree and then click **Add**.
- Select **Custom mode** from the **IPSec Proposal Configuration Wizard** page.
- Type **proposal** as the IPsec proposal name, and use the default settings for the proposal, as shown in Figure 35.

Figure 35 Configure an IPsec proposal

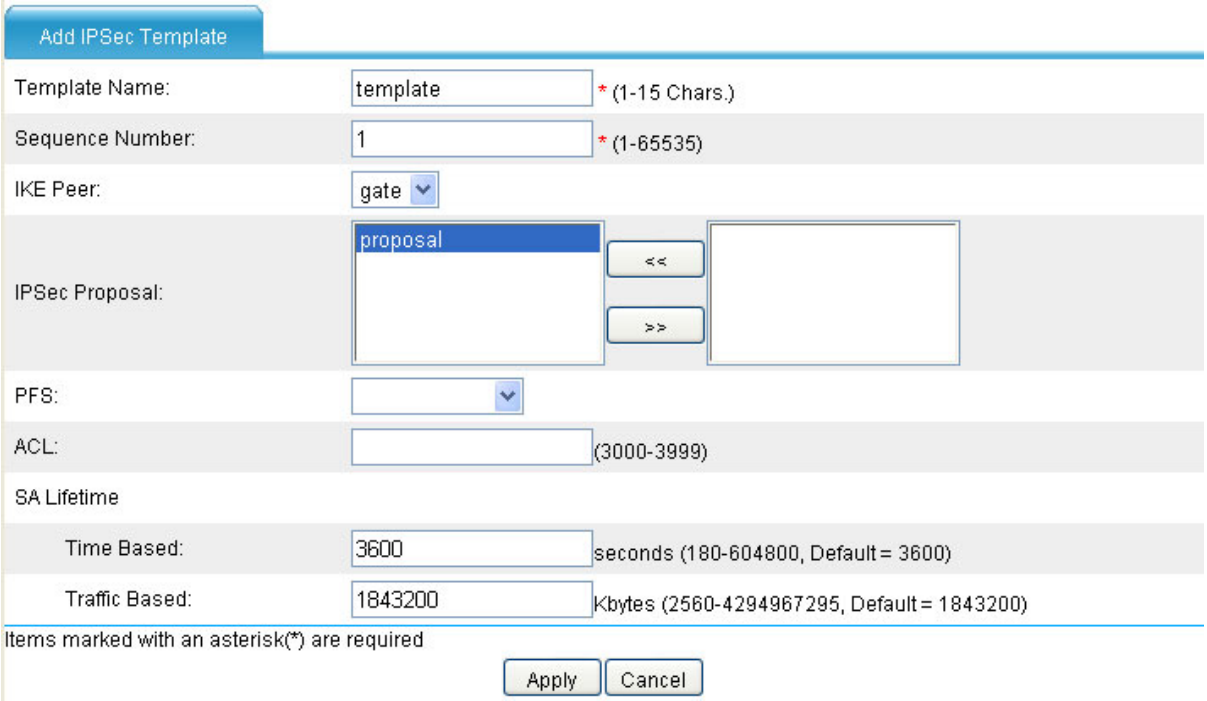


Configure an IPsec policy template.

- Type **1** as the sequence number.
- Select **gate** as the IKE peer.
- Select IPsec proposal **proposal**, and click **<<**.

- Click **Apply**.

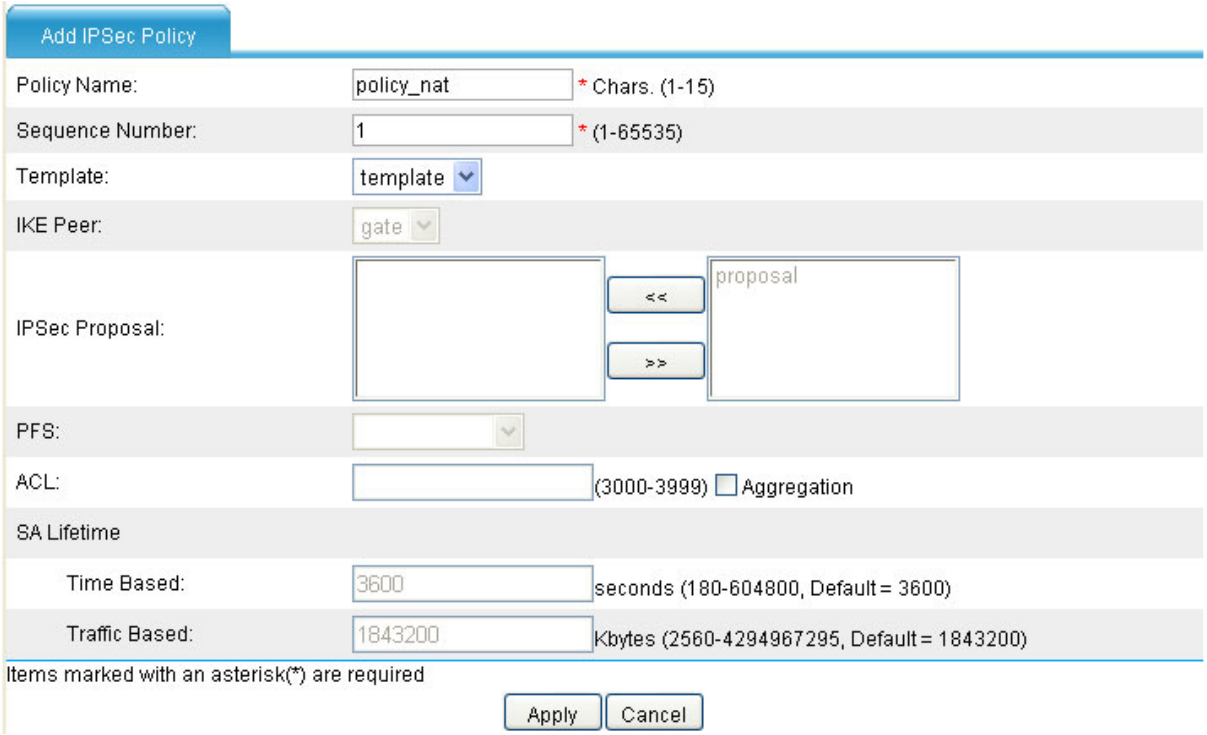
Figure 36 Add an IPsec policy template



Configure an IPsec policy named **policy_nat**.

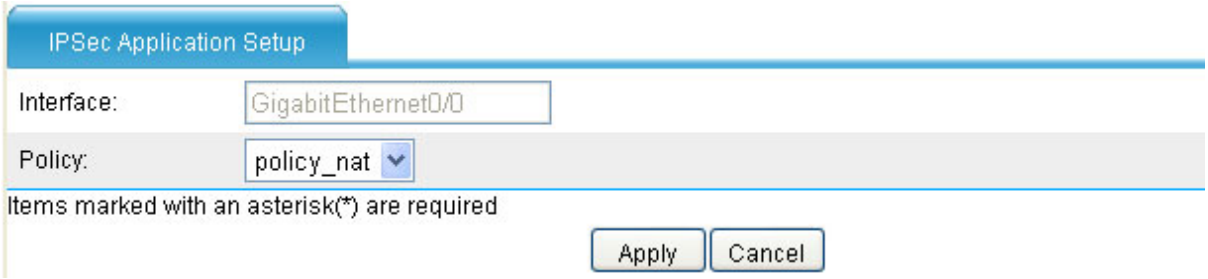
- Select **VPN** > **IPSec** > **Policy** from the navigation tree and then click **Add**. Perform the configurations shown in Figure 37.

Figure 37 Configure an IPsec policy



Apply the IPsec policy to interface GigabitEthernet 0/0.

Figure 38 Apply the IPsec policy



Configuring Device B

Assign IP addresses to the interfaces and add the interfaces to their target zones. (Omitted)

Configure ACL 3101 to permit packets from subnet 192.168.1.0/24 to subnet 172.16.0.0/24.

Figure 39 Configure a rule for ACL 3101

Advanced ACL3101

Rule ID	Operation	Description
0	permit	ip source 192.168.1.0 0.0.0.255 destination 172.16.0.0 0.0.0.255

Note

NAT applied to physical interfaces process packets before IPsec. You must exclude the target traffic of IPsec from NAT mappings, so NAT does not translate the source address of target traffic.

For example, NAT on port GE 0/0 uses ACL 3901 for identifying traffic. In this ACL, you must add a rule (rule 1) to deny traffic from 192.168.1.0/24 to 172.16.0.0/24. This rule must have a higher priority than the permit rule that identifies all traffic sourced from 192.168.1.0/24, as shown in Figure 40.

Figure 40 Add a rule in the ACL for NAT to deny IPsec protected traffic

Advanced ACL3901

Rule ID	Operation	Description
1	deny	ip source 192.168.1.0 0.0.0.255 destination 172.16.0.0 0.0.0.255
5	permit	ip source 192.168.1.0 0.0.0.255

Add Back

Configure the IKE local name named **branch**.

Figure 41 Configure the IKE local name

IKE Global Configuration

IKE Local Name:	branch	(1-32 Chars.)
NAT Keepalive Interval:	20	seconds(5-300, Default = 20)

Items marked with an asterisk(*) are required

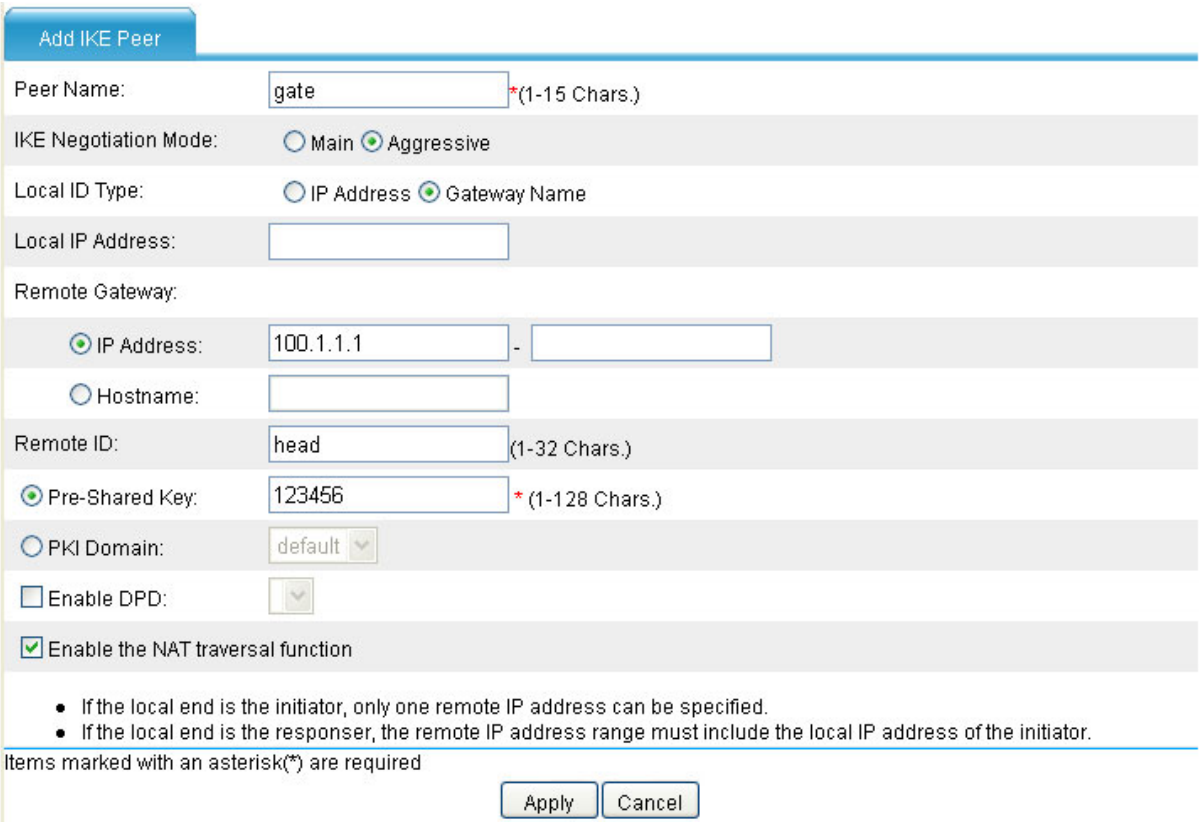
Apply Cancel

Configure an IKE peer named **gate**.

- Select **VPN** > **IKE** > **Peer** from the navigation tree and then click **Add**.
- Type **gate** as the peer name.
- Select **Aggressive** as the negotiation mode.
- Select **IP Address** as the gateway name.

- Type **100.1.1.1** as the IP address of the remote gateway. This step is to configure the IP address of Device A on Device B.
- Type **head** as the remote ID.
- Select **Pre-Shared Key** and type **123456** as the pre-shared key.
- Select the **Enable NAT traversal function** check box.
- Click **Apply**.

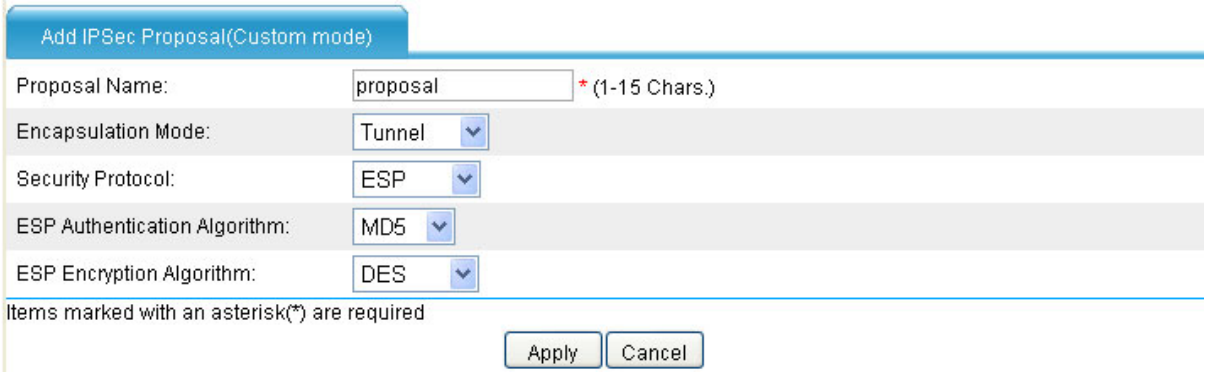
Figure 42 Configure an IKE peer



Configure an IPsec proposal named **proposal**.

- Select **VPN** > **IPSec** > **Proposal** from the navigation tree and then click **Add**.
- Select **Custom mode** from the **IPSec Proposal Configuration Wizard** page.
- Type **proposal** as the proposal name, and use the default settings for the proposal, as shown in Figure 43.

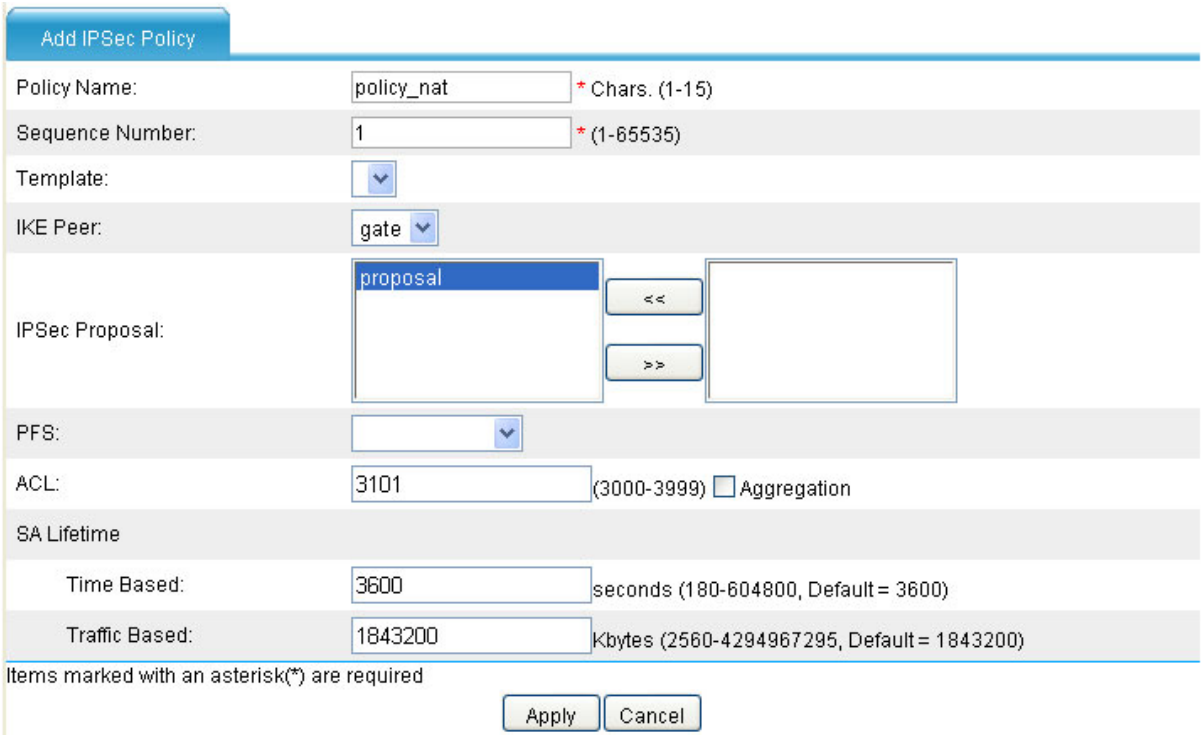
Figure 43 Configure an IPsec proposal



Configure an IPsec policy named **policy_nat**.

- Select **VPN** > **IPSec** > **Policy** from the navigation tree and then click **Add**. Perform the configurations shown in Figure 44.

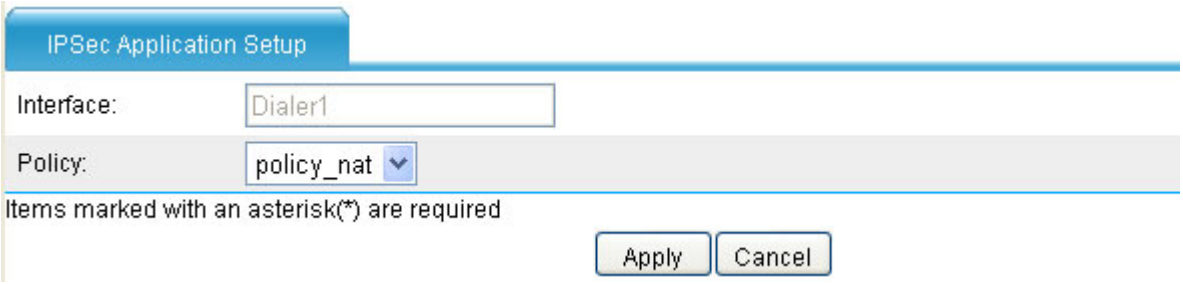
Figure 44 Configure an IPsec policy



- Type **policy_nat** as the policy name.
- Type **1** as the sequence number.
- Select **gate** as the IKE peer.
- Select **proposal** for the IPsec policy, and click **<<**.
- Type **3101** in the ACL text box.
- Click **Apply**.

Apply IPsec policy **policy_nat** to interface Dialer 1.

Figure 45 Apply the IPsec policy to an interface



Verification

After configuration, packets to be exchanged between subnet 192.168.1.2 and subnet 172.16.1.2 will trigger the negotiation of SAs by IKE. After IKE negotiation succeeds and the IPsec SAs are established, traffic between subnet 172.16.1.2 and subnet 172.16.1.2 will be protected by IPsec.

Viewing IPSec SAs

Select **VPN** > **IPSec** > **IPSec SA** from the navigation tree to display brief information about established IPsec SAs, as shown in Figure 46.

Figure 46 IPsec SAs

Local IP	Remote IP	SPI	Security Protocol	Authentication Algorithm	Encryption Algorithm
100.1.1.1	140.0.0.7	2342415508	ESP	HMAC-MD5-96	DES

Viewing Packet Statistics

Select **VPN** > **IPSec** > **Statistics** from the navigation tree to view packet statistics, as shown in Figure 47.

Figure 47 Packet statistics

Statistic Item	Statistic Value
IPSec protected packets(inbound/outbound)	18109/25970
IPSec protected bytes(inbound/outbound)	9174824/31471120
IPSec protected packets discarded by device (inbound/outbound)	0/0
Dropped packets(lack of memory)	0
Dropped packets(no SA)	0
Dropped packets(full queues)	0
Dropped packets(failed authentication)	0
Dropped packets(wrong packet length)	0
Replayed packets	0
Dropped packets(excessive packet length)	0
Dropped packets(improper SA)	0

Refresh Reset All

Configuration Guidelines

When configuring IPsec, follow these guidelines:

- Typically, IKE uses UDP port 500 for communication, and AH and ESP use the protocol numbers 51 and 50 respectively. Therefore, you need to make sure that flows of these protocols are not denied on the interfaces with IKE and/or IPsec configured.
- If you enable both IPsec and QoS on an interface, traffic of an IPsec SA may be put into different queues by QoS, causing some packets to be sent out of order. As IPsec performs anti-replay operation, packets outside the anti-replay window in the inbound direction may be discarded, resulting in packet loss. Therefore, when using IPsec together with QoS, ensure that they use the same classification rules. IPsec classification rules depend on the referenced ACL rules.

References

Protocols and Standards

- RFC 2401: Security Architecture for the Internet Protocol
- RFC 2402: IP Authentication Header
- RFC 2406: IP Encapsulating Security Payload

Related Documentation

IPsec Configuration in the web configuration manual

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SecPath Series Firewalls DHCP Configuration Examples

Keywords: DHCP

Abstract: This document describes DHCP configuration methods and configuration examples.

Acronyms:

Acronym	Full spelling
DHCP	Dynamic Host Configuration Protocol

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Feature Overview

DHCP Overview

A DHCP client sends a configuration request and then a DHCP server returns a reply to send configuration parameters such as an IP address to the client.

Address Allocation Mechanisms

DHCP supports three mechanisms for IP address allocation.

- Manual allocation: The network administrator assigns an IP address to a client like a web server, and DHCP conveys the assigned address to the client.
- Automatic allocation: DHCP assigns a permanent IP address to a client.
- Dynamic allocation: DHCP assigns an IP address to a client for a limited period of time, which is called a lease. Most DHCP clients obtain their addresses in this way.

IP Address Allocation Sequence

A DHCP server assigns an IP address to a client according to the following sequence:

1) The IP address manually bound to the client's MAC address or ID
2) The IP address that was ever assigned to the client
3) The IP address designated by the Option 50 field in the DHCP-DISCOVER message
4) The first assignable IP address found in a proper common address pool
5) The IP address that was a conflict or passed its lease duration

If no IP address is assignable, the server does not respond.

Application Scenarios

As many people need to take their laptops across networks, the IP addresses need to be changed accordingly. Therefore, related configurations on hosts become more complex. Built on a client-server model, DHCP provides dynamic address allocation to simplify host configuration.

DHCP Configuration Example I

Network Requirements

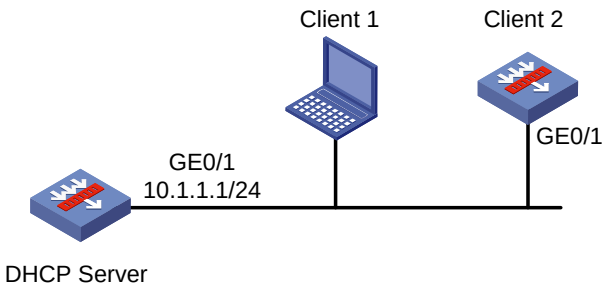
Note

The U200-S is used in this configuration example. This configuration example is applicable to SecPath F5000-A5, SecPath F1000E, and SecPath UTM 200-A/200-M/200-S firewalls.

As shown in Figure 1, two DHCP clients, the client 2 and client 1, reside on the same subnet as the DHCP server. Client 2 is connected to the DHCP server through GigabitEthernet 0/1, and client 1 is connected to the DHCP sever through a network interface card. The IP address of the GigabitEthernet 0/1 of the DHCP server is 10.1.1.1/24.

Configure the U200-S to allow the client 1 to obtain an IP address and other parameters dynamically from the DHCP server, and to allow client 2 to obtain a fixed IP address and other parameters from the DHCP server.

Figure 1 Network diagram for DHCP configuration example I



Configuration Considerations

- Configure the DHCP server.
- Configure client 1 and client 2 as DHCP clients.

Software Version Used

SecPath F1000E: V300R001B01 R3166 series and V300R001B01 F3166 series

SecPath F5000-A5: V300R002B01 R3206 series

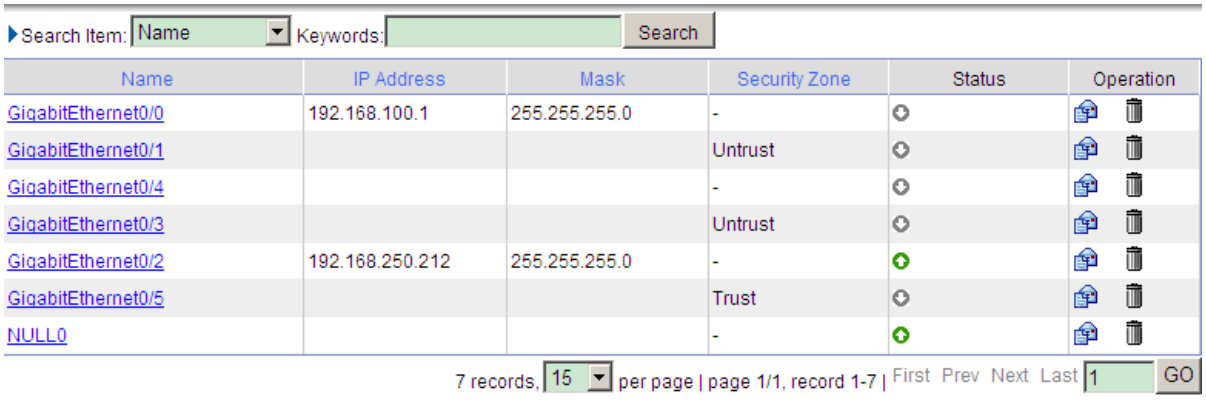
SecPath UTM 200-A/200-M/200-S firewalls: V500R001B01 R5116 series

Configuration Procedures

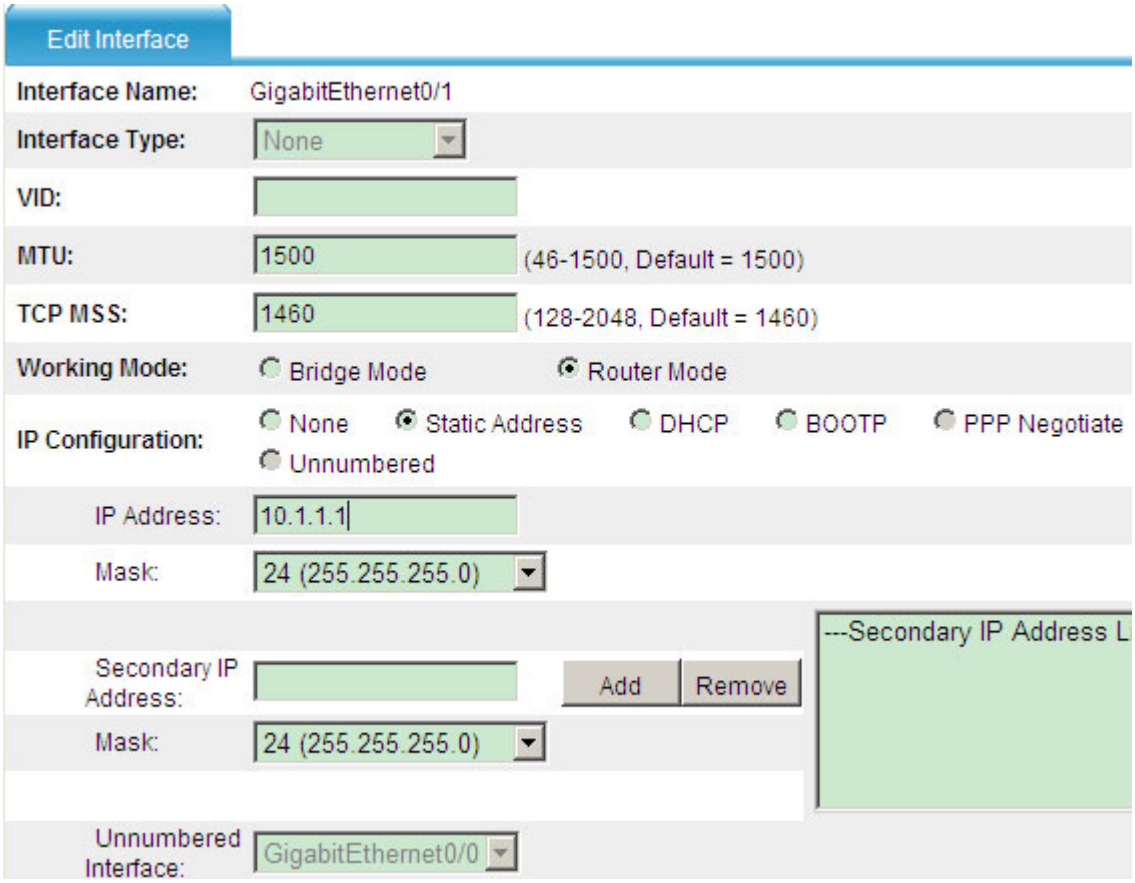
Basic Configuration

Specify the IP address of GigabitEthernet 0/1

- Select **Device Management** > **Interface** from the navigation tree.



- Click the icon of GigabitEthernet 0/1 to enter the **Edit Interface** page. Configure the interface as shown in the figure below, and then click **Apply** to return the **Interface** page.



Add GigabitEthernet 0/1 to the Trust zone

- Select **Device Management** > **Zone** from the navigation tree.

Zone ID	Zone Name	Preference	Share	Virtual Device	Operation
0	Management	100	no	--	
1	Local	100	no	Root	
2	Trust	85	no	Root	
3	DMZ	50	no	Root	
4	Untrust	5	no	Root	

- Click the icon of the Trust zone to enter the **Modify Zone** page. Add GigabitEthernet 0/1 to the Trust zone as shown in the figure below, and then click **Apply** to return to the **Zone** page.

Modify Zone

Zone ID: 2

Zone Name: Trust

Preference: 85 (1-100)

Share: No

Virtual Device: Root

Interface Name: Interface Search | Advanced Search

	Interface	VLAN
☐	GigabitEthernet0/1	
☐	GigabitEthernet0/2	
☐	GigabitEthernet0/3	
☐	GigabitEthernet0/4	
☐	NULL0	

The VLANs should be separated by ',' or '-'. For example:3, 5-10

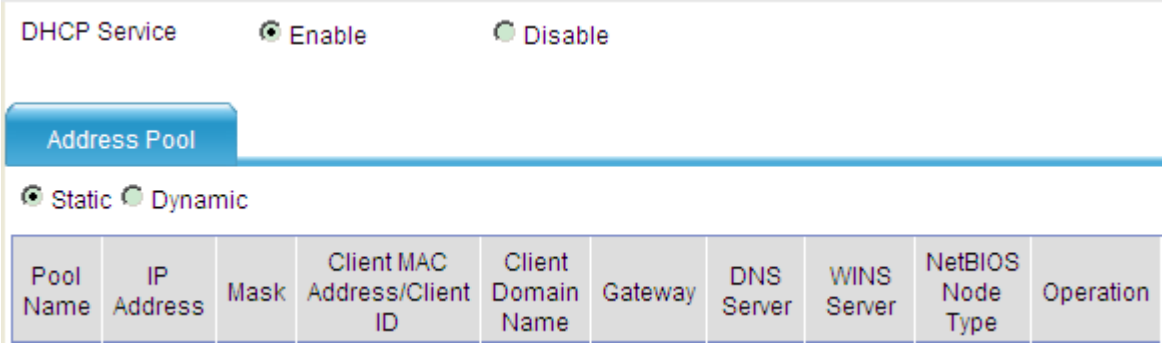
Items marked with an asterisk(*) are required

Apply Cancel

Configuration on the DHCP Server

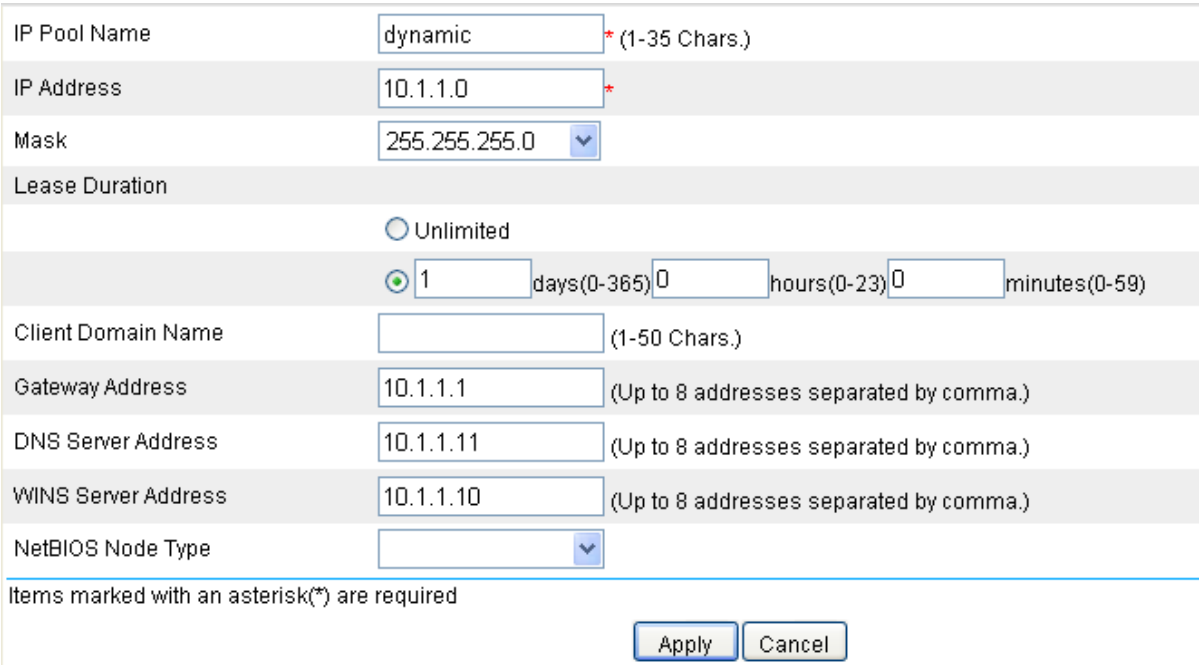
1) Enable DHCP.

Select **Network** > **DHCP** > **DHCP Server** from the navigation tree, and then click on the **Enable** radio button, as shown in the figure below.



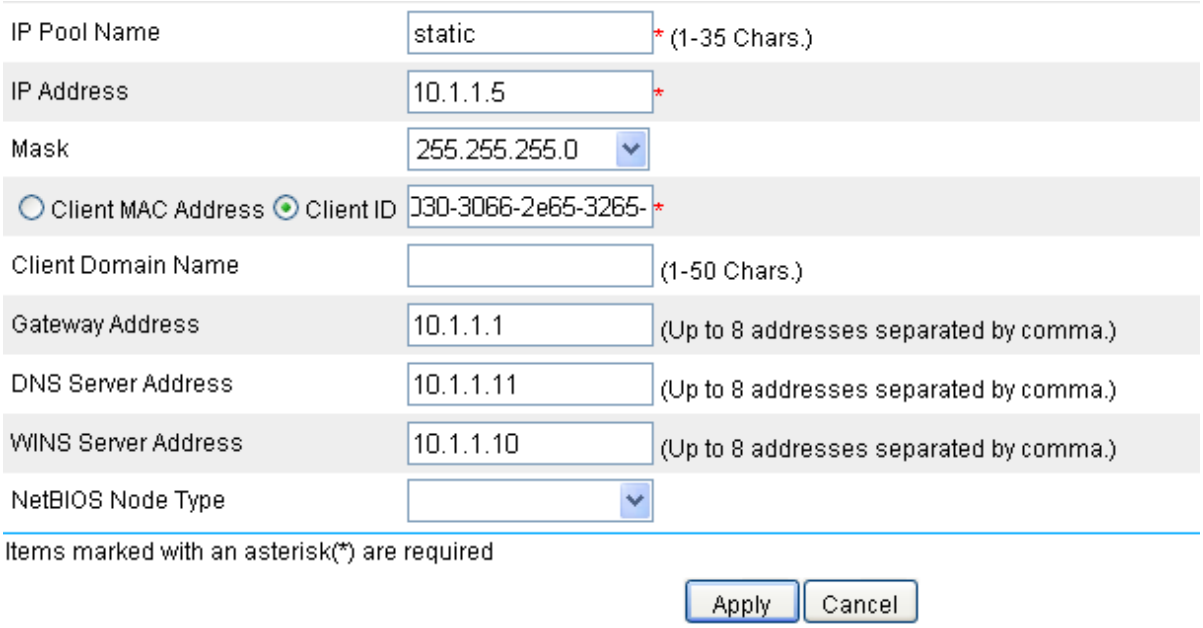
2) Create a dynamic DHCP address pool

On the **DHCP Server** page, click on the **Dynamic** radio button and click **Add** to enter the page shown below:



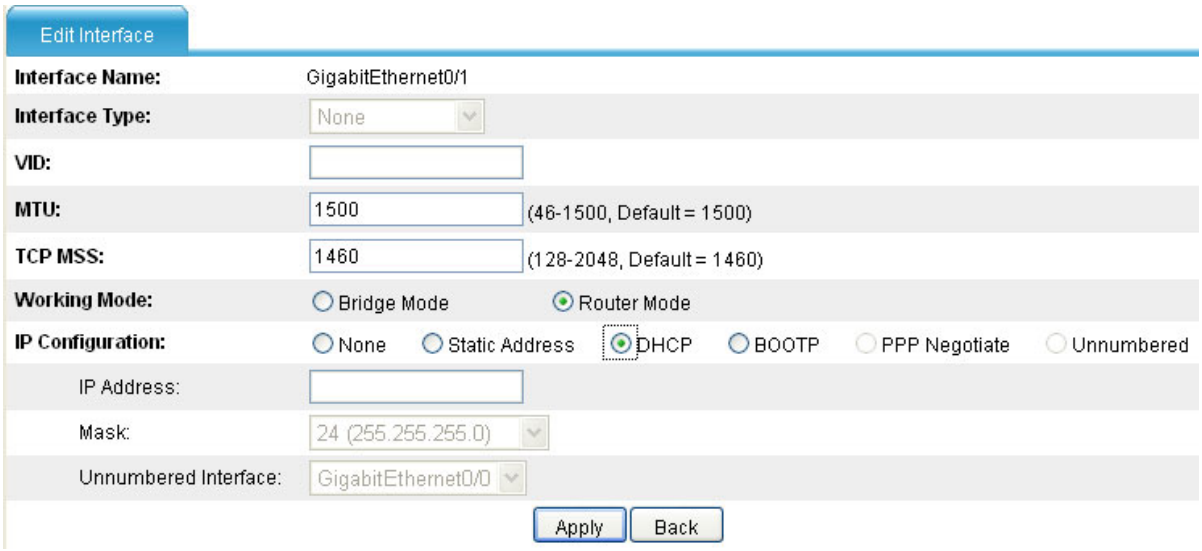
3) Create a static DHCP address pool

On the **DHCP Server** page, click on the **Static** radio button and click **Add** to enter the page shown below:



Configuration on DHCP Clients

1) Configure GigabitEthernet 0/1 of client 2 to obtain an IP address through DHCP.



2) Configure client 1 (running Window XP in the example) as a DHCP client.

Right-click **Network Neighborhood** on the desktop and select **Properties** from the shortcut menu to enter the **Network Connections** window. Right-click **Local Area Connection** and select **Properties** from the shortcut menu to enter the **Local Area Connection Properties** window. Select a proper network interface card for **Connect using** and select **Internet Protocol (TCP/IP)**. Click **Internet Protocol (TCP/IP)** and then click **Properties** to enter the **Internet Protocol (TCP/IP) Properties** window. Click on radio buttons next to **Obtain an IP address automatically** and **Obtain DNS server address automatically**.

Verification

After the preceding configurations are complete, you can see that client 2 obtains a fixed IP address 10.1.1.5, and client 1 obtains an IP address on subnet 10.1.1.0/24.

1) View the detailed information of GigabitEthernet 0/1 on client 2. You can view the IP address that the interface has obtained.

Port Statistics

```
GigabitEthernet0/1 current state: UP
Line protocol current state: UP
Description: GigabitEthernet0/1 Interface
The Maximum Transmit Unit is 1500, Hold timer is 10(sec)
Internet Address is 10.1.1.5/24, acquired via DHCP
```

2) Run the **ipconfig/all** command in the **Command Prompt** window. You can see configuration information including that the corresponding network interface card has obtained IP address 10.1.1.6 from the DHCP server.

```
Ethernet adapter 本地连接 6:

        Connection-specific DNS Suffix  . :
        Description . . . . . . . . . . . : Realtek RTL8139 Family PCI Fast Ethe
rnet NIC
        Physical Address. . . . . . . . . : 00-0A-EB-5B-8C-7F
        Dhcp Enabled. . . . . . . . . . . : Yes
        Autoconfiguration Enabled . . . . : Yes
        IP Address. . . . . . . . . . . . : 10.1.1.6
        Subnet Mask . . . . . . . . . . . : 255.255.255.0
        Default Gateway . . . . . . . . . : 10.1.1.1
        DHCP Server . . . . . . . . . . . : 10.1.1.1
        DNS Servers . . . . . . . . . . . : 10.1.1.11
        Primary WINS Server . . . . . . . : 10.1.1.10
        Lease Obtained. . . . . . . . . . : 2009年4月6日 14:34:57
        Lease Expires . . . . . . . . . . : 2009年4月7日 14:34:57
```

Configuration Guidelines

1) When a DHCP client resides on the same subnet as the DHCP server, to ensure communication between them after the client obtains an IP address, it is recommended that you configure the interface through which the server is connected to the client with an IP address from the address pool and with the same mask as the address pool.
2) To configure a valid static binding, you need to bind an IP address to a MAC address or a client ID. In this example, you can also bind the MAC address of the PC to the IP address, so that the PC can obtain a fixed IP address.
3) If you bind an IP address to both a client ID and a MAC address, the IP-to-client ID binding is preferential.
4) You can use the **display shcp client verbose** command on a DHCP client to view the client ID.
5) Currently, a static DHCP address pool supports one static binding only. That is, each static binding is a static address pool.

6) The DHCP server does not perform address conflict detection on the IP address in a static binding. To ensure communication after the client obtains the IP address, it is recommended that you specify the static binding with the IP address on the same network segment as the server's interface.
7) To exclude specific IP addresses from dynamic allocation, use the **dhcp server forbidden-ip** command in system view.

Troubleshooting

Symptom

The client 2 in the preceding example obtains no IP address.

Analysis

The network connection fails or the interface of the DHCP server does not reside on the network segment of the DHCP address pool.

Solution

1) Check that the interface through which the DHCP server is connected to the client resides in the address pool.
2) Check that the **dhcp enable** command is configured on the DHCP server.
3) Configure the interface of client 2 with an IP address from the address pool and ping from the IP address to the DHCP server to ensure the network connectivity.
4) Use the **debug** command on the DHCP server and the client respectively to verify that the packet exchange process is normal.

DHCP Configuration Example II

No matter whether a relay agent exists or not, the DHCP server and client interact with each other in a similar way.

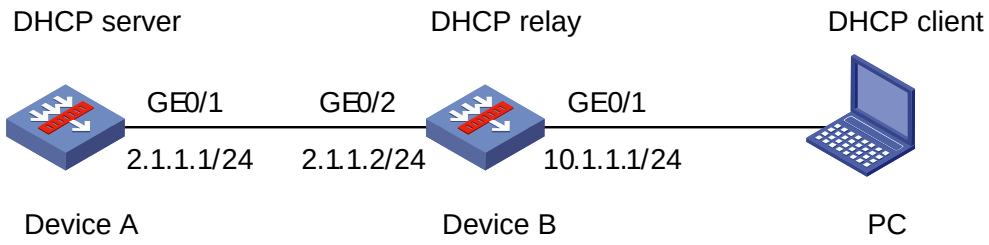
The DHCP relay agent works as follows:

1) A DHCP client broadcasts a DHCP-DISCOVER message.
2) The DHCP relay agent forwards the message to the designated DHCP server in unicast mode.
3) The DHCP server returns an IP address and other configuration parameters to the relay agent, which conveys them to the client.

Network Requirements

As shown in Figure 2, Device B is connected to the network where the DHCP client (PC) resides through GigabitEthernet 0/1, and is connected to the DHCP server (Device A) through GigabitEthernet 0/2. The IP address of GigabitEthernet 0/1 on Device A is 2.1.1.1/24, and that of GigabitEthernet 0/2 on Device B is 2.1.1.2/24. Device B serves as a DHCP relay agent to forward DHCP messages, so that the DHCP client can obtain an IP address and other parameters from the DHCP server.

Figure 2 Network diagram for DHCP configuration example II



Configuration Considerations

- Configure Device A as the DHCP server.
- Configure Device B as the DHCP replay.
- Configure the PC as the DHCP client.

Software Version Used

SecPath F1000E: V300R001B01 R3166 series and V300R001B01 F3166 series

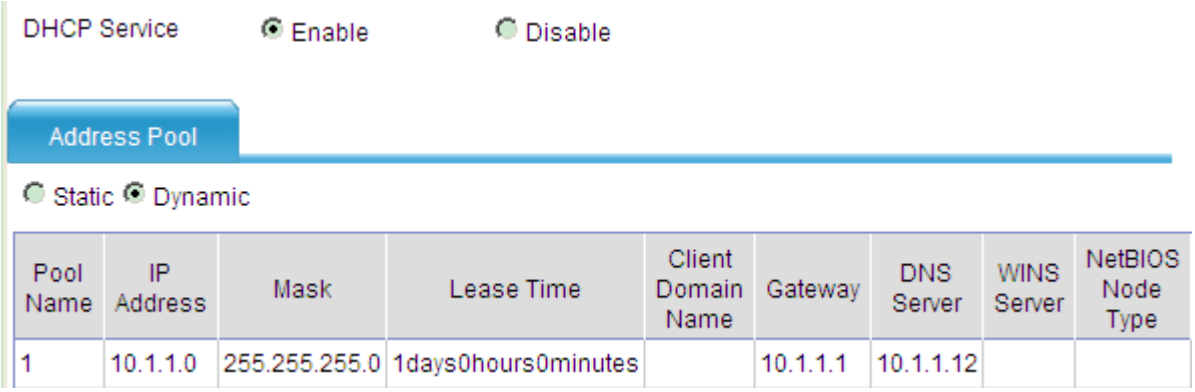
SecPath F5000-A5: V300R002B01 R3206 series

SecPath UTM 200-A/200-M/200-S firewall: V500R001B01 R5116 series

Configuration Procedure

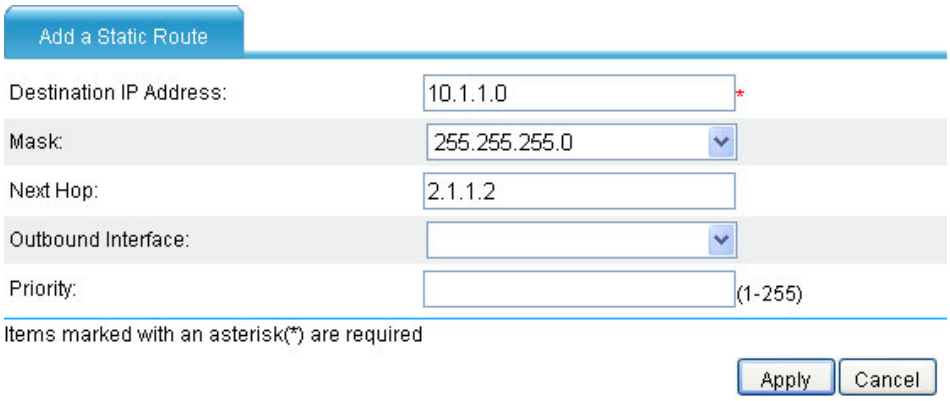
Configuration on the DHCP Server

- Specify the IP address of GigabitEthernet 0/1 on Device A as 2.1.1.1/24 and add the interface to the Trust zone. For more information, see Basic Configuration.
- Select **Network** > **DHCP** > **DHCP Server** from the navigation tree, click on the **Enable** radio button, and configure a dynamic DHCP address pool, as shown in the figure below.



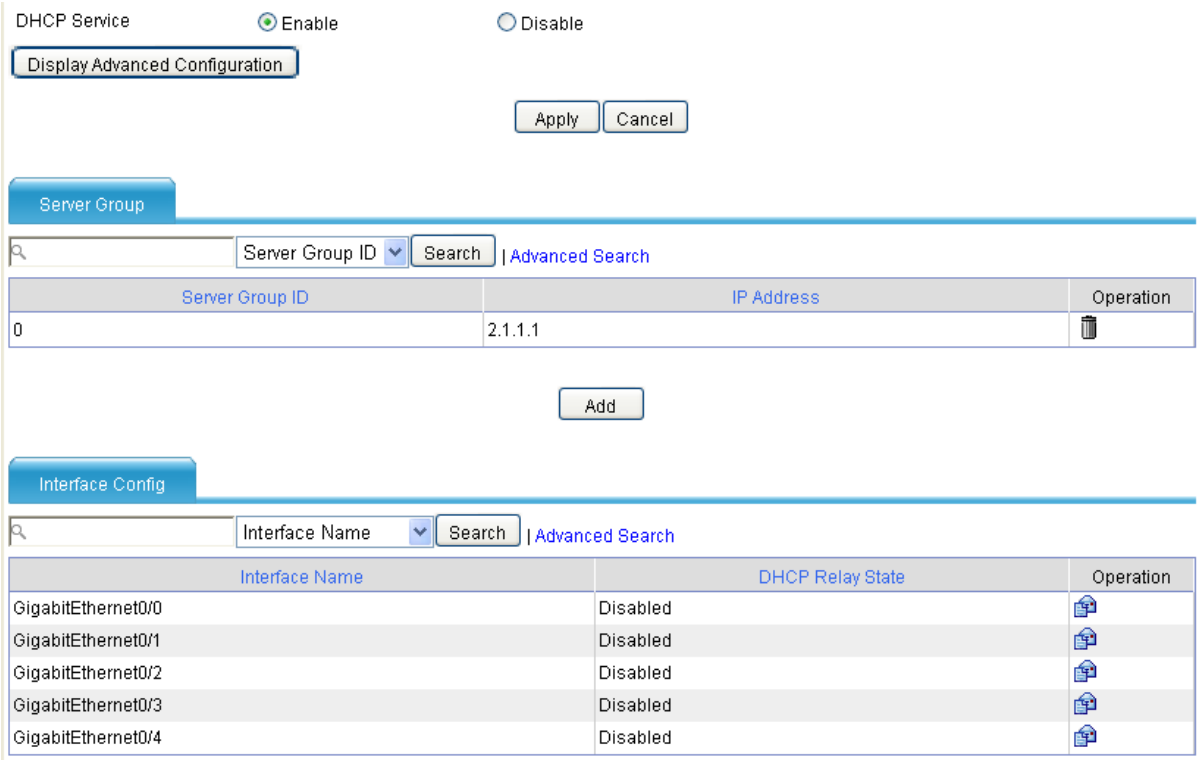
Pool Name	IP Address	Mask	Lease Time	Client Domain Name	Gateway	DNS Server	WINS Server	NetBIOS Node Type
1	10.1.1.0	255.255.255.0	1days0hours0minutes		10.1.1.1	10.1.1.12		

- Add a static route to the network segment 10.1.1.0. Select **Network Management** > **Routing Management** > **Static Routing** from the navigation tree, click **Add**, and then perform the operations as shown in the figure below.

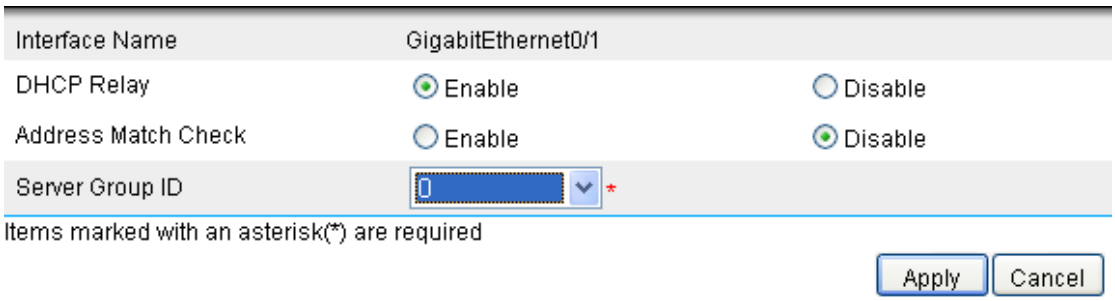


Configuration on the DHCP Relay

- Specify the IP address of GigabitEthernet 0/2 on the Device B as 2.1.1.2/24 and that of GigabitEthernet 0/1 as 10.1.1.1/24.
- Add GigabitEthernet 0/1 and GigabitEthernet 0/2 to the security zones as needed. For more information about the configurations, see Basic Configuration.
- Select **Network** > **DHCP** > **DHCP Relay** from the navigation tree, click on the **Enable** radio button and then click **Apply**. Create a server group with IP address 2.1.1.1, that is, the IP address of GigabitEthernet on the DHCP server, as shown in the figure below.



- On the **Interface Config** field, click the icon of GigabitEthernet 0/1. Click on the **Enable** radio button next to **DHCP Relay**, select **0** for **Server Group ID**, and click **Apply**.



Configuration on DHCP Client

- Configure the PC (running Window XP in the example) as a DHCP client.

Right-click **Network Neighborhood** on the desktop and select **Properties** from the shortcut menu to enter the **Network Connections** window. Right-click **Local Area Connection** and select **Properties** from the shortcut menu to enter the **Local Area Connection Properties** window. Select a proper network interface card for **Connect using** and select **Internet Protocol (TCP/IP)**. Click **Internet Protocol (TCP/IP)** and then click **Properties** to enter the **Internet Protocol (TCP/IP) Properties** window. Click on radio buttons next to **Obtain an IP address automatically** and **Obtain DNS server address automatically**.

Verification

After the preceding configurations are complete, you can see that the PC obtains an IP address from the address pool configured on the DHCP server (Device A). Run the **ipconfig/all** command in the **Command Prompt** window and you can see detailed configuration information.

Configuration Guidelines

1) When the DHCP server resides on a different network from the DHCP client, the interface through which the DHCP server is connected to the DHCP relay agent can be configured with any IP address not belonging to the address pool, whereas the interface through which the DHCP relay agent is connected to the DHCP client needs to be configured with an IP address from the address pool. To ensure normal communication after the client obtains an IP address, you need to configure the interface with the same mask as the address pool.
2) You can configure static bindings in a similar way as that of configuration example I. The DHCP server does not perform conflict detection on the IP address of a static binding. Therefore, to ensure the interconnection after the client obtains the IP address, it is recommended that you specify the static binding with the IP address on the same network segment as the DHCP relay agent's interface.
3) Configure a reachable route between the DHCP server and the DHCP client; otherwise, the client may fail to communicate with the server after obtaining an IP address, or the client cannot obtain an IP address because the server cannot forward the DHCP-OFFER message to the client. In this example, static routes are configured on the server and the client. You can use other routing protocols as well.

4) When multiple DHCP relay agents exist, you need to configure the interface address, relay agent mode and the corresponding next server group for each DHCP relay agent, and ensure that the route is reachable. You can also select the DHCP server address as the server group and ensure the route to the DHCP server is reachable.
5) To enhance security, you can enable the invalid IP address check feature on the interface through which the DHCP relay agent is connected to the client. With this feature enabled, the DHCP relay agent checks whether a requesting client's security entry exists on the DHCP relay agent. If not, the client cannot access outside networks via the DHCP relay agent. Note that the security entry of a client is added in the user information.

Troubleshooting

Symptom

The DHCP client (PC) cannot obtain an IP address.

Analysis

The network connection fails, the routes are unreachable, or the interface enabled with DHCP relay agent does not belong to the DHCP address pool configured on the DHCP server.

Solutioin

1) Check that the IP address of GigabitEthernet 0/1 of the DHCP relay agent (Device B) belongs to the DHCP address pool.
2) Check that the DHCP service is enabled on Device B.
3) Check that routes between devices are reachable. You can manually configure an IP address for the PC and ping the DHCP server and relay agent to check connectivity.
4) Check that the invalid IP address check feature is disabled on GigabitEthernet 0/2. If the feature is enabled, remove the configuration or add a static security entry for the server on the DHCP relay agent, so as to ensure the normal packet exchange between the server and the client.
5) View the server group information on the DHCP relay agent and make sure that the relay agent interface address is not used as the IP address of the server group.
6) Run the **debug** command on the server and the relay agent respectively to verify that the packet exchange process is normal.

References

Protocols and Standards

- *Routing TCP/IP, Volume II*
- RFC 2131, *Dynamic Host Configuration Protocol*
- RFC 2132, *DHCP Options and BOOTP Vendor Extensions*
- RFC 1542, *Clarifications and Extensions for the Bootstrap Protocol*

Related Documentation

H3C MSR 20/30/50 Series Routers User Manual

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SecPath Series Firewalls NAT Configuration Examples

Keywords: NAT, PAT, private address, public address, address pool

Abstract: This document describes the characteristics, application scenarios, and configuration examples of the network address translation (NAT) features of SecPath series firewalls.

Acronyms:

Acronym	Full spelling
NAT	Network Address Translation
ALG	Application Level Gateway
ACL	Access Control List
VPN	Virtual Private Network
PAT	Port Address Translation
No-PAT	No-Port Address Translation

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Feature Overview

NAT translates an IP address in an IP packet header to another IP address.

In practice, NAT is primarily used to allow users using private IP addresses to access public networks. With NAT, a small number of public IP addresses are used to enable large numbers of internal hosts to access the Internet. Thus NAT effectively alleviates the depletion of IP addresses. NAT provides privacy for the internal network and can provide specific services for users on the Internet as needed.

The SecPath series high-end firewalls use a multi-core CPU, featuring excellent service processing capability and performance. They can be used as the security gateways of large scale enterprise networks to provide one-to-many, one-to-one, and internal server address translation functions. In addition, they support multiple VPNs and address translation of VLAN interfaces..

Application Scenarios

- Using a small number of public IP addresses to enable a large number of internal hosts to access the Internet.
- Providing privacy for the internal network.
- Providing specific services for users on the Internet as needed.

Configuration Guide

NAT basic configuration can be performed through the web interface. NAT support for multi-VPN, such as multi-VPN routing and multi-VPN access control list (ACL) can be configured only through the command line interface (CLI).

You can configure the following NAT features through the web interface:

- Easy IP
- PAT
- No-PAT
- Static NAT
- NAT server

Devices Supporting NAT

SecPath F5000-A5, SecPath F1000E, and SecPath UTM 200-A/200-M/200-S firewalls.

Software Version Used

SecPath F1000E: V300R001B01 R3166 series and V300R001B01 F3166 series

SecPath F5000-A5: V300R002B01 R3206 series

SecPath UTM 200-A/200-M/200-S firewalls: V500R001B01 R5116 series

Configuration Saving

Save your configuration in time. To do so, select **Device Management** > **Maintenance** > **Save** from the navigation tree, and click **Apply**, as shown in the following figure.

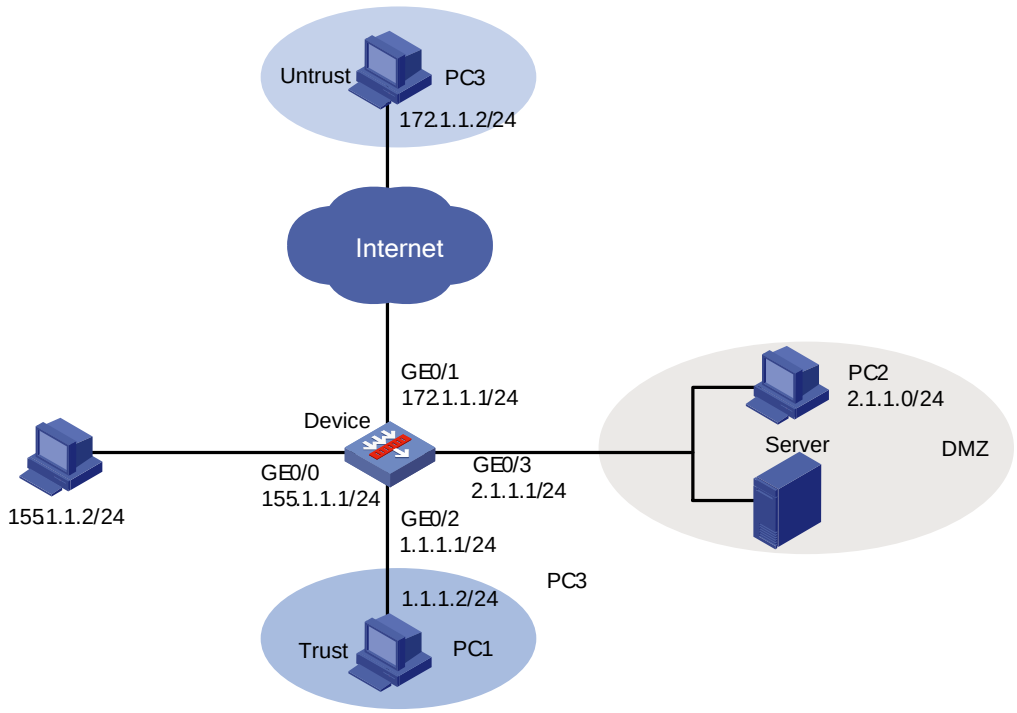
Configuration Examples

Note

The SecPath F1000E is used in the configuration examples.

Networking Scenarios

Figure 1 Network diagram for NAT operation



Device Basic Configuration

Configuring Interfaces

Select **Device Management** > **Interface** from the navigation tree. Perform interface configuration. GigabitEthernet 0/0, GigabitEthernet 0/1, GigabitEthernet 0/2, and GigabitEthernet 0/3 are Layer 3 interfaces, and their IP addresses are shown in Figure 2.

Adding the Interfaces to Zones

Select **Device Management** > **Zone** from the navigation tree, and add the following interfaces to the corresponding zones.

- Add GigabitEthernet 0/0 into the management zone (default).
- Add GigabitEthernet 0/1 into the Untrust zone
- Add GigabitEthernet 0/2 into the Trust zone.
- Add GigabitEthernet 0/3 into the DMZ zone.

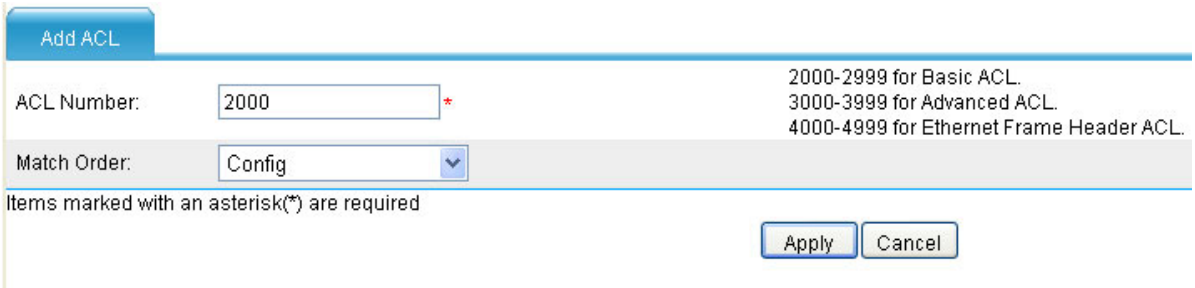
Figure 2 Add interfaces to zones

Name	IP Address	Mask	Security Zone
GigabitEthernet0/0	155.1.1.1	255.255.255.0	-
GigabitEthernet0/1	172.1.1.1	255.255.255.0	Untrust
GigabitEthernet0/2	1.1.1.1	255.255.255.0	Trust
GigabitEthernet0/3	2.1.1.1	255.255.255.0	DMZ

Configuring ACL

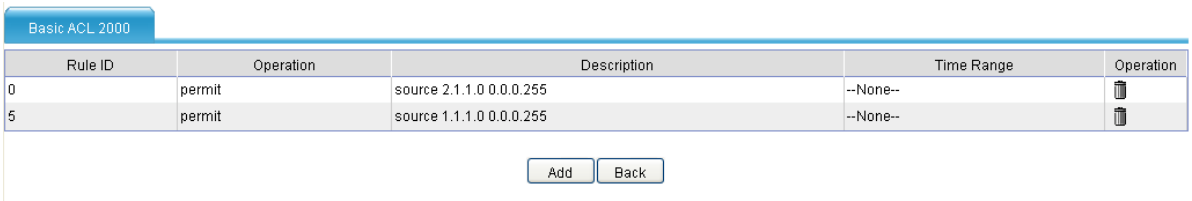
Configure ACL 2000 to match traffic from subnet 192.168.1.0/24 to subnet 172.16.0.0/24.

Select **Firewall** > **ACL** from the navigation tree, and click **Add** to enter the following page:



- Type **2000** for **ACL number**.
- Select the match order **Config**.
- Click **Apply**.
- Click the icon of ACL 2000 to enter the ACL rule page. Click **Add** and configure as follows:

Figure 3 Configure the ACL



NAT Configuration Examples

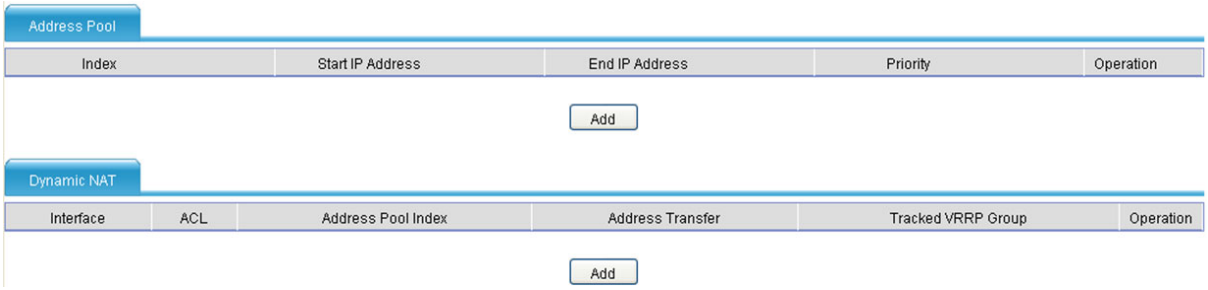
Easy IP

Requirements

Use an ACL to permit only certain internal IP addresses to be NATed and use the public IP address of an interface as the translated source address.

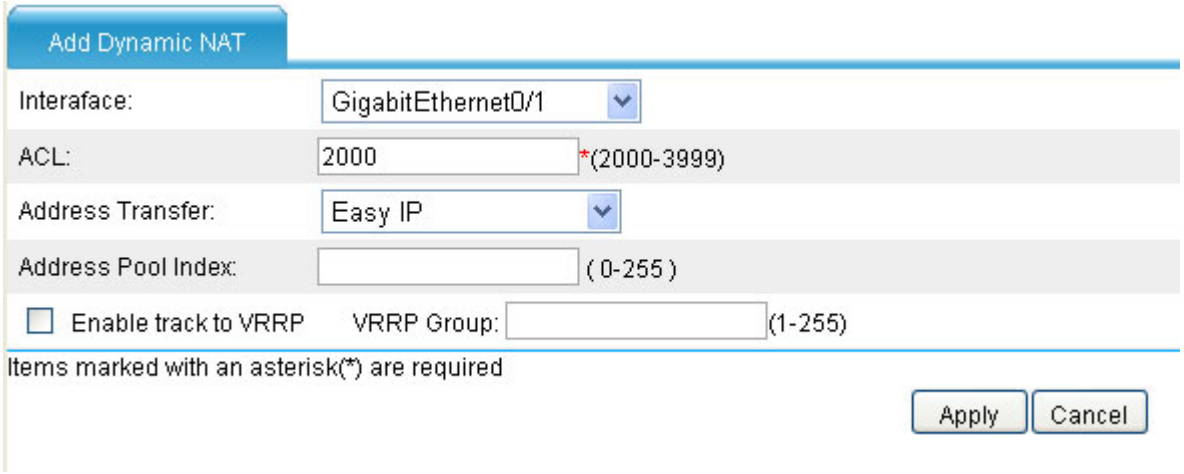
Configuration steps

1) Select **Firewall** > **NAT** > **Dynamic NAT** from the navigation tree, as shown in the following figure:



2) Click **Add** in the **Dynamic NAT** field to enter the **Add Dynamic NAT** page.

- Select **GigabitEthernet0/1** for **Interface**, type **2000** for **ACL**, select **Easy IP** for **Address Transfer**, and then click **Apply**.



- Access PC 3 in the Trust zone from PC 2 in the DMZ zone, and perform ping, HTTP, FTP, DNS, and Telnet operations.
- Check the session list to view the results.

Verification results

1) The ping, HTTP, FTP, DNS, and Telnet operations are successful.
2) Check the session list:

- Select **Firewall** > **Session Table** > **Session Summary** from the navigation tree to enter the following page:

Query Item: Init Src IP IP Address: Search

Init Src IP	Init Dest IP	Init VPN VPN / VLAN / INLINE	Resp Src IP	Resp Dest IP	Resp VPN VPN / VLAN / INLINE	Protocol	Session Status	Lifetim (s)
192.168.100.14:3303	192.168.250.230:8081	---	192.168.250.230:8081	192.168.100.14:3303	---	TCP	SYN	12
2.1.1.2:1395	172.1.1.2:80	---	172.1.1.2:80	172.1.1.1:1102	---	TCP	TCP-EST	3600
172.1.1.1:21	172.1.1.2:12292	---	172.1.1.2:12292	172.1.1.1:21	---	TCP	TCP-EST	3592
192.168.100.14:3346	192.168.250.230:161	---	192.168.250.230:161	192.168.100.14:3346	---	UDP	UDP-OPEN	24
192.168.96.15:4352	192.168.250.241:80	---	192.168.250.241:80	192.168.96.15:4352	---	TCP	TCP-EST	3600
2.1.1.2:1392	172.1.1.2:21	---	172.1.1.2:21	172.1.1.1:1100	---	TCP	TCP-EST	3597

6 records, 15 per page | page 1/1, record 1-6 | First Prev Next Last 1

Del Selected Del All

- Type **2.1.1.2** in the **IP Address** text box, and click **Search** to display the search result, as shown in the following figure.

Query Item: Init Src IP IP Address: 2.1.1.2 Search

Init Src IP	Init Dest IP	Init VPN VPN / VLAN / INLINE	Resp Src IP	Resp Dest IP	Resp VPN VPN / VLAN / INLINE	Protocol	Session Status	Lifetime (s)
2.1.1.2:1043	172.1.1.2:21	---	172.1.1.2:21	172.1.1.1:1027	---	TCP	TCP-EST	3538

Del Selected Del All

Remarks

Remove the configuration in this example before performing another configuration example.

PAT

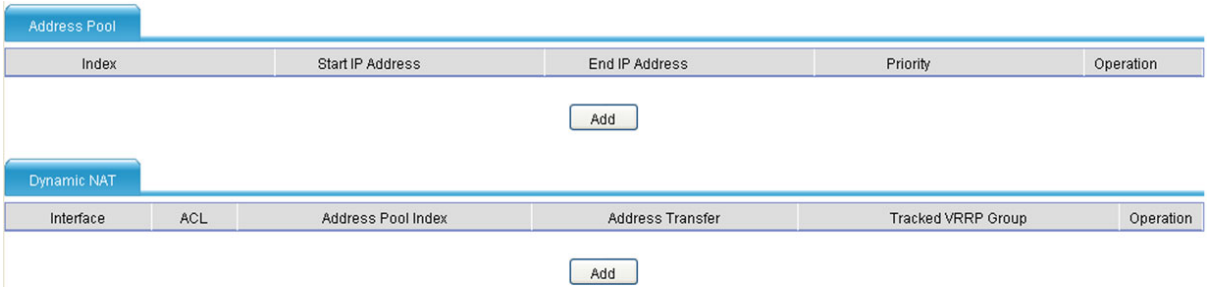
Requirements

Translate the source address of a packet into an IP address in the NAT address pool and translate the source port of the packet.

Configuration steps

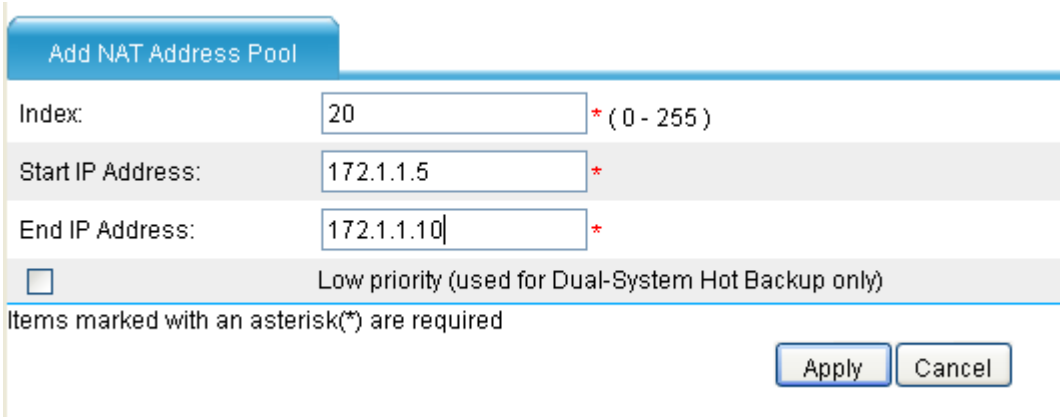
1) Create an address pool.

- Select **Firewall** > **NAT** > **Dynamic NAT** from the navigation tree, to enter the following page:



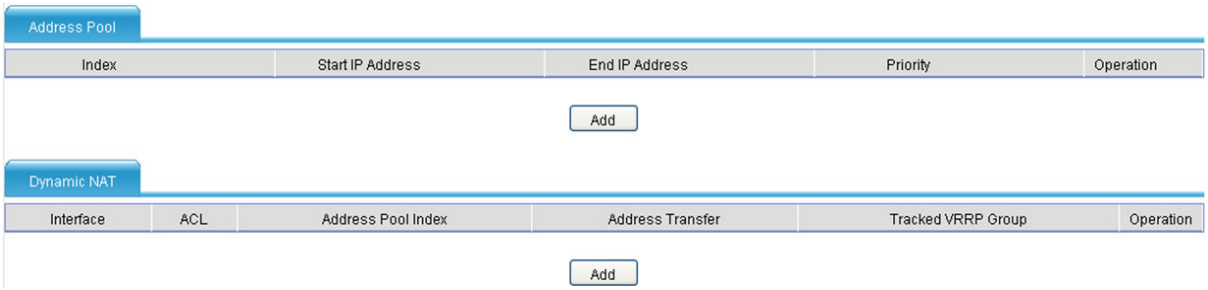
- Click **Add** in the **Address Pool** field to enter the **Add NAT Address Pool** page, as shown in the following figure.

Type the address pool index, start IP address, and end IP address, and then click **Apply**.



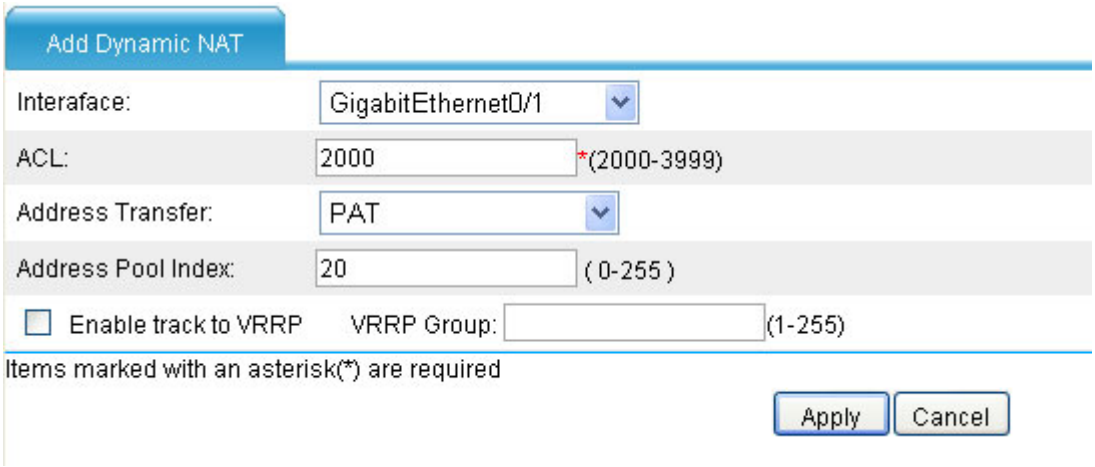
2) Configure NAT PAT

- Select **Firewall** > **NAT** > **Dynamic NAT** from the navigation tree, to enter the page as shown in the following figure:



- Click **Add** in the **Dynamic NAT** field to enter the **Add Dynamic NAT** page.

Select **GigabitEthernet0/1** for **Interface**, type **2000** for **ACL**, select **PAT** for **Address Transfer**, and then click **Apply**.



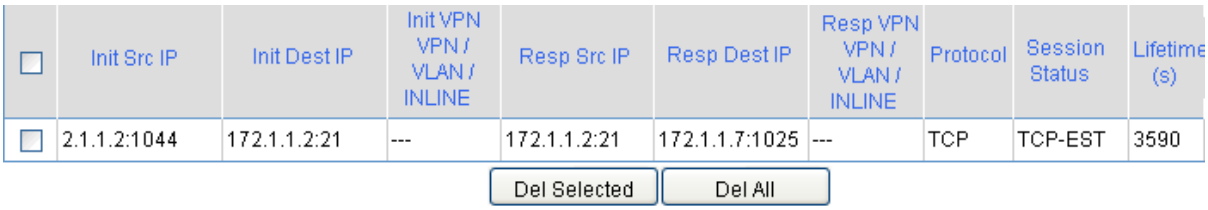
- Access PC 3 in the Trust zone from PC 2 in the DMZ zone, and perform ping, HTTP, FTP, DNS, and Telnet operations.

Check the session list to view the result.

Verification results

1) The ping, HTTP, FTP, DNS, and Telnet operations are successful.
2) Check the session list: The destination IP address (the translated address) of the session response is an IP address in the address pool, and the source port is translated.

Type **2.1.1.2** in the **IP Address** text box and click **Search** to display the search result, as shown in the following figure.



	Init Src IP	Init Dest IP	Init VPN VPN / VLAN / INLINE	Resp Src IP	Resp Dest IP	Resp VPN VPN / VLAN / INLINE	Protocol	Session Status	Lifetime (s)
	2.1.1.2:1044	172.1.1.2:21	---	172.1.1.2:21	172.1.1.7:1025	---	TCP	TCP-EST	3590

Del Selected Del All

Remarks

Remove the configuration in this example before performing another configuration example.

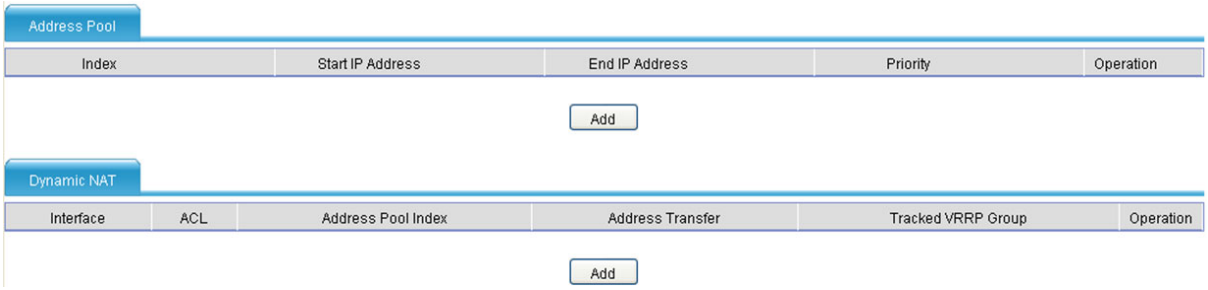
No-PAT

Requirements

Configuration steps

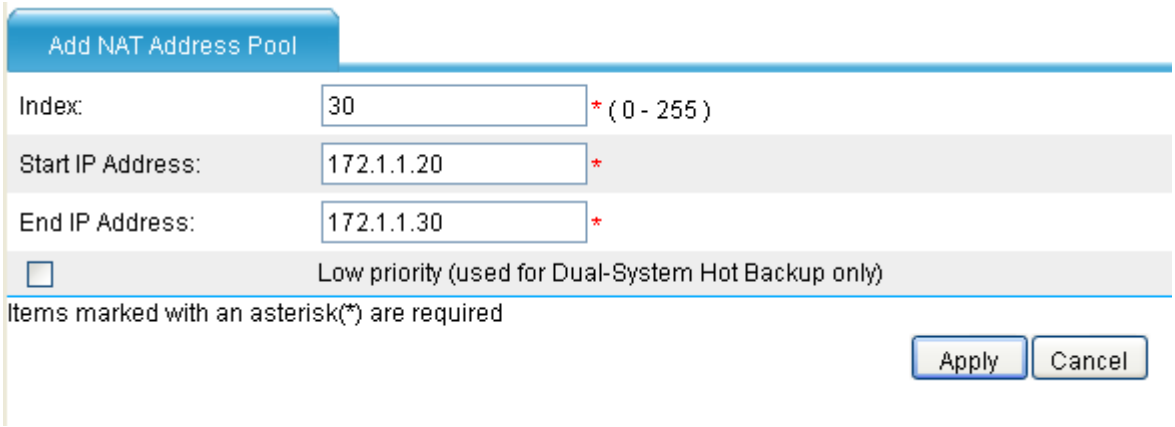
1) Create an address pool.

- Select **Firewall** > **NAT** > **Dynamic NAT** from the navigation tree, as shown in the following figure:



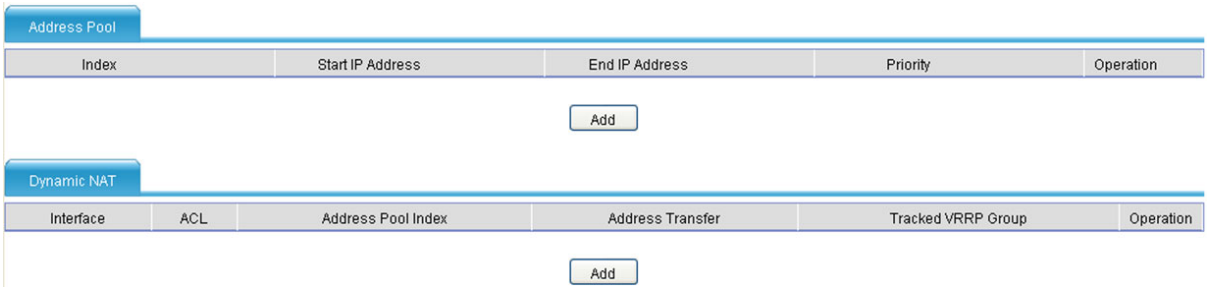
- Click **Add** in the **Address Pool** field, to enter the **Add NAT Address Pool** page, as shown in the following figure.

Type the address pool index, start IP address, and end IP address, and then click **Apply**.



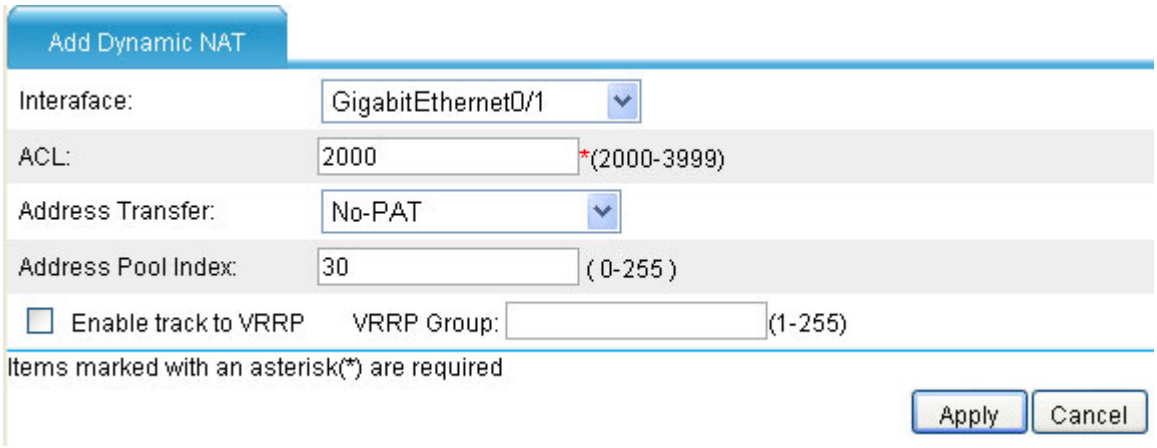
2) Configure No-PAT

- Select **Firewall** > **NAT** > **Dynamic NAT** from the navigation tree, to enter the page as shown in the following figure:



- Click **Add** in the **Dynamic NAT** field to enter the **Add Dynamic NAT** page.

Select **GigabitEthernet0/1** for **Interface**, type **2000** for **ACL**, select **No-PAT** for **Address Transfer**, and then click **Apply**.

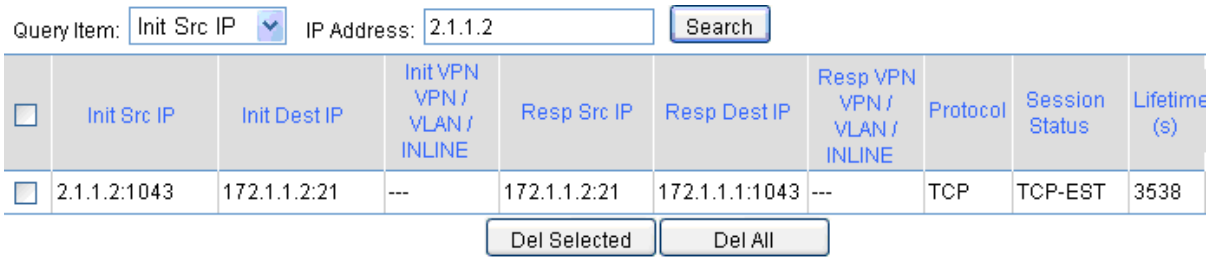


- Access PC 3 in the Trust zone from PC 2 in the DMZ zone, and perform ping, HTTP, FTP, DNS, and Telnet operations.
- Check the session list to view the result.

Verification results

1) The ping, HTTP, FTP, DNS, and Telnet operations are successful.
2) Check the session list: The destination IP address (the translated address) of the session response is an IP address in the address pool, and the source port is not changed.

Type **2.1.1.2** in the **IP Address** text box and click **Search** to display the search result, as shown in the following figure.



Remarks

Remove the configuration in this example before performing another configuration example.

Static NAT

Requirements

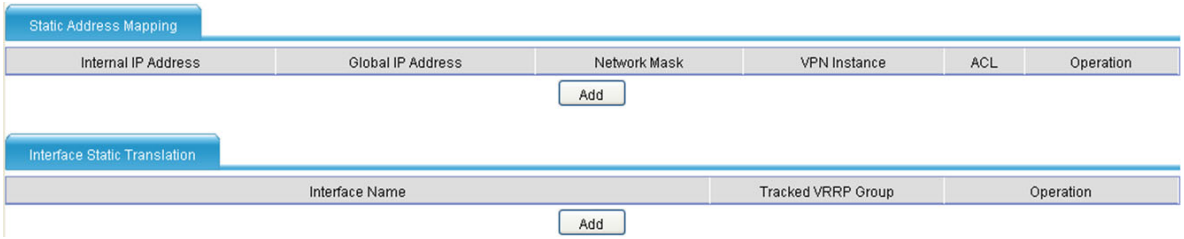
Configure a static one-to-one NAT entry that does not translate the source or destination port.

When an ACL is specified, the static NAT entry only translates packets permitted by the ACL.

Configuration steps

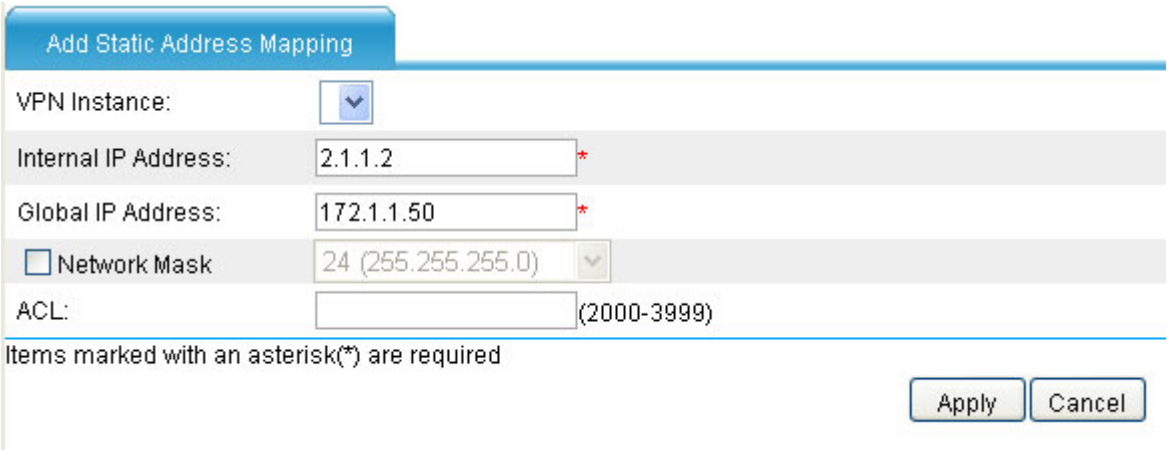
1) Configure static address translation.

- Select **Firewall** > **NAT** > **Static NAT** from the navigation tree, as shown in the following figure:



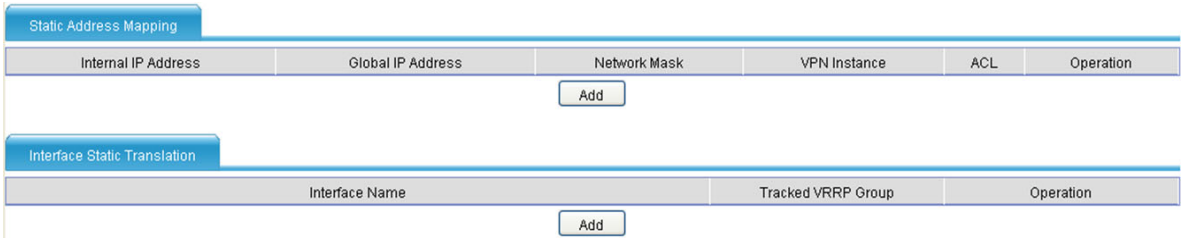
- Click **Add** in the **Static Address Mapping** field to enter the **Add Static Address Mapping** page.

Type the internal and global IP addresses and click **Apply**.



2) Enable static address translation.

- Select **Firewall** > **NAT** > **Static NAT** from the navigation tree, as shown in the following figure:



- Click **Add** in the **Static Address Mapping** field to enter the **Enable Interface Static Translation** page.

Select **GigatbitEthernet0/1** for **Interface Name** and click **Apply**.

- Access PC 3 from PC 2 and perform ping, HTTP, FTP, DNS, and Telnet operations.
- Check the session list. Verification result (1) is expected.

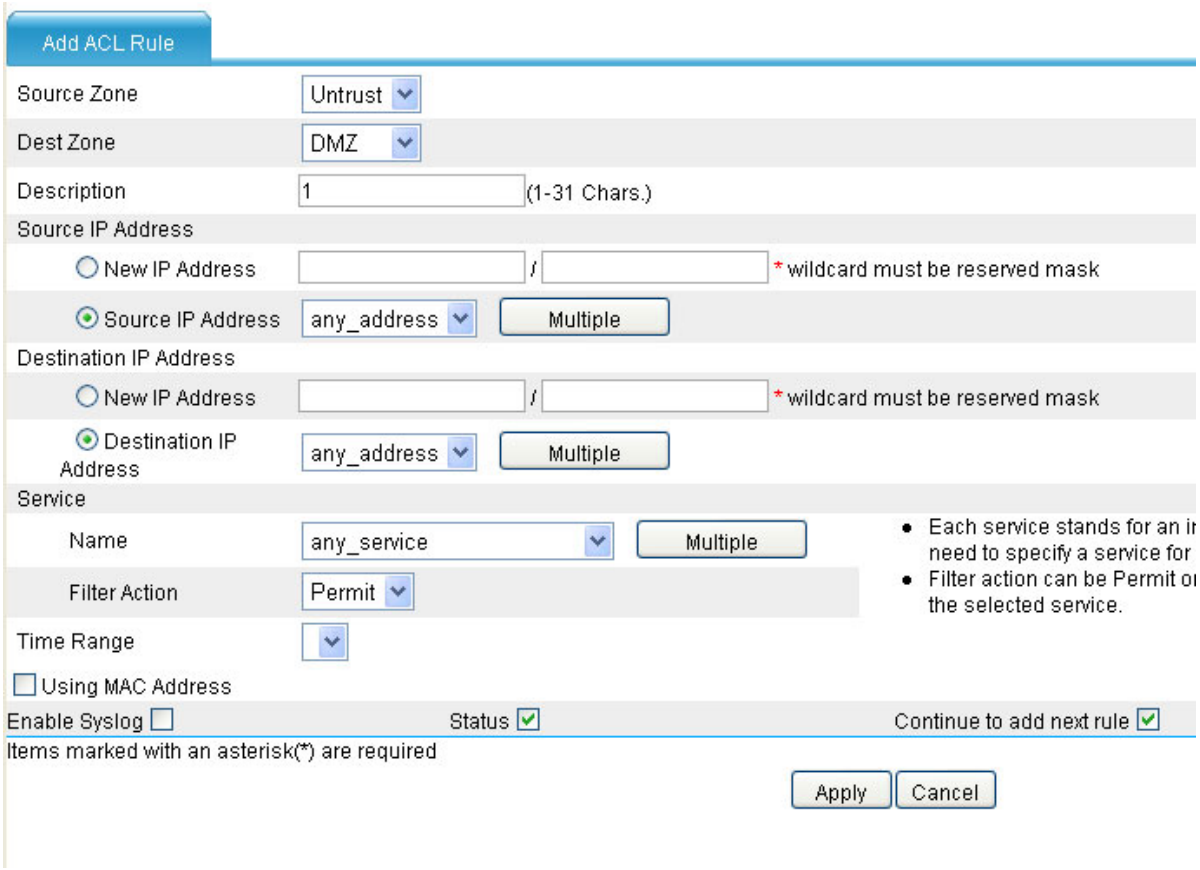
3) Create an ACL to control the access from the Untrust zone to the DMZ zone.

Note

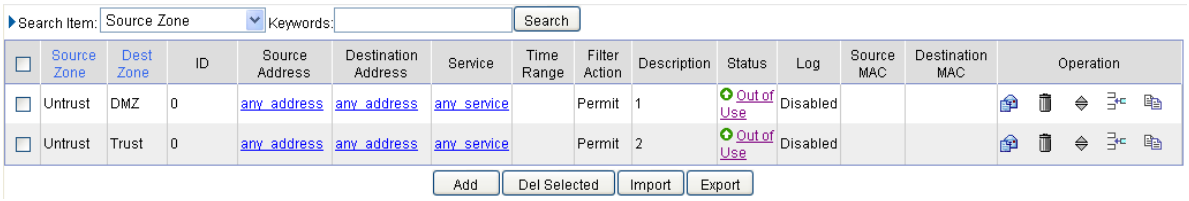
By default, the SecPath firewalls allow hosts in higher-priority security zones to access hosts in lower-priority security zones, but not vice versa. To allow an external host to access an internal host, you need to configure an interzone policy.

- Select **Firewall** > **Security Policy** > **Interzone Policy** from the navigation tree, as shown below:

- Click **Add** to enter the **Add ACL Rule** page, and perform the configuration as shown in the figure below:

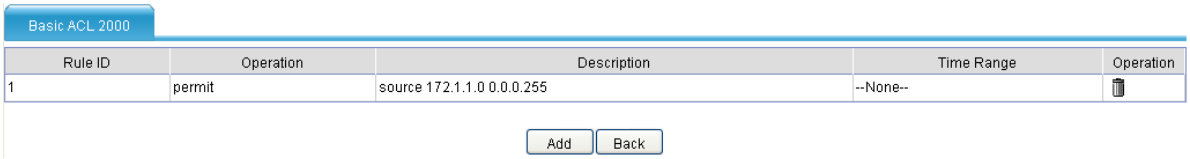


- In the same way, create an ACL rule to control the access from the Untrust zone to the Trust zone. The configured ACL rules are shown as follows:

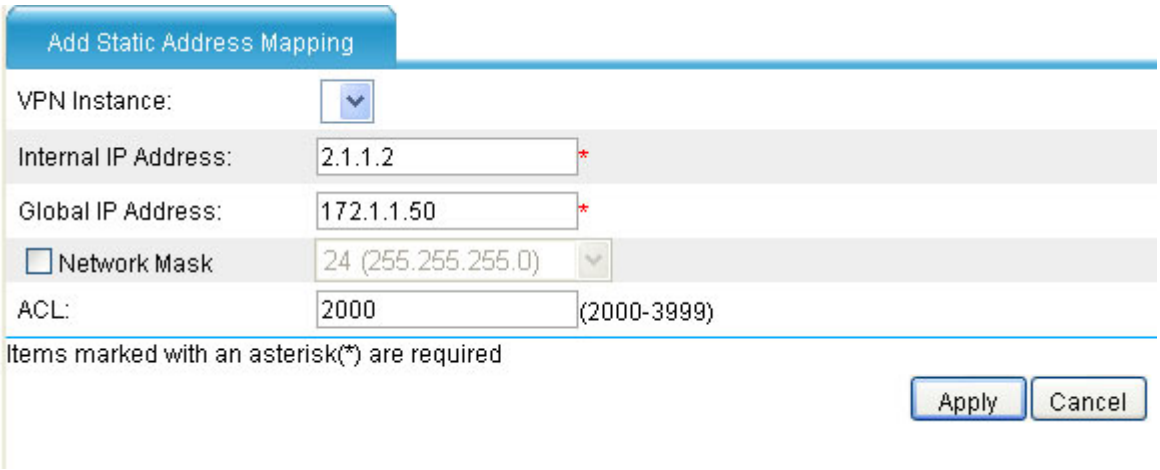


- Access PC 2 in the DMZ zone from PC 3 in the Trust zone, and perform ping, HTTP, FTP, DNS, and Telnet operations.
- Check the session list. Verification (2) is expected.

4) Create ACL 2000 as follows:



- Apply ACL 2000 to the static NAT entry.



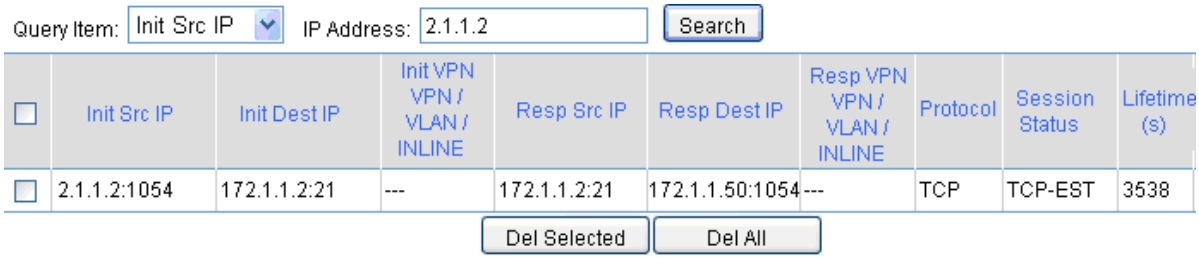
- Access PC 3 from PC 2 and ping IP address 172.1.1.2. Verification (3) is expected.
- Access PC 2 from PC 4 and ping IP address 172.1.1.50. Verification (4) is expected.

Verification results

1) The ping, HTTP, FTP, DNS, and Telnet operations are successful.

Check the session list:

Type **2.1.1.2** in the **IP Address** text box and click **Search** to display the search result, as shown in the following figure.



2) The ping, HTTP, FTP, DNS, and Telnet operations are successful.

Check the session list. The destination IP address is translated to the internal address but the destination port number keeps unchanged.

Type **172.1.1.2** in the **IP Address** text box, and click **Search** to display the search results.

3) PC 2 cannot access PC 3 because ACL 2000 only permits packets from 172.1.1.0 and thus denies packets from subnet 2.1.1.0.
4) PC 3 can access PC 2 because ACL 2000 permits packets from subnet 172.1.1.0.

Query Item: Init Src IP IP Address: 172.1.1.2 Search

	Init Src IP	Init Dest IP	Init VPN VPN / VLAN / INLINE	Resp Src IP	Resp Dest IP	Resp VPN VPN / VLAN / INLINE	Protocol	Session Status	Lifetime (s)
	172.1.1.2:2082	172.1.1.50:21	---	2.1.1.2:21	172.1.1.2:2082	---	TCP	TCP-EST	3593

Del Selected Del All

Remarks

Remove the configuration in this example before performing another configuration example.

Internal Server

Requirements

Configure an internal server that provides services to external hosts. Upon receiving a request from an external host that wants to access the internal server, NAT on the firewall translates the destination address and port of the request to the private address of the internal server and a specified destination port. .

Configuration steps

1) Configure an internal server

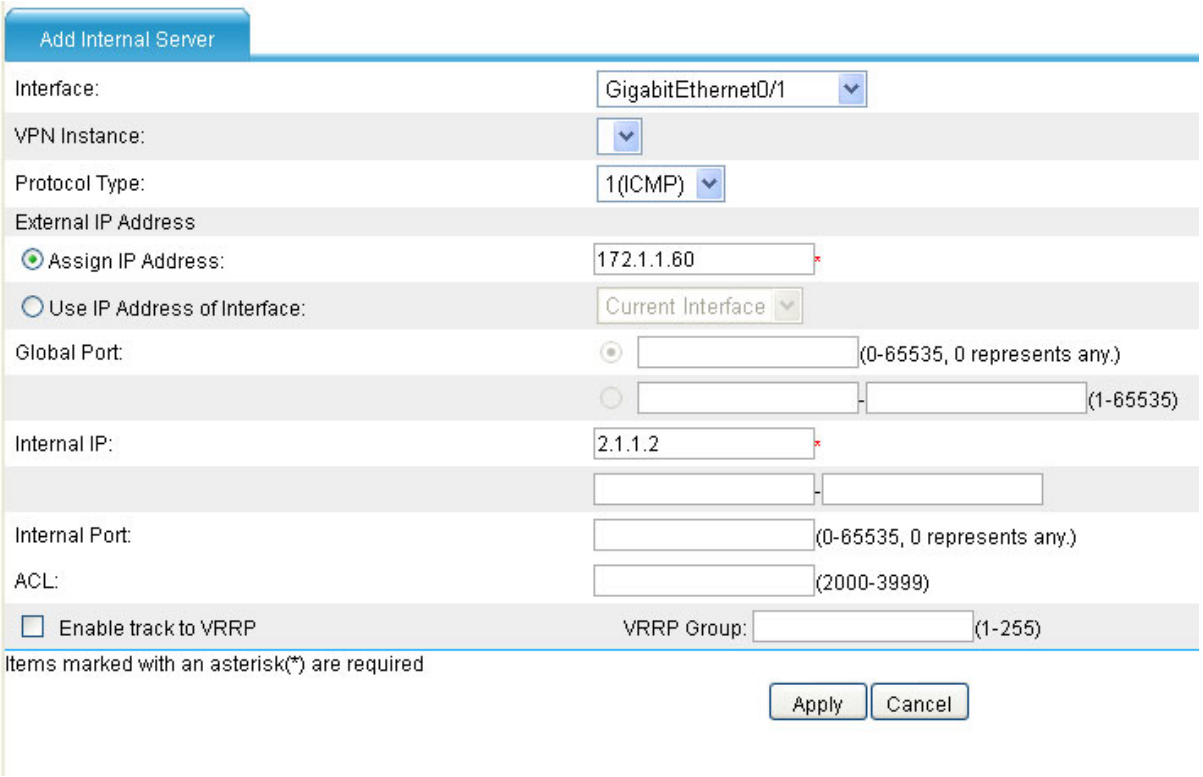
- Select **Firewall** > **NAT** > **Internal Server** from the navigation tree to enter the page as shown below:

Internal Server

Interface	VPN Instance	Global IP	Range of Global Port	Range of Internal IP	Internal Port	Protocol Type	ACL	Tracked VRRP Group	Operation

Add

- Click **Add** to enter the **Add Internal Server** page, and perform the configuration as shown in the page below, and click **Apply**.



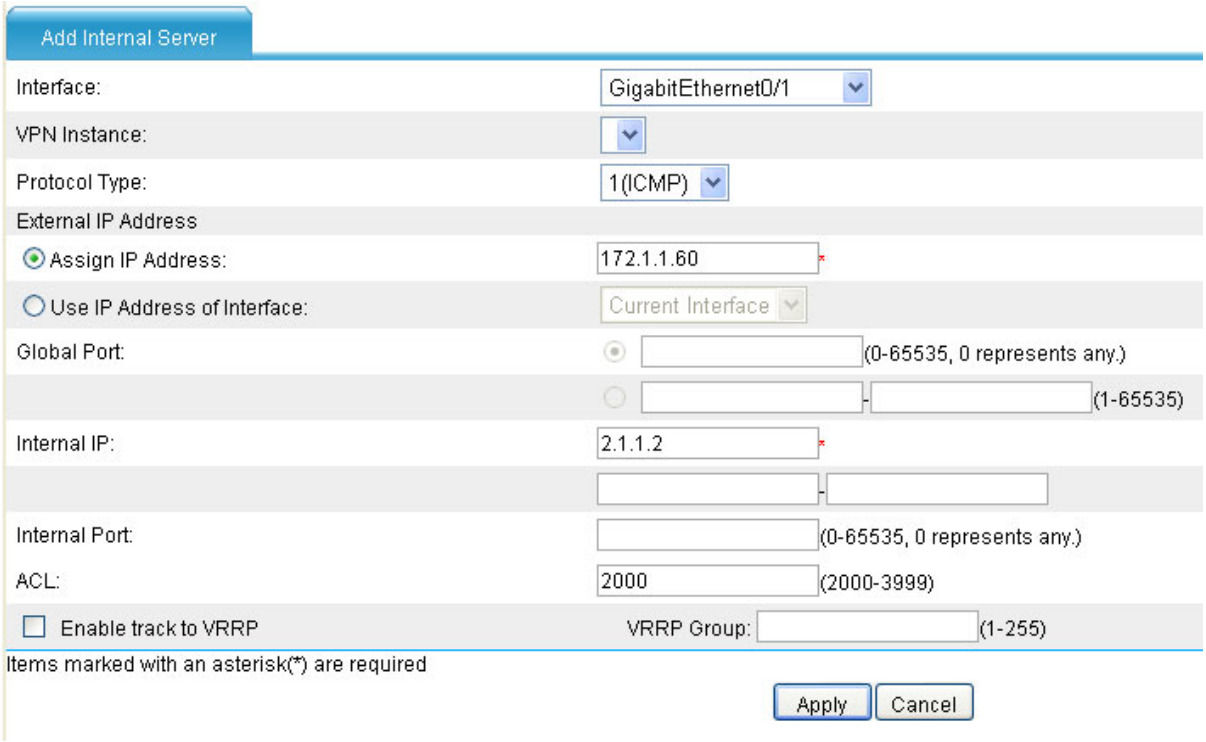
2) Create an ACL that permits access from the Untrust zone to the DMZ zone.

In the same way, create an ACL to permit access from the Untrust zone to the Trust zone.

Access PC 2 from PC 3, ping public address 172.1.1.60. Verification (1) is expected.

3) Create ACL 2000 that denies all packets.

4) Apply ACL 2000 to the internal server as shown below.



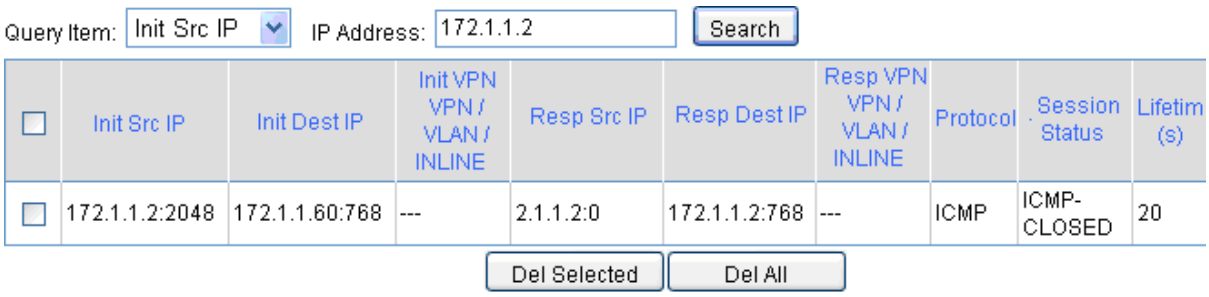
5) Access PC 2 from PC 3, ping public address 172.1.1.60. Verification (2) is expected.

Verification results

1) The ping operation is successful.

Check the session list:

Type **172.1.1.2** in the **IP Address** text box, and click **Search** to display the search results.



2) Because ACL 2000 denies all packets, the ping operation fails and the internal server does not work.

Remarks

Remove the configuration in this example before performing another configuration example..

NAT on a VLAN Interface

Requirements

Easy IP is used in this example.

Configuration steps

Note

Step 1 and 2 are configured at the CLI.

1) Specify interfaces GigabitEthernet 0/0, GigabitEthernet 0/2, and GigabitEthernet 0/3 as Layer 3 interfaces. Specify GigabitEthernet 0/1 as a Layer 2 access interface and add it to VLAN 3.

```
<Device>system-view
System View: return to User View with Ctrl+Z.
[Device]vlan 3
[Device-vlan3]quit
[Device]interface GigabitEthernet0/1
[Device-GigabitEthernet0/1]port link-mode bridge
[Device-GigabitEthernet0/1]port access vlan 3
```

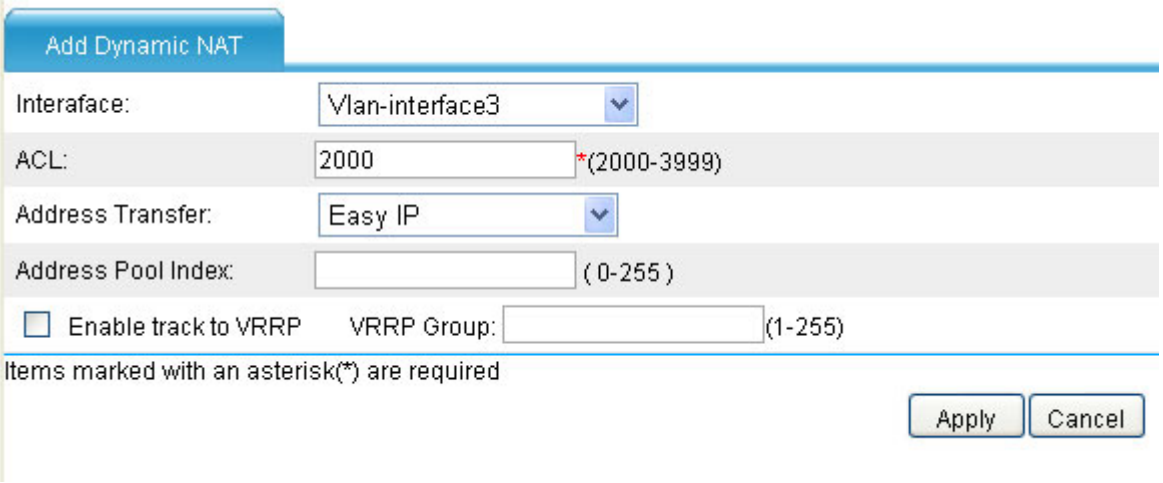
2) Create VLAN-interface 3 and specify an IP address for VLAN-interface 3.

```
[Device]interface Vlan-interface3
[Device-Vlan-interface3]ip address 172.1.1.1 255.255.255.0
```

3) Add GigabitEthernet 0/0 to the Management zone, GigabitEthernet 0/1 and VLAN-interface 3 to the Untrust zone of the root device, and GigabitEthernet 0/3 to the DMZ zone of the root device.

- Select **Firewall** > **NAT** > **Dynamic NAT** from the navigation tree, click **Add** in the **Dynamic NAT** field to enter the **Add Dynamic NAT** page, as shown in the following figure.

Select **GigabitEthernet0/1** for **Interface**, type **2000** for **ACL**, select **Easy IP** for **Address Transfer**, and then click **Apply**.

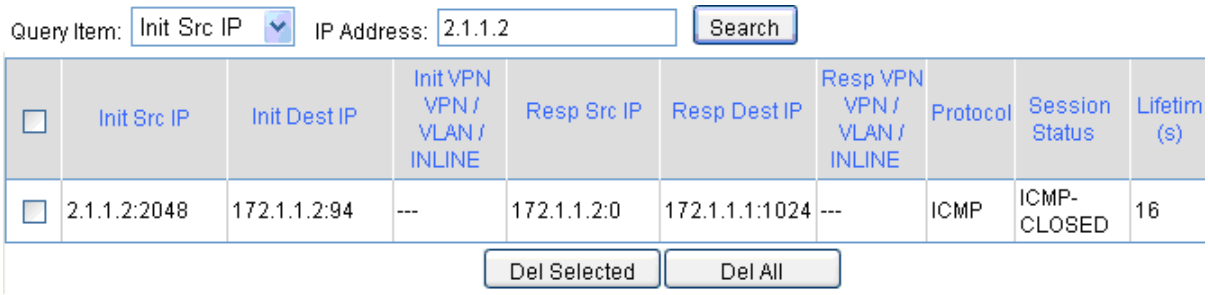


- Access PC 3 from PC 2 and perform ping, HTTP, FTP, DNS, and Telnet operations.
- Check the session list to view the result.

Verification results

- The ping, HTTP, FTP, DNS, and Telnet operations are successful.
- Check the session list:

Type **2.1.1.2** in the **IP Address** text box and click **Search** to display the search result, as shown in the following figure.



Remarks

Remove the configuration in this example before performing another configuration example.

NAT Support for Multi-VPN

Requirements

Easy IP is used in this example. Perform the configuration at the CLI and web interface.

Configuration steps

1) Configure VPNs:

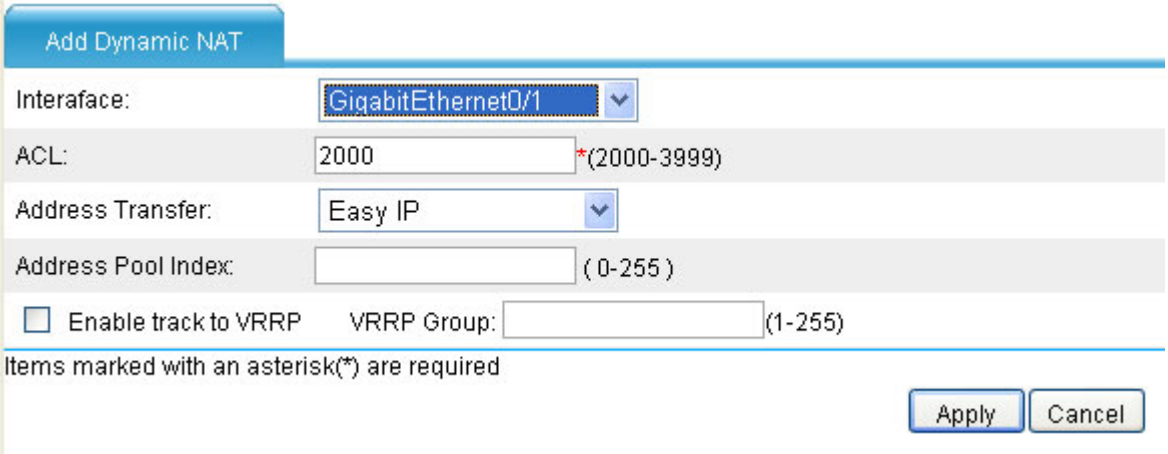
- Configure multi-VPN;
- Bind an interface to multi-VPN;

- Configure VPN routes;
- Configure a VPN ACL.

View	Command	Description
[Device]	ip vpn-instance vpn1	Configures a VPN instance.
[Device-vpn-instance-vpn1]	route-distinguisher 111:1	
[Device-vpn-instance-vpn1]	vpn-target 111:1 export-extcommunity	
[Device-vpn-instance-vpn1]	vpn-target 111:1 import-extcommunity	
[Device-vpn-instance-vpn1]	quit	
[Device]	interface GigabitEthernet0/3	
[Device-GigabitEthernet0/3]	ip binding vpn-instance vpn1	Binds the interface to the VPN instance.
[Device-GigabitEthernet0/3]	ip address 2.1.1.1 24	Specifies an IP address for an interface.
[Device-GigabitEthernet0/3]	quit	
[Device]	interface GigabitEthernet0/1	
[Device-GigabitEthernet0/1]	ip binding vpn-instance vpn1	Binds the interface to the VPN instance.
[Device-GigabitEthernet0/1]	ip address 172.1.1.1 24	Specifies an IP address for the interface.
[Device-GigabitEthernet0/1]	quit	
[Device]	acl number 2000	
[Device-acl-basic-2000]	rule permit	Adds an ACL rule.
[Device-acl-basic-2000]	rule permit vpn-instance vpn1	Adds a VPN ACL rule.
[Device]	ip route-static vpn-instance vpn1 0.0.0.0 0 172.1.1.2 public	Configures a VPN route to the public network.

2) Select **Firewall** > **NAT** > **Dynamic NAT** from the navigation tree, click **Add** in the **Dynamic NAT** field to enter the **Add Dynamic NAT** page, as shown in the following figure.

- Select **GigabitEthernet0/1** for **Interface**, type **2000** for **ACL**, select **Easy IP** for **Address Transfer**, and then click **Apply**.

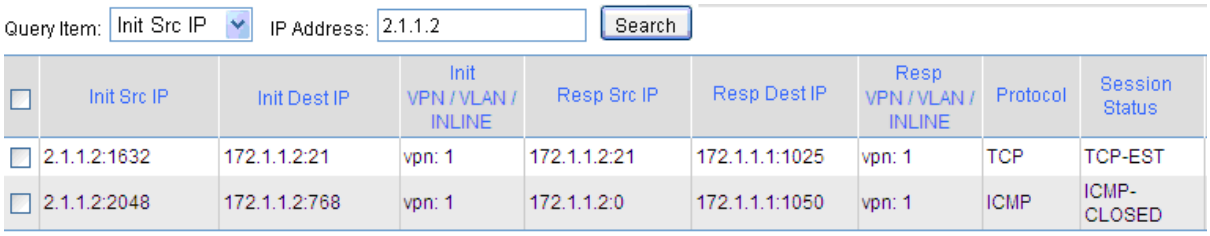


- Access PC 3 from PC 2 and perform ping, HTTP, FTP, DNS, and Telnet operations.
- Check the session list to view the result.

Verification results

- The ping, HTTP, FTP, DNS, and Telnet operations are successful.
- Check the session list:

Type **2.1.1.2** in the **IP Address** text box and click **Search** to display the search result, as shown in the following figure.

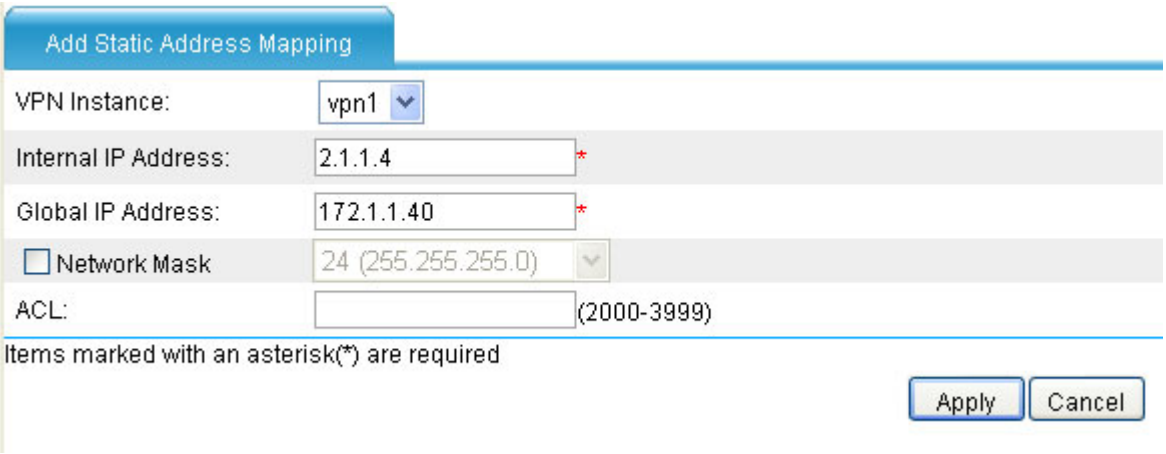


Init Src IP	Init Dest IP	Init VPN / VLAN / INLINE	Resp Src IP	Resp Dest IP	Resp VPN / VLAN / INLINE	Protocol	Session Status
2.1.1.2:1632	172.1.1.2:21	vpn: 1	172.1.1.2:21	172.1.1.1:1025	vpn: 1	TCP	TCP-EST
2.1.1.2:2048	172.1.1.2:768	vpn: 1	172.1.1.2:0	172.1.1.1:1050	vpn: 1	ICMP	ICMP-CLOSED

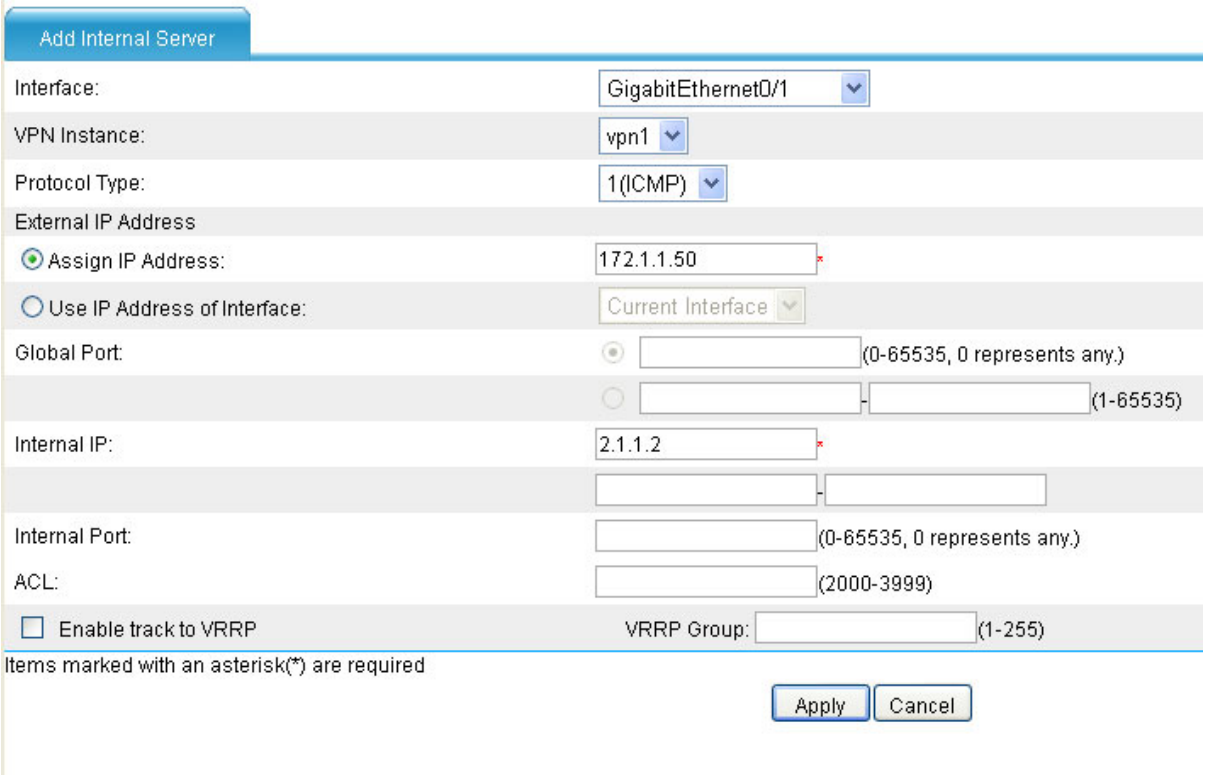
Remarks

Remove the configuration in this example before performing another configuration example. <0

- Specify a VPN instance when configuring a static NAT entry, as shown below:



- Specify a VPN instance when configuring an internal server.



References

Protocols and Standards

- RFC1631
- RFC1918

Related Documentation

NAT Configuration in the Web configuration documentation set

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SecPath Series Firewalls Layer 2 and Layer 3 Forwarding Configuration Examples

Keywords: Transparent mode, routing mode, hybrid mode, VLAN

Abstract: This document presents configuration examples for the SecPath series firewalls operating in transparent mode, routing mode, and hybrid mode respectively.

Acronyms:

Acronym	Full spelling
UTM	Unified Threat Management
VLAN	Virtual Local Area Network

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Feature Overview

Layer 2 and Layer 3 forwarding falls into the following types: general Layer 2, general Layer 3, inline, and inter-VLAN Layer 2.

General Layer 2 and Layer 3 Forwarding

A SecPath series firewall operates either in route or bridge mode. When operating in route mode, the firewall supports Layer 3 forwarding only. When operating in bridge mode, the firewall supports Layer 2, Layer 3 (by using VLAN interfaces), and Layer 2 and Layer 3 hybrid forwarding. When the destination MAC address of an incoming packet matches the MAC address of the receiving VLAN interface, the firewall forwards the packet through the receiving VLAN interface at Layer 3. If the destination MAC address of the packet matches a Layer 2 MAC address table entry, the firewall forwards the packet through a Layer 2 Ethernet interface. By default, the firewall operates in route mode.

Inline Forwarding

The SecPath series firewalls support inline Layer 2 forwarding, where you specify interface pairs as the ingress and egress interfaces for packets. With the inline forwarding mode, packet forwarding does not rely on the MAC address tables. Packets coming in through one interface of an interface pair are directly forwarded out of another interface of the interface pair. Support for inline Layer 2 forwarding depends on your firewall model.

Inter-VLAN Layer 2 Forwarding

Inter-VLAN Layer 2 forwarding enables inter-VLAN communications at the data link layer, and is deployed typically on firewall cards and sometimes on box-type firewall devices.

To configure inter-VLAN Layer 2 forwarding on a SecPath series firewall collaborating with a switch:

- Assign the ingress and egress interfaces of traffic on the switch to different VLANs.
- Configure the Ethernet interfaces at both ends of the link that connects the switch and the firewall as trunk ports.
- Configure multiple subinterfaces on the firewall's Ethernet interface that connects the switch, and assign each subinterface to a different VLAN. Each VLAN on the firewall corresponds to a VLAN on the switch.

Application Scenarios

Various Layer 2 and Layer 3 forwarding modes, including Layer 2, Layer 3, Layer 2 and Layer 3 hybrid, inline, and inter-VLAN forwarding, are commonly used in packet switching and routing networks to forward packets while providing necessary security mechanisms.

Configuration Examples

Note

The following examples use UTM firewalls (Device in the network diagrams) to show how to configure Layer 2 and Layer 3 forwarding on the H3C SecPath series firewalls, including the SecPath F5000-A5, SecPath F1000E, and SecPath UTM 200-A/200-M/200-S.

Network Requirements

Figure 1 Network diagram for Layer 2 and Layer 3 forwarding configuration example (I)

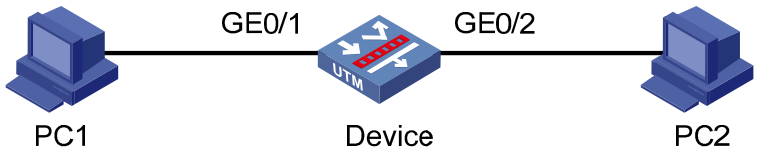
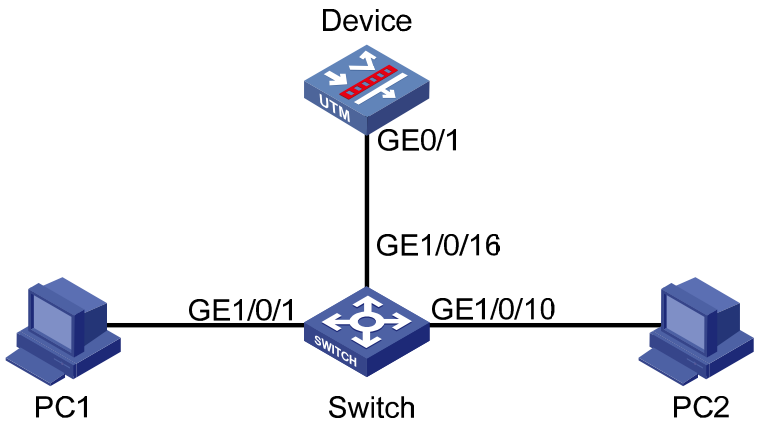


Figure 2 Network diagram for Layer 2 and Layer 3 forwarding configuration example (II)



Configuration Considerations

- Configure the operating mode for interfaces.
- Add interfaces to security zones.
- Configure NAT entries, ACLs, routes, and other necessary information.

Software Version Used

Model	Version/Release
SecPath F1000E	V300R001B01 R3166, V300R001B01 F3166

Model	Version/Release
SecPath F5000-A5	V300R002B01 R3206
SecPath UTM 200-A/200-M/200-S	V500R001B01 R5116

Configuration Procedures

Transparent Mode

Configuring general Layer 2 forwarding

1) Configuration description

Configure hosts in the same VLAN with IP addresses on the same network segment, so that the hosts can communicate with each other.

2) Configuration procedure (see Figure 1)

- Select **Device Management** > **Interface** from the navigation tree. Configure GigabitEthernet 0/1 and GigabitEthernet 0/2 as Layer 2 interfaces.

Figure 3 Configure GigabitEthernet 0/1 as a Layer 2 interface

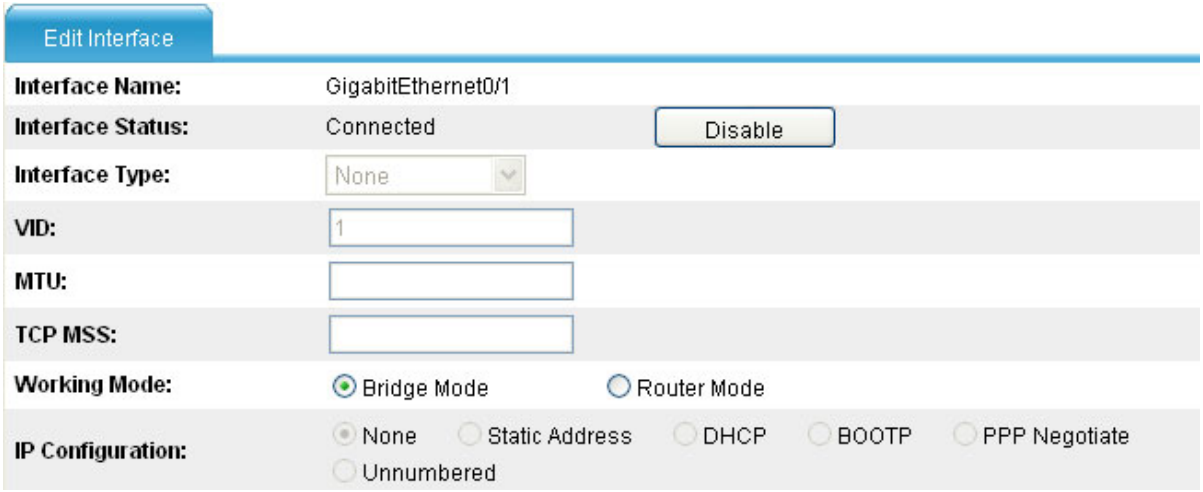
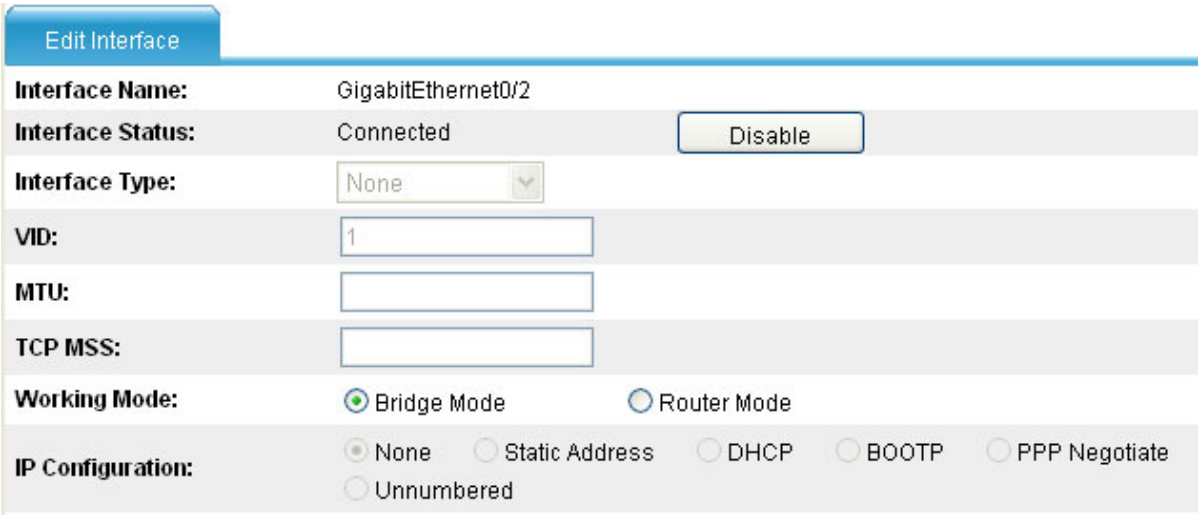
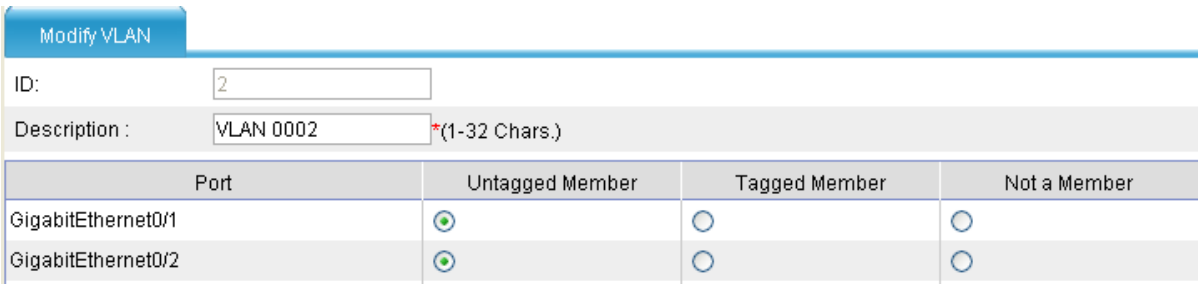


Figure 4 Configure GigabitEthernet 0/2 as a Layer 2 interface



- Select **Network** > **VLAN** > **VLAN** from the navigation tree, create VLAN 2, and assign GigabitEthernet 0/1 and GigabitEthernet 0/2 to VLAN 2.

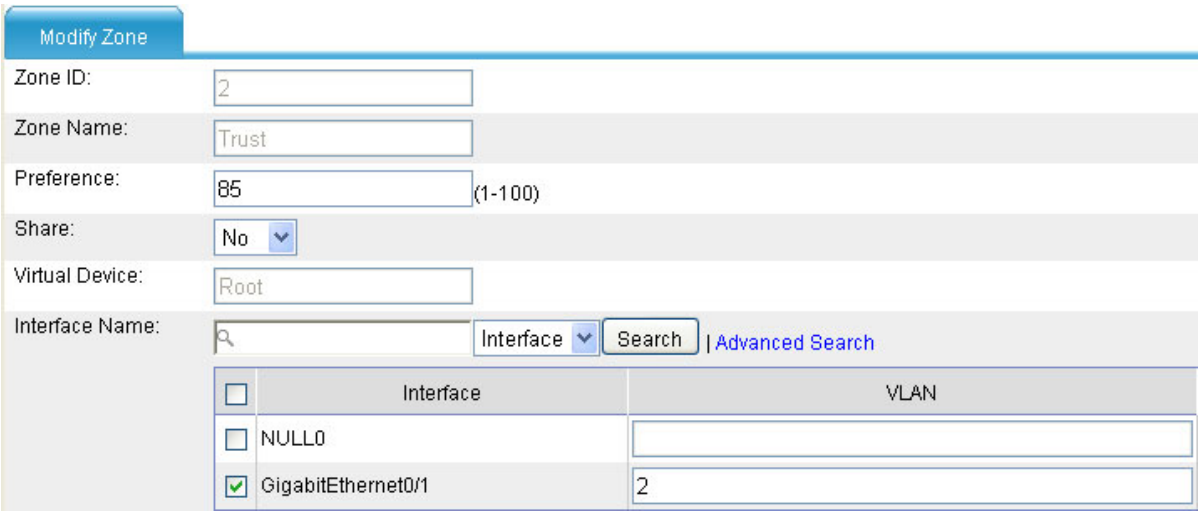
Figure 5 Add interfaces to VLAN 2



Assign IP addresses for PCs: 192.168.2.10/24 for PC1 and 192.168.2.11/24 for PC2.

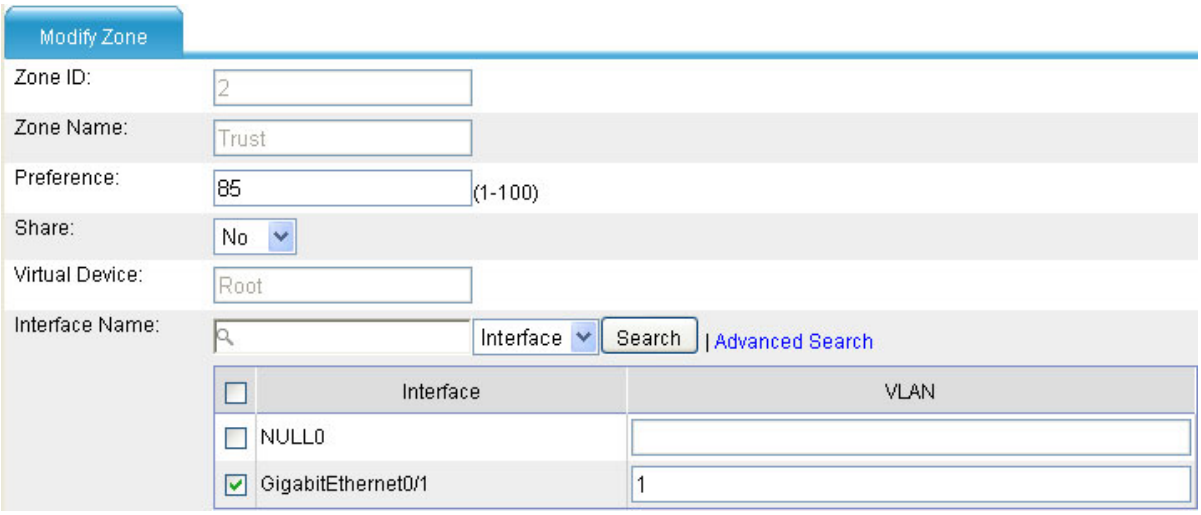
- Select **Device Management** > **Zone** from the navigation tree and edit the Trust zone of the root virtual device. Add GigabitEthernet 0/1 to the Trust zone, and GigabitEthernet 0/2 to the Untrust zone. Ping PC2 from PC1. Result A is obtained.
- Edit the Trust zone and modify the VLAN for GigabitEthernet 0/1 from the default 1-4094 to 2, as shown in the figure below. Modify the VLAN for GigabitEthernet 0/2 to 2 and add the interface to the Untrust zone. Ping PC2 from PC1. Result B is obtained.

Figure 6 Modify the Trust zone (1)



- Edit the Trust zone again. Set the VLAN ID for GigabitEthernet 0/1 to a value different from the PVID 2. In this example, the VLAN ID is set to 1, as shown in the figure below. Ping PC2 from PC1. Result C is obtained.

Figure 7 Modify the Trust zone (2)



3) Verification

Result A: The ping operation succeeds.

Result B: The ping operation succeeds.

Result C: The ping operation fails. Layer 2 packets are forwarded between security zones according to the zones where the interfaces' VLANs reside. In this example, GigabitEthernet 0/1 rejects VLAN 2 packets because VLAN 2 to which GigabitEthernet 0/1 belongs is not added to the Trust zone, though GigabitEthernet 0/1 is added to the Trust zone.

4) Configuration guidelines

When editing VLANs for a Layer 2 interface in a security zone, pay attention to the VLANs you specify, as the Layer 2 interface may be used by other security zones on the virtual device.

Configuring inline Layer 2 forwarding

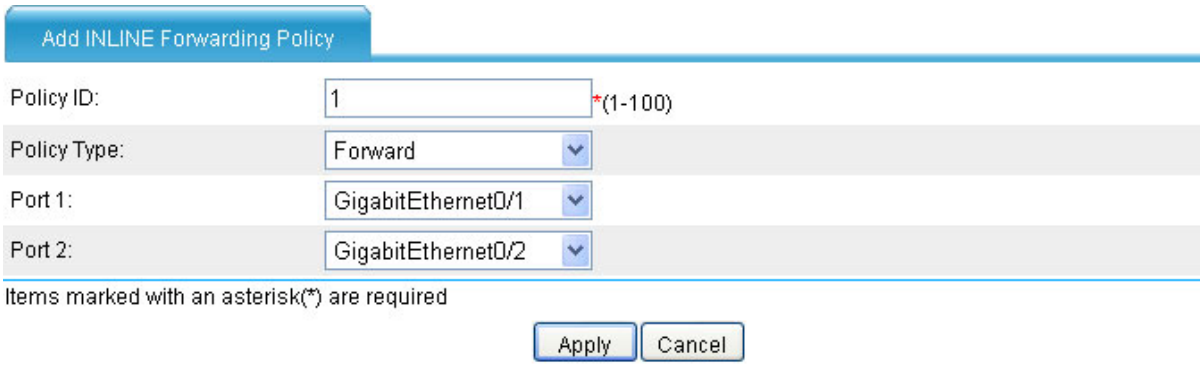
1) Configuration description

Add interfaces to an inline forwarding group.

2) Configuration procedure (see Figure 1)

Select **Network** > **Forwarding** from the navigation tree, type **1** for **Policy ID**, and select GigabitEthernet 0/1 and GigabitEthernet 0/2 as **Port 1** and **Port 2** respectively. Note that you need to configure the two interfaces as Layer 2 interfaces in advance.

Figure 8 Create an inline forwarding policy



Assign IP addresses for PCs: 192.168.2.10/24 for PC1 and 192.168.2.11/24 for PC2.

- Add GigabitEthernet 0/1 to the Trust zone, and GigabitEthernet 0/2 to the Untrust zone. Ping PC2 from PC1. Result A is obtained.
- Add GigabitEthernet 0/1 to VLAN 2, and GigabitEthernet 0/2 to VLAN 3. Ping PC2 from PC1. Result B is obtained.
- Configure GigabitEthernet 0/1 as an access port, and GigabitEthernet 0/2 as a trunk port. Ping PC2 from PC1. Result C is obtained.

3) Verification

Result A: The ping operation succeeds.

Result B: The ping operation succeeds.

Result C: The ping operation succeeds. VLAN and port type configuration on the forwarding interfaces does not impact inline Layer 2 forwarding.

4) Configuration guidelines

- Inline Layer 2 forwarding is implemented through inline forwarding groups, and not MAC addresses.
- Inline Layer 2 forwarding can be configured on Layer 2 physical interfaces and subinterfaces only.
- In inline Layer 2 forwarding, the ingress interface checks the VLAN tag of a packet to see if the packet's VLAN ID is configured in the security zone of the virtual device. If yes, it forwards the packet. If the packet's VLAN ID matches a Layer 3 VLAN interface and the destination MAC

address matches the MAC address of the VLAN interface, the firewall forwards the packet at Layer 3.

- If the ingress interface is an access port, the interface does not check the VLAN ID of incoming packets against its PVID upon receiving packets with different VLAN tags. When general Layer 2 forwarding is implemented, the interface accepts only untagged packets or packets whose VLAN ID matches its PVID.
- Inline Layer 2 forwarding on a trunk port is irrelevant to the permitted VLANs configured on the port. In general Layer 2 forwarding, a trunk port forwards a packet only if the packet's VLAN ID is permitted.
- In this example, GigabitEthernet 0/2, the egress interface, transparently transmits packets without removing their VLAN tags. That is, packets are received on one interface of the inline forwarding group, and after being processed by the security module, are forwarded through the other interface transparently.

Configuring inter-VLAN Layer 2 forwarding

1) Configuration description

Configure hosts in different VLANs but with IP addresses on the same network segment to communicate with each other.

2) Configuration procedure (see Figure 2)

- Configure devices through CLI

On the switch:

```
#
interface GigabitEthernet1/0/1
 port access vlan 102
#
interface GigabitEthernet1/0/10
 port access vlan 103
#
interface GigabitEthernet1/0/16
port link-type trunk
undo port trunk permit vlan 1
port trunk permit vlan 102 to 103
#
```

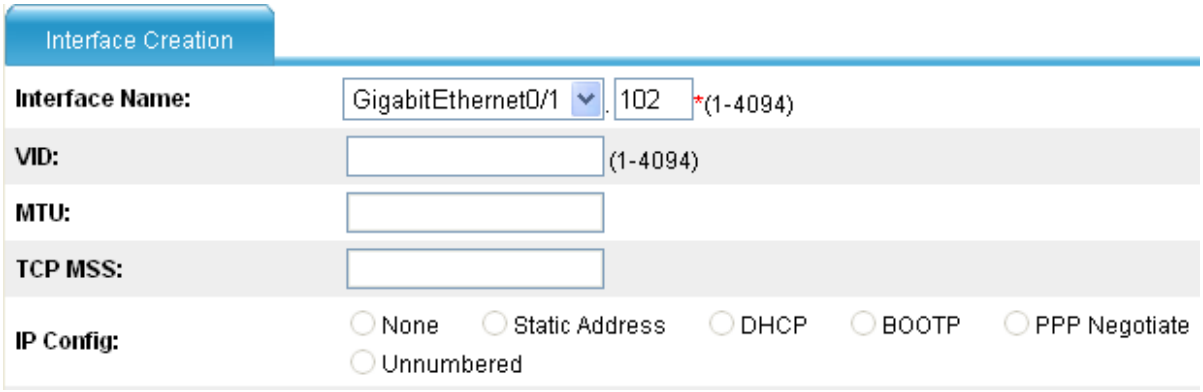
On the Device:

```
#
vlan 102 to 103
#
vlan 1000
#
interface GigabitEthernet0/1
port link-mode bridge
port link-type trunk
port trunk permit vlan 1 102 to 103
#
```

- Configure the Device through the web interface

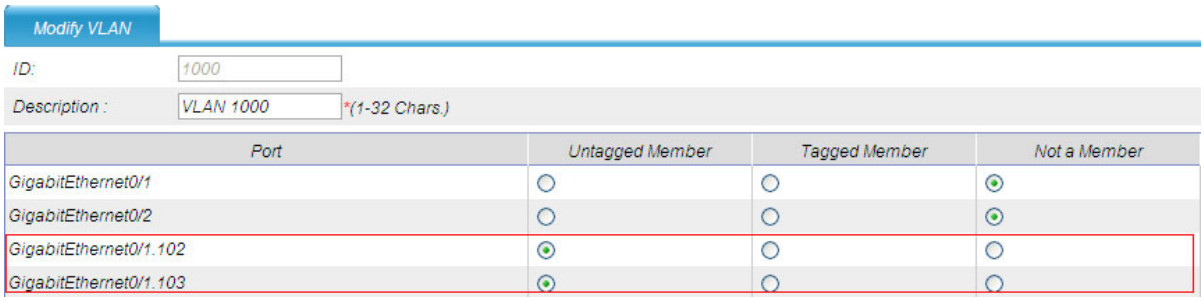
Select **Device Management** > **Interface** from the navigation tree and create Layer 2 subinterfaces GigabitEthernet 0/1.102 and GigabitEthernet 0/1.103.

Figure 9 Create GigabitEthernet 0/1.102



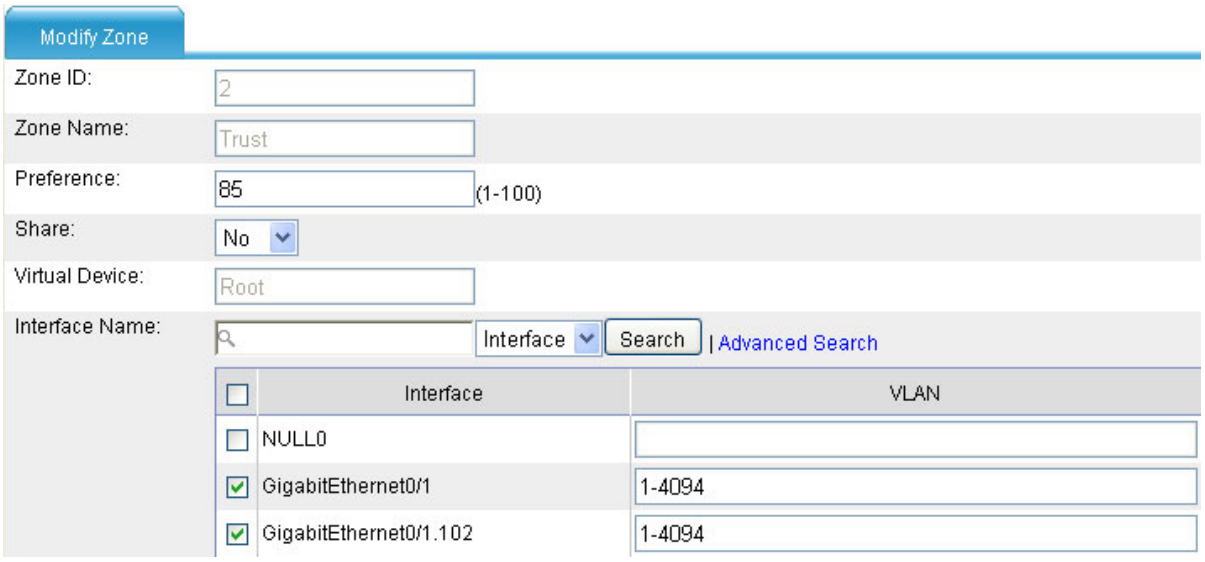
Select **Network** > **VLAN** > **VLAN** from the navigation tree, and add GigabitEthernet 0/1.102 and GigabitEthernet 0/1.103 to VLAN 1000.

Figure 10 Add subinterfaces to VLAN 1000



Select **Device Management** > **Zone** from the navigation tree. Add GigabitEthernet 0/1 and GigabitEthernet 0/1.102 to the Trust zone and make sure that VLAN 1000 is permitted on the interfaces. Add GigabitEthernet 0/1.103 to the Untrust zone and make sure that VLAN 1000 is permitted on the interface.

Figure 11 Edit the Trust zone



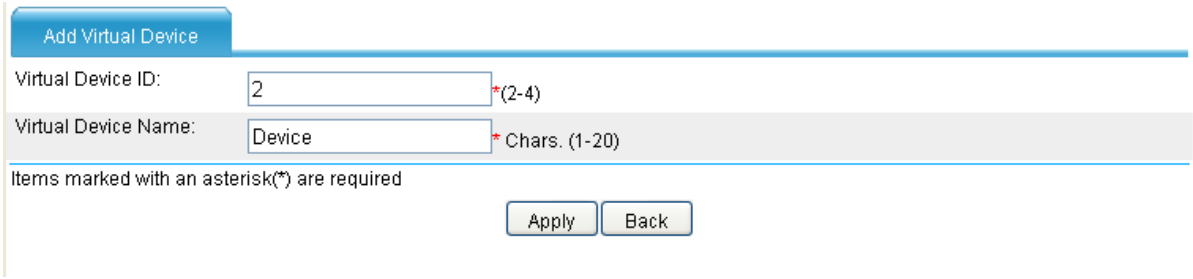
Assign IP addresses for PCs: 192.168.2.10/24 for PC1 and 192.168.2.11/24 for PC2.

- Ping PC2 from PC1. Result A is obtained.
- Ping PC1 from PC2. Result B is obtained.
- Add GigabitEthernet 0/1 to the Untrust zone and then ping PC2 from PC1. Result C is obtained.
- Delete VLAN 1000 and configure VLANs 102 and 103 on the Device. Ping PC2 from PC1. Result D is obtained.
- Delete VLANs 102 and 103 and configure VLAN 1000 on the Device. Ping PC2 from PC1. Result E is obtained.

Configuring Inter-VLAN Layer 2 forwarding on a non-default virtual device:

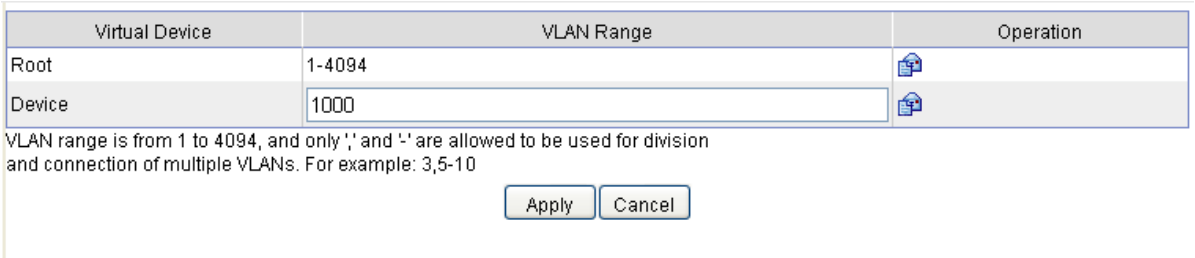
- Select **Device Management** > **Virtual Device** > **Configuration** from the navigation tree and click **Add** to create a virtual device named Device.

Figure 12 Create a virtual device



- Select **Device Management** > **Virtual Device** > **VLAN** from the navigation tree, and configure VLAN 1000 as the VLAN member of the virtual device.

Figure 13 Configure the VLAN member for the virtual device



- Select **Device Management** > **Zone** from the navigation tree. Create security zones Device_Trust and Device_Untrust for the virtual device.

Figure 14 Create security zone Device_Trust

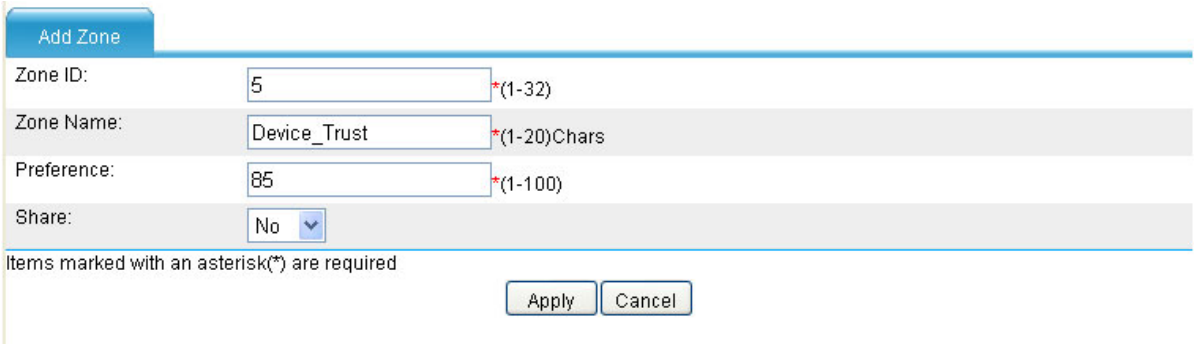
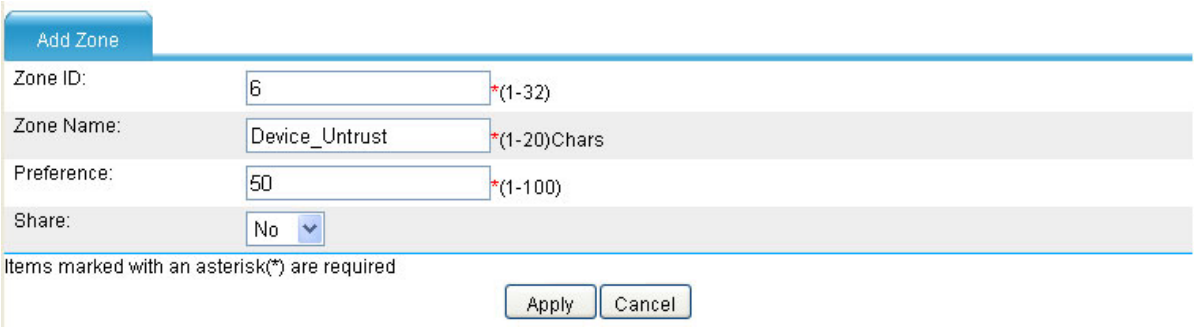


Figure 15 Create security zone Device_Untrust



- Add GigabitEthernet 0/1.102 to Device_Trust, and GigabitEthernet 0/1.103 to Device_Untrust. Ping PC2 from PC1. Result F is obtained.

3) Verification

Result A: The ping operation succeeds.

Result B: The ping operation fails. This is because PC2 resides in the Untrust zone, whereas PC1 resides in the Trust zone, which has a higher priority than the Untrust zone.

Result C: The ping operation succeeds. Packet forwarding is not affected after GigabitEthernet 0/1 is added to the Untrust zone.

Result D: The ping operation succeeds. After VLAN 1000 is deleted, traffic can still be forwarded because the PVID of GigabitEthernet 0/1.102 and GigabitEthernet 0/1.103 is 1.

Result E: The ping operation fails. No Layer 2 forwarding entry is created because VLANs 102 and 103 do not exist.

Result F: The ping operation succeeds.

4) Configuration guidelines

- To implement inter-VLAN Layer 2 forwarding, make sure that the VLAN with the same ID as the Layer 2 subinterface ID exists.
- On a physical port working in bridge mode, Layer 2 subinterfaces are configured to implement inter-VLAN Layer 2 forwarding. Packets are forwarded between security zones according to the zones permitted on the Layer 2 subinterfaces, rather than the security zone where the physical interface resides.
- To implement inter-VLAN Layer 2 forwarding, make sure that you add the PVID of the subinterface to the VLAN range of the security zone.
- If no VLAN is configured for a subinterface, the PVID is 1, and therefore, you need to add VLAN 1 in the VLAN range of the security zone.
- When configuring inter-VLAN Layer 2 forwarding, do not set the PVID of a subinterface to the subinterface ID. Otherwise, the downstream switches may fail to learn the MAC address of the subinterface properly. This problem is listed as a defect.

Routing Mode

Configuring Layer 3 interface forwarding

1) Configuration description

Configure the Device to route packets between hosts on different network segments.

2) Configuration procedure (see Figure 1)

Select **Device Management** > **Interface** from the navigation tree. Configure the route mode for GigabitEthernet 0/1 and specify the IP address as 192.168.2.1/24. Configure the route mode for GigabitEthernet 0/2 and specify the IP address as 192.168.3.1/24.

Figure 16 Configure GigabitEthernet 0/1

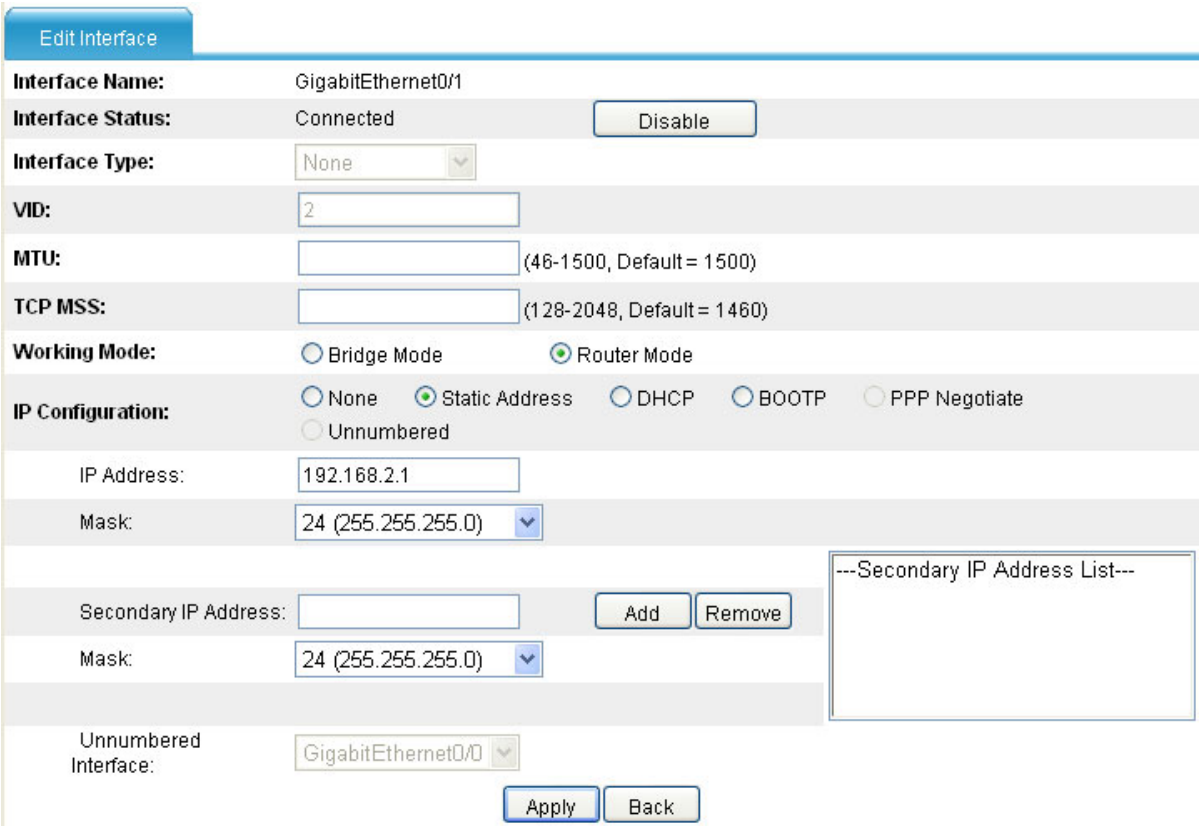
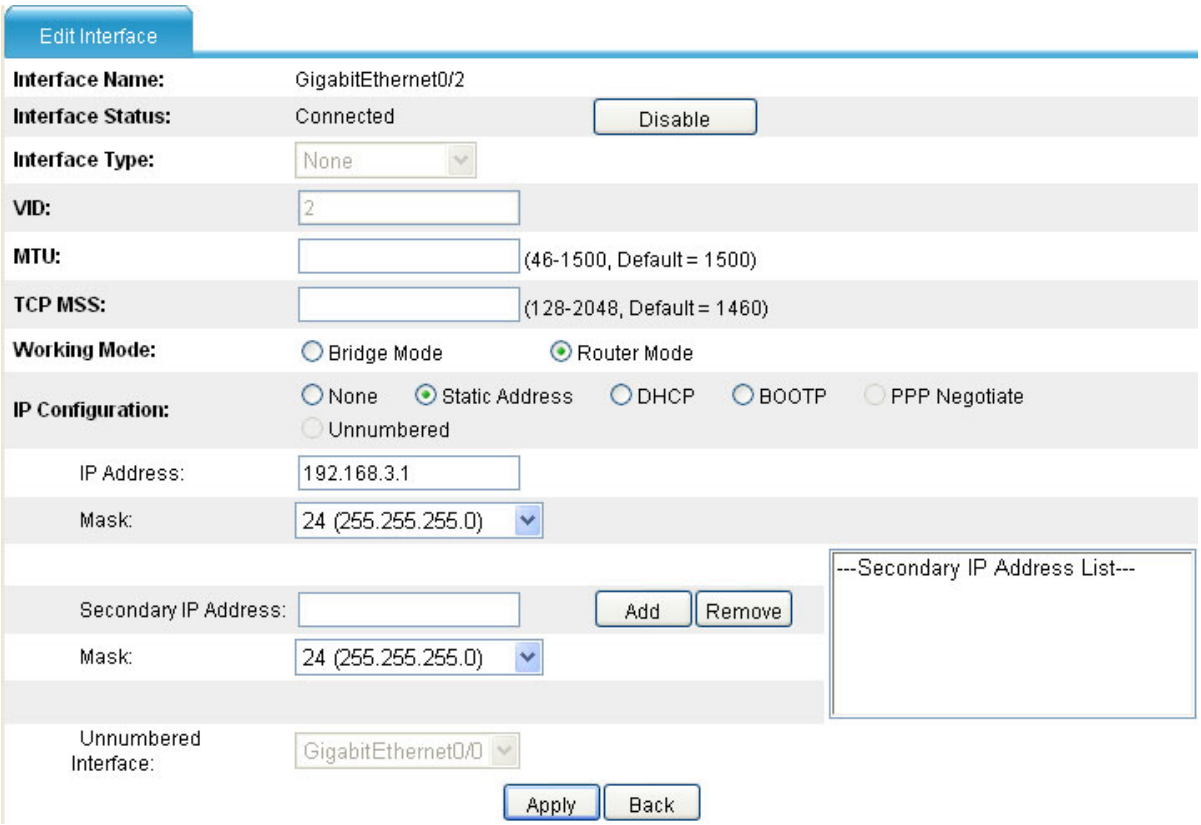


Figure 17 Configure GigabitEthernet 0/2



Select **Device Management** > **Zone** from the navigation tree. Add GigabitEthernet 0/1 to the Trust zone and GigabitEthernet 0/2 to the Untrust zone.

Figure 18 Add GigabitEthernet 0/1 to the Trust zone

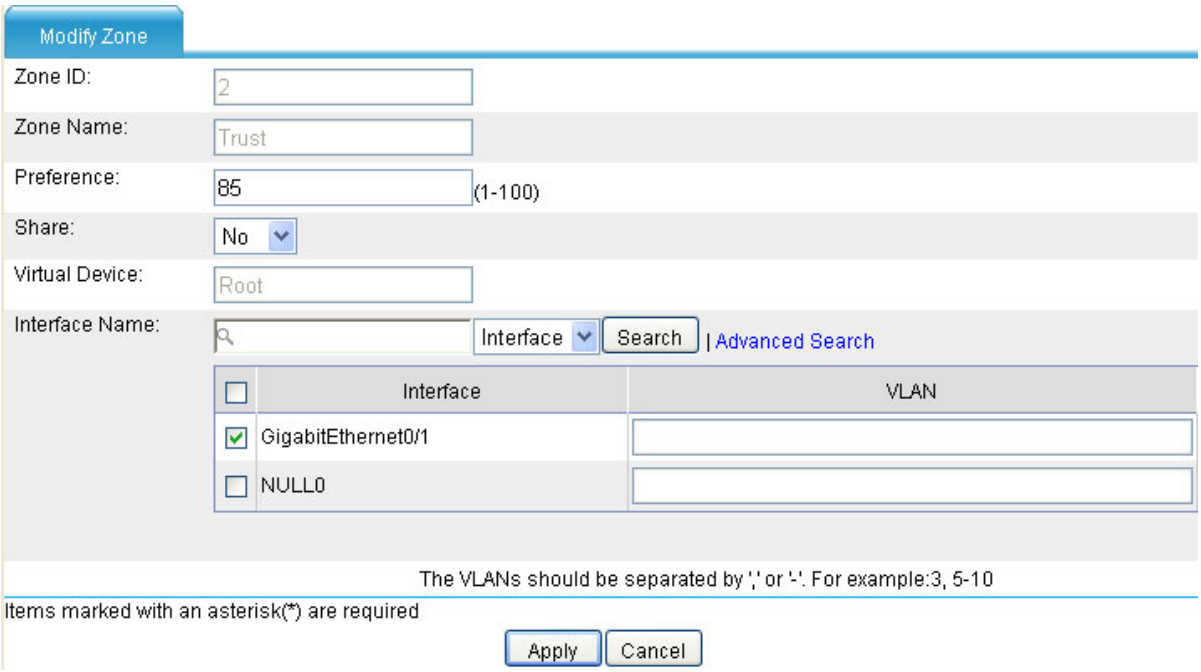
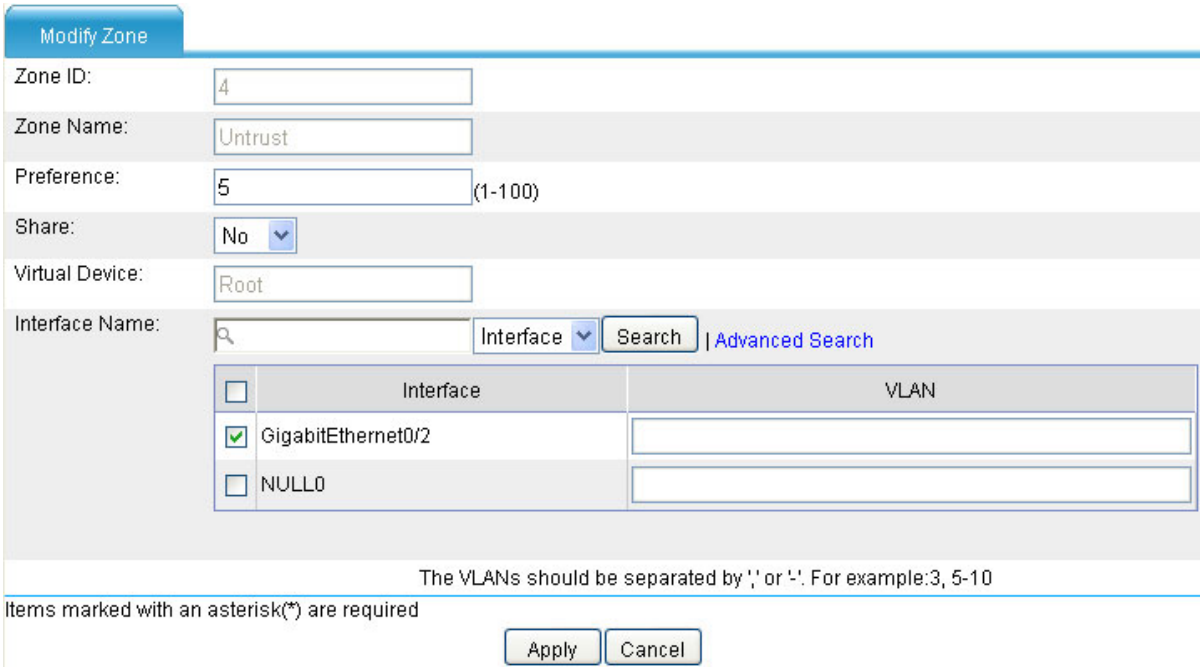


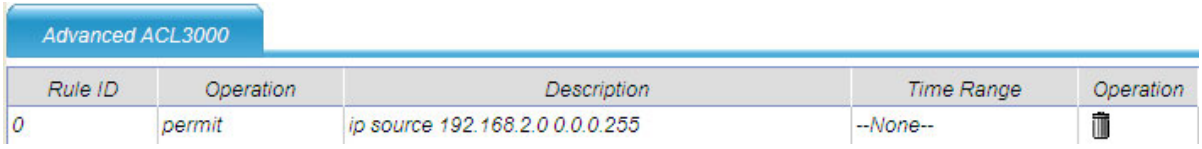
Figure 19 Add GigabitEthernet 0/2 to the Untrust zone



Select **Firewall** > **NAT Policy** > **Dynamic NAT** from the navigation tree. Apply ACL 3000 to GigabitEthernet 0/2 and enable Easy IP. ACL 3000 allows packets from 192.168.2.0/24 to pass.

Figure 20 Configure dynamic NAT

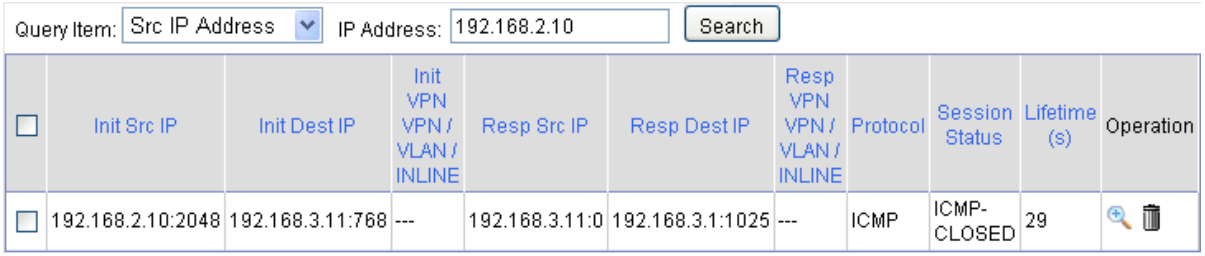
Figure 21 Configure ACL 3000



3) Verification

Configure IP address 192.168.2.10/24 and gateway 192.168.2.1 for PC1, and IP address 192.168.3.11/24 and gateway 192.168.3.1 for PC2. Ping PC2 from PC1. The ping operation succeeds and the session information displayed on the Device is as follows:

Figure 22 Session information



Configuring inter-VLAN Layer 3 forwarding

1) Configuration description

Configure the Device to forward packets through VLAN interfaces.

2) Configuration procedure (see Figure 1)

Select **Device Management** > **Interface** from the navigation tree. Configure GigabitEthernet 0/1 as a Layer 2 access port, assign the interface to VLAN 2, create VLAN interface 2 and assign IP address 192.168.2.1/24 to the VLAN interface. Configure GigabitEthernet 0/2 as a Layer 2 access port, assign the interface to VLAN 3, create VLAN interface 3 and assign IP address 192.168.3.1/24 to the VLAN interface.

Figure 23 Create VLAN interface 2

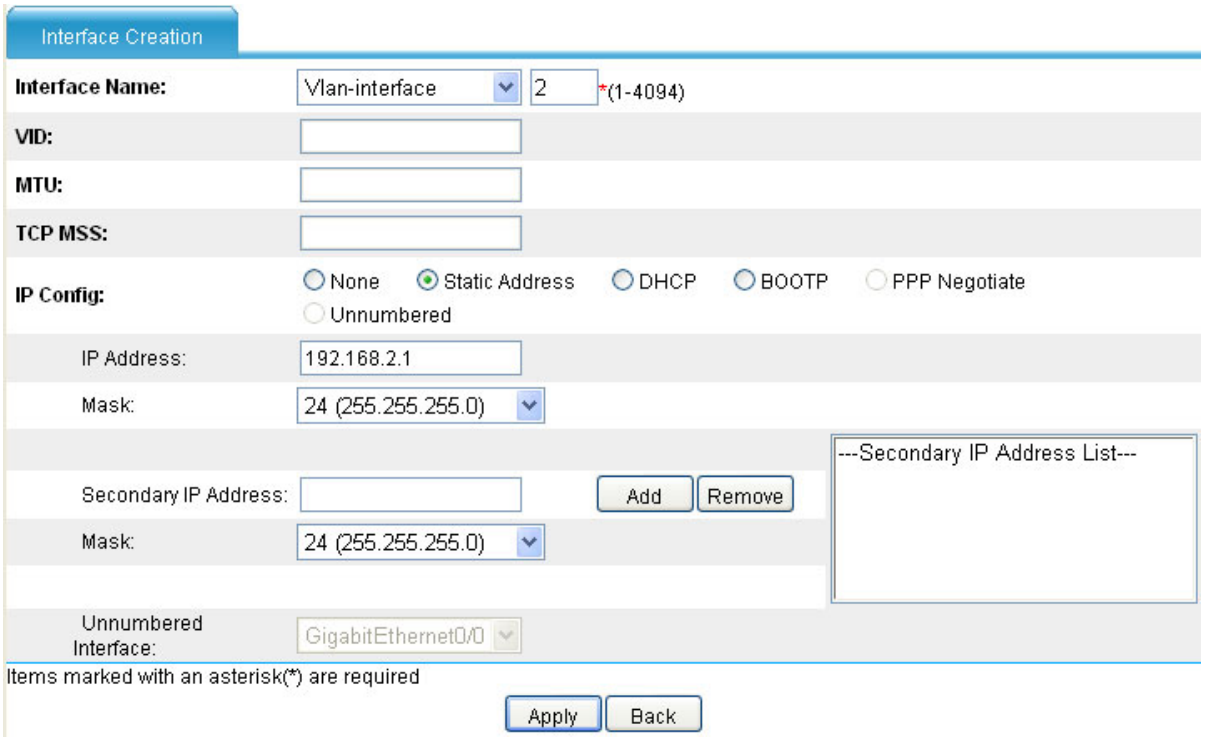
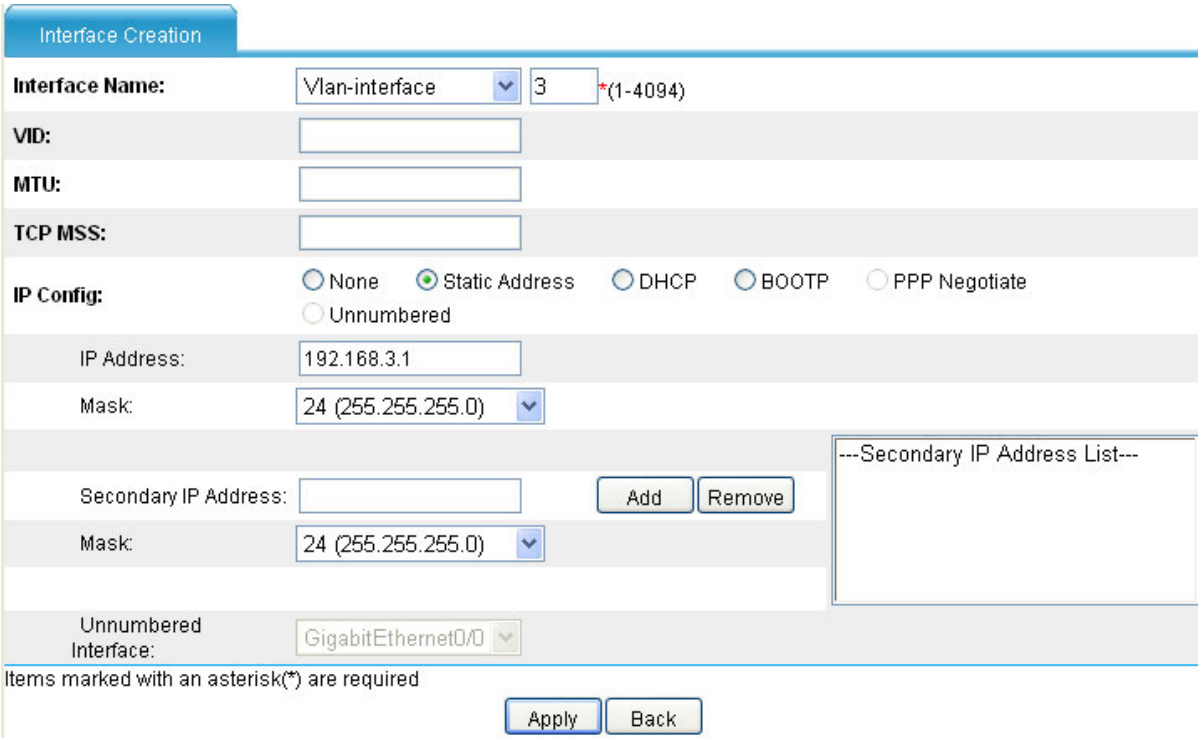


Figure 24 Create VLAN interface 3



Select **Device Management** > **Zone** from the navigation tree. Add VLAN interface 2 to the Trust zone, and VLAN interface 3 to the Untrust zone.

Figure 25 Add interfaces to the Trust zone

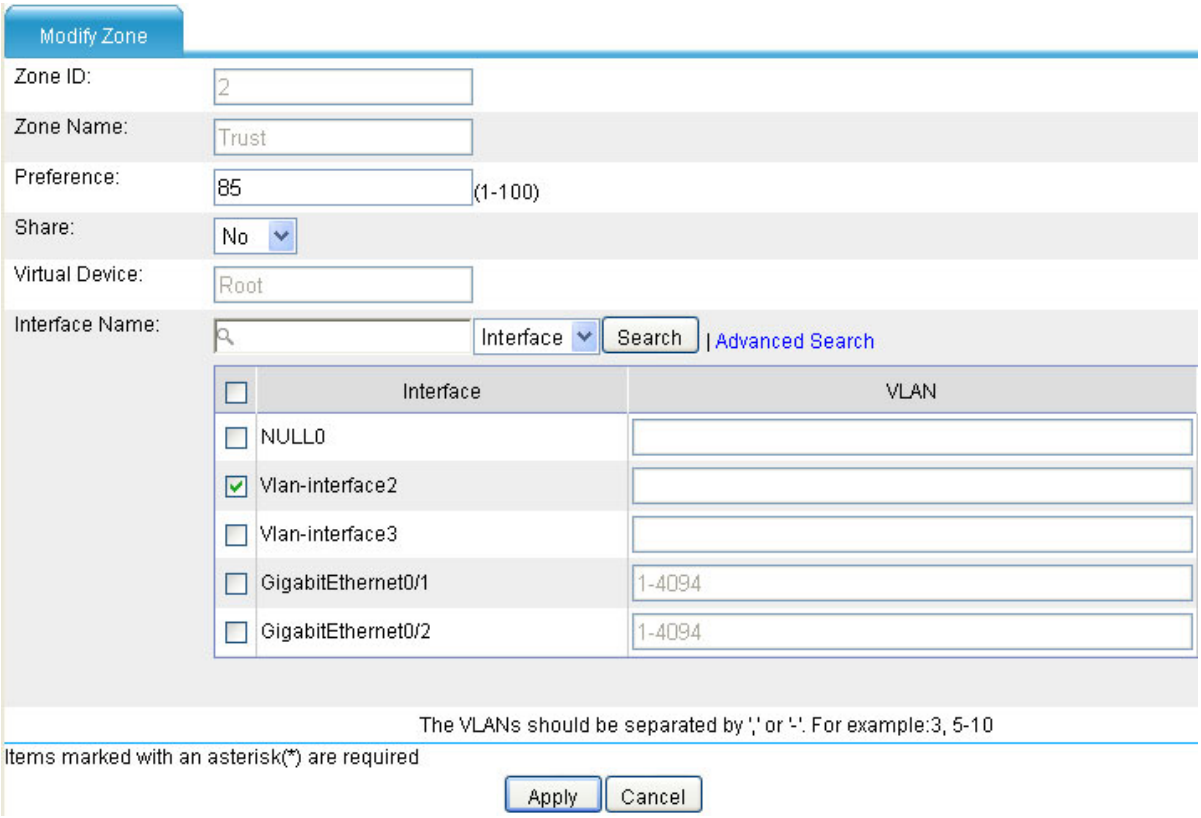
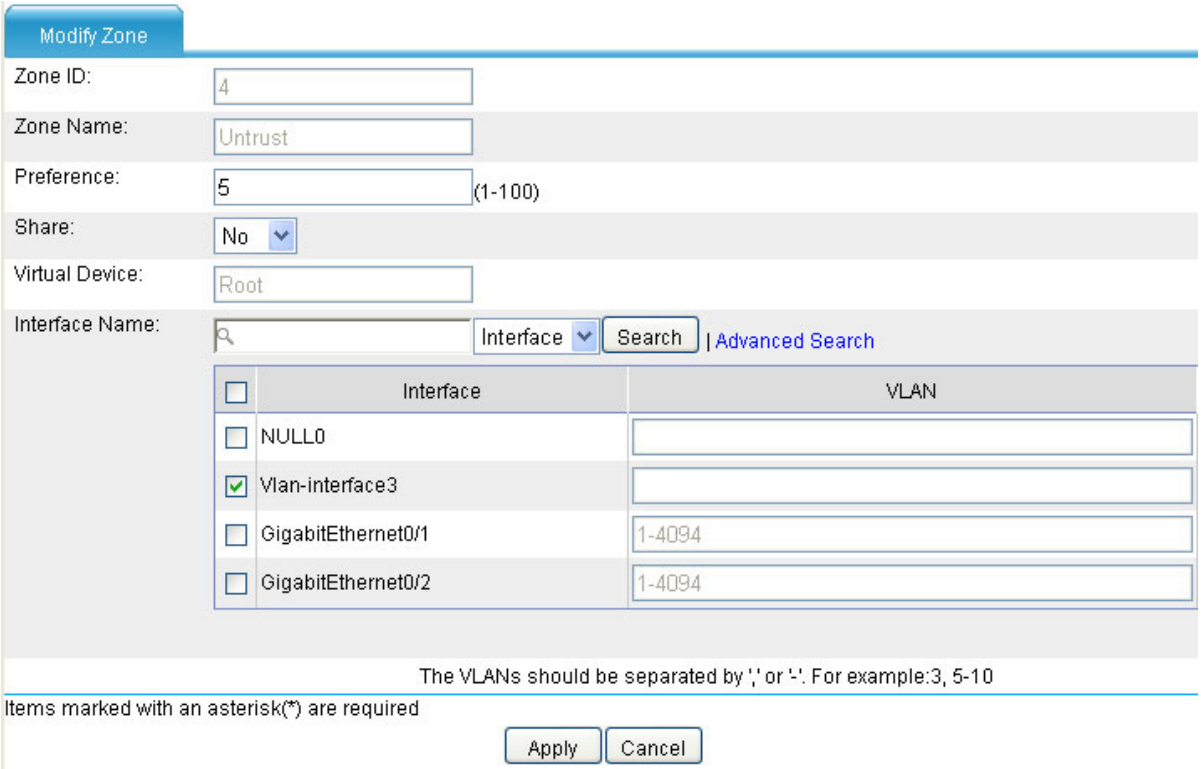


Figure 26 Add interface to the Untrust zone



Select **Firewall** > **NAT Policy** > **Dynamic NAT** from the navigation tree. Apply ACL 3000 to VLAN-interface 3 and enable Easy IP. ACL 3000 allows packets from 192.168.2.0/24 to pass.

Figure 27 Configure dynamic NAT

Dynamic NAT

Interface	ACL	Address Pool Index	Address Transfer	Global VPN Instance	Operation
Vlan-interface3	3000		Easy IP		

Figure 28 Configure ACL 3000

Advanced ACL3000

Rule ID	*Operation*	*Description*	*Time Range*	*Operation*
0	*permit*	*ip source 192.168.2.0 0.0.0.255*	*--None--*	

3) Verification

Configure IP address 192.168.2.10/24 and gateway 192.168.2.1 for PC1, and IP address 192.168.3.11/24 and gateway 192.168.3.1 for PC2. Ping PC2 from PC1. The ping operation succeeds and the session information displayed on the Device is as follows:

Figure 29 Session information

Query Item: Src IP Address IP Address: 192.168.2.10 Search

	Init Src IP	Init Dest IP	Init VPN VPN / VLAN / INLINE	Resp Src IP	Resp Dest IP	Resp VPN VPN / VLAN / INLINE	Protocol	Session Status	Lifetime (s)	Operation
	192.168.2.10:2048	192.168.3.11:768	---	192.168.3.11:0	192.168.3.1:1024	---	ICMP	ICMP-CLOSED	29	

Configuring Layer 3 subinterface forwarding

1) Configuration description

Configure the Device to forward packets through Layer 3 subinterfaces.

2) Configuration procedure (see Figure 2)

- Configure the switch

```
interface GigabitEthernet1/0/1
port access vlan 102
#
interface GigabitEthernet1/0/10
port access vlan 103
#
interface GigabitEthernet1/0/16
```

```
port link-type trunk
undo port trunk permit vlan 1
port trunk permit vlan 102 to 103
#
```

- Configure the Device

Select **Device Management** > **Interface** from the navigation tree. Configure the route mode for GigabitEthernet 0/1. Create subinterface GigabitEthernet 0/1.1 and specify the VID as 102, and the IP address as 192.168.2.1/24. Create subinterface GigabitEthernet 0/1.2 and specify the VID as 103, and the IP address as 192.168.3.1/24.

Figure 30 Configure GigabitEthernet 0/1

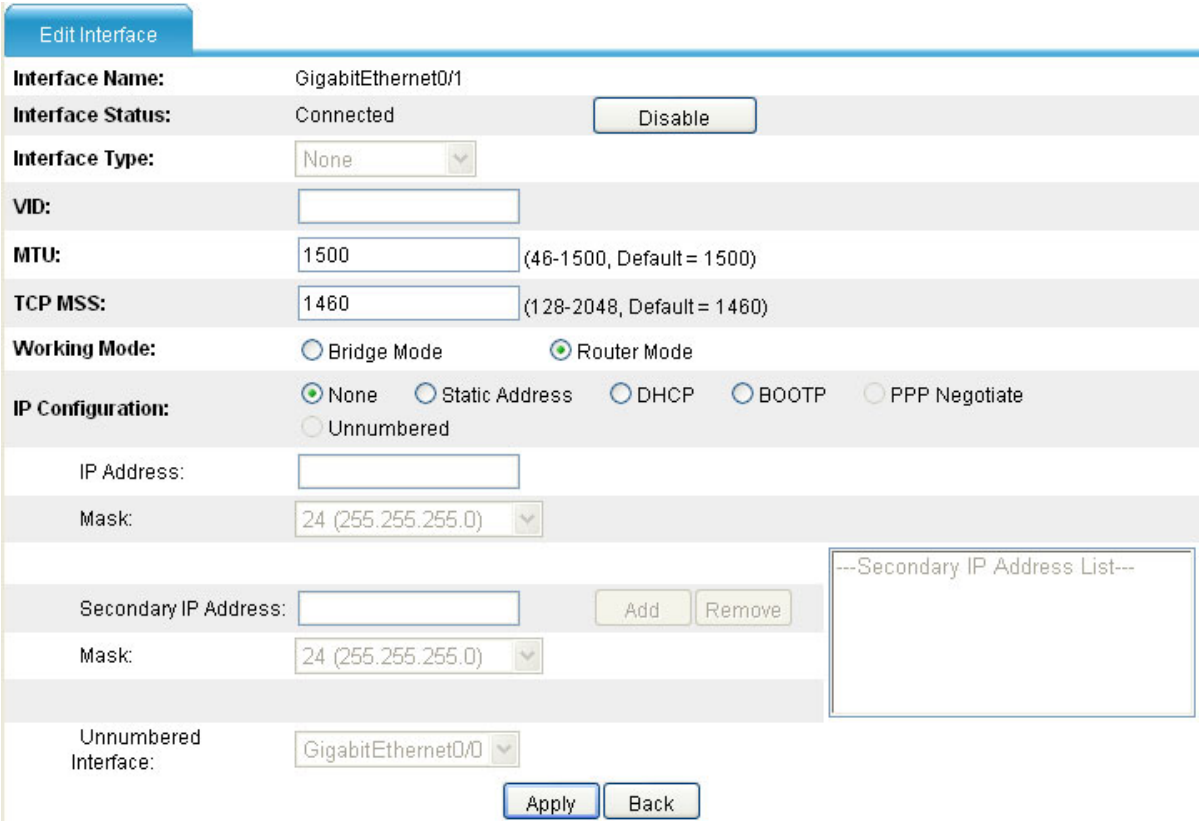


Figure 31 Create GigabitEthernet 0/1.1

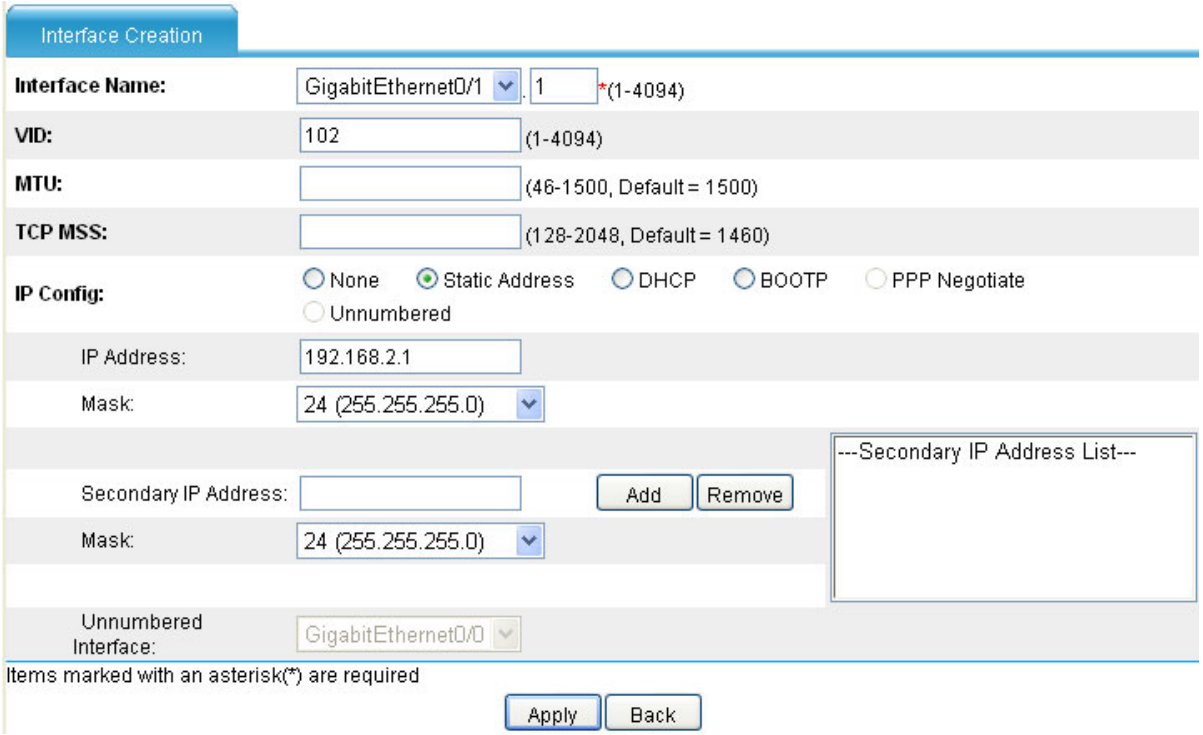
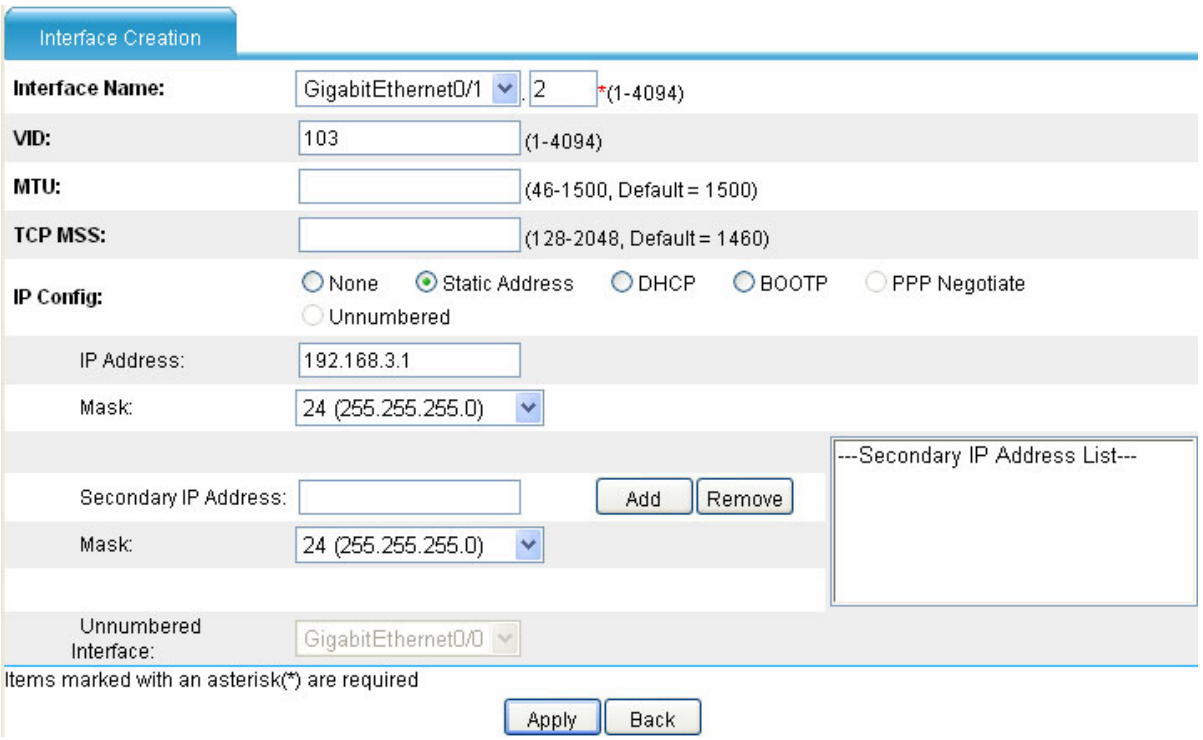
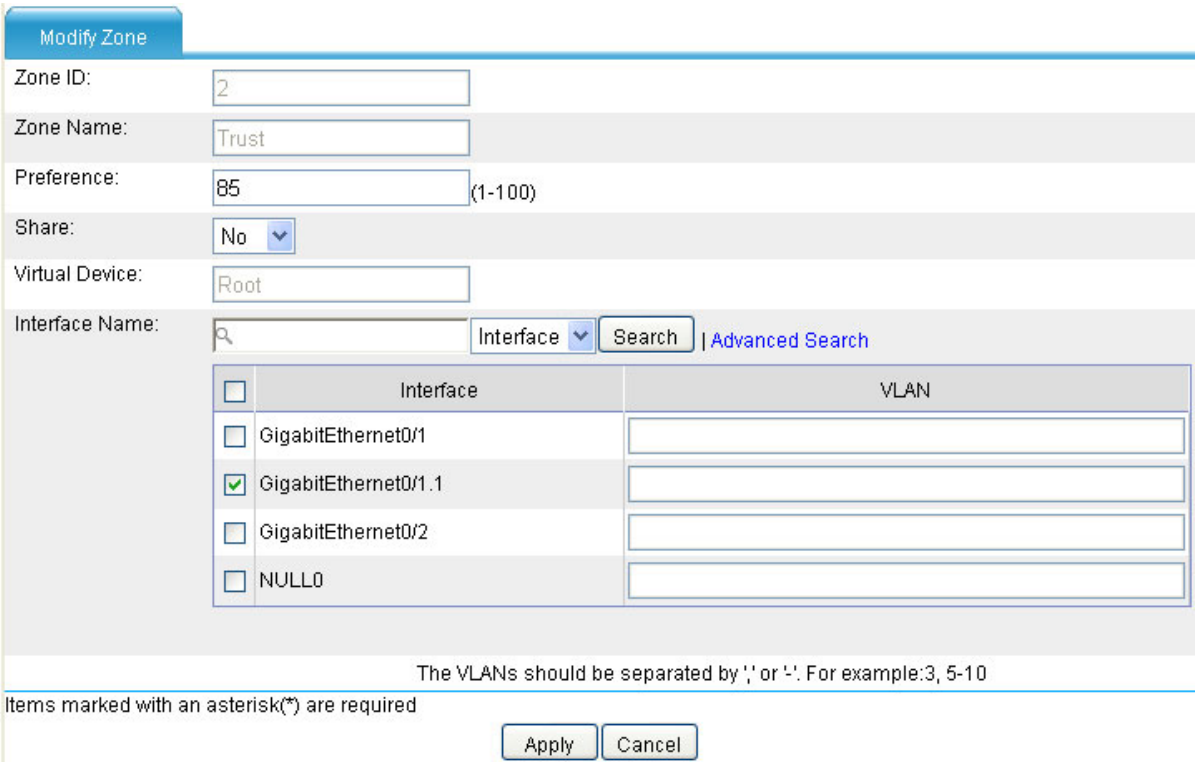


Figure 32 Create GigabitEthernet 0/1.2



Select **Device Management** > **Zone** from the navigation tree. Add GigabitEthernet 0/1 and GigabitEthernet 0/1.1 to the Trust zone, and GigabitEthernet 0/1.2 to the Untrust zone.

Figure 33 Add interfaces to the Trust zone



Configure IP address 192.168.2.10 and default gateway 192.168.2.1 for PC1, and IP address 192.168.3.11 and default gateway 192.168.3.1 for PC2.

- Ping PC2 from PC1. Result A is obtained.
- Ping PC1 from PC2. Result B is obtained.
- Add GigabitEthernet 0/1 to the Untrust zone, and then ping PC2 from PC1. Result C is obtained.
- Remove the VID specified for the Layer 3 subinterfaces of the Device and then ping PC2 from PC1. Result D is obtained.

Configure Layer 3 subinterface forwarding on a non-default virtual device. Create a virtual device named Device, create Device_Trust and Device_Untrust zones for the virtual device, and add subinterfaces GigabitEthernet 0/1.1 and GigabitEthernet 0/1.2 to the virtual device as interface members.

Select **Device Management** > **Virtual Device** > **Interface** from the navigation tree to display the page as shown in the following figure:

Figure 34 Add interfaces to the virtual device

Interface Member	Virtual Device
GigabitEthernet0/0	Root
GigabitEthernet0/1	Root
GigabitEthernet0/1.1	H3C
GigabitEthernet0/1.2	H3C
GigabitEthernet0/3	Root
GigabitEthernet0/4	Root
NULL0	Root
Vlan-interface60	Root

- Add GigabitEthernet 0/1.1 to Device_Trust, and GigabitEthernet 0/1.2 to Device_Untrust. Ping PC2 from PC1. Result E is obtained.

3) Verification

Result A: The ping operation succeeds.

Result B: The ping operation fails.

Result C: The ping operation succeeds.

Result D: The ping operation fails. The VID is needed to specify the tag type and VLAN.

Result E: The ping operation succeeds.

4) Configuration guidelines

- After Layer 3 subinterfaces are configured on a physical port working in router mode, packets are forwarded between security zones according to the security zones where Layer 3 subinterfaces reside.
- To implement Layer 3 subinterface forwarding in a non-default virtual device, you need to configure the subinterfaces used for forwarding packets as the interface members of the virtual device.

Hybrid Mode

Configuring general hybrid mode

1) Configuration description

Configure VLAN virtual interfaces and Layer 3 interfaces on the Device to forward packets.

2) Configuration procedure (see Figure 1)

Select **Device Management** > **Interface** from the navigation tree. Configure GigabitEthernet 0/1 as a Layer 2 access port, assign the interface to VLAN 2, create VLAN interface 2, and assign IP address 192.168.2.1/24 to the VLAN interface. Configure the route mode for GigabitEthernet 0/2 and assign IP address 192.168.3.1/24 to it.

Figure 35 Create VLAN interface 2

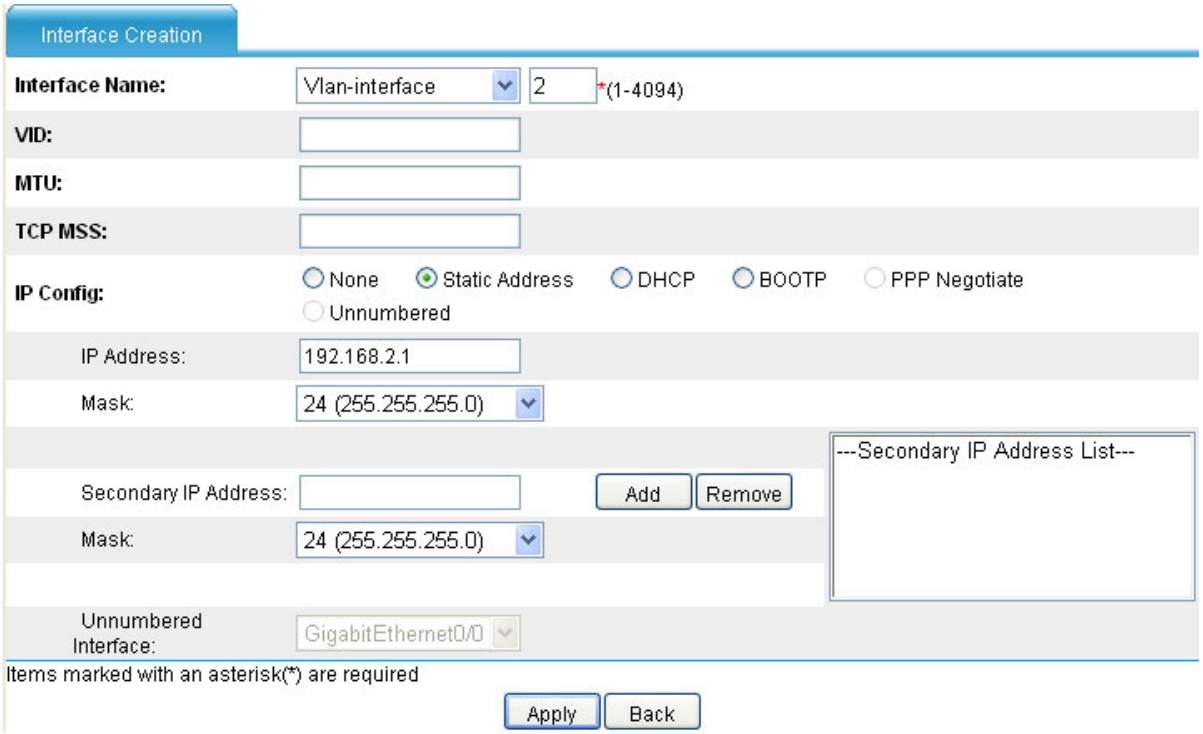
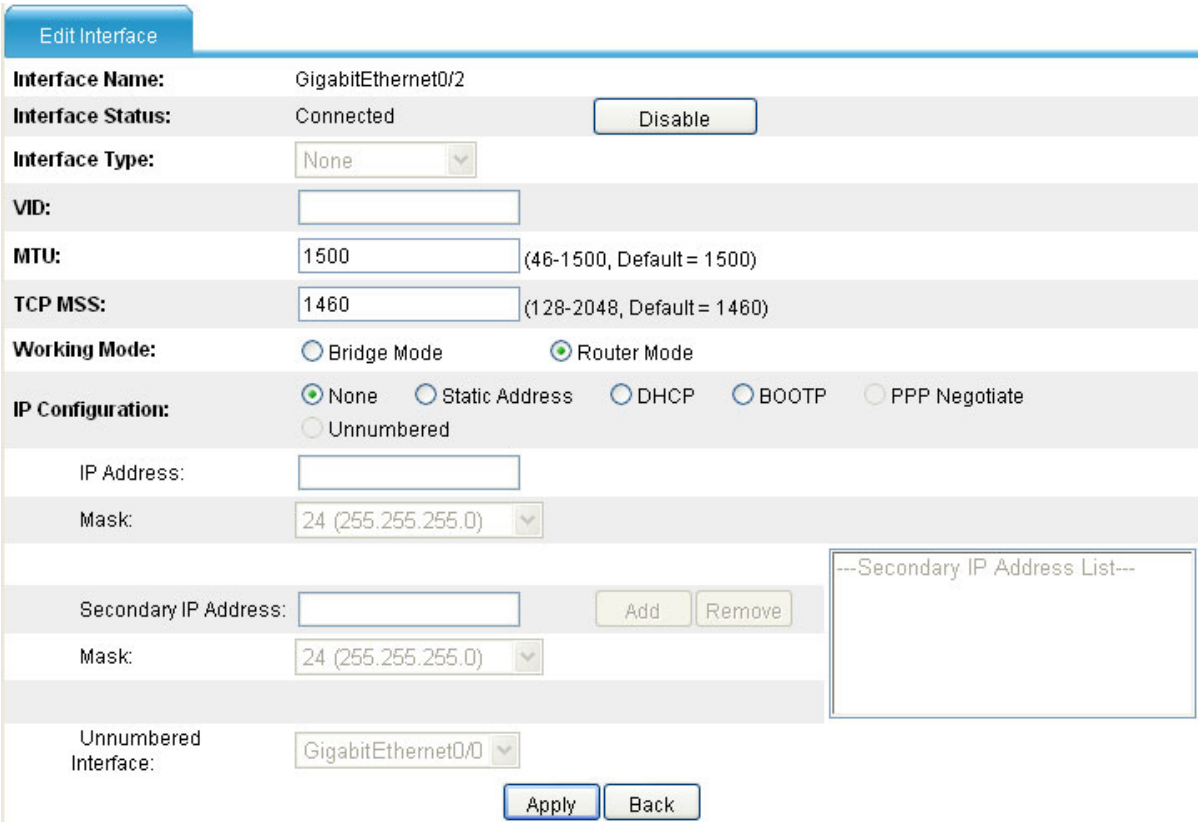


Figure 36 Configure GigabitEthernet 0/2



Select **Device Management** > **Zone** from the navigation tree. Add VLAN interface 2 to the Trust zone, and GigabitEthernet 0/2 to the Untrust zone.

Figure 37 Add interfaces to the Trust zone

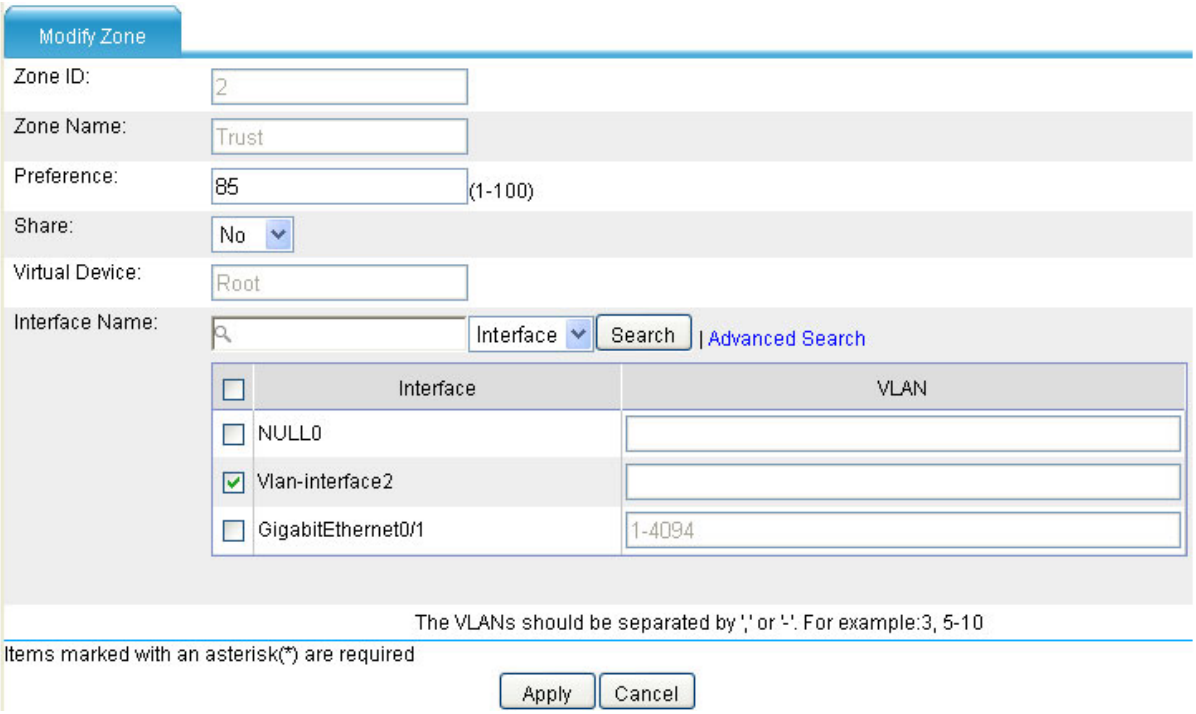
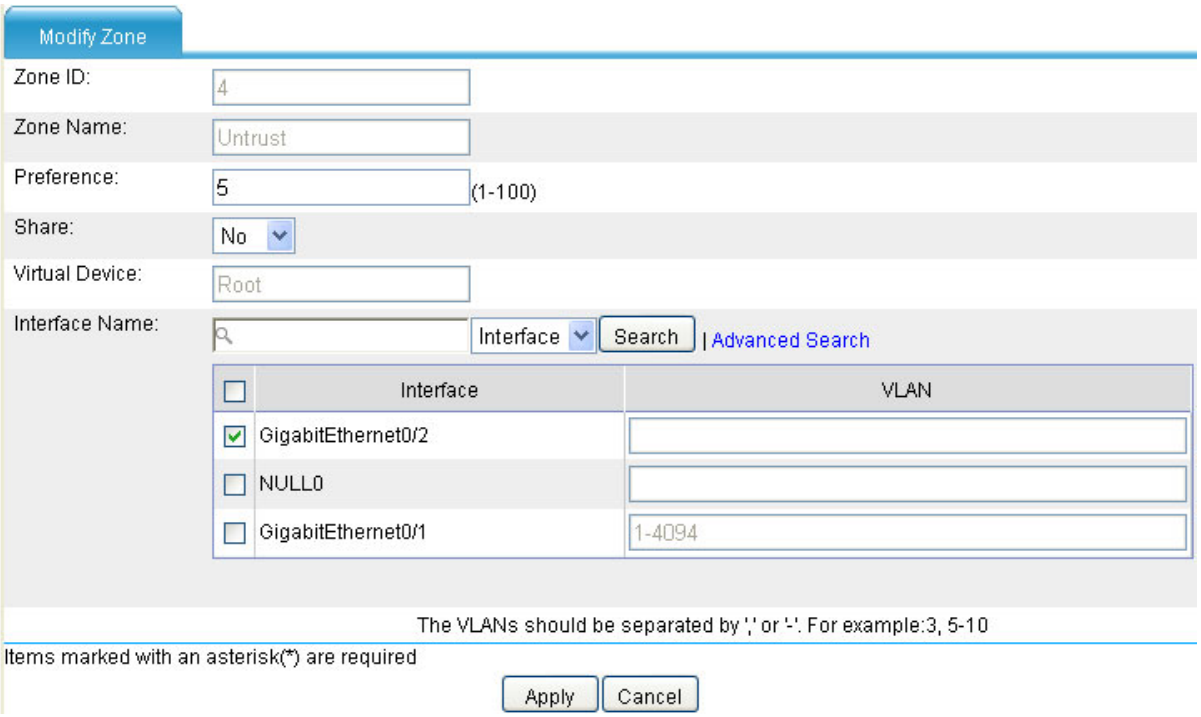


Figure 38 Add GigabitEthernet 0/2 to the Untrust zone



Select **Firewall** > **NAT Policy** > **Dynamic NAT** from the navigation tree. Apply ACL 3000 to GigabitEthernet 0/2 and enable Easy IP. ACL 3000 allows packets from 192.168.2.0/24 to pass.

Figure 39 Configure dynamic NAT

Dynamic NAT

Interface	ACL	Address Pool Index	Address Transfer	Global VPN Instance	Operation
GigabitEthernet0/2	3000		Easy IP		

Figure 40 Configure ACL 3000

Advanced ACL3000

Rule ID	Operation	Description	Time Range	Operation
0	permit	ip source 192.168.2.0 0.0.0.255	--None--	

3) Verification

Configure IP address 192.168.2.10/24 and gateway 192.168.2.1 for PC1, and IP address 192.168.3.11/24 and gateway 192.168.3.1 for PC2. Ping PC2 from PC1. The ping operation succeeds and the session information displayed on the Device is as follows:

Figure 41 Session information

Query Item: Src IP Address IP Address: 192.168.2.10 Search

	Init Src IP	Init Dest IP	Init VPN VPN / VLAN / INLINE	Resp Src IP	Resp Dest IP	Resp VPN VPN / VLAN / INLINE	Protocol	Session Status	Lifetime (s)	Operation
	192.168.2.10:2048	192.168.3.11:768	---	192.168.3.11:0	192.168.3.1:1024	---	ICMP	ICMP-CLOSED	29	

Configuring Layer 2 and Layer 3 hybrid forwarding

1) Configuration description

Configure Layer 2 and Layer 3 hybrid forwarding on the Device.

2) Configuration procedure (see Figure 2)

- Configure devices through CLI

On the switch:

```
#
interface GigabitEthernet1/0/1
 port access vlan 102
#
interface GigabitEthernet1/0/10
```

```
 port access vlan 103
#
interface GigabitEthernet1/0/16
 port link-type trunk
 undo port trunk permit vlan 1
 port trunk permit vlan 102 to 103
#
```

On the Device:

```
#
vlan 100 to 103
#
interface GigabitEthernet0/1
 port link-mode bridge
 port link-type trunk
 port trunk permit vlan 1 102 to 103
#
```

- Configure the Device through the web interface

Select **Device Management** > **Interface** from the navigation tree. Create Layer 2 subinterface GigabitEthernet 0/1.102, add it to VLAN 100. Create VLAN-interface 100 and specify the IP address as 192.168.2.1/24. Create VLAN-interface 103 and specify the IP address as 192.168.3.1/24.

Figure 42 Create GigabitEthernet 0/1.102

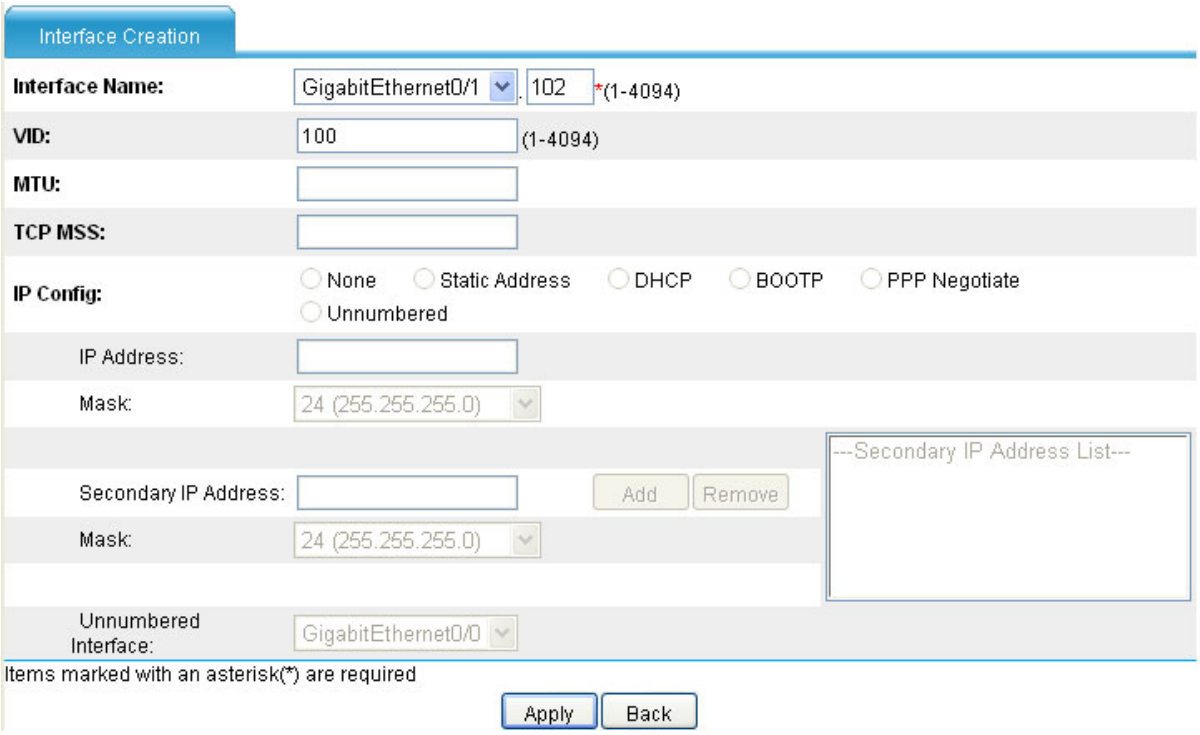


Figure 43 Create VLAN interface 100

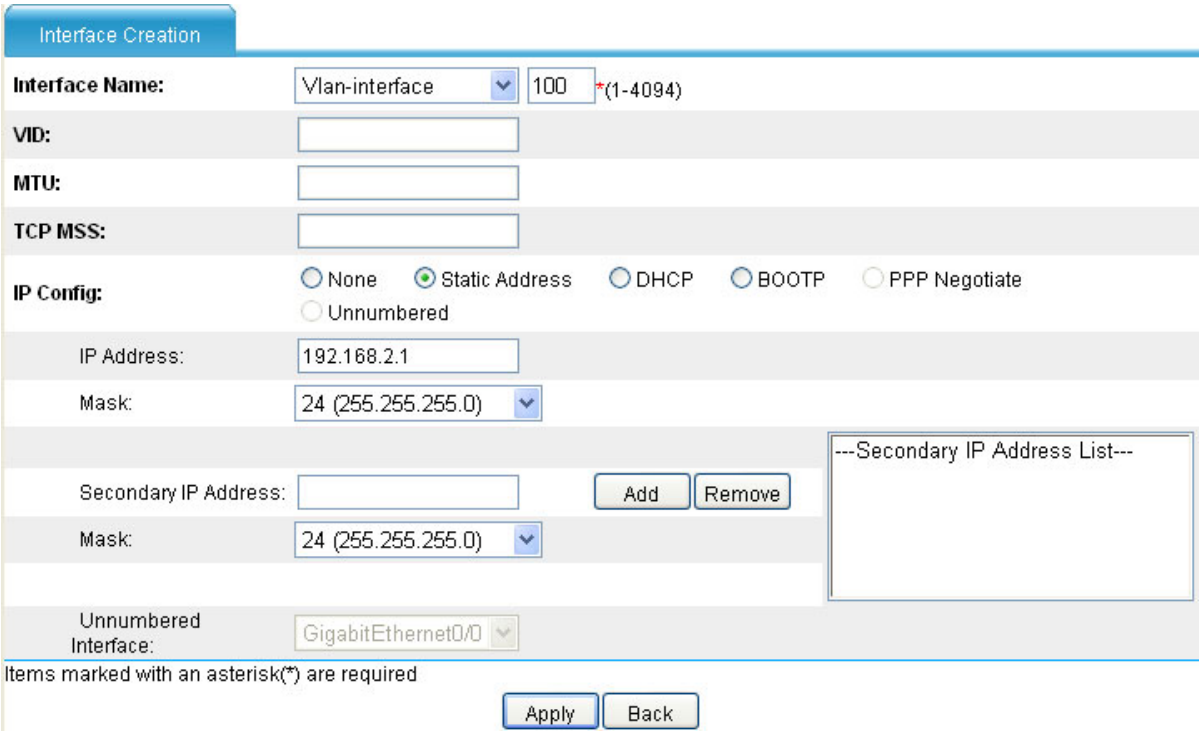
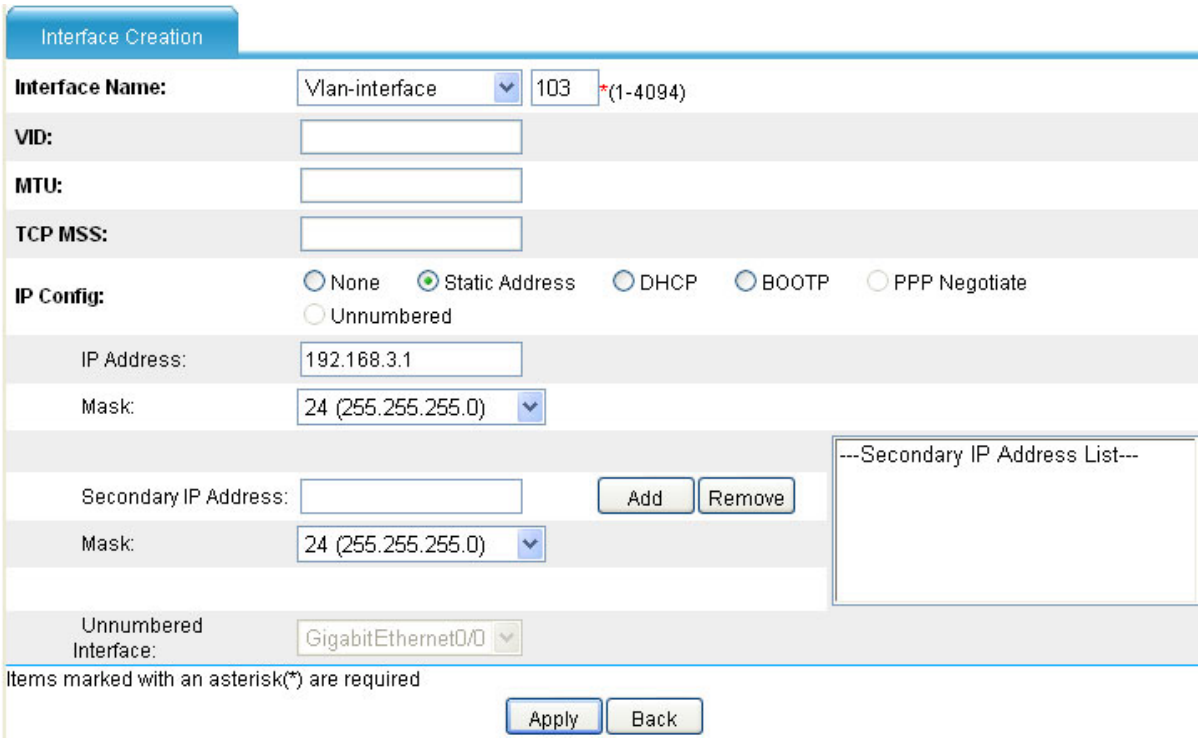


Figure 44 Create VLAN interface 103



Select **Device Management** > **Zone** from the navigation tree. Add VLAN interface 100 to the Trust zone. Add VLAN interface 103 to the Untrust zone.

Figure 45 Add interfaces to the Trust zone

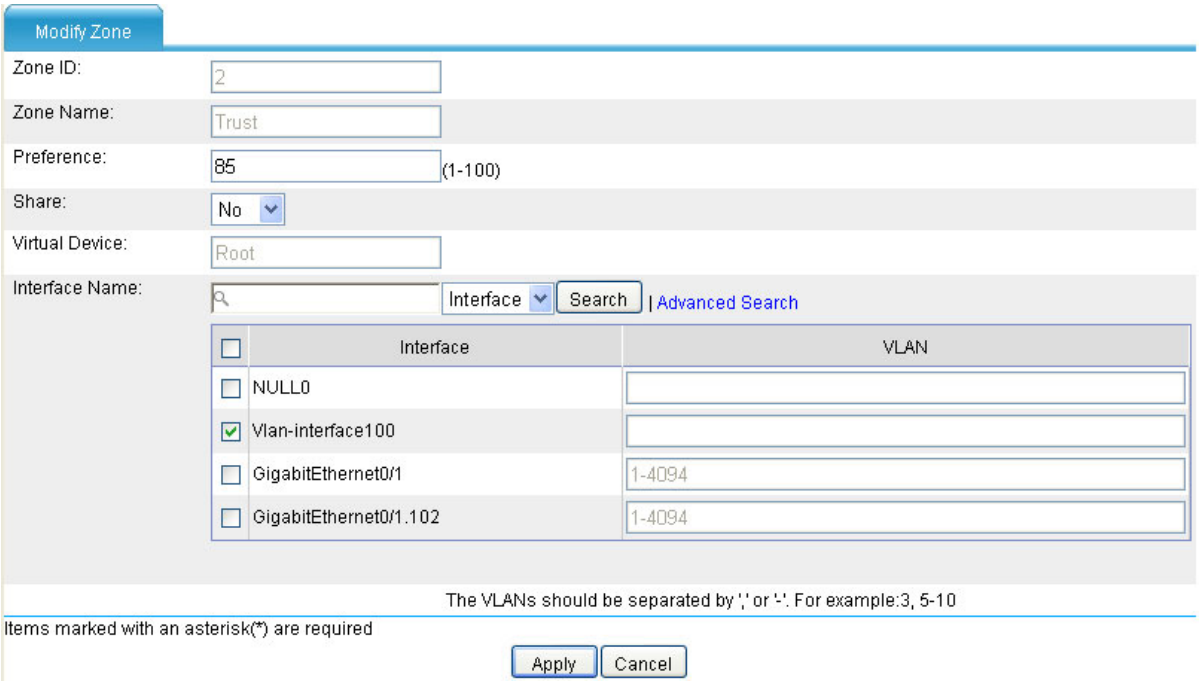
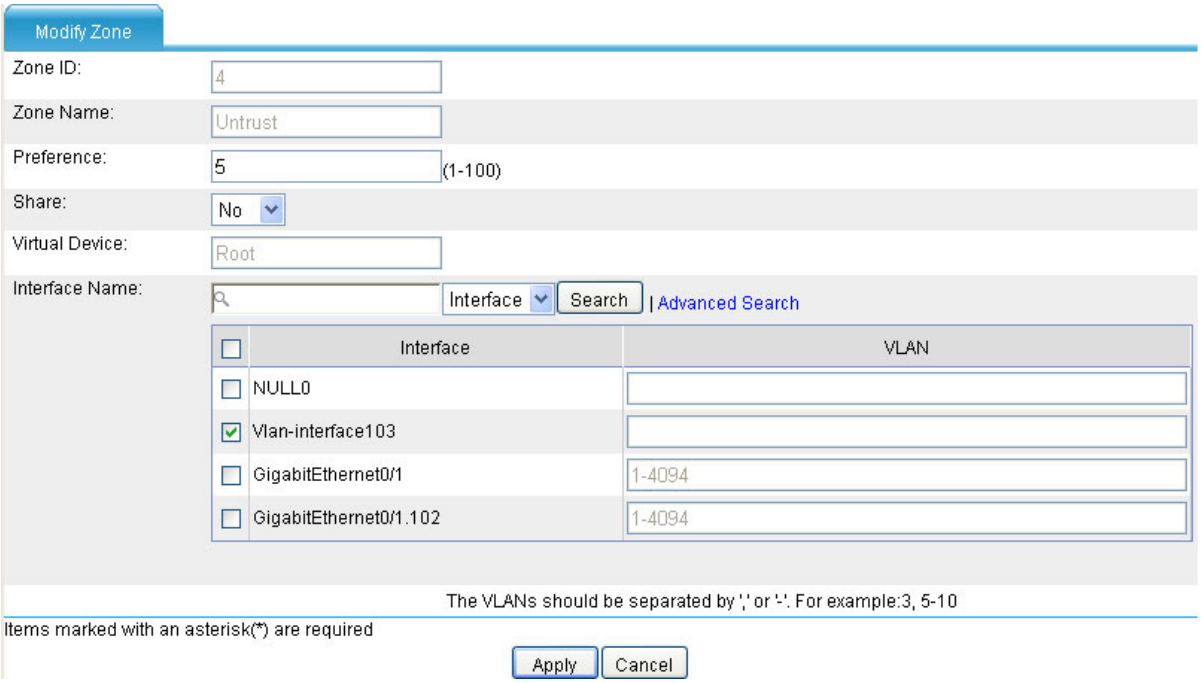


Figure 46 Add VLAN interface 103 to the Untrust zone



Configure IP address 192.168.2.10 and default gateway 192.168.2.1 for PC1, and IP address 192.168.3.11 and default gateway 192.168.3.1 for PC2.

- Ping the IP address of PC2 from PC1. Result A is obtained.

- Select **Firewall** > **Security Policy** > **Interzone Policy** from the navigation tree. Define a policy to permit all traffic from the Untrust zone to the Trust zone. Ping the gateway of PC1 from PC2. Result B is obtained.

Figure 47 Define an inter-zone policy

	Source Zone	Dest Zone	ID	Source Address	Destination Address	Service	Time Range	Filter Action	Content Filtering Policy Template	Description	Status	Log	Source MAC	Destination MAC	Operation
	Untrust	Trust	0	any_address	any_address	any_service		Permit			Out of Use	Disabled			

- Configure Layer 2 and Layer 3 hybrid forwarding on a non-default virtual device. Create a virtual device named Device and configure VLAN 100 and VLAN 103 as the device members of the virtual device. Type **100** in the **VLAN** text box next to GigabitEthernet 0/1.102 and add VLAN-interface 100 to the Device_Trust zone. Type **103** in the **VLAN** text box next to GigabitEthernet 0/1 and add VLAN interface 103 to the Device_Untrust zone. Ping PC2 from PC1. Result C is obtained.

3) Verification

Result A: The ping operation succeeds.

Result B: The ping operation succeeds.

Result C: The ping operation succeeds.

4) Configuration guidelines

The PVID of a Layer 2 subinterface cannot be the same as the subinterface ID, or the ID of the VLAN to which a Layer 3 VLAN interface belongs. In this example, the ID of the Layer 2 subinterface is 102, the PVID is 100, and the VLAN ID of the Layer 3 virtual interface is 103.

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SecPath Series Firewalls Attack Protection Configuration Example

Keywords: Attack protection, scanning, blacklist

Abstract: This document describes the attack protection functions of the H3C UTM firewalls, including SYN flood attack protection, UDP flood attack protection, ICMP flood attack protection, scanning attack protection, single-packet attack protection, static blacklist, and dynamic blacklist. This document also presents the configuration and verification methods in detail through examples.

Acronyms:

Acronym	Full spelling
DDOS	Distributed Denial of Service
HTTP	Hypertext Transfer Protocol
ICMP	Internet Control Message Protocol
IP	Internet Protocol
TCP	Transfer Control Protocol
UDP	User Datagram Protocol

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Feature Overview

Attack protection is an important firewall feature. It allows a firewall to detect attacks by analyzing the contents and behavior characteristics of received packets and, based on the analysis result, takes countermeasures such as blacklisting the source IP addresses, outputting alarm logs, and/or discarding packets.

The attack protection feature can detect kinds of Denial of Service (DoS) attacks, scanning attacks, and malformed packet attacks, and take actions in response. It does so by using blacklists, matching packets against attack signatures, and detecting traffic abnormalities. The attack protection feature also provides attack statistics.

Application Scenarios

The attack protection feature is usually deployed at the egress of a campus network or corporate network to detect and handle with possible attack packets between the internal network and external network, so as to protect the security of the internal network.

Configuration Guidelines

1) Packet inspection and scanning prevention apply to only the inbound direction, that is, the internal zone. When deployed in the outbound direction, that is, the external zone, they do not take effect.
2) The flood attack protection functions apply to only the outbound direction. When deployed in the inbound direction, they do not take effect.

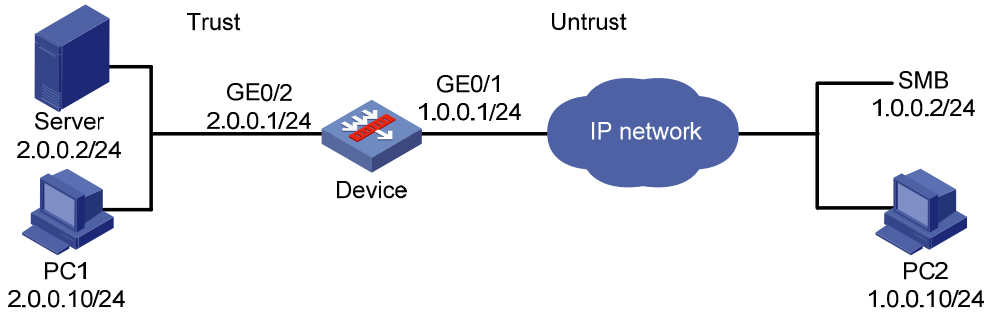
Configuration Example

Network Requirements

Note

This configuration example is applicable to SecPath F5000-A5, SecPath F1000E, and SecPath UTM 200-A/200-M/200-S firewalls. A UTM200-S firewall is used in this configuration example for illustration.

Figure 1 Network diagram for attack protection configuration



Configuration Considerations

- Add the interface connecting the internal network (that is, GigabitEthernet 0/2) to zone Trust.
- Add the interface connecting the external network (that is, GigabitEthernet 0/1) to zone Untrust.

Software Version Used

SecPath F1000E: V300R001B01 R3166 series and V300R001B01 F3166 series.

SecPath F5000-A5: V300R002B01 R3206 series

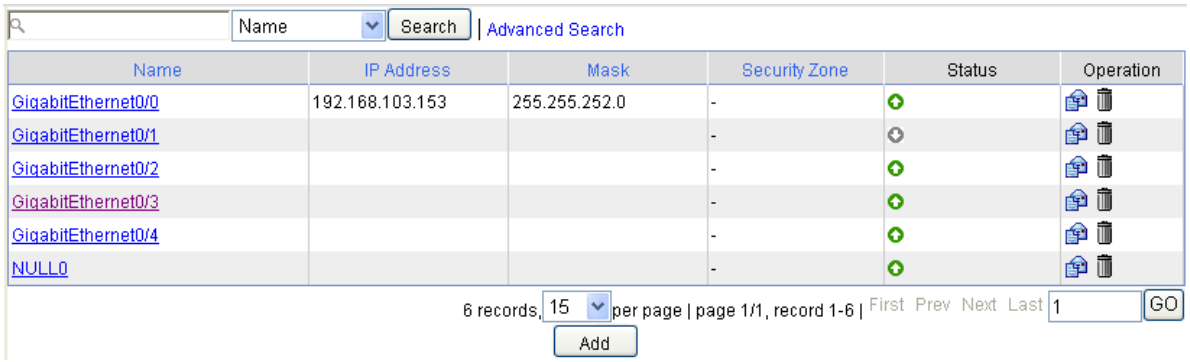
SecPath UTM 200-A/200-M/200-S: V500R001B01 R5116 series

Configuration Procedures

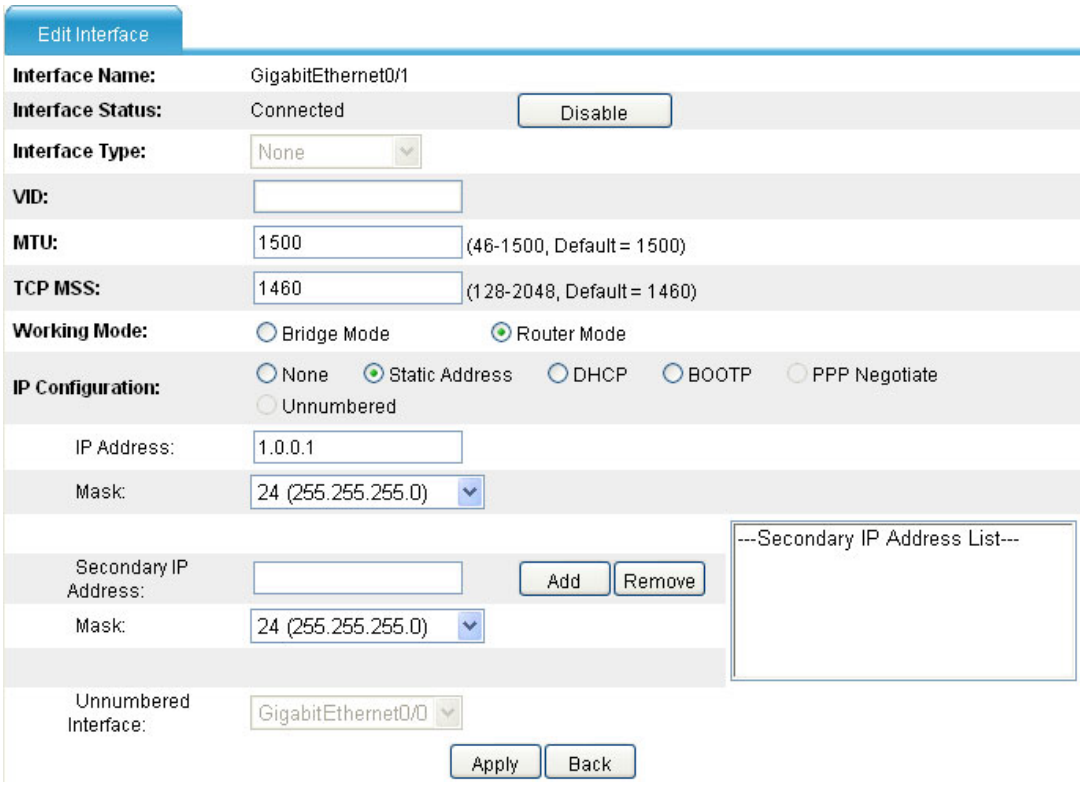
Basic Configurations

Assigning IP addresses to interfaces

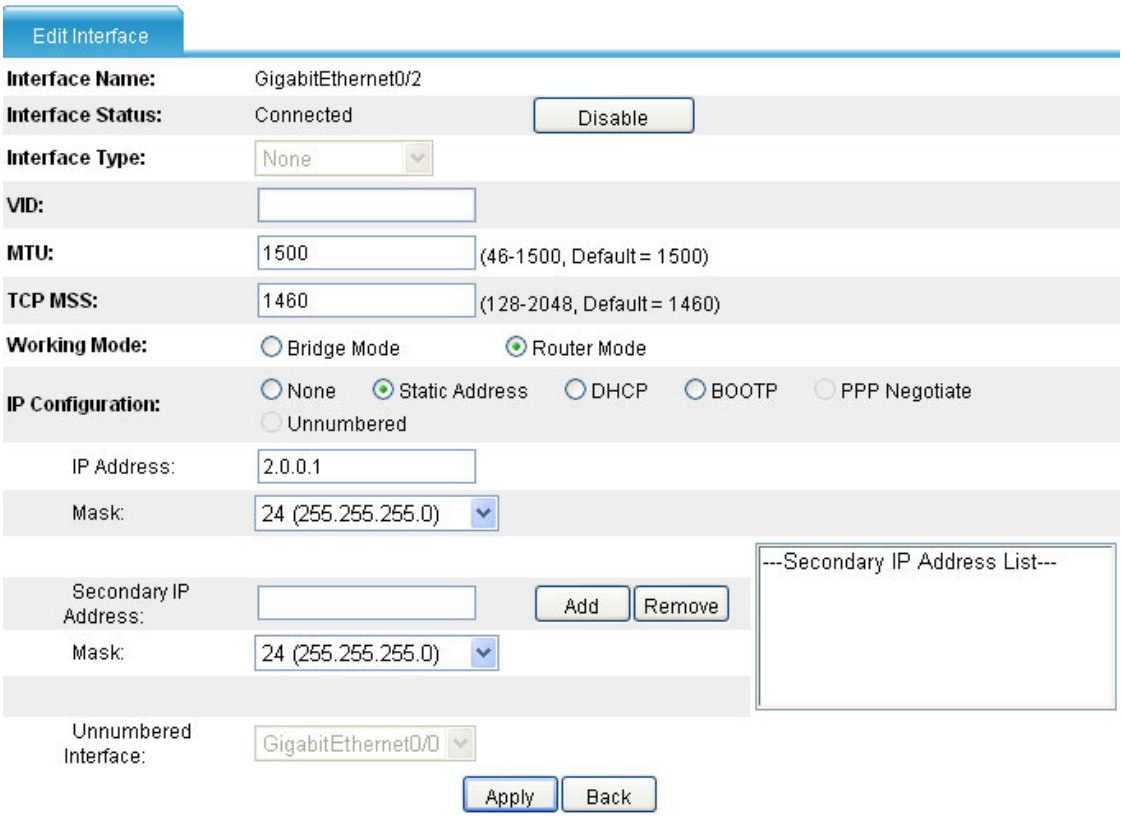
- From the navigation tree, select **Device Management** > **Interface** to enter the interface management page.



- Click the icon of GigabitEthernet 0/1 to enter the interface configuration page. Then, configure the interface as follows and click **Apply** to return to the interface management page.

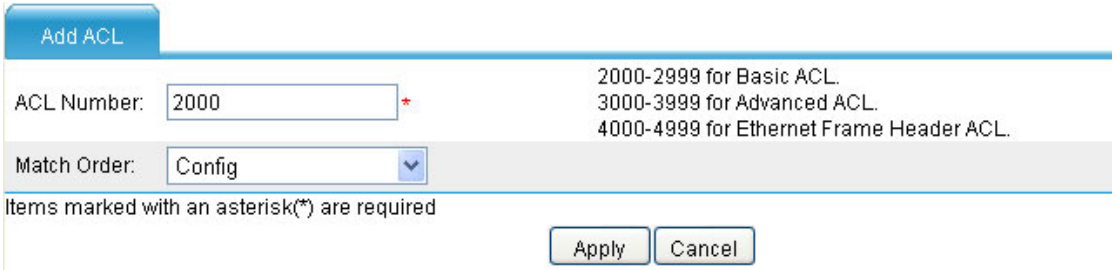


- Click the icon of GigabitEthernet 0/2 to enter the interface configuration page. Then, configure the interface as follows and click **Apply** to return to the interface management page.

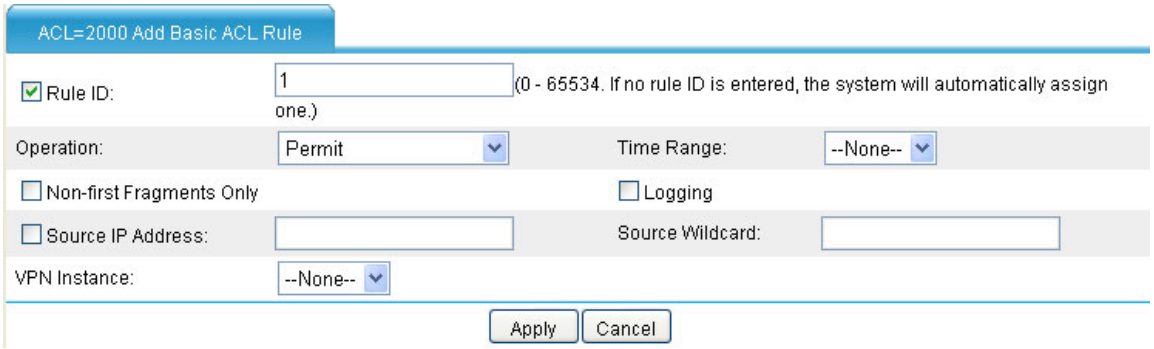


Configuring the ACL

- From the navigation tree, click **Firewall** > **ACL** to enter the ACL management page. Then, click **Add** to create ACL 2000.



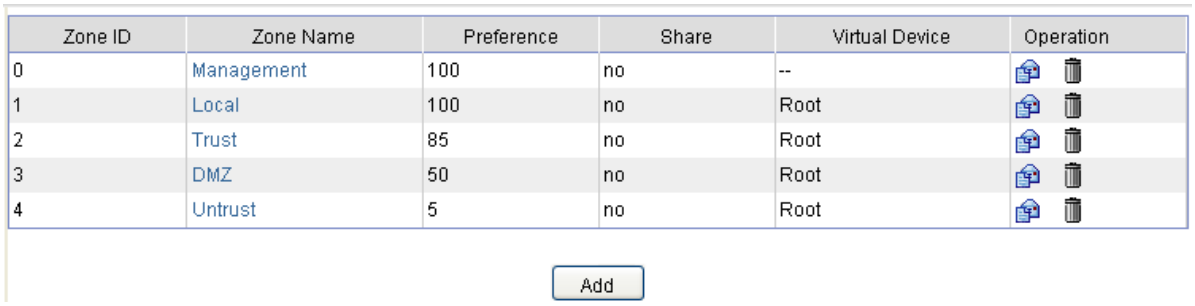
- On the ACL management page, click the icon of ACL 2000 and then click **Add** to create a rule that allows all packets to pass.



- Click **Apply**.

Adding interfaces to zones

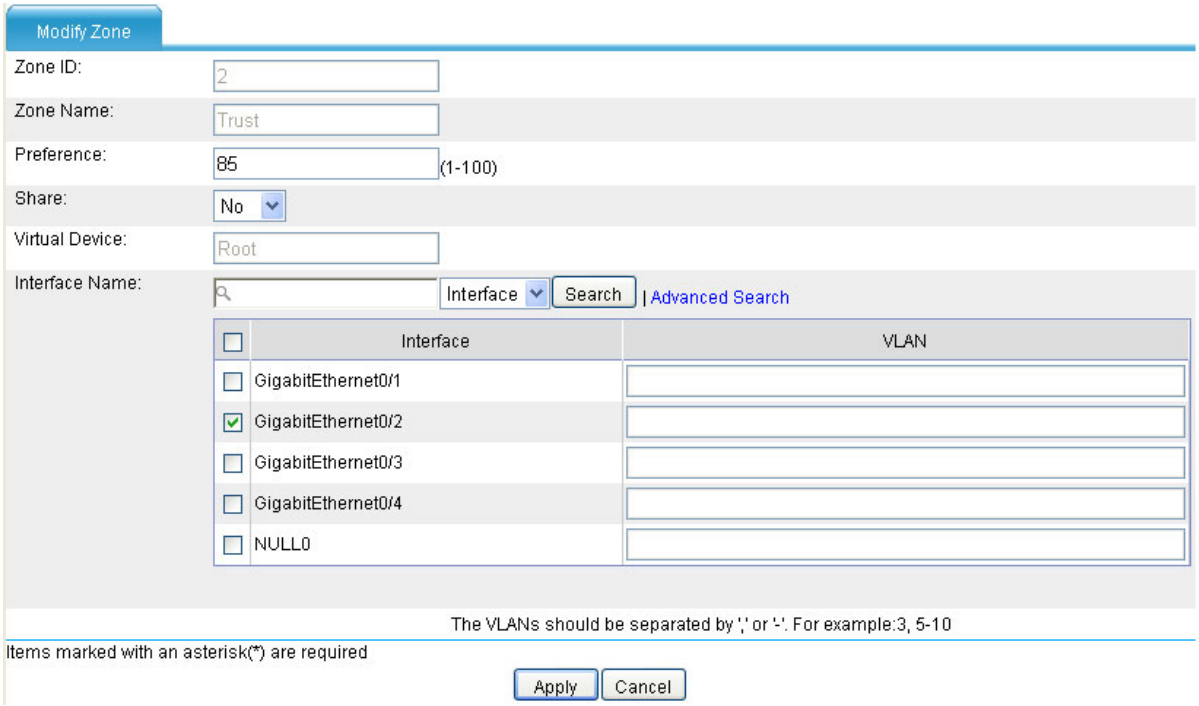
- From the navigation tree, select **Device Management** > **Zone** to enter the security zone management page.



Zone ID	Zone Name	Preference	Share	Virtual Device	Operation
0	Management	100	no	--	
1	Local	100	no	Root	
2	Trust	85	no	Root	
3	DMZ	50	no	Root	
4	Untrust	5	no	Root	

Add

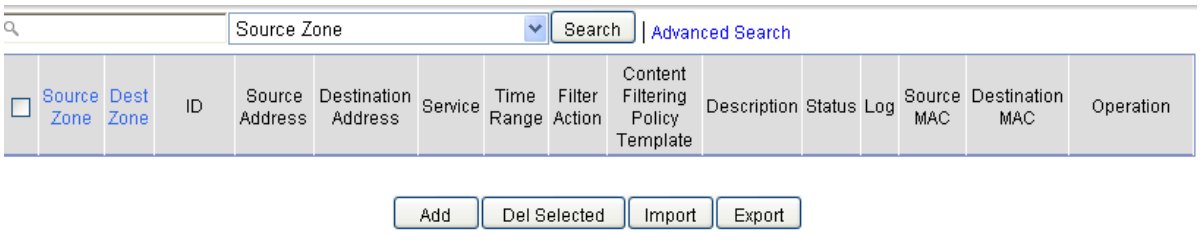
- Click the icon of zone Trust to enter the security zone modification page. Then, add interface GigabitEthernet 0/2 to the zone as follows and click **Apply** to return to the security zone management page.



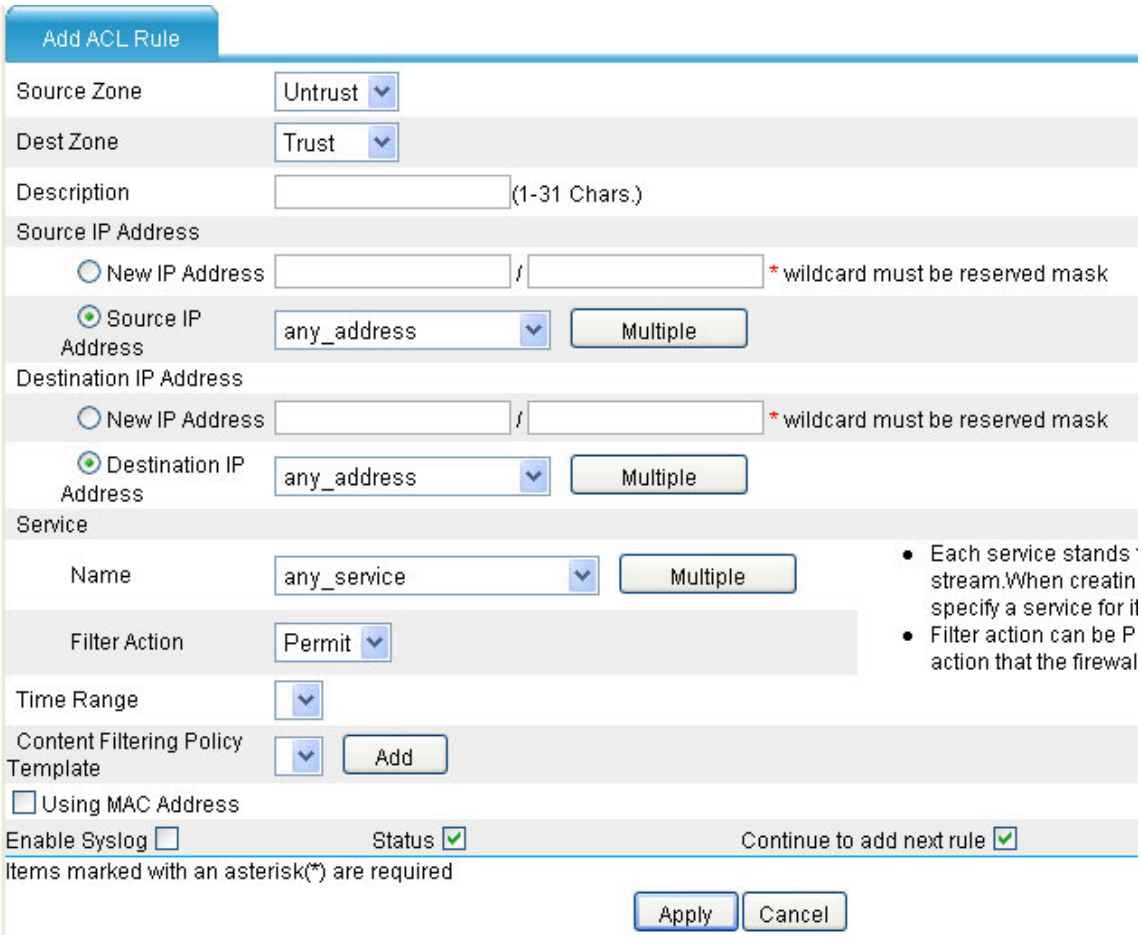
- Add interface GigabitEthernet 0/1 to zone Untrust in the same way.

Configuring interzone policies

- From the navigation tree, select **Firewall** > **Security Policy** > **Interzone Policy**.

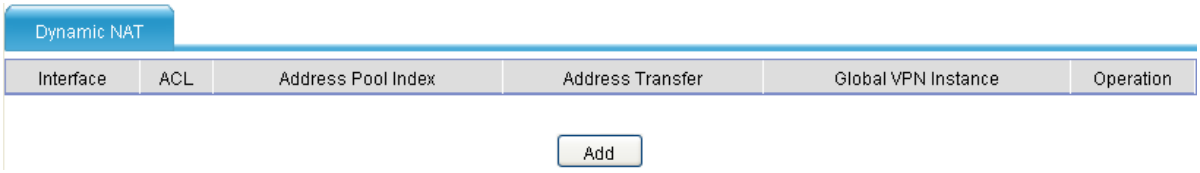


- Click **Add** and then configure an interzone policy from Untrust to Trust as follows:

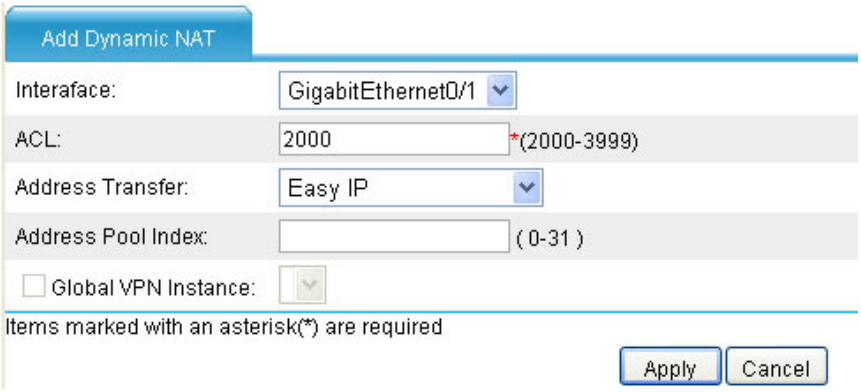


Configuring NAT for the outbound interface

- From the navigation tree, select **Firewall** > **NAT Policy** > **Dynamic NAT**. Then click **Add**.



- Configure NAT for interface GigabitEthernet 0/1 as follows, and then click **Apply**.

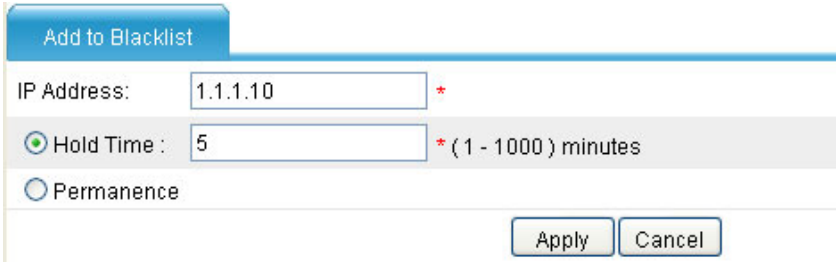


Configuring Attack Protection

Configuring the Static Blacklist Function

- From the navigation tree, select **Intrusion Detection** > **Blacklist**. Then, select the **Enable Blacklist** check box and click **Apply** to enable the blacklist function.

- Click **Add**.
- Type the address to be blacklisted and specify the lifetime of the blacklist entry. Then, click **Apply**.

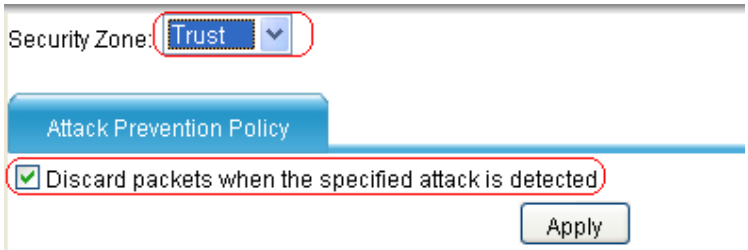


Configuring the Dynamic Blacklist Function

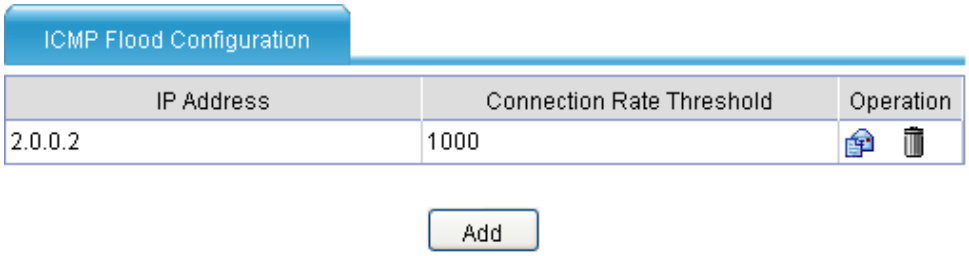
- From the navigation tree, select **Intrusion Detection** > **Blacklist**. Then, select the **Enable Blacklist** check box and click **Apply** to enable the blacklist function.

Configuring ICMP Flood Attack Protection

- From the navigation tree, select **Intrusion Detection** > **Traffic Abnormality** > **ICMP Flood**. Then, select security zone **Trust** and select **Discard packets when the specified attack is detected** and click **Apply**.

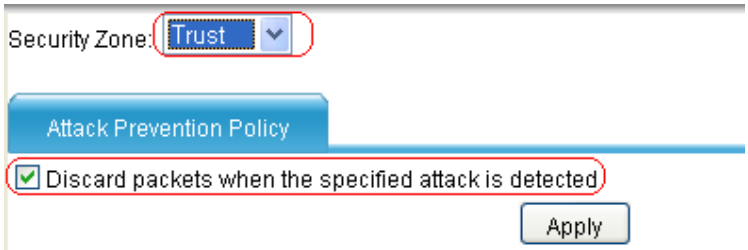


- In the **ICMP Flood Configuration** area, click **Add** and add host address 2.0.0.2 as an object to be protected.

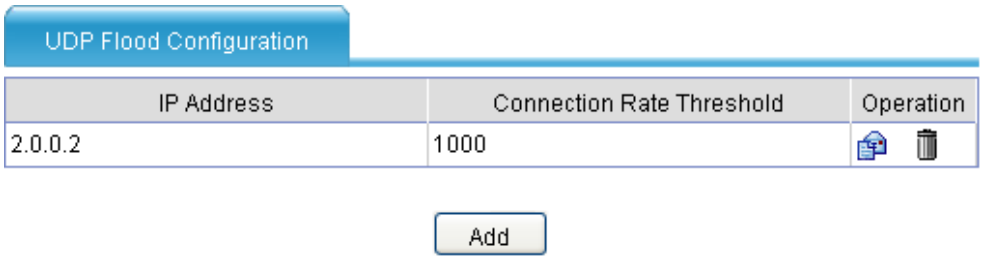


Configuring UDP Flood Attack Protection

- From the navigation tree, select **Intrusion Detection** > **Traffic Abnormality** > **UDP Flood**. Then, select security zone **Trust** and select **Discard packets when the specified attack is detected** and click **Apply**.

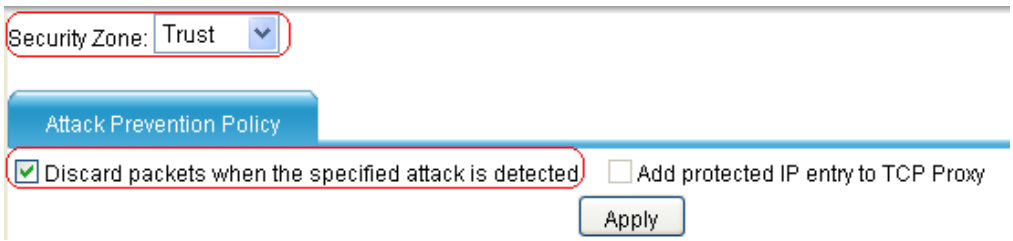


- In the **UDP Flood Configuration** area, click **Add** and add host address 2.0.0.2 as an object to be protected.

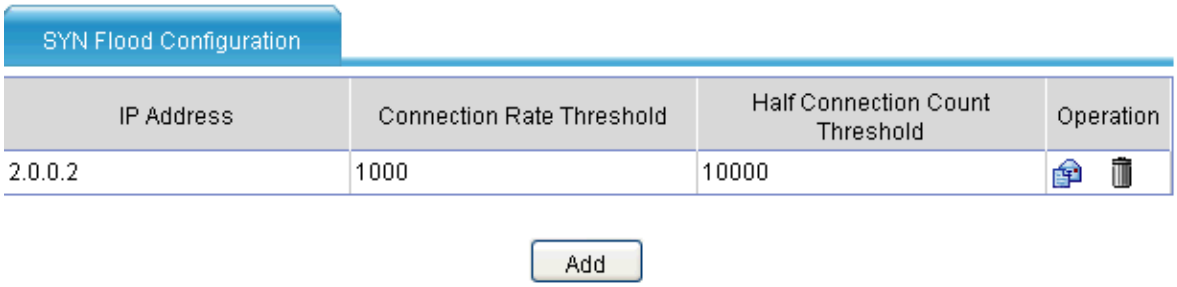


Configuring SYN Flood Attack Protection

- From the navigation tree, select **Intrusion Detection** > **Traffic Abnormality** > **SYN Flood**. Then, select security zone **Trust** and select **Discard packets when the specified attack is detected** and click **Apply**.



- In the **SYN Flood Configuration** area, click **Add** and add host address 2.0.0.2 as an object to be protected.



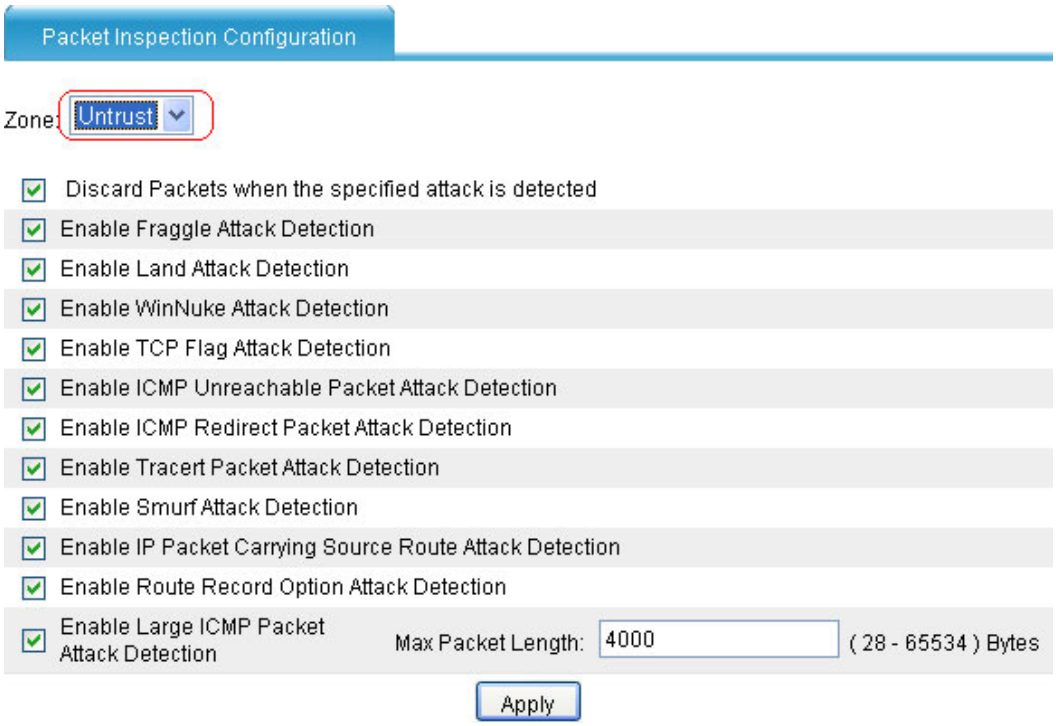
Configuring Scanning Prevention

- From the navigation tree, select **Intrusion Detection** > **Traffic Abnormality** > **Scanning Detection**. Then, select security zone **Untrust** and select **Enable Scanning Detection** and **Add a source IP to the blacklist** and click **Apply**.

Configuring Packet Inspection

Packet inspection is used to detect single-packet attacks, which has nothing to do with traffic and sessions. Packet inspection is implemented by checking whether a packet has the specified signatures.

- From the navigation tree, select **Intrusion Detection** > **Packet Inspection**. Then, select security zone **Untrust** and the types of attacks to be detected, and click **Apply**.

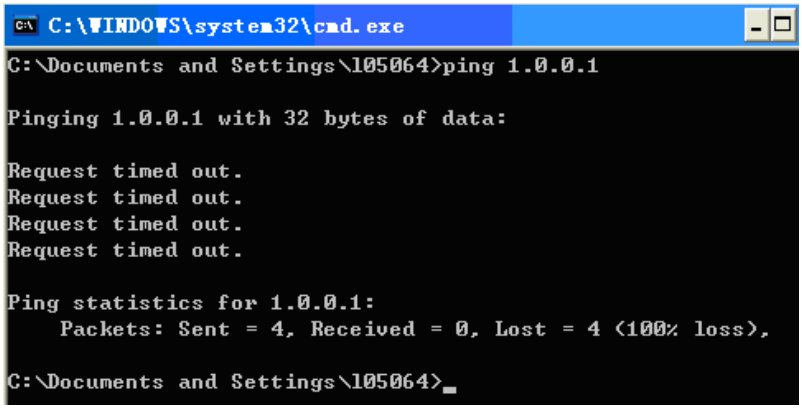


Verification

On PC 2, use a packet constructing tool to simulate various attacks targeting the host or server of the internal network.

Static Blacklist

- Before the static blacklist entry expires or is cleared, PC 2 cannot ping the IP address (1.0.0.1) of the UTM device's interface GigabitEthernet 0/1.



- When PC 2 is not in the blacklist, PC 2 can ping the IP address (1.0.0.1) of the UTM device's interface GigabitEthernet 0/1.

```
C:\WINDOWS\system32\cmd.exe
C:\Documents and Settings\105064>ping 1.0.0.1

Pinging 1.0.0.1 with 32 bytes of data:

Reply from 1.0.0.1: bytes=32 time<1ms TTL=255
Reply from 1.0.0.1: bytes=32 time<1ms TTL=255
Reply from 1.0.0.1: bytes=32 time<1ms TTL=255
Reply from 1.0.0.1: bytes=32 time<1ms TTL=255

Ping statistics for 1.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Documents and Settings\105064>_
```

Dynamic Blacklist

- Use a PC (1.0.0.100, for example) in the external network to log in to the server in the internal network, inputting the correct username but a wrong password for five times.
- Selecting **Intrusion Detection** > **Blacklist** from the navigation tree, you can see that the IP address of the PC (1.0.0.100) has been added to the blacklist.
- Because you selected **Add a source IP to the blacklist** when configuring scanning prevention, the device also automatically adds scanning sources to the blacklist. For details, refer to Scanning Prevention.

ICMP Flood Attack Protection

- Use SmartBits to send ICMP packets with the destination address 2.0.0.2 to zone Trust at a rate higher than 1000 frames per second for three seconds, changing the source address frequently.

Note

- SmartBits is a data protocol analyzer from Spirent Communications.
- For ICMP flood, UDP flood, and SYN flood attacks, the sampling interval of the device is one second. If the number of half-open connections or the session establishment rate exceeds the threshold in three consecutive sampling intervals, the device considers that an attack has occurred. Therefore, when using SmartBits to simulate a flood attack, be sure to send attack packets for at least four seconds.

- Select **Intrusion Detection** > **Statistics** from the navigation tree and then select zone **Trust**. You can view the number of ICMP flood attacks and the number of dropped ICMP flood attack packets.

Zone: Trust

Attack Type	Attack Count	Dropped Packet Count
Fraggle	0	0
ICMP Redirect	0	0
ICMP Unreachable	0	0
Land	0	0
Large ICMP	0	0
Route Record	0	0
Scan	0	0
Source Route	0	0
Smurf	0	0
TCP Flag	0	0
Tracert	0	0
WinNuke	0	0
SYN Flood	0	0
ICMP Flood	2	157016
UDP Flood	0	0
Number of connections per source IP exceeds the threshold	0	0
Number of connections per dest IP exceeds the threshold	0	0

Clear Refresh

UDP Flood Attack Protection

- Use SmartBits to send UDP packets from zone Untrust to 2.0.0.2 in zone Trust at a rate higher than 1000 frames per second, changing the source address frequently.
- Select **Intrusion Detection** > **Statistics** from the navigation tree and then select zone **Trust**. You can view the number of UDP flood attacks and the number of dropped UDP flood attack packets.

Zone: Trust

Attack Type	Attack Count	Dropped Packet Count
Fraggle	0	0
ICMP Redirect	0	0
ICMP Unreachable	0	0
Land	0	0
Large ICMP	0	0
Route Record	0	0
Scan	0	0
Source Route	0	0
Smurf	0	0
TCP Flag	0	0
Tracert	0	0
WinNuke	0	0
SYN Flood	0	0
ICMP Flood	2	157016
UDP Flood	2	43392
Number of connections per source IP exceeds the threshold	0	0
Number of connections per dest IP exceeds the threshold	0	0

Clear Refresh

SYN Flood Attack Protection

- Use SmartBits to send TCP SYN packets from zone Untrust to 2.0.0.2 in zone Trust at a rate higher than 1000 frames per second, changing the source address frequently.
- Select **Intrusion Detection** > **Statistics** from the navigation tree and then select zone **Trust**. You can view the number of SYN flood attacks and the number of dropped SYN flood attack packets.

Zone: Trust

Attack Type	Attack Count	Dropped Packet Count
Fraggle	0	0
ICMP Redirect	0	0
ICMP Unreachable	0	0
Land	0	0
Large ICMP	0	0
Route Record	0	0
Scan	0	0
Source Route	0	0
Smurf	0	0
TCP Flag	0	0
Tracert	0	0
WinNuke	0	0
SYN Flood	3	99402
ICMP Flood	2	157016
UDP Flood	2	43392
Number of connections per source IP exceeds the threshold	0	0
Number of connections per dest IP exceeds the threshold	0	0

Clear Refresh

Scanning Prevention

- Use SmartBits to send packets from zone Untrust to zone Trust at a rate higher than 500 frames per second, keeping the source address the same and changing the destination address frequently.
- Select **Intrusion Detection** > **Statistics** from the navigation tree and then select zone **Untrust**. You can view the number of scanning attacks and the number of dropped scanning attack packets.
- Because you selected **Add a source IP to the blacklist** when configuring scanning prevention, the device automatically adds scanning sources to the blacklist. You can see the source address used in the attack packets is on the blacklist.

Zone: Untrust

Attack Type	Attack Count	Dropped Packet Count
Fraggle	0	0
ICMP Redirect	0	0
ICMP Unreachable	0	0
Land	0	0
Large ICMP	0	0
Route Record	0	0
Scan	1	1
Source Route	0	0
Smurf	0	0
TCP Flag	0	0
Tracert	0	0
WinNuke	0	0
SYN Flood	0	0
ICMP Flood	0	0
UDP Flood	0	0
Number of connections per source IP exceeds the threshold	0	0
Number of connections per dest IP exceeds the threshold	0	0

Clear Refresh

Packet Inspection

- Construct test packets as described in the following table. This table lists the types of attacks that the device can detect and protect against.

No.	Attack type	Packet characteristics
1	Tracert	ICMP packets with an increasing TTL (starting from 1) on Windows system, or UDP packets with a large destination port number and an increasing TTL (starting from 1)
2	Large_ICMP	ICMP packets larger than the allowed size
3	Smurf	ICMP packets whose destination address is a broadcast address or a subnet address
4	ICMP Redirect	ICMP redirect packets (type 5)
5	ICMP Unreachable	ICMP unreachable packets (type 3)
6	Fraggle	UDP packets with the destination port number of 19 or 7
7	WinNuke	TCP packets with the destination port number of 139, with the URG bit set, and with a non-null urgent pointer.
8	TCP Flag	TCP packets with improper flags
9	Land	TCP SYN packets whose source address is on the 127.0.0.0 segment, or is the same as the destination address.

No.	Attack type	Packet characteristics
10	Route Record	IP data packets with the Route Record option (0x07) selected
11	Source Route	IP data packets with the Source Route option select and with the code field set to loose source routing (0x83) or strict source routing (0x89).

- Select **Intrusion Detection** > **Statistics** from the navigation tree and then select zone **Untrust**, you can view the counts of kinds of attacks and the counts of dropped attack packets.

Zone: Untrust

Attack Type	Attack Count	Dropped Packet Count
Fraggle	7	7
ICMP Redirect	11644	11644
ICMP Unreachable	4	4
Land	0	0
Large ICMP	0	0
Route Record	37590	37590
Scan	2	2
Source Route	15240	15240
Smurf	0	0
TCP Flag	0	0
Tracert	0	0
WinNuke	0	0
SYN Flood	0	0
ICMP Flood	0	0
UDP Flood	0	0
Number of connections per source IP exceeds the threshold	0	0
Number of connections per dest IP exceeds the threshold	0	0

Clear Refresh

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SecPath Series Firewalls Interzone Policy Configuration Example

Keyword: interzone policy

Abstract: Interzone policies, based on ACLs, are used for identification and monitoring of traffic between zones.

Acronyms:

Acronym	Full name
ACL	Access Control List

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Feature Overview

Interzone policies, based on access control lists (ACLs), are used for identification of traffic between zones. An interzone policy references one ACL for a pair of source zone and destination zone. This ACL contains a group of ACL rules, each of which permits or denies packets matching the match criteria.

Interzone policies can reference address resources and service resources to define the packet match criteria and reference time range resources to specify the effective time ranges of the rules.

Application Scenarios

The interzone policies can be used for identifying traffic, monitoring traffic, and setting a firewall between zones.

Configuration Guidelines

The number of an ACL referenced by an interzone policy is assigned automatically by the system. When you create the first rule for two zones, the system automatically creates an ACL, and assigns it an ACL number that is one more than the last assigned ACL number, starting from 6000. If you remove all rules of the interzone policy, the system automatically removes the ACL.

Rules for a pair of source zone and destination zone are listed in match order on the web page. A rule listed earlier has a higher priority, and is matched earlier. By default, the rules are in the order they are created, and you can manually adjust the order.

Interzone Policy Configuration Example

Network Requirements

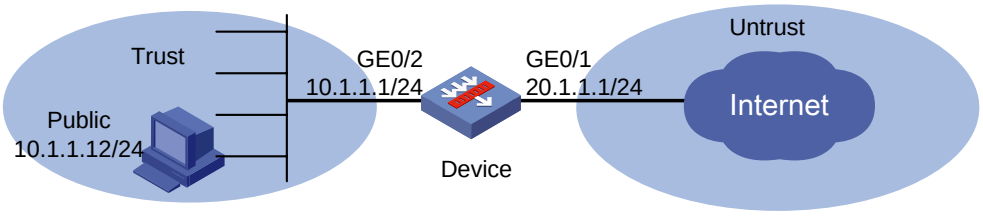
Note

This configuration example is applicable to SecPath F5000-A5, SecPath F1000E, and SecPath UTM 200-A/200-M/200-S firewalls. A UTM 200-S firewall is used in this configuration example for illustration.

- As shown in Figure 1, Device connects the corporate network to the Internet. The corporate network belongs to zone **Trust**, while the external network belongs to zone **Untrust**.

- Configure an interzone policy, allowing internal host **Public** to access the external network at any time and denying all the other internal hosts' access to the external network during working hours (from 8:00 to 18:00) on working days (Monday through Friday).

Figure 1 Network diagram for configuring interzone policies



Configuration Considerations

- Assign IP addresses to the interfaces
- Configure zones
- Configure a time range resource
- Configure an address resource
- Configure an interzone policy

Software Version Used

SecPath F1000E: V300R001B01 R3166 series and V300R001B01 F3166 series

SecPath F5000-A5: V300R002B01 R3206 series

SecPath UTM 200-A/200-M/200-S firewalls: V500R001B01 R5116 series

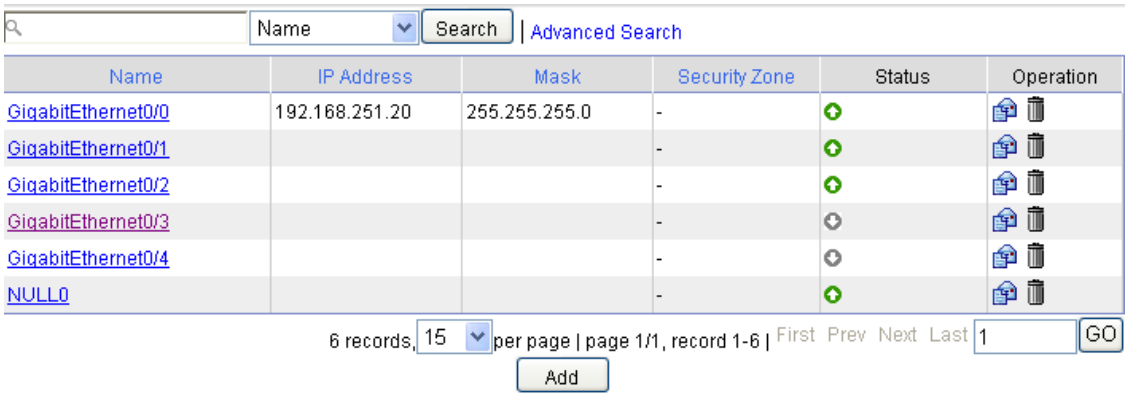
Configuration Procedures

Assigning IP Addresses to Interfaces

Configuring GigabitEthernet 0/2

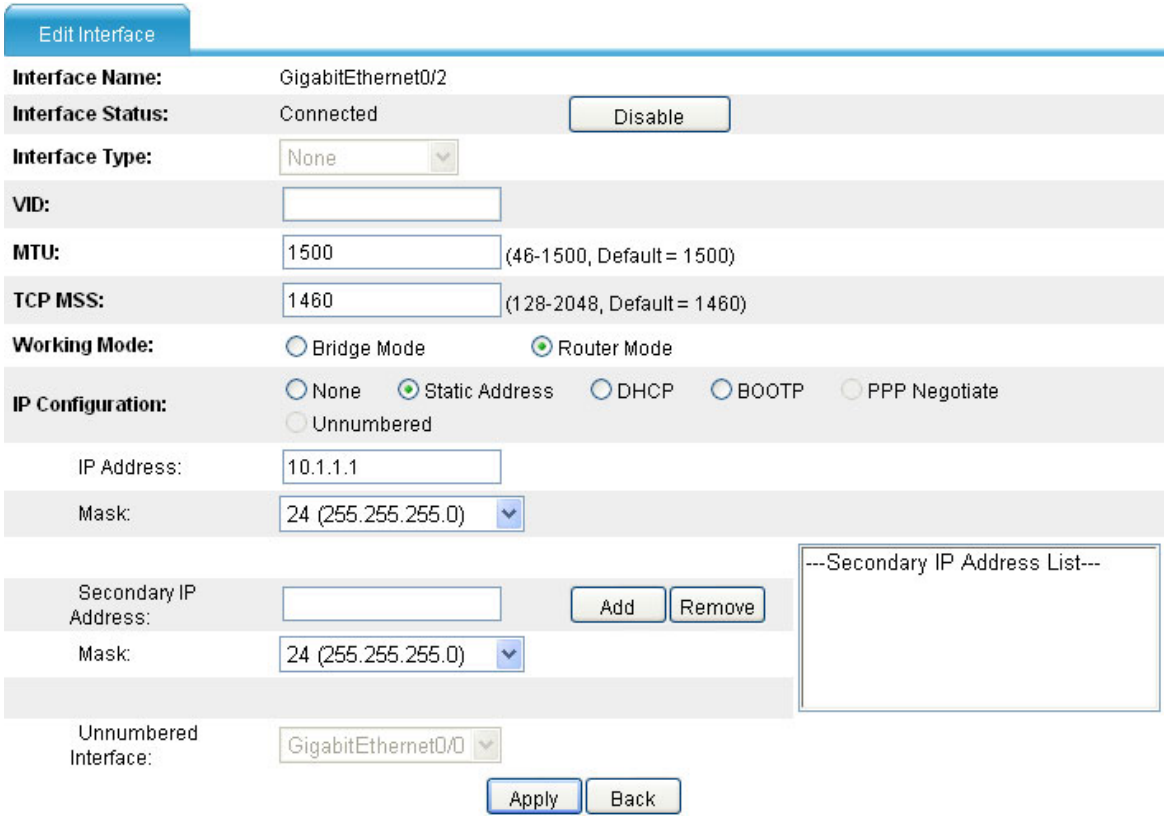
- From the navigation tree, select **Device Management** > **Interface** to enter the interface management page.

Figure 2 Interface management page



- Click the icon of interface GigabitEthernet 0/2 to enter the page for configuring the interface. Configure the interface information as shown in the following figure, and then click **Apply**. The interface management page appears, displaying the configuration result.

Figure 3 Configure interface GigabitEthernet 0/2



Configuring GigabitEthernet 0/1

- From the navigation tree, select **Device Management** > **Interface** to enter the interface management page.

Figure 4 Interface management page

Name	IP Address	Mask	Security Zone	Status	Operation
GigabitEthernet0/0	192.168.251.20	255.255.255.0	-		
GigabitEthernet0/1	20.1.1.1	255.255.255.0	-		
GigabitEthernet0/2	10.1.1.1	255.255.255.0	-		
GigabitEthernet0/3			-		
GigabitEthernet0/4			-		
NULL0			-		

- Click the icon of interface GigabitEthernet 0/1 to enter the page for configuring the interface. Configure the interface as shown in the following figure, and then click **Apply**. The interface management page appears, displaying the configuration result.

Figure 5 Interface configuration

Edit Interface

Interface Name:	GigabitEthernet0/1
Interface Status:	Connected Disable
Interface Type:	None
VID:	
MTU:	1500 (46-1500, Default = 1500)
TCP MSS:	1460 (128-2048, Default = 1460)
Working Mode:	Bridge Mode Router Mode
IP Configuration:	None Static Address DHCP BOOTP PPP Negotiate Unnumbered
IP Address:	20.1.1.1
Mask:	24 (255.255.255.0)
Secondary IP Address:	Add Remove
Mask:	24 (255.255.255.0)
Unnumbered Interface:	GigabitEthernet0/0

---Secondary IP Address List---

Apply Back

Adding Interfaces to Zones

Adding GigabitEthernet 0/2 to the Trust zone

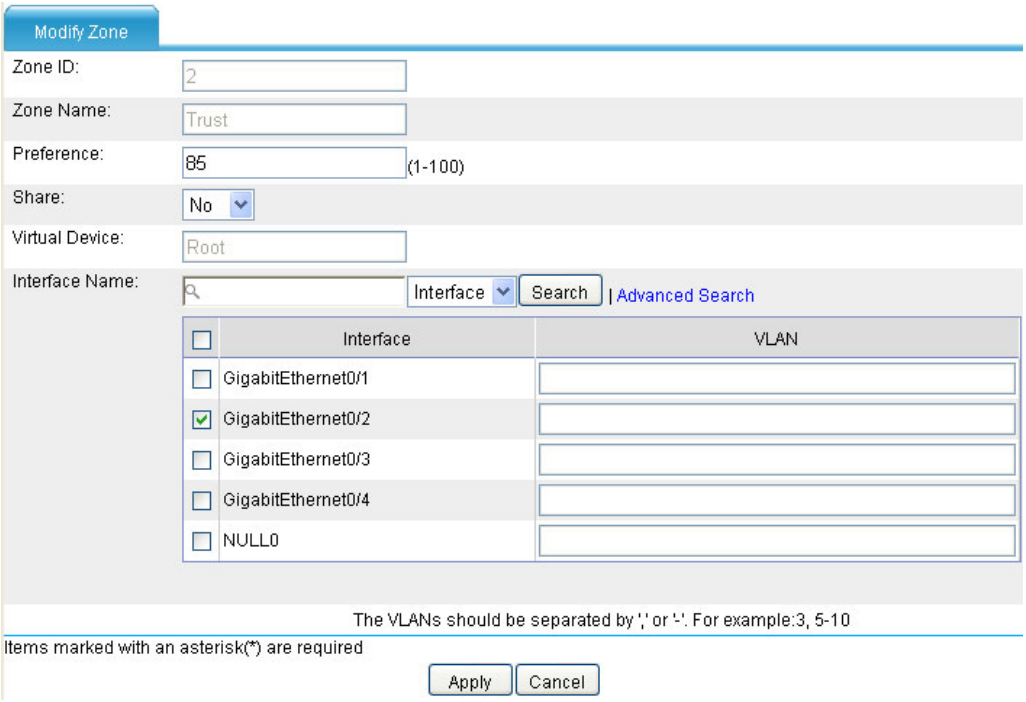
- Select **Device Management** > **Zone** from the navigation tree to display the zone list.

Figure 6 Zone list

Zone ID	Zone Name	Preference	Share	Virtual Device	Operation
0	Management	100	no	--	
1	Local	100	no	Root	
2	Trust	85	no	Root	
3	DMZ	50	no	Root	
4	Untrust	5	no	Root	

- Click the icon of zone **Trust** to enter the page for modifying the zone. Add interface GigabitEthernet 0/2 to zone **Trust** as shown in the following figure, and then click **Apply**.

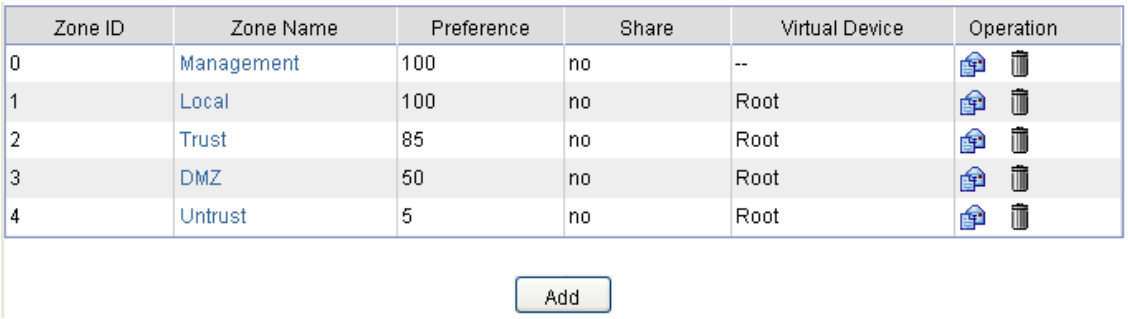
Figure 7 Add GigabitEthernet 0/2 to the Trust zone



Adding GigabitEthernet 0/1 to the Untrust zone

- Select **Device Management** > **Zone** from the navigation tree to display the zone list.

Figure 8 Zone ilst

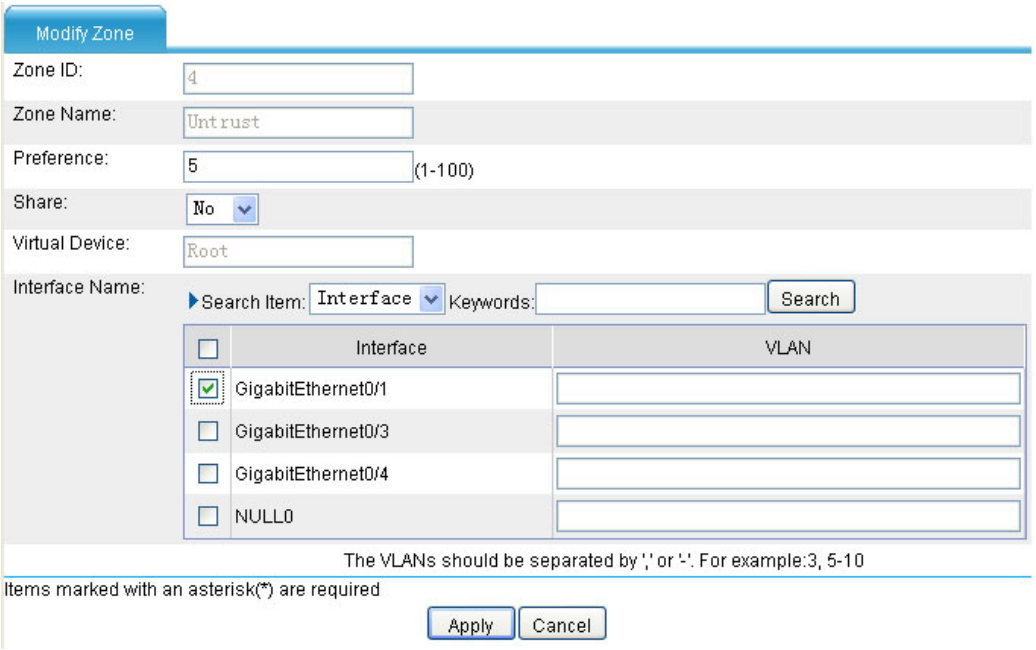


Zone ID	Zone Name	Preference	Share	Virtual Device	Operation
0	Management	100	no	--	
1	Local	100	no	Root	
2	Trust	85	no	Root	
3	DMZ	50	no	Root	
4	Untrust	5	no	Root	

Add

- Click the icon of the zone Untrust to enter the zone modification page. Add interface GE 0/1 to the zone Untrust, and click **Apply**.

Figure 9 Modify the zone configuration

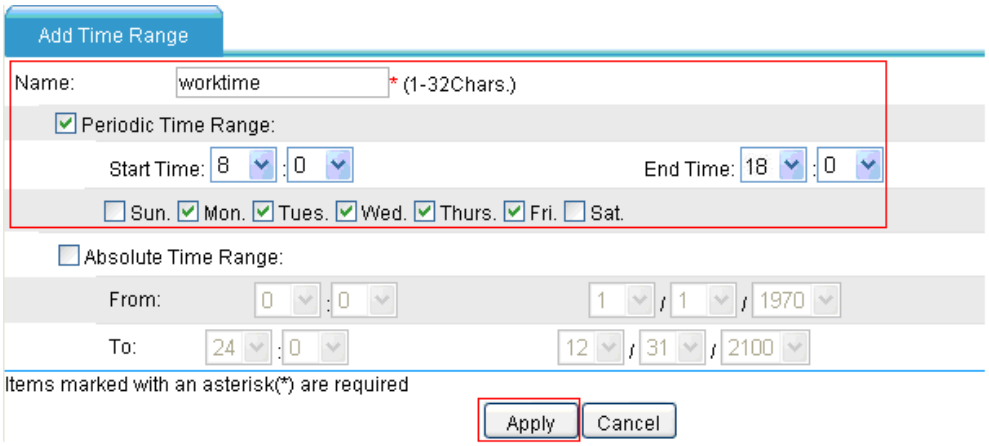


Configuring a Time Range Resource

Configure a time range from 8:00 to 18:00 on working days (Monday through Friday).

- Select **Resource** > **Time Range** from the navigation tree, and click **Add**. Perform the configurations shown in Figure 10.

Figure 10 Configure a time range resource



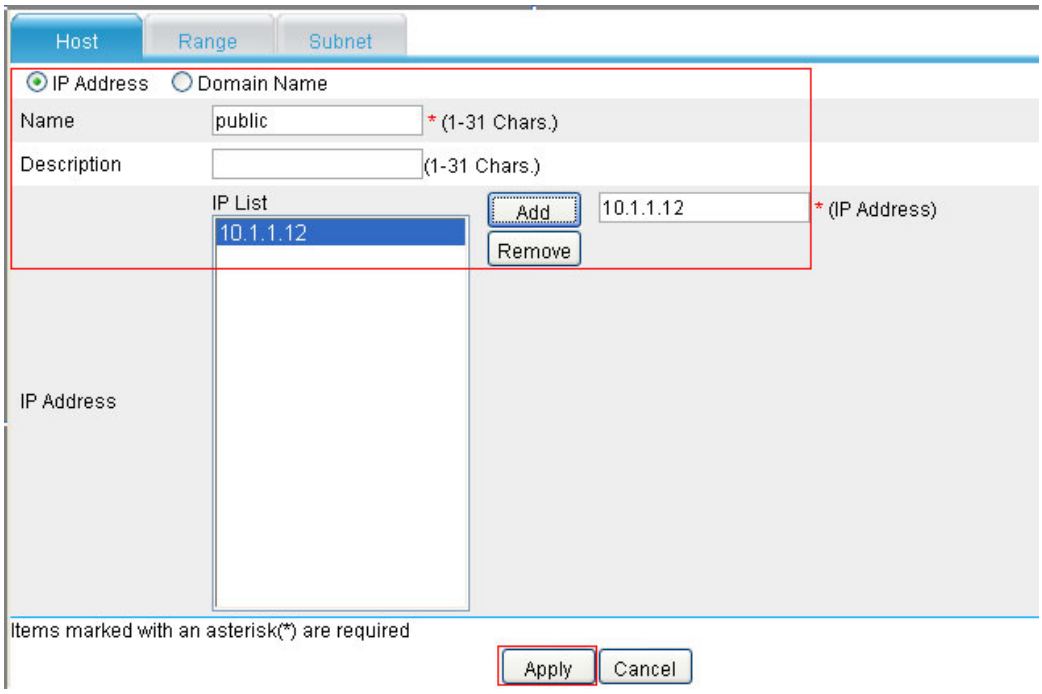
- Type **worktime** in the **Name** text box.
- Select the **Periodic Time Range** check box.
- Set the start time to **8:00**.
- Set the end time to **18:00**.
- Select the **Mon.**, **Tues.**, **Wed.**, **Thurs.**, and **Fri.**, check boxes.
- Click **Apply**.

Configuring an Address Resource

Configuring an IP address resource

- Select **Resource** > **Address** > **IP Address** from the navigation tree, and then click **Add**. Perform the configurations shown in Figure 11.

Figure 11 Create an IP address resource



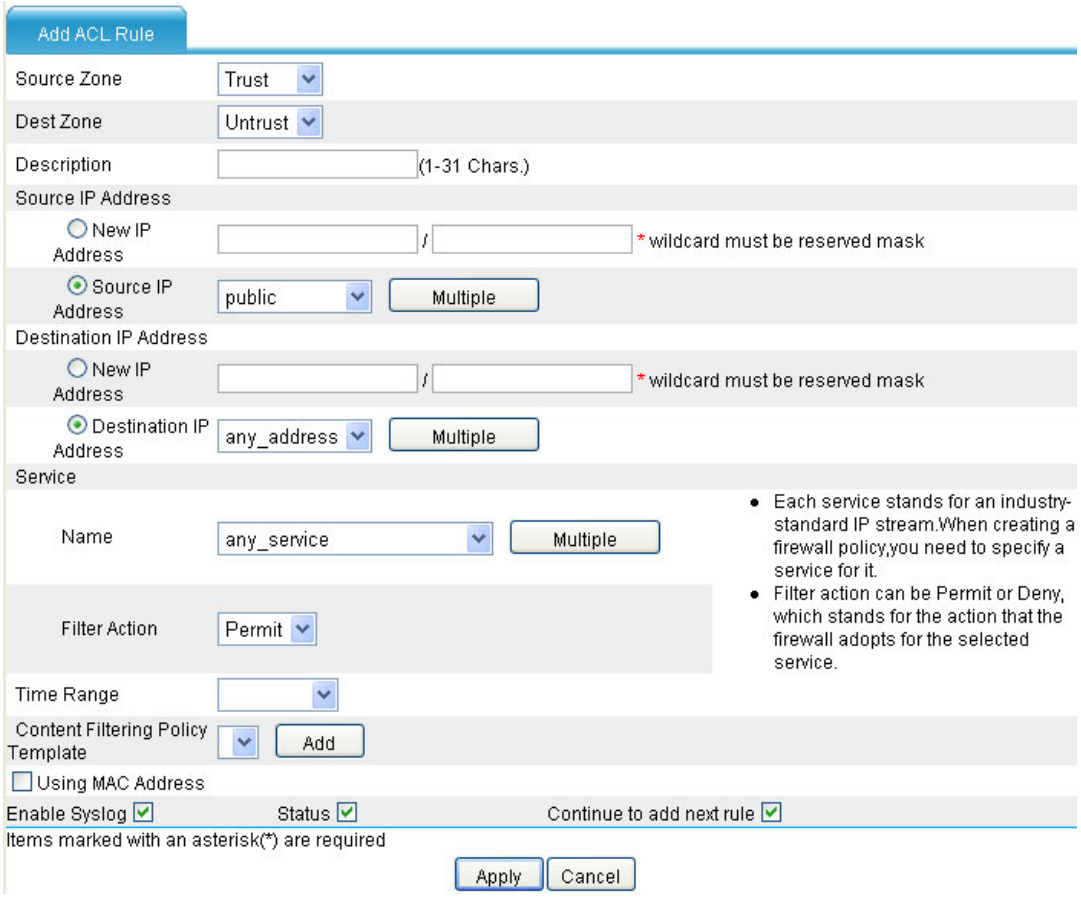
- Select the **IP Address** option.
- Type **public** as the name.
- Type **10.1.1.12** as the IP address. Then click **Add** to add the address to the IP address list.
- Click **Apply**.

Configuring an Interzone Policy

Configure an access rule for host public to access the external network at any time

- Select **Firewall** > **Security Policy** > **Interzone Policy** from the navigation tree, and then click **Add**. Perform the configurations shown in Figure 13.

Figure 12 Allow host public to access the external network at any time

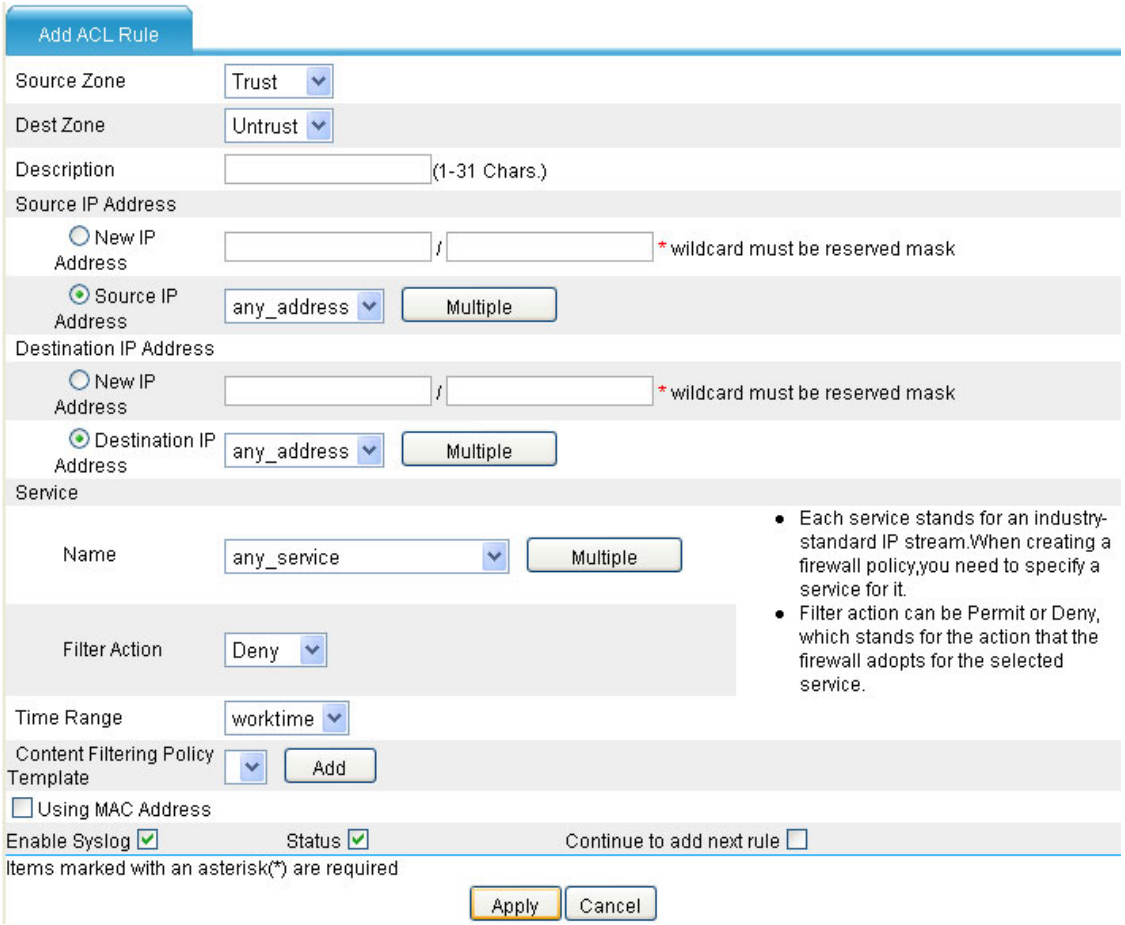


- Select **Trust** as the source zone and **Untrust** as the destination zone.
- Select **public** as the source address.
- Select **Permit** as the filter action.
- Select the **Enable Syslog** check box.
- Select the **Status** check box.
- Select the **Continue to add next rule** check box.
- Click **Apply**.

Configuring a rule to deny access of all the other hosts to the external network during working time

- After the last configuration step, the interzone policy rule configuration page appears, with the source and destination zones selected for the last rule. Perform the configurations shown in Figure 13.

Figure 13 Deny all the other hosts' access to the external network during working time



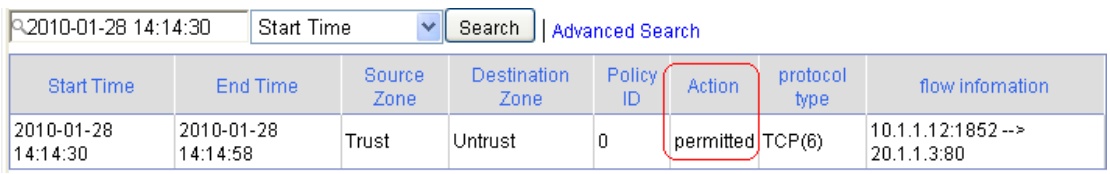
- Select **Deny** as the filter action.
- Select **worktime** as the time range.
- Select the **Enable Syslog** check box.
- Select the **Status** check box.
- Click **Apply**.

Verification

Accessing the External Network from Host Public in Working Hours

You are allowed to access the external network from host Public in working hours. Select **Log Report** > **Report** > **Interzone Policy Log** to enter the interzone policy log page. The log shows that access to the external network is permitted.

Figure 14 Interzone policy log



Start Time	End Time	Source Zone	Destination Zone	Policy ID	Action	protocol type	flow infomation
2010-01-28 14:14:30	2010-01-28 14:14:58	Trust	Untrust	0	permitted	TCP(6)	10.1.1.12:1852 --> 20.1.1.3:80

Accessing the External Network from Other Hosts in Working Hours

In working hours, you cannot access the external network from any other hosts, for example a host at 10.1.1.13/24. Select **Log Report** > **Report** > **Interzone Policy Log** to enter the interzone policy log page. The log shows that access to the external network is denied.

Figure 15 Interzone policy log

References

Protocols and Standards

TCP/IP Routing, Volume II

Related Documentation

Interzone Policy Configuration in the web configuration manual

Address Resource Configuration in the web configuration manual

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SecPath Series Firewalls Link Aggregation Configuration Examples

Keywords: Link aggregation

Abstract: This document presents some link aggregation configuration examples for the SecPath series firewalls.

Acronyms:

Acronym	Full spelling
—	—

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Feature Overview

Link aggregation aggregates multiple physical Ethernet ports into an aggregation group, thus increasing the link speed beyond the limits of any one single port. To upper layer entities such as applications running on the network, they look like a single logical link.

Link aggregation increases bandwidth by distributing traffic across the member ports in an aggregation group. Because these member ports can dynamically back up one another, it improves connectivity reliability in addition.

Application Scenarios

Typically, you use link aggregation to increase bandwidth or reliability of the network.

Configuration Examples

Network Requirements

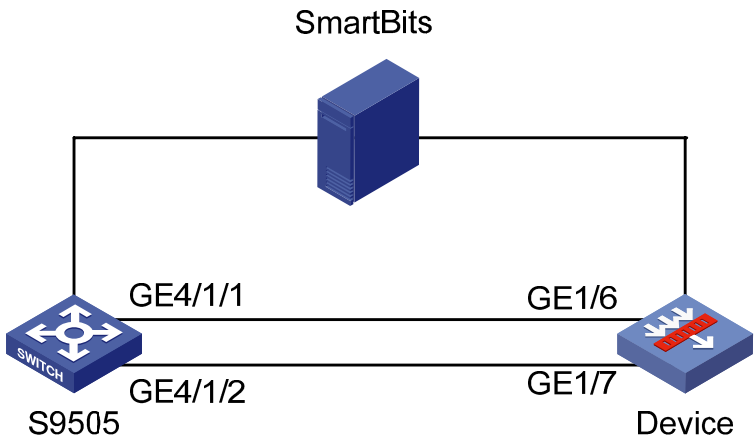
Note

The following examples use an F5000-A5 firewall (Device in the network diagram below) to show how to configure link aggregation on the H3C SecPath series firewalls, including the SecPath F5000-A5, SecPath F1000E, and SecPath UTM. Support for link aggregation depends on your firewall model.

As shown in Figure 1, an S9505 switch and the Device are connected through two GE links, which are aggregated into one logical link. The S9505 is the downstream switch. GE1/6 and GE1/7 of the Device form aggregation group 1. Layer 2 link aggregation is configured on the S9505 switch. Source IP-based link-aggregation load sharing is configured on the Device. OSPF is enabled between the switch and Device. Configure the following types of link aggregation:

- Layer 3 link aggregation: dynamic and static.
- Layer 2 link aggregation: dynamic and static.

Figure 1 Network diagram for link aggregation



Configuration Considerations

Configure the Device (firewall) by following these general steps:

- Create aggregation group 1.
- Assign interfaces GE1/6 and GE1/7 to aggregation group 1.
- Add the physical and aggregate interfaces to a security zone.
- Configure OSPF.

Currently, you cannot configure link aggregation on the Web configuration interface. To configure link aggregation, you need to use the command line interface (CLI).

Software Version Used

Model	Version/Release
SecPath F1000E	V300R001B01 R3166, V300R001B01 F3166
SecPath F5000-A5	V300R002B01 R3206
SecPath UTM 200-A/200-M/200-S	V500R001B01 R5116

Configuring Layer 3 Link Aggregation in Static Mode

Static aggregation is stable. The aggregation state of the member ports is not affected by their peers, which also means that the member ports cannot change their aggregation state in consistent with their peers. The administrator must manually maintain link aggregations. Hence, static aggregation is inflexible.

Configuration on the Device

Create Layer 3 aggregate interface Route-Aggregation1, and assign an IP address for it.

```
interface Route-Aggregation1
  ip address 10.1.1.1 255.255.255.0
```

Assign interfaces GE1/6 and GE1/7 to aggregation group 1, which corresponds to Route-Aggregation1.

```
interface GigabitEthernet1/6
  port link-mode route
  port link-aggregation group 1
interface GigabitEthernet1/7
  port link-mode route
  port link-aggregation group 1
```

Configure source IP-based load sharing.

```
link-aggregation load-sharing mode source-ip
```

Log in through the Web interface, and add GE1/6, GE1/7, and the aggregate interface to the Trust zone.

Zone ID	Zone Name	Preference	Share	Virtual Device	Operation
2	Trust	85	no	Root	

Interface	VLAN
GigabitEthernet0/2	
GigabitEthernet1/6	
GigabitEthernet1/7	

Back

Configure OSPF.

This part is the same as any common OSPF configuration process.

Configuration on the S9505 switch

Create aggregation group 1, and configure the aggregation group to operate in manual aggregation mode.

```
link-aggregation group 1 mode manual
```

Assign interfaces GE4/1/1 and GE4/1/2 to aggregation group 1.

```
interface GigabitEthernet4/1/1
  port access vlan 10
  port link-aggregation group 1
interface GigabitEthernet4/1/2
  port access vlan 10
  port link-aggregation group 1
```

Create VLAN interface 10, and assign IP address 10.1.1.2 to it.

```
interface Vlan-interface10
  ip address 10.1.1.2 255.255.255.0
```

Configure OSPF.

Configure OSPF as needed.

Note

When the firewall is connected with an S7500 or S9500 series switch of the V3 version, use the **manual** keyword to configure the firewall to operate in static aggregation mode.

Configuring Layer 3 Link Aggregation in Dynamic Mode

In dynamic aggregation mode, the peer systems maintain the aggregation state of the member ports automatically, but because the aggregation state of member ports is susceptible to network changes, aggregation is instable.

If you configure the Device (firewall) to operate in dynamic aggregation mode, you must configure the S9505 to operate in dynamic mode too. If the S9505 is of the V5 version, LACP is automatically enabled when you enable dynamic aggregation. If the S9505 is of the V3 version, you need to use the **lacp enable** command in interface view to enable LACP.

Configuration on the Device

Create Layer 3 aggregate interface Route-Aggregation1, assign an IP address for it, and set the dynamic aggregation mode.

```
interface Route-Aggregation1
 link-aggregation mode dynamic
 ip address 10.1.1.1 255.255.255.0
```

Assign interfaces GE1/6 and GE1/7 to aggregation group 1, which corresponds to Route-Aggregation1.

```
interface GigabitEthernet1/6
 port link-mode route
 port link-aggregation group 1
interface GigabitEthernet1/7
 port link-mode route
 port link-aggregation group 1
```

Configure source IP-based load sharing.

```
link-aggregation load-sharing mode source-ip
```

Log in through the Web interface, and add GE1/6, GE1/7, and the aggregate interface to the Trust zone.

Zone ID	Zone Name	Preference	Share	Virtual Device	Operation
2	Trust	85	no	Root	

Interface	VLAN
GigabitEthernet0/2	
GigabitEthernet1/6	
GigabitEthernet1/7	

Back

Configure OSPF.

This part is the same as any common OSPF configuration process.

Configuration on the S9505 switch

Create aggregation group 1, and configure the aggregation group to operate in static aggregation mode.

```
link-aggregation group 1 mode static
```

Assign interfaces GE4/1/1 and GE4/1/2 to aggregation group 1.

```
interface GigabitEthernet4/1/1
  port access vlan 10
  port link-aggregation group 1
interface GigabitEthernet4/1/2
  port access vlan 10
  port link-aggregation group 1
```

Create VLAN interface 10, and assign IP address 10.1.1.2 to it.

```
interface Vlan-interface10
 ip address 10.1.1.2 255.255.255.0
```

Configure OSPF.

Configure OSPF as needed.

Note

When the firewall is connected with an S7500 or S9500 series switch of the V3 version, use the **static** keyword to configure the firewall to operate in dynamic aggregation mode.

Configuring Layer 2 Link Aggregation in Static Mode

Static aggregation is stable. The aggregation state of the member ports is not affected by their peers, which also means that the member ports cannot change their aggregation state in consistent with

their peers. The administrator must manually maintain link aggregations. Hence, static aggregation is inflexible.

Configuration on the Device

Create Layer 2 aggregate interface Bridge-Aggregation1, and assign it to VLAN 10.

```
interface Bridge-Aggregation1
   port access vlan 10
```

Assign interfaces GE1/6 and GE1/7 to aggregation group 1, which corresponds to Bridge-Aggregation1.

```
   interface GigabitEthernet1/6
   port link-mode bridge
   port access vlan 10
   port link-aggregation group 1
interface GigabitEthernet1/7
   port link-mode bridge
   port access vlan 10
   port link-aggregation group 1
   int vlan-interface 10
   ip address 10.1.1.1 24
```

Configure source IP-based load sharing.

```
link-aggregation load-sharing mode source-ip
```

Log in through the Web interface, and add GE1/6, GE1/7, and the aggregate interface to the Trust zone.

Zone ID	Zone Name	Preference	Share	Virtual Device	Operation
2	Trust	85	no	Root	

Interface	VLAN
GigabitEthernet0/2	
GigabitEthernet1/6	
GigabitEthernet1/7	

Back

Configure OSPF.

This part is the same as any common OSPF configuration process.

Configuration on the S9505 (typically V3) switch

Create aggregation group 1, and configure the aggregation group to operate in manual aggregation mode.

```
link-aggregation group 1 mode manual
```

Assign interfaces GE4/1/1 and GE4/1/2 to aggregation group 1.

```
interface GigabitEthernet4/1/1
```

```
        port access vlan 10
        port link-aggregation group 1
interface GigabitEthernet4/1/2
        port access vlan 10
        port link-aggregation group 1
```

Create VLAN interface 10, and assign IP address 10.1.1.2 to it.

```
interface Vlan-interface10
        ip address 10.1.1.2 255.255.255.0
```

Configure OSPF.

Configure OSPF as needed.

Configuring Layer 2 Link Aggregation in Dynamic Mode

Configuration on the Device

Create Layer 2 aggregate interface Bridge-Aggregation1, and assign it to VLAN 10.

```
interface Bridge-Aggregation1
 port access vlan 10
 link-aggregation mode dynamic
```

Assign interfaces GE1/6 and GE1/7 to aggregation group 1, which corresponds to Route-Aggregation1.

```
interface GigabitEthernet1/6
   port link-mode bridge
   port access vlan 10
   port link-aggregation group 1
interface GigabitEthernet1/7
   port link-mode bridge
   port access vlan 10
   port link-aggregation group 1
int vlan-interface 10
   ip address 10.1.1.1 24
```

Configure source IP-based load sharing.

```
link-aggregation load-sharing mode source-ip
```

Log in through the Web interface, and add GE1/6, GE1/7, and the aggregate interface to the Trust zone.

Zone ID	Zone Name	Preference	Share	Virtual Device	Operation
2	Trust	85	no	Root	

Interface	VLAN
GigabitEthernet0/2	
GigabitEthernet1/6	
GigabitEthernet1/7	

Back

Configure OSPF.

This part is the same as any common OSPF configuration process.

Configuration on the S9505 (typically V3) switch

Create aggregation group 1, and configure the aggregation group to operate in static aggregation mode.

```
link-aggregation group 1 mode static
```

Assign interfaces GE4/1/1 and GE4/1/2 to aggregation group 1.

```
interface GigabitEthernet4/1/1
        port access vlan 10
        port link-aggregation group 1
interface GigabitEthernet4/1/2
        port access vlan 10
        port link-aggregation group 1
```

Create VLAN interface 10, and assign IP address 10.1.1.2 to it.

```
interface Vlan-interface10
        ip address 10.1.1.2 255.255.255.0
```

Configure OSPF.

Configure OSPF as needed.

Note

The firewall supports two link-aggregation load sharing criteria: source and destination IP addresses, which you can use the following command to configure:

```
[Device] link-aggregation load-sharing mode ?
      destination-ip  Destination IP address
      source-ip       Source IP address
```

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SecPath Series Firewalls Log Management and SecCenter Configuration Example

Keywords: syslog

Abstract: This document describes the log management function of SecPath series firewalls, and presents configuration examples for cooperation with SecCenter.

Acronyms:

Acronym	Full spelling
Syslog	—

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Feature Overview

The log management feature enables you to store the system messages or logs generated by actions such as packet filtering to the log buffer or send them to the log hosts. The analysis and archiving of the logs can enable you to check the security holes of the firewall, when and who try to disobey security policies, and the types of the network attacks. The real-time logs can also be used to detect the ongoing attacks.

Configuring Syslog

The syslog module allows you to set the related parameters of the information center. Acting as the system information hub, the information center classifies and manages the system information, offering a powerful support for network administrators and developers in monitoring the network performance and diagnosing network problems. The information center can output the log information to the Web interface for users to view the logs. Meanwhile, it can also output the log information to the specified syslog log host based on your configuration.

Select **Log Report > Syslog** from the navigation tree to enter the page as shown in Figure 1.

Figure 1 Syslog

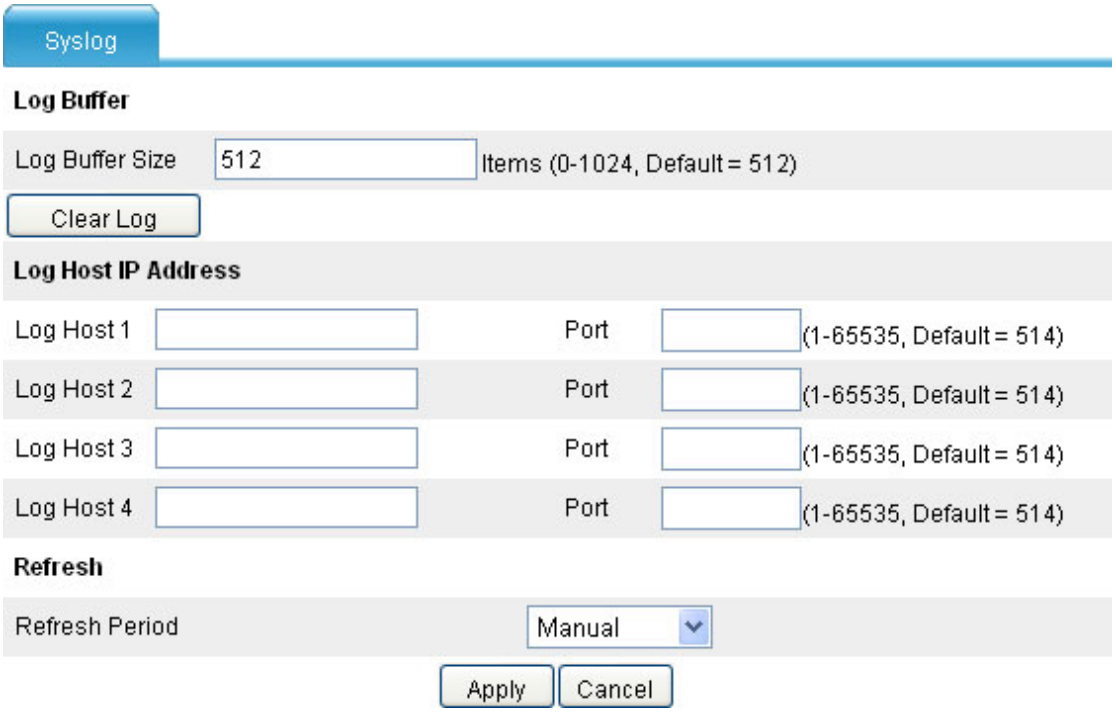


Table 1 describes the syslog configuration items.

Table 1 Syslog configuration items

Item	Description
Log Buffer Size	Set the number of syslogs that can be stored in the log buffer.

Item	Description
Clear Log	To clear the logs in the log buffer, click this button.
Log Host 1	Set the IP address and port number of the syslog log hosts. The log information can be reported to the specified remote log hosts in the format of syslog, and you can specify up to four syslog log hosts.
Log Host 2	
Log Host 3	
Log Host 4	
Refresh Period	Set the refresh period on the log information displayed on the log report web interface. • Manual: You need to refresh the web interface when displaying log report information. • Automatic: You can select to refresh the Web page every 10 seconds, 30 seconds, 1 minute, 5 minutes, or 10 minutes.

Configuring User Logging

User logs can be output in the following two formats, and you can select either one:

- Output to the information center of the device in the format of system information, and the information center then decides the output destination.
- Output to the specified userlog log host in UDP packets in binary format.

Configuring Flow Logging

Note

Flow logs refer to session logs only. To generate flow logs, you need to configure session logging.

Introduction

Flow logging records users' access information to the external network. The device classifies and calculates flows through the 5-tuple information, which includes source IP address, destination IP address, source port, destination port, and protocol number, and generates user flow logs. Flow logging records the 5-tuple information of the packets and number of the bytes received and sent. With flow logging, administrators can track and record accesses to the network, facilitating the availability and security of the network.

Two versions are available with flow logging: version 1.0 and version 3.0, which are slightly different in packet format. For more information, see Table 2 and Table 3.

Table 2 Packet format in flow logging version 1.0

Field	Description
SourceIP	Source IP address

Field	Description
DestIP	Destination IP address
SrcPort	TCP/UDP source port number
DestPort	TCP/UDP destination port number
StartTime	Start time of a flow, in seconds, counted from 1970/1/1 0:0
EndTime	End time of a flow, in seconds, counted from 1970/1/1 0:0
Prot	Protocol carried over IP
Operator	Indicates the reason why a flow has ended
Reserved	For future applications

Table 3 Packet format in flow logging version 3.0

Field	Description
Prot	Protocol carried over IP
Operator	Indicates the reason why a flow has ended
IpVersion	IP packet version
TosIPv4	ToS field of the IPv4 packet
SourceIP	Source IP address
SrcNatIP	Source IP address after Network Address Translation (NAT)
DestIP	Destination IP address
DestNatIP	Destination IP address after Network Address Translation (NAT)
SrcPort	TCP/UDP source port number
SrcNatPort	TCP/UDP source port number after NAT
DestPort	TCP/UDP destination port number
DestNatPort	TCP/UDP destination port number after NAT
StartTime	Start time of a flow, in seconds, counted from 1970/1/1 0:0
EndTime	Start time of a flow, in seconds, counted from 1970/1/1 0:0
InTotalPkg	Number of packets received
InTotalByte	Number of bytes received
OutTotalPkg	Number of packets sent
OutTotalByte	Number of the bytes sent
Reserved1	• Reserved in version 0x02 (FirewallV200R001); • In version 0x03 (FirewallV200R005), the first byte is the source VPN ID, the second byte is the destination VPN ID, and the third and forth bytes are reserved.
Reserved2	For future applications

Field	Description
Reserved3	For future applications

Configuring flow logging

Select **Log Report** > **Userlog** from the navigation tree to enter the page as shown in Figure 2.

Figure 2 Flow logging

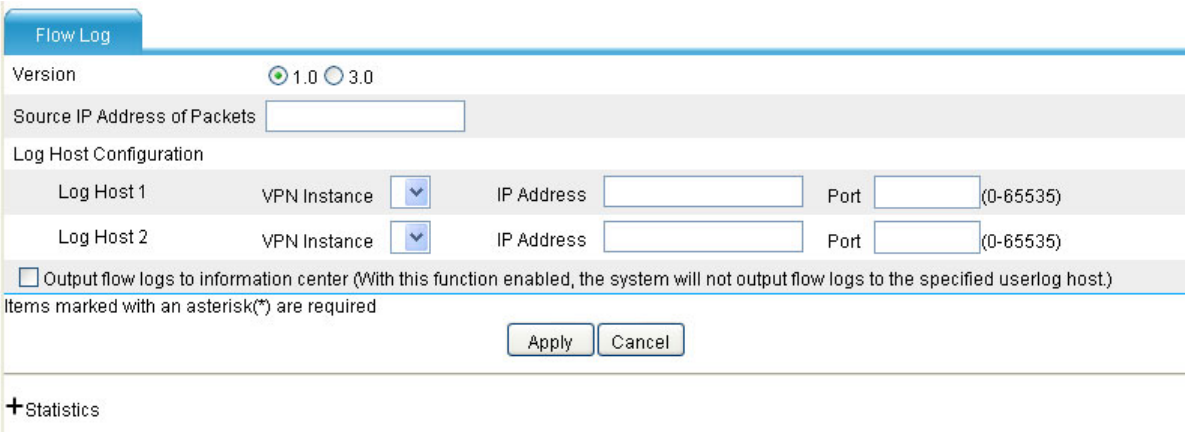


Table 4 describes the configuration items of flow logging.

Table 4 Flow logging configuration items

Item	Description
Version	Set the version of flow logging, including 1.0 and 3.0. **Highlight** *Configure the flow logging version according to the capacity of the log receiving device. If the log receiving device does not support flow logging of a certain version, the device cannot resolve the logs received.*
Source IP Address of Packets	Set the source IP address of flow logging packets. After the source IP address is specified, when Device A sends flow logs to Device B, it uses the specified IP address instead of the actual egress address as the source IP address of the packets. In this way, although Device A sends out packets to Device B through different ports, Device B can judge whether the packets are sent from Device A according to their source IP addresses. This function also simplifies the configurations of ACL and security policy: If you specify the same source address as the source or destination address in the **rule** command in ACL, the IP address variance and the influence of interface status can be masked, thus filtering flow logging packets. You are recommended to use the IP address of the loopback interface as the source IP address of flow logging packets.

Item	Description
Log Host 1	Set the IPv4/IPv6 addresses, and port number and the VPN instance (this option is available only when you specify a log host with an IPv4 address) of the Userlog log host to encapsulate flow logs in UDP packets and send them to the specified userlog log host. The log host can analyze and display the flow logs to remotely monitor the device. • Centralized device: Up to two different userlog log hosts can be specified. • Distributed device or Intelligent Resilient Framework (IRF) device: Up to two different userlog log hosts can be specified for each card. **Highlight** *To avoid collision with the common UDP port numbers, you are recommended to use a UDP port number in the range from 1025 to 65535.*
Log Host 2	
Output flows logs to information center	Set to output flow logs to the information center in the format of system information. **Highlight** • *With this function enabled, flow logs will not be output to the specified userlog log host.* • *Outputting flow logs to the information center occupies the storage space of the device. Therefore, you are recommended to output flow logs to the information center in case that there are a small amount of flow logs.*

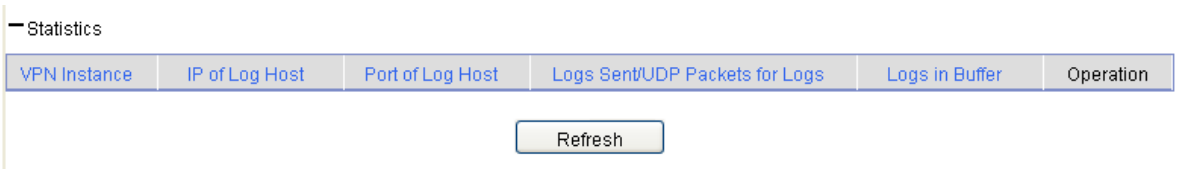
Displaying flow logging statistics

If you set to send flow logs in UDP packets to the specified userlog log host, you can view the related statistics, including the total number of flow logs sent to the log host, the total number of UDP packets, and the total number of flow logs stored on the device cache.

If you click the **Statistics** expansion button on the **Flow Log** page, you can view the information as shown in Figure 3.

- Centralized device: You can clear all the flow logging statistics of the device and the flow logs in the cache by clicking **Reset**.
- Distributed or IRF device: You can clear all the flow logging statistics of a card and the flow logs in the cache by clicking **Reset**.

Figure 3 View flow logging statistics



Session Logging

Introduction

Session logging records users' access information, IP address translation information, and traffic information, and can output the records in a specific format to a log host, allowing administrators to perform security auditing.

Session logging records an entry for a session if it reaches the specified threshold. Session logging supports two categories of thresholds:

- Time threshold: When the lifetime of a session reaches this threshold, a log entry is output for the session.
- Traffic threshold: The traffic threshold can be in units of the number of bytes or the number of packets. When the traffic of a session reaches the specified number of bytes or packets, a log entry is output for the session.

Note

- For more information about session management, see *Session Management*.
- Session logs are output in the format of flow logs. To view session logs, you also need to configure flow logging.

Perform the tasks in Table 5 to configure session logging.

Table 5 Session logging configuration task list

Task	Remarks
Configuring a Session Logging Policy	Required Configure a session logging policy, specifying the source zone and destination zone of the sessions and the ACL for filtering log entries. By default, no session logging policy exists.
Setting Session Logging Thresholds	Required Configure the time threshold or/and traffic threshold for session logging. By default, both the time threshold and traffic threshold are 0, meaning that no session logging entries should be output. **Highlight** *If both the time threshold and traffic threshold are configured, a log entry is output for the session when it reaches whichever threshold and the statistics of the session will be cleared.*

Configuring a Session Logging Policy

Select **Log Report** > **Session Log** > **Log Policy** from the navigation tree to display existing session logging policies, as shown in Figure 4. Then, click **Add** to enter the session logging policy configuration page, as shown in Figure 5.

Figure 4 Session logging policy list

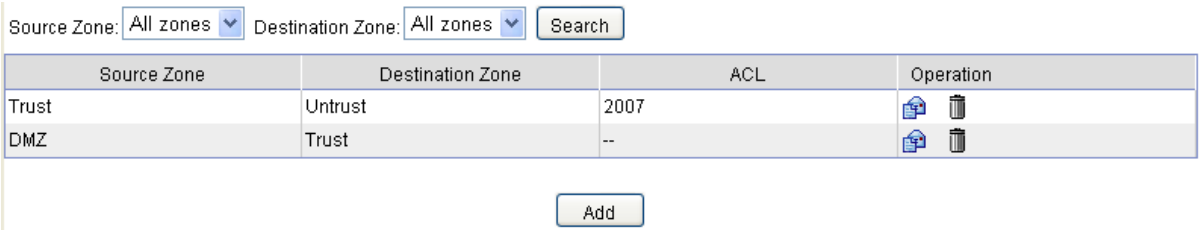


Figure 5 Create a session logging policy

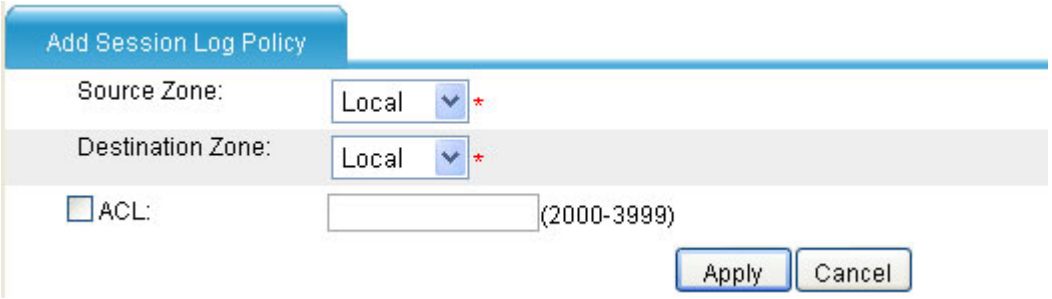


Table 6 describes the configuration items for configuring a session logging policy.

Table 6 Configuration items for configuring a session logging policy

Item	Description
Source Zone	Specify the source zone and destination zone.
Destination Zone	You can configure an optional security zone through **System** > **Zone**.
ACL	Specify the ACL for filtering log entries, and only log entries permitted by the ACL will be output.

Return to Session logging configuration task list.

Setting Session Logging Thresholds

Select **Log Report** > **Session Log** > **Global Setup** from the navigation tree to enter the page for setting session logging thresholds, as shown in Figure 6.

Figure 6 Global configuration page

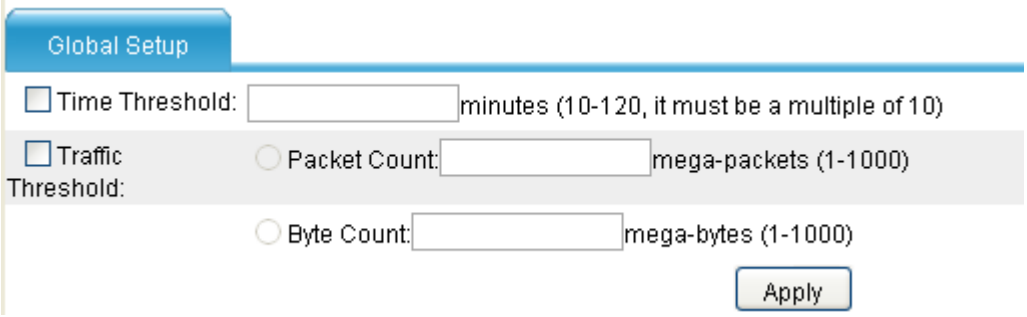


Table 7 describes the configuration items for setting session logging thresholds.

Table 7 Configuration items for setting session logging thresholds

Item	Description
Time Threshold	Set the time threshold for outputting session logging entries. With this argument set, log entries will be output for sessions whose lifetimes reach the specified time threshold.
Traffic Threshold	Set the traffic threshold for outputting session logging entries. It can be in number of packets or bytes. With the traffic threshold set, log entries will be output for sessions whose traffic reaches the specified threshold in number of bytes or packets. **Highlight** *Support for this feature depends on your device model.*

Return to Session logging configuration task list.

Log Report

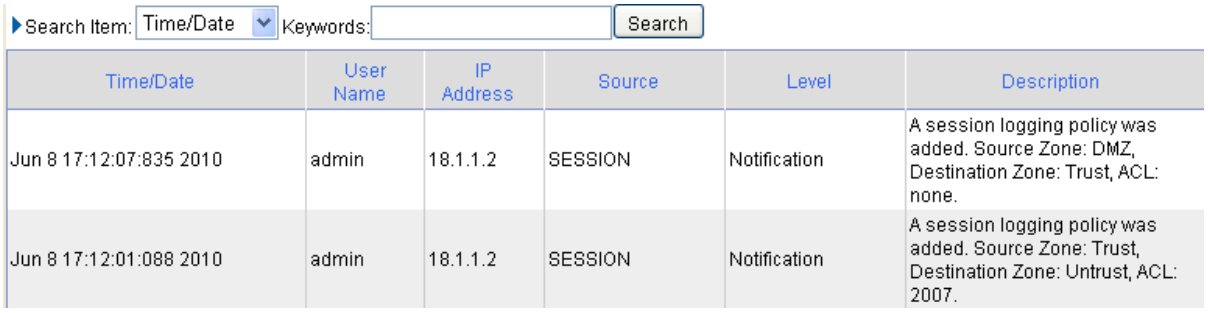
The log report module allows you to view the log information on the device, and you can view the following logs through the Web interface:

- System logs
- Connection limit logs
- Attack prevention logs
- Blacklist logs
- Inter-zone policy logs
- User logs

Displaying System Logs

Select **Log Report > Report > System Log** from the navigation tree to enter the page as shown in Figure 7.

Figure 7 System logs



Time/Date	User Name	IP Address	Source	Level	Description
Jun 8 17:12:07:835 2010	admin	18.1.1.2	SESSION	Notification	A session logging policy was added. Source Zone: DMZ, Destination Zone: Trust, ACL: none.
Jun 8 17:12:01:088 2010	admin	18.1.1.2	SESSION	Notification	A session logging policy was added. Source Zone: Trust, Destination Zone: Untrust, ACL: 2007.

Table 8 describes the system log configuration items.

Table 8 System log configuration items

Item	Description
Time/Date	Displays the time when the system logs are generated.
Source	Displays the module that generates the system logs.
Level	Displays the severity level of the system logs. For more information about severity levels, see Table 9.
Description	Displays the contents of the system logs.

Table 9 System log severity level

Severity level	Description	Value
Emergency	The system is unavailable.	0
Alert	Information that demands prompt reaction	1
Critical	Critical information	2
Error	Error information	3
Warning	Warnings	4
Notification	Normal information that needs to be noticed	5
Informational	Informational information to be recorded	6
Debugging	Information generated during debugging	7
Note: A smaller value represents a higher severity level.		

Displaying Connection Limit Logs

Select **Log Report > Report > Connection Limit Log** from the navigation tree to enter the page as shown in Figure 8.

Figure 8 Connection limit log configuration page

Table 10 describes the connection limit log configuration items.

Table 10 Connection limit log configuration items

Item	Description
Time/Date	Displays the time when the connection limit logs are generated.
Type	Displays the types of the traffic alarms: The number of source IP-based connections exceeds the upper limit or the number of destination IP-based connections exceeds the upper limit.
Source Zone	Displays the source zone of the connection.
Source IP	Displays the source IP address of the connection.
Destination Zone	Displays the destination zone of the connection.
Destination IP	Displays the destination IP address of the connection.
Current Rate	Displays the rate of the current connection.
Current Connection	Displays total number of the current connections.
TCP Percentage	Displays the percentage of TCP packets to the total packets.
UDP Percentage	Displays the percentage of UDP packets to the total packets.
ICMP Percentage	Displays the percentage of ICMP packets to the total packets.

Displaying Attack Prevention Logs

Select **Log Report > Report > Attack Prevention Log** from the navigation tree to enter the page as shown in Figure 9.

Figure 9 Attack prevention log configuration page

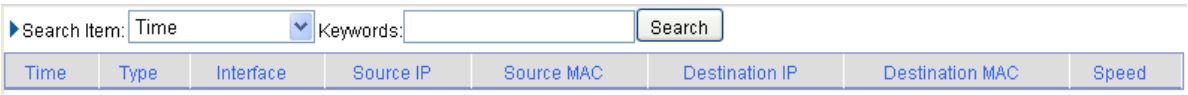


Table 11 describes the attack prevention log configuration items.

Table 11 Attack prevention log configuration items

Item	Description
Time	Displays the time when attacks are detected.
Type	Displays the attack type.

Item	Description
Interface	Displays the interface that receives the attack packets.
Source IP	Displays the source IP address of the attack packets.
Source MAC	Displays the source MAC address of the attack packets.
Destination IP	Displays the destination IP address of the attack packets.
Destination MAC	Displays the destination MAC address of the attack packets.
Speed	Displays the connection speed of the attacks.

Displaying Blacklist logs

Select **Log Report > Report > Blacklist Log** from the navigation tree to enter the page as shown in Figure 10.

Figure 10 Blacklist log configuration page

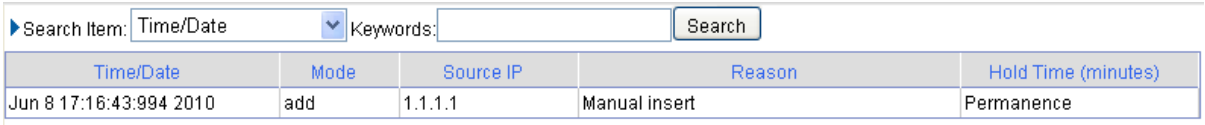


Table 12 describes the blacklist log configuration items.

Table 12 Blacklist log configuration items

Item	Description
Time/Date	Displays the time when the blacklist members are generated.
Mode	Displays whether the blacklist members are newly added or removed.
Source IP	Displays the source IP addresses of the blacklist members.
Reason	Displays the reasons why the addresses are added to the blacklist, including manual add and automatic add: • Automatic add means that the system automatically adds the source IP address to the blacklist. • Manual add means that the blacklist is manually added through Web interface.
Hold Time	Displays the hold time of the blacklist members.

Displaying Inter-Zone Policy Logs

Inter-zone logs are logs of the flows matching an inter-zone policy. To record inter-zone policy logs, you need to enable the Syslog function when configuring an inter-zone policy. For more information, see *Inter-Zone Policy Configuration*.

Select **Log Report** > **Report** > **InterZone Policy Log** from the navigation tree to enter the page as shown in Figure 11.

Figure 11 Inter-zone policy log configuration page

Table 13 describes the inter-zone policy log configuration items.

Table 13 Inter-zone policy log configuration items

Item	Description
Start Time	Displays the time when the flows are created.
End Time	Displays the time when the flows are removed.
Source Zone	Displays the source zone of the flows.
Destination Zone	Displays the destination zone of the flows.
Policy ID	Displays the ID of the inter-zone policy that the flows match.
Action	Displays the actions taken against the flows, permitted or denied.
Protocol Type	Displays the protocol type of the flows.
Flow Information	Displays the flow information. • If the protocol type is TCP or UDP, the displayed flow information is source IP address:source port-->destination IP address:destination port, for example, 1.1.1.2:1026-->1.1.2.10:69. • If the protocol type is ICMP, the displayed flow information is source IP address-->destination IP address,ICMP type (ICMP code), for example, 1.1.1.2-->1.1.2.10, echo(8). • If the protocol type is another type except these three, the displayed flow information is source IP address-->destination IP address, for example, 1.1.1.2-->1.1.2.10.

Displaying User Logs

Note

To display user logs through the Web interface, configure outputting user logs to the information center.

Displaying flow logs

Select **Log Report** > **Report** > **Userlog** from the navigation tree to enter the page for displaying flow logs. If you select the **1.0** radio box, the flow logging information will be displayed, as shown in Figure

12; if you select the **3.0** radio box, the flow logging 3.0 information will be displayed, as shown in Figure 13.

Figure 12 Flow logging 1.0 log report

Flow Log

Version 1.0 3.0

Search Item: Time/Date Keywords: Search

Time/Date	Protocol Type	Flow Information	Start Time	End Time	Flow Action
Jun 8 17:30:51:031 2010	TCP	18.1.1.2:4426 --> 192.168.100.10:80	2010-06-08 17:29:46	2010-06-08 17:30:51	(1)Normal over
Jun 8 17:30:02:283 2010	ICMP	18.1.1.2 --> 192.168.100.10	2010-06-08 17:29:33	2010-06-08 17:30:03	(2)Aged for timeout
Jun 8 17:29:45:785 2010	TCP	18.1.1.2:4426 --> 192.168.100.10:80	2010-06-08 17:29:46	2010-06-08 17:29:46	(8)Data flow created
Jun 8 17:29:32:531 2010	ICMP	18.1.1.2 --> 192.168.100.10	2010-06-08 17:29:33	2010-06-08 17:29:33	(8)Data flow created

Figure 13 Flow logging 3.0 log report

Flow Log

Version 1.0 3.0

Search Item: Time/Date Keywords: Search

Time/Date	Protocol Type	Flow Information	Received Packets/Bytes	Send Packets/Bytes	Source VPN	Destination VPN	Start Time	End Time	Flow Action
Jun 8 17:34:12:852 2010	TCP	18.1.1.2:4839 (192.168.251.21:1029) --> 192.168.100.10:80	4/690	5/1036			2010-06-08 17:32:06	2010-06-08 17:34:13	(1) Normal over
Jun 8 17:32:29:786 2010	ICMP	18.1.1.2 (192.168.251.21) --> 192.168.100.10	1/60	1/60			2010-06-08 17:32:00	2010-06-08 17:32:30	(2) Aged for timeout
Jun 8 17:32:06:031 2010	TCP	18.1.1.2:4839 (192.168.251.21:1029) --> 192.168.100.10:80	0/0	1/48			2010-06-08 17:32:06	2010-06-08 17:32:06	(8)Data flow created
Jun 8 17:32:00:284 2010	ICMP	18.1.1.2 (192.168.251.21) --> 192.168.100.10	0/0	1/60			2010-06-08 17:32:00	2010-06-08 17:32:00	(8)Data flow created
Jun 8 17:31:56:807 2010	TCP	18.1.1.2:4828 (192.168.251.21:1027) --> 192.168.100.10:8081	13/15610	11/1578			2010-06-08 17:31:55	2010-06-08 17:31:57	(1) Normal over
Jun 8 17:31:56:806 2010	TCP	18.1.1.2:4827 (192.168.251.21:1026) --> 192.168.100.10:8081	14/15973	14/2696			2010-06-08 17:31:55	2010-06-08 17:31:57	(1) Normal over
Jun 8 17:31:55:284 2010	TCP	18.1.1.2:4828 (192.168.251.21:1027) --> 192.168.100.10:8081	0/0	1/48			2010-06-08 17:31:55	2010-06-08 17:31:55	(8)Data flow created
Jun 8 17:31:55:031 2010	TCP	18.1.1.2:4827 (192.168.251.21:1026) --> 192.168.100.10:8081	0/0	1/48			2010-06-08 17:31:55	2010-06-08 17:31:55	(8)Data flow created

8 records, 15 per page | page 1/1, record 1-8 | First Prev Next Last 1 GO

Table 14 and Table 15 describe the flow logging 1.0 and 3.0 configuration items respectively.

Table 14 Flow logging 1.0 configuration items

Item	Description
Time/Date	Displays the time and date when a flow log was generated.
Protocol Type	Displays the protocol type of a flow log.
Flow Information	Displays the flow information. • If the protocol type is TCP or UDP, the displayed flow information is source IP address:source port-->destination IP address:destination port, for example, 1.1.1.2:1026-->1.1.2.10:69. • If the protocol type is another type except these three, the displayed flow information is source IP address-->destination IP address, for example, 1.1.1.2-->1.1.2.10.
Start Time	Displays the time when a flow was created.
End Time	Displays the time when a flow was removed.
Flow Action	Displays the operator field of a flow. • (1)Normal over: The flow ended normally. • (2)Aged for timeout: Timer timed out. • (3)Aged for reset or config-change: Flow aging due to configuration change. • (4)Aged for no enough resource: Flow aging due to insufficient resource. • (5)Aged for no-pat of NAT: One to one NAT. In this case, only the source IP address, the source IP address after translation and the time fields are available. • (6)Active data flow timeout: The life time of the flow reached the limit. • (7)Data flow deleted: Record for the flow when it was deleted. • (8)Data flow created: Record for the flow when it was created. • (254)Other: Other reasons

Table 15 Flow logging 3.0 configuration items

Item	Description
Time/Date	Displays the time and date when a flow log was generated.
Protocol Type	Displays the protocol type of a flow.
Flow Information	Displays the flow information. • If the protocol type is TCP or UDP, the displayed flow information is source IP address:source port-->destination IP address:destination port, for example, 1.1.1.2:1026-->1.1.2.10:69. • If the protocol type is another type except TCP or UDP, the displayed flow information is source IP address-->destination IP address, for example, 1.1.1.2-->1.1.2.10.
Received Packets/Bytes	Displays the number of received packets/bytes.
Send Packets/Bytes	Displays the number of packets/bytes sent.
Source VPN	Displays the source VPN of the packets.

Item	Description
Destination VPN	Displays the destination VPN of the packets.
Start Time	Displays the time when a flow was created.
End Time	Displays the time when a flow was removed.
Flow Action	Displays the operator field of a flow. • (1)Normal over: The flow ended normally. • (2)Aged for timeout: Timer timed out. • (3)Aged for reset or config-change: Flow aging due to configuration change. • (4)Aged for no enough resource: Flow aging due to insufficient resource. • (5)Aged for no-pat of NAT: One to one NAT. In this case, only the source IP address, the source IP address after translation and the time fields are available. • (6)Active data flow timeout: The life time of the flow reached the limit. • (8)Data flow created: Record for the flow when it was created. • (254)Other: Other reasons

Configuration Example

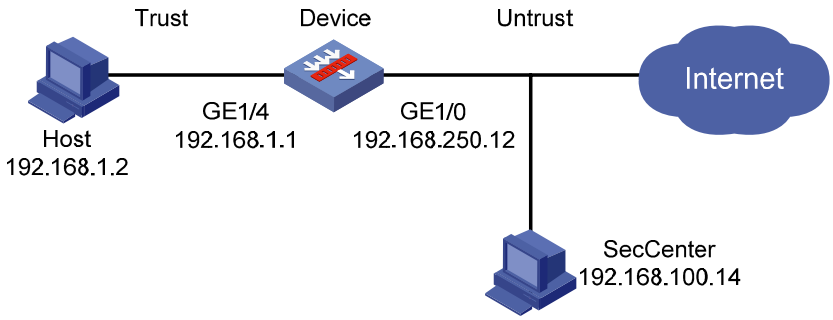
Network Requirements

Note

This configuration example uses an F5000-A5 firewall. This configuration example is applicable to SecPath F5000-A5, SecPath F1000E, and SecPath UTM 200-A/200-M/200-S firewalls.

As shown in Figure 14, the internal host access the Internet through a firewall. The firewall records the session logs for the traffic passing through, and sends the syslogs and session logs to the SecCenter for analysis.

Figure 14 Network diagram for log management and SecCenter configuration



Configuration Considerations

The major configurations comprise:

- Setting the logging policy on the firewall.
- Setting the SecCenter

Software Version Used

SecPath F1000E: V300R001B01 R3166 series and V300R001B01 F3166 series

Secpath F5000-A5: V300R002B01 R3206 series

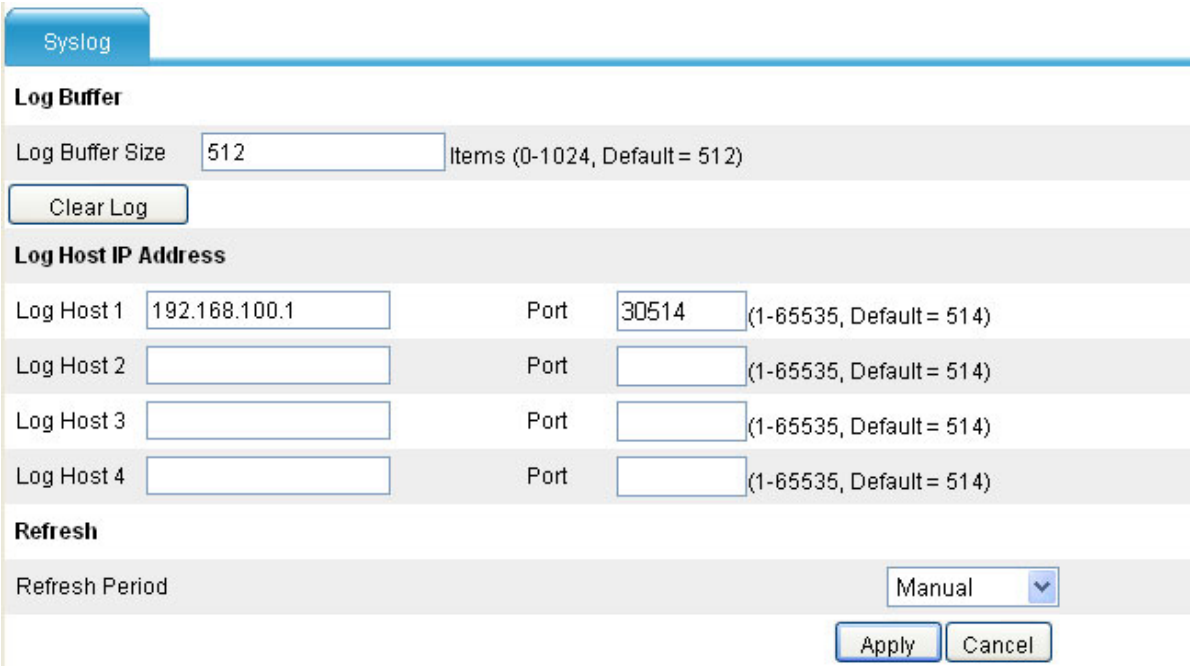
SecPath UTM 200-A/200-M/200-S firewall: V500R001B01 R5116 series

Configuration Procedures

Configuring the Firewall to Send the Syslogs to the SecCenter

Configure the firewall to send the syslogs to the SecCenter. Perform the configuration as shown in Figure 15, and set the port number to 30514.

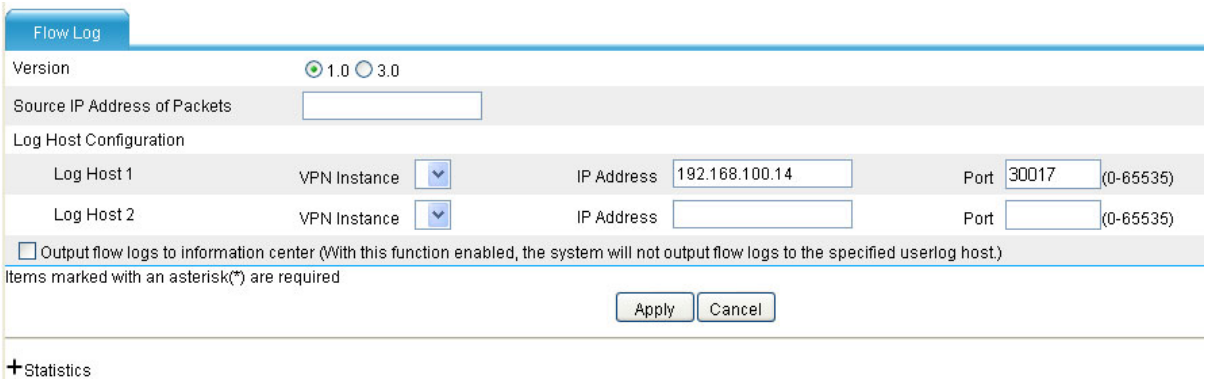
Figure 15 Syslog



Configuring the Firewall to Send the Session Logs to the SecCenter

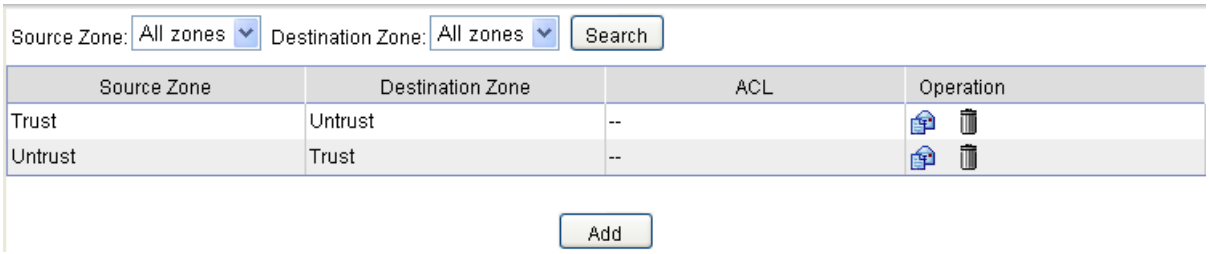
Step1 Select **Log Report** > **Userlog** from the navigation tree, and input the IP address and receiving port number of the log host on the page as shown in Figure 16. The flow log receiving port number of the SecCenter is 30017.

Figure 16 Flow logging



Step2 Select **Log Report** > **Session Log** > **Log Policy** from the navigation tree, and configure the firewall to log the traffic between the trust zone and untrust zone on the page as shown in Figure 17.

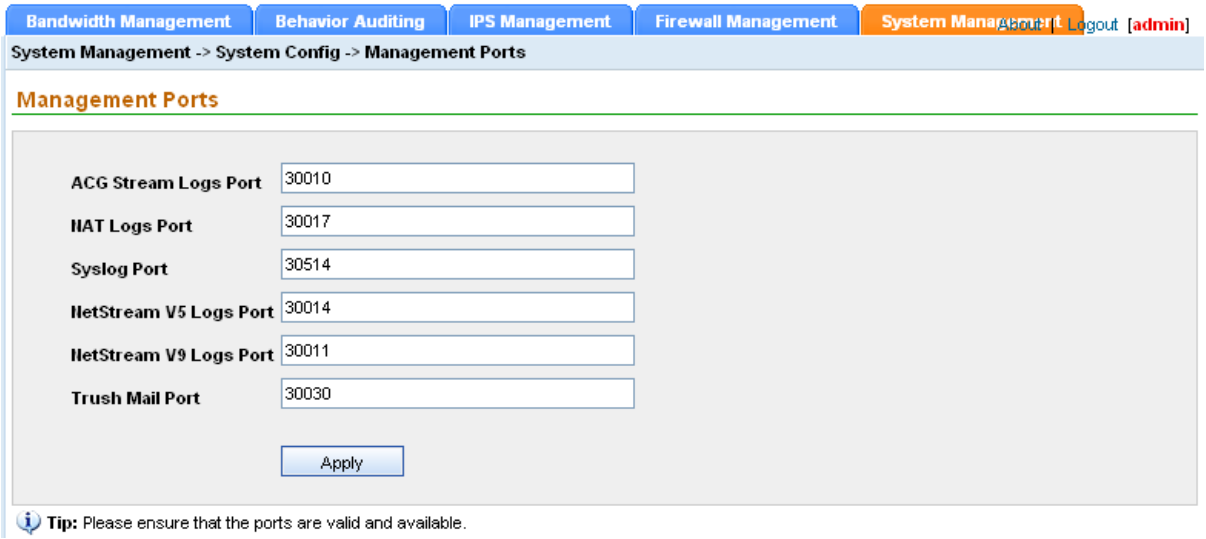
Figure 17 Session logging policy list



Note

The log sending port numbers must be the same as the corresponding port numbers on the SecCenter. The default port numbers on the SecCenter are as shown in Figure 18.

Figure 18 Management ports



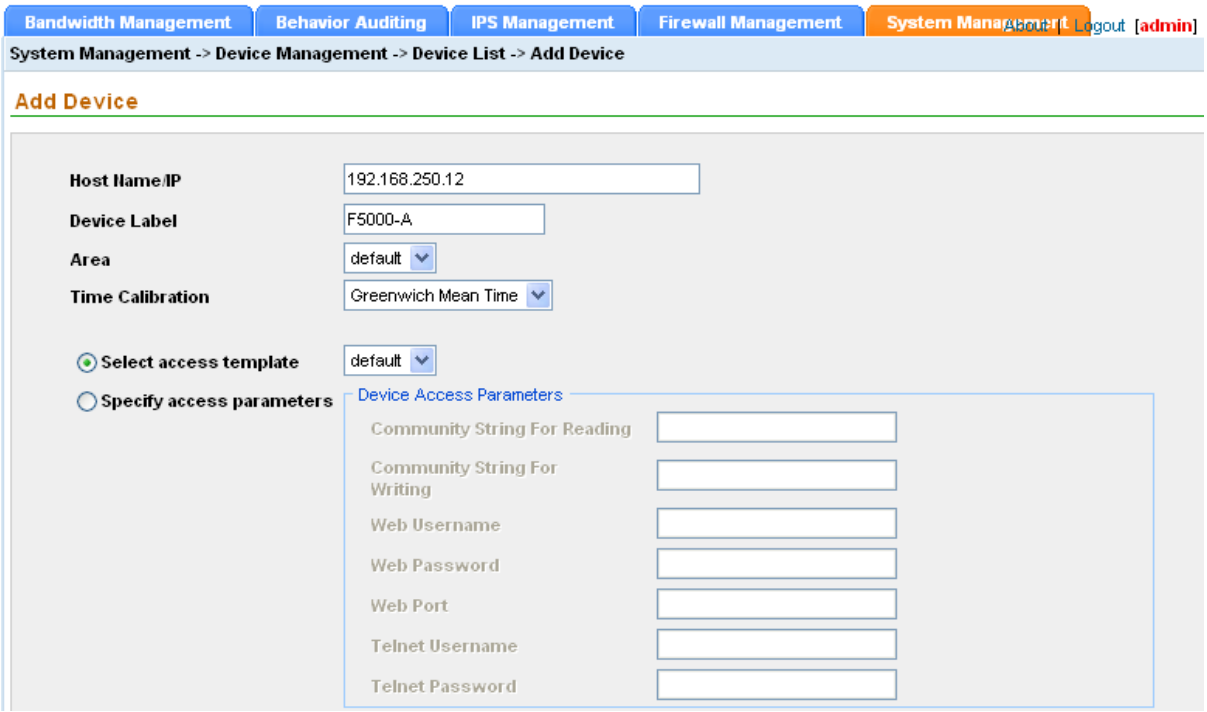
Enabling SNMP Agent on the Firewall to Connect to the SecCenter for Management

```
[Device] snmp-agent community read public
[Device] snmp-agent community write private
[Device] snmp-agent sys-info version all
```

Adding a device to the SecCenter

Input http://192.168.100.14/SecCenter/ into the address bar of your browser to log in to the management interface of SecCenter. Select the **System Management** tab, and then select **Device List** under **Device Management** to enter the device management page. Then, click **Add** to enter the page for adding a device, as shown in Figure 19. On the page, add the device under test to the device list.

Figure 19 Add device



Verification

The PC accesses the Internet through the firewall. The firewall generates NAT session logs and inter-zone policy logs. On the web interface of the firewall, you can display the logs stored in the log buffer. Alternatively, you can view the corresponding logs on the SecCenter. When the firewall uses the UTC time, the SecCenter uses the GMT time. When the firewall uses the GMT+8 time, the SecCenter uses the local time (GMT+8 time).

Viewing the Logs on the Firewall

- **Log Report** > **Report > System Log**

Search Item: Time/Date Keywords: Search

Time/Date	User Name	IP Address	Source	Level	Description
Jun 8 20:01:04:456 2010			DEV	Warning	Board temperature is too high on Chassis 0 Slot 0, type is RPU.
Jun 8 20:01:01:319 2010			DRVMSG	Error	Temperature Point 0/0 Too High.
Jun 8 20:00:59:656 2010			DEV	Warning	Board temperature changes to normal on Chassis 0 Slot 0, type is RPU.
Jun 8 20:00:57:319 2010			DRVMSG	Error	Temperature Point 0/0 Recovered from OT.
Jun 8 20:00:45:256 2010			DEV	Warning	Board temperature is too high on Chassis 0 Slot 0, type is RPU.

- **Log Report** > **Report > Blacklist Log**

Search Item: Time/Date Keywords: Search

Time/Date	Mode	Source IP	Reason	Hold Time (minutes)
Jun 8 20:04:25:030 2010	add	1.1.1.1	Manual insert	Permanence
Jun 8 20:04:20:023 2010	delete	1.1.1.1	Manual delete	Permanence
Jun 8 20:04:03:089 2010	add	18.1.1.23	Auto insert	10
Jun 8 20:03:43:261 2010	add	18.1.1.22	Auto insert	10

- **Log Report** > **Report > InterZone Policy Log**

Search Item: Start Time Keywords: Search

Start Time	End Time	Source Zone	Destination Zone	Policy ID	Action	protocol type	flow infomation
2010-06-08 20:04:02	2010-06-08 20:04:32	Trust	Untrust	0	permitted	UDP(17)	18.1.1.23:785 --> 172.16.16.3:288
2010-06-08 20:03:42	2010-06-08 20:04:12	Trust	Untrust	0	permitted	UDP(17)	18.1.1.22:785 --> 172.16.16.3:288

Viewing the Logs on the SecCenter

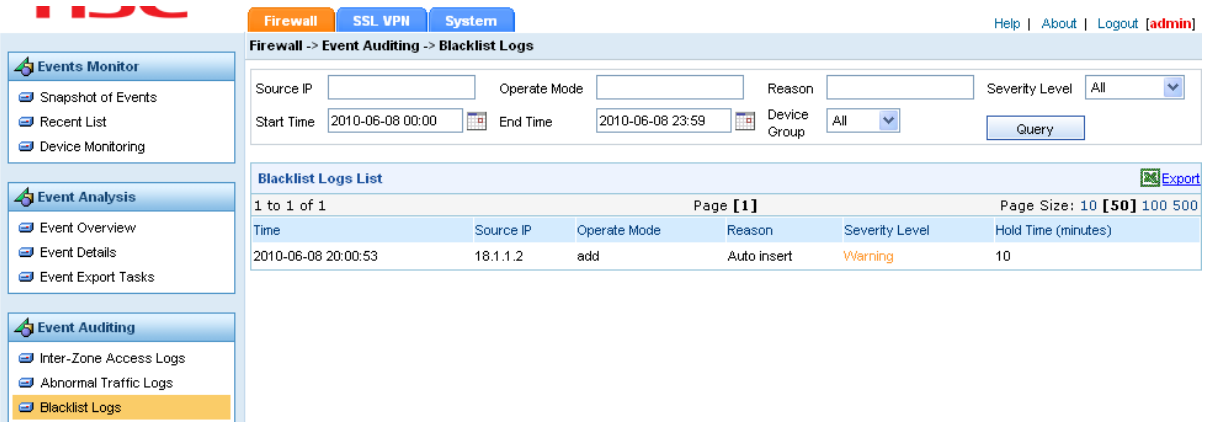
On the management interface of the SecCenter, select the **Firewall** tab, and click links in the **Event Auditing** pane on the left to view various logs.

- Inter-Zone Access Logs:

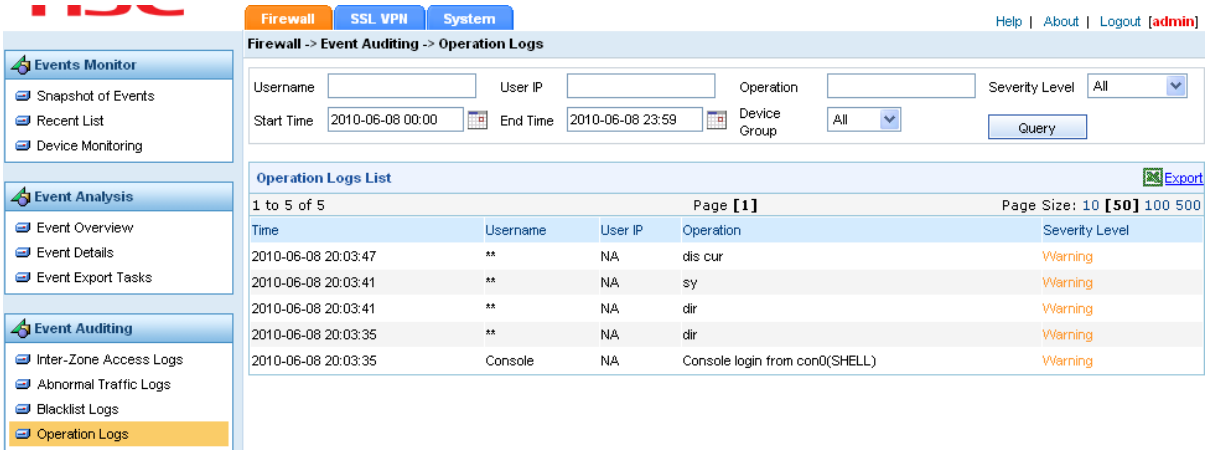
Search Item: Start Time Keywords: Search

Start Time	End Time	Source Zone	Destination Zone	Policy ID	Action	protocol type	flow infomation
2010-06-08 20:04:02	2010-06-08 20:04:32	Trust	Untrust	0	permitted	UDP(17)	18.1.1.23:785 --> 172.16.16.3:288
2010-06-08 20:03:42	2010-06-08 20:04:12	Trust	Untrust	0	permitted	UDP(17)	18.1.1.22:785 --> 172.16.16.3:288

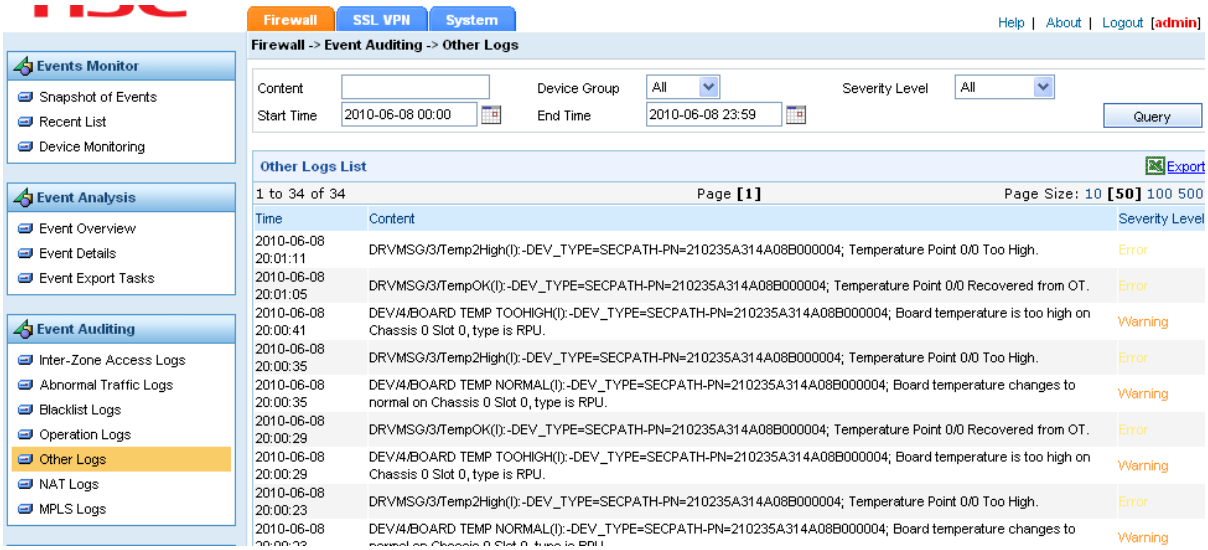
- Blacklist Logs:



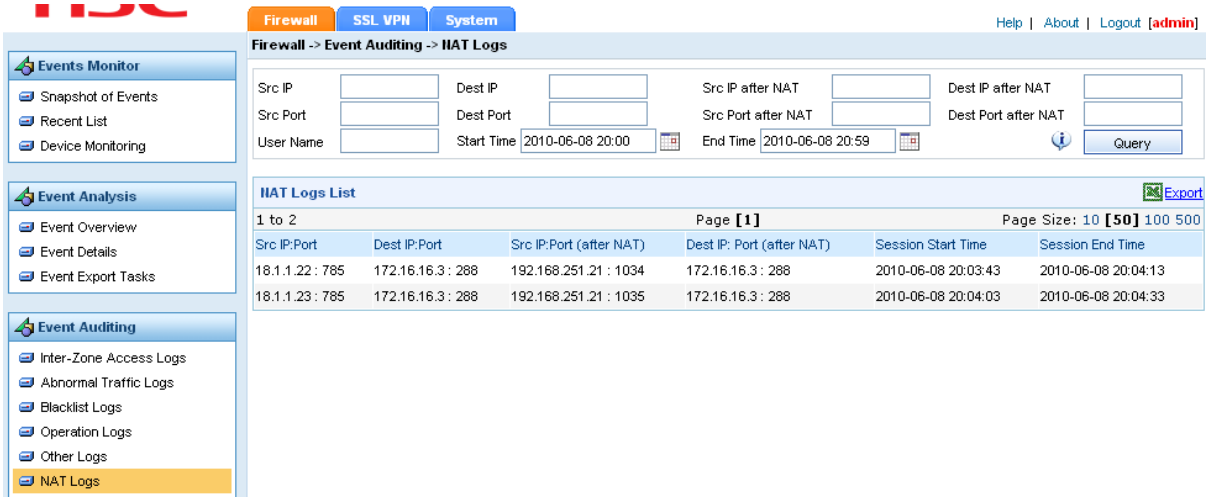
- Operation Logs:



- Other Logs:



- NAT Logs:



References

Protocols and Standards

RFC 3164: The BSD syslog Protocol

Related Documentation

Log Management in the Web configuration documentation set

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SecPath Series Firewalls Virtual Firewall Configuration Examples

Keywords: VPN instance, VRF, private address, public address, address pool

Abstract: This document describes the virtual firewall implementation on a virtual device and/or multiple VPN instances. This document also presents the configuration and verification methods in detail through examples.

Acronyms:

Acronym	Full spelling
VPN	Virtual Private Network
VRF	VPN routing and forwarding

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Feature Overview

Virtual firewalls are most commonly implemented by separating a single physical firewall into multiple logical firewalls, each of which has its own routing table. VPN instances are used to separate VPN routes from public network routes, and separate routes among different VPNs. The following describes how to create a VPN instance, associate it with an interface, and make VPN instances to work with routing protocols.

Creating a VPN Instance

A VPN instance is associated with a site, rather than a VPN. It is a collection of the VPN membership and routing rules of its associated site.

A VPN instance takes effect only after you configure a routing distinguisher (RD) for it. Before configuring an RD for a VPN instance, you can configure no parameters for the instance other than a description.

A VPN instance description is a piece of descriptive information about the VPN instance. You can use it to keep information such as the relationship of the VPN instance with a VPN.

Follow these steps to create and configure a VPN instance:

To do…	Use the command…	Remarks
Enter system view	**system-view**	—
Create a VPN instance and enter VPN instance view	**ip vpn-instance** *vpn-instance-name*	Required
Configure an RD for the VPN instance	**route-distinguisher** *route-distinguisher*	Required
Configure a description for the VPN instance	**description** *text*	Optional

Associating a VPN Instance with an Interface

After creating and configuring a VPN instance, you associate the VPN instance with the connected interface.

Follow these steps to associate a VPN instance with an interface:

To do…	Use the command…	Remarks
Enter system view	**system-view**	—
Enter interface view	**interface** *interface-type interface-number*	—
Associate the current interface with a VPN instance	**ip binding vpn-instance** *vpn-instance-name*	Required No VPN instance is associated with an interface by default.

Note

When configured on an interface, the **ip binding vpn-instance** command clears the IP address of the interface. Therefore, you must re-configure the IP address of the interface after configuring the command.

Configuring Route Exchange

You can configure route exchange among different VPN instances by using static routes, RIP, OSPF, IS-IS, EBGP, or IBGP as needed.

Configuring Route Exchange by Using Static Routes

Follow these steps to configure route exchange by using static routes:

To do…	Use the command…	Remarks
Enter system view	**system-view**	—
Configure static routes for a specified VPN instance	**ip route-static** *dest-address* { *mask* | *mask-length* } { *gateway-address* | *interface-type interface-number* [*gateway-address*] | **vpn-instance** *d-vpn-instance-name gateway-address* } [**preference** *preference-value*] [**tag** *tag-value*] [**description** *description-text*]	Required Configured on the firewall. The configuration on the CE is the same as ordinary static route configuration.
	ip route-static vpn-instance *s-vpn-instance-name*&<1-5> *dest-address* { *mask* | *mask-length* } { *gateway-address* [**public**] | *interface-type interface-number* [*gateway-address*] | **vpn-instance** *d-vpn-instance-name gateway-address* } [**preference** *preference-value*] [**tag** *tag-value*] [**description** *description-text*]	

Configuring Route Exchange by Using RIP

One RIP process can belong to only one VPN instance. If you do not bind a RIP process with any VPN instance, it belongs to the public network.

Follow these steps to configure route exchange by using RIP:

To do…	Use the command…	Remarks
Enter system view	**system-view**	—
Create RIP instance and enter RIP view	**rip** [*process-id*] **vpn-instance** *vpn-instance-name*	Required Configured on the firewall. On the CE, configure an ordinary RIP instance

Configuring Route Exchange by Using OSPF

An OSPF process that is bound with a VPN instance does not use the public network router ID configured in system view. Therefore, you need to configure a router ID when starting the OSPF process, or all OSPF processes to be bound must have an interface configured with IP address.

One OSPF process can belong to only one VPN instance. If you do not bind an OSPF process with a VPN instance, the process belongs to the public network.

Follow these steps to configure route exchange by using OSPF:

To do…	Use the command…	Remarks
Enter system view	**system-view**	—
Create OSPF instance and enter OSPF view	**ospf** [*process-id* | **router-id** *router-id* | **vpn-instance** *vpn-instance-name*] *	Required Configured on the firewall. On the CE, configure an ordinary OSPF instance

Application Scenarios

This feature is applicable to intranets of enterprises and schools. You can divide the firewall into multiple virtual firewalls to make a large, complex security network into multiple logical networks, facilitating networking, management, and maintenance.

Configuration Examples

Network Requirements

Note

This configuration example is applicable to SecPath F5000-A5, SecPath F1000E, and SecPath UTM series firewalls, and uses the SecPath F5000-A5 to show how to configure the virtual firewall. Support for link aggregation depends on the firewall version.

As shown in Figure 1, PC 1 and PC 3 are in VPN 1, and PC 2 and PC 4 are in VPN 2. VPN 1 constructs virtual firewall 1, and VPN 2 constructs virtual firewall 2.

Figure 1 Virtual firewall network diagram A

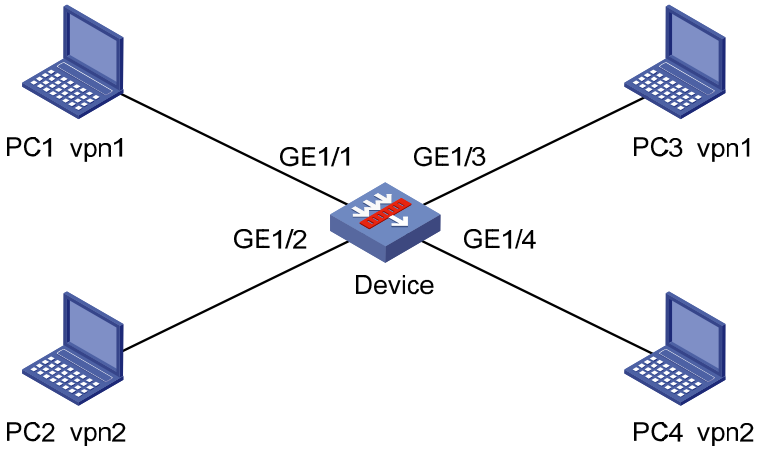
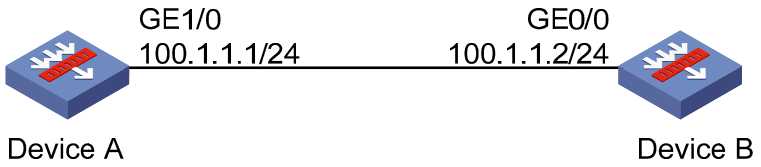


Figure 2 Virtual firewall network diagram B



Configuration Considerations

- Configure multiple VPN instances
- Associate the VPN instances with interfaces
- Configure routing among different VPN instances

Software Version Used

SecPath F1000E V300R001B01 R3166 series and V300R001B01 F3166 series

SecPath F5000-A5 V300R002B01 R3206 series

SecPath UTM 200-A/200-M/200-S V500R001B01 R5116 series

Basic Configurations

- Interface: Configure M-GE0/0 as the management interface:

```
Interface                      Physical    Protocol    IP Address
M-GigabitEthernet0/0             up          up           155.1.1.1
```

- Security zone (by selecting **Device Management** > **Zone)**

Add M-GE 0/0 to the management zone (default)

Configuring Forwarding within the Same Virtual Firewall

Requirements

To verify the forwarding configuration within the same virtual firewall, as shown in Figure 1.

Add GE 1/1 to security zone v1_z1 and GE 1/3 to security zone v1_z2, and associate GE 1/1 and GE 1/3 with VPN 1.

Add GE 1/2 to security zone v2_z1 and GE 1/4 to security zone v2_z2, and associate GE 1/2 and GE 1/4 with VPN 2.

Basic Configurations

Create and configure VPNs VPN 1 and VPN 2.

```
ip vpn-instance vpn1
 route-distinguisher 100:1
 vpn-target 100:1 export-extcommunity
 vpn-target 100:1 import-extcommunity

ip vpn-instance vpn2
route-distinguisher 200:1
vpn-target 200:1 export-extcommunity
vpn-target 200:1 import-extcommunity
```

Associate ports GE 1/1 and GE 1/3 with VPN 1.

```
interface GigabitEthernet1/1
  port link-mode route
  ip binding vpn-instance vpn1
ip address 10.1.1.1 255.255.255.0

interface GigabitEthernet1/3
 port link-mode route
 ip binding vpn-instance vpn1
ip address 20.1.1.1 255.255.255.0
```

Associate ports GE 1/2 and GE 1/4 with VPN 2, and set their IP addresses the same as ports GE 1/1 and GE 1/3.

```
interface GigabitEthernet1/2
 port link-mode route
 ip binding vpn-instance vpn2
ip address 10.1.1.1 255.255.255.0

interface GigabitEthernet1/4
 port link-mode route
 ip binding vpn-instance vpn2
 ip address 20.1.1.1 255.255.255.0
```

Create security zones v1_z1, v1_z2, v2_z1, and v2_z2.Add port GE 1/1 to v1_z1, GE 1/3 to v1_z2, GE 1/2 to v2_z1, and GE 1/4 to v2_z2. After the security zones are created, the web interface shows the following information.

10	v1_z1	60	no	Root
11	v1_z2	50	no	Root
12	v2_z1	60	no	Root
13	v2_z2	50	no	Root

After the ports are added to the security zones, the web interface shows the following information:

GigabitEthernet1/1	10.1.1.1	255.255.255.0	v1_z1
GigabitEthernet1/2	10.1.1.1	255.255.255.0	v2_z1
GigabitEthernet1/3	20.1.1.1	255.255.255.0	v1_z2
GigabitEthernet1/4	20.1.1.1	255.255.255.0	v2_z2

Assign IP addresses to the PCs.

Assign 10.1.1.2 to PC 1 with the default gateway as 10.1.1.1, and 20.1.1.2 to PC 3 with the default gateway as 20.1.1.1.

Assign 10.1.1.3 to PC 2 with the default gateway as 10.1.1.1, and 20.1.1.3 to PC 4 with the default gateway as 20.1.1.1.

Verification

PC 1 can ping PC 3, and PC 2 can ping PC 4.

Configuring Routes on the Virtual Firewall

Requirements

Virtual firewalls in multiple VPNs have their own independent routing tables. Configure static route, RIP, and OSPF in virtual firewalls.

Basic Configurations

- Configuration on Device A

Create interface loopback 1 on Device A, and associate loopback 1, GE 1/0, and GE 1/3 with VPN 1.

```
interface GigabitEthernet1/0
 port link-mode route
 ip binding vpn-instance vpn1
 ip address 100.1.1.1 255.255.255.0
 arp max-learning-num 2048

interface LoopBack1
 ip binding vpn-instance vpn1
```

```
ip address 30.1.1.1 255.255.255.255

interface GigabitEthernet1/3
 port link-mode route
 ip binding vpn-instance vpn1
 ip address 20.1.1.1 255.255.255.0
```

- Configuration on Device B

```
interface GigabitEthernet0/0
  port link-mode route
ip address 100.1.1.2 255.255.255.0

interface LoopBack1
 ip address 31.1.1.1 255.255.255.255
```

Configuring Static Routes

Requirements

Configure static routes in multiple VPNs.

Configuration procedures

Based on the basic configurations, perform the following configuration on Device A:

Configure a static route to loopback 1 of Device B.

```
ip route-static vpn-instance vpn1 31.1.1.1 0 100.1.1.2
```

Verification

On Device A, execute the **ping -vpn-instance vpn1 31.1.1.1** command. The ping succeeds.

Configuring RIP Routes

Requirements

Configure RIP routes in multiple VPNs.

Configuration procedures

After the basic configuration, perform the following configuration on Device A and Device B:

Configuration on Device A

```
rip 1 vpn-instance vpn1
network 100.0.0.0
network 30.0.0.0
```

Configuration on Device B:

```
rip
network 100.0.0.0
network 31.0.0.0
```

Verification

On Device A, execute the **ping -vpn-instance vpn1 31.1.1.1** command. The ping succeeds.

On Device B, execute the **ping 30.1.1.1** command. The ping succeeds.

On Device A, display the routing table of the virtual firewall after VPN instances are associated with the interfaces.

```
[Device A] dis ip routing-table vpn-instance vpn1
Routing Tables: vpn1
         Destinations : 10       Routes : 10
Destination/Mask    Proto  Pre  Cost         NextHop         Interface
10.1.1.0/24         Direct 0    0            10.1.1.1        GE1/1
10.1.1.1/32         Direct 0    0            127.0.0.1       InLoop0
20.1.1.0/24         Direct 0    0            20.1.1.1        GE1/3
20.1.1.1/32         Direct 0    0            127.0.0.1       InLoop0
30.1.1.1/32         Direct 0    0            127.0.0.1       InLoop0
31.0.0.0/8          RIP    100  1            100.1.1.2       GE1/0
100.1.1.0/24        Direct 0    0            100.1.1.1       GE1/0
100.1.1.1/32        Direct 0    0            127.0.0.1       InLoop0
127.0.0.0/8         Direct 0    0            127.0.0.1       InLoop0
127.0.0.1/32        Direct 0    0            127.0.0.1       InLoop0
```

The above route entries are not in the public routing table.

Configuring OSPF Routes

Requirements

In the firewall, configure OSPF routes in multiple VPNs.

Configuration procedures

After the basic configuration, perform the following configuration on Device A and Device B:

Configuration on Device A

```
ospf 1 vpn-instance vpn1
area 0.0.0.0
network 100.1.1.0 0.0.0.255
network 30.1.1.0 0.0.0.255
```

Configuration on Device B:

```
ospf 1
area 0.0.0.0
network 31.1.1.0 0.0.0.255
network 100.1.1.0 0.0.0.255
```

Verification

On Device A, execute the **ping -vpn-instance vpn1 31.1.1.1** command. The ping succeeds.

On Device A, display the routing table of the virtual firewall after VPN instances are associated with the interfaces.

```
[DeviceA]dis ip routing-table vpn-instance vpn1
Routing Tables: vpn1
         Destinations : 10       Routes : 10

Destination/Mask    Proto  Pre  Cost         NextHop         Interface

10.1.1.0/24         Direct 0    0            10.1.1.1        GE1/1
10.1.1.1/32         Direct 0    0            127.0.0.1       InLoop0
20.1.1.0/24         Direct 0    0            20.1.1.1        GE1/3
20.1.1.1/32         Direct 0    0            127.0.0.1       InLoop0
30.1.1.1/32         Direct 0    0            127.0.0.1       InLoop0
31.1.1.1/32         OSPF   10   2            100.1.1.2       GE1/0
100.1.1.0/24        Direct 0    0            100.1.1.1       GE1/0
100.1.1.1/32        Direct 0    0            127.0.0.1       InLoop0
127.0.0.0/8         Direct 0    0            127.0.0.1       InLoop0
127.0.0.1/32        Direct 0    0            127.0.0.1       InLoop0
```

The above output information shows that multi-VPN-instance through OSPF is effective.

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SecPath Series Firewalls Connection Limit Configuration Examples

Keywords: web, TCP, IP

Abstract: The document describes the connection limit feature, and presents some configuration examples for the SecPath series firewalls.

Acronyms:

Acronym	Full spelling
HTTP	Hypertext Transfer Protocol
TCP	Transfer Control Protocol
IP	Internet Protocol

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Overview

An internal user that initiates a large quantity of connections through a device to external networks in a short period of time occupies large amounts of system resources of the device, making other users unable to access network resources normally. An internal server that receives large numbers of connection requests within a short time cannot process those requests in time or accept other normal connection requests. To avoid these problems, you can configure connection limit policies to limit the number of connections.

Application Scenarios

The connection limit feature can limit the number of concurrent connections from internal users to external networks or the number of connections from external users to an internal server.

Connection Limit Configuration Example

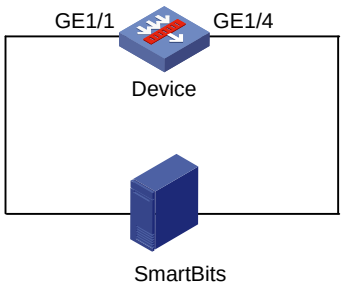
Network Requirements

Note

This configuration example is applicable to SecPath F5000-A5, SecPath F1000E, and SecPath UTM 200-A/200-M/200-S firewalls. An F5000-A5 firewall is used in this configuration example for illustration.

As shown in Figure 1, GE 1/1 is in the Trust zone, and GE 1/4 is in the Untrust zone. It's required to limit the number of sessions between the Untrust zone and the Trust zone.

Figure 1 Network diagram



Configuration on the Device

CLI Configuration

Configure interfaces GE 1/1 and GE 1/4 so that:

```
Interface                      Physical   Protocol   IP Address
GigabitEthernet1/1              up          up           192.168.0.1
GigabitEthernet1/4              up          up           200.1.1.1
```

Web Configuration

On the device's web configuration page, select **Device Management** > **Zone** from the navigation tree, add interface GE 1/1 to the Trust zone, and add GE 1/4 to the Untrust zone. The configuration steps are omitted.

Configuration Procedures

Note

Limit on connection numbers applies to connections of TCP, UDP, DNS, HTTP, and IP. UDP connection is described in this example.

Limiting the Number of UDP Sessions Based on a Network Segment

Requirements

Allow up to 100 sessions sourced from a specified network segment.

Configuration steps

1) Create a connection limit policy, and configure a rule for the policy.

```
connection-limit policy 0
 limit 1 source ip 192.168.0.0 16 destination ip any protocol udp max-connections 100
```

2) Apply the connection limit policy.

```
connection-limit apply policy 0
```

Verification

Use the SmartBits to send 1000 UDP flows with the network segment 192.168.0.0/16 to interface GE 1/4. Up to 100 sessions can be set up. Following is the log information:

Jul 29 09:18:57:504 2009			DPCONLMT	Warning	Source IP:192.168.0.0/16 Source VPN ID:--- Destination IP:0.0.0.0/0 Destination VPN ID:--- Current UDP amount h already reached on upper-limit! Maximum amount:100.
Jul 29 09:18:57:192 2009			DPCONLMT	Warning	Source IP:192.168.0.0/16 Source VPN ID:--- Destination IP:0.0.0.0/0 Destination VPN ID:--- Current UDP amount h already reached on upper-limit! Maximum amount:100.
Jul 29 09:18:57:005 2009			DPCONLMT	Warning	Source IP:192.168.0.0/16 Source VPN ID:--- Destination IP:0.0.0.0/0 Destination VPN ID:--- Current UDP amount h already reached on upper-limit! Maximum amount:100.

Remarks

After finishing this example, remove the configuration made in this example.

Limiting the Number of UDP Sessions Based on a Network Segment

Requirements

Allow up to 100 sessions to be set up to a specified network segment.

Configuration steps

1) Create a connection limit policy, and configure a rule for the policy.

```
connection-limit policy 0
limit 0 source ip any destination ip 192.168.0.0 16 protocol udp max-connections 100
```

2) Apply the connection limit policy.

```
connection-limit apply policy 0
```

Verification

Use the SmartBits to send 1000 UDP flows with different source IP addresses and the destination IP address 192.168.0.2 or 192.168.0.3 to interface GE 1/1. Up to 100 sessions with the destination IP address of 192.168.0.2 or 192.168.0.3 can be set up.

Remarks

After finishing the example, remove the configuration made in this example.

Limiting the Number of Connections on a Per-Source Basis

Requirements

Allow up to 100 connections to be sourced from each host on a specified network segment.

Configuration steps

1) Create a connection policy and configure a rule for it.

```
connection-limit policy 0
limit 0 source ip 192.168.0.0 16 destination any protocol udp max-connections 100 per-source
```

2) Apply the connection limit policy.

```
connection-limit apply policy 0
```

Verification result

Use the SmartBits to send 1000 UDP flows with the source IP address 192.168.0.2 and different destination addresses to interface GE 1/4. Use the SmartBits to send 1000 UDP flows with the source IP address 192.168.0.3 and different destination addresses to GE 1/4. Up to 100 sessions with the source IP address of 192.168.0.2 can be set up, and up to 100 sessions with the source IP address of 192.168.0.3 can be set up.

Remarks

After finishing the example, remove the configuration made in this example.

Limiting the Number of Connections on a Per-Destination Basis

Requirements

Allow up to 100 connections to be destined to each host address on the specified network segment.

Configuration steps

1) Create a connection limit policy, and configure a rule for it.

```
connection-limit policy 0
 limit 0 source ip any destination 192.168.0.0 16 protocol udp max-connections 100 per-destination
```

2) Apply the connection limit policy.

```
connection-limit apply policy 0
```

Verification result

Use the SmartBits to send 1000 UDP flows with the destination IP address 192.168.0.2 and different source addresses to interface GE 1/1. Use the SmartBits to send 1000 UDP flows with the destination IP address 192.168.0.3 and different source addresses to GE 1/1. Up to 100 sessions with the destination IP address of 192.168.0.2 can be set up, and up to 100 sessions with the destination IP address of 192.168.0.3 can be set up.

Remarks

After finishing the example, remove the configuration made in this example.

Removing the Connection Limits

Requirements

Remove the connection limits.

Configuration steps

1) Remove the connection limit policy.

```
undo connection-limit apply policy 0
```

Verification result

Connections are no longer limited.

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SecPath Series Firewalls Virtual Device and Security Zone Configuration Examples

Keywords: web, TCP, IP

Abstract: This document describes the features of the SecPath firewall virtual device, security zone, session management, ASPF, and packet filtering, and their configuration procedures in detail.

Acronyms:

Acronym	Full spelling
HTTP	Hypertext Transfer Protocol
TCP	Transfer Control Protocol
IP	Internet Protocol

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Feature Overview

- A firewall device can be divided into multiple parts logically, each of which can function as a separate virtual device. A firewall product is required to support virtual devices in its most firewall features. Each virtual device is separated from each other and cannot communicate with each other generally. A virtual device is a so called virtual firewall, and also constitutes a virtual firewall instance (VFI).
- Security zone is a logical concept. It can contain Layer 3 interfaces, Layer 2 VLAN sub-interfaces, and Layer 2 physical trunk interfaces bound with VLANs. Security zone helps the network administrator categorize the interfaces with the same security requirements into a zone, so that hierarchical policy management can be implemented.
- Session management simplifies the design of function modules such as Network Address Translation (NAT), application specific packet filter (ASPF), Application Level Gateway (ALG), attack defense, and connection number limit modules. It is responsible for processing kinds of session information, and aging sessions based on session states. It can work with multiple firewall features, such as NAT, ASPF, attack defense, and connection number limitation, featuring united resource management, and improving the firewall performance.
- ASPF provides session status detection between zones based on the session management feature. It checks protocol related information in packets and monitors connection-based protocol status. ASPF is a session context based dynamic firewall because it dynamically determines where packets are allowed to pass on all connections.

Application Scenarios

- Virtual device application is applied to divide a physical firewall into multiple logical firewalls. Creating virtual devices allows for lease services of firewalls.
- Security zone application allows a high-end firewall that can provide multiple physical interfaces to connect to multiple logical network segments in different modes, for example, within an internal network, across internal networks and the public network, and within DMZ zone. In a network configured with security zones, it is not necessary to configure a security policy for each interface, thus reducing the workload of the network administrator for maintaining security policies, and the risks due to frequent configurations.
- ASPF policies are configured among zones. During packet processing, the session management module provides such information as whether a connection is in correct state, whether a packet is the initial packet, and whether a packet is an ICMP error packet. Based on such information, ASPF, also according to the ASPF policies, determines whether a packet is allowed to pass.

Configuration Guidelines

Configure the virtual device, security zone, session management, ASPF, and packet filtering on the web interfaces.

The configuration contents include:

- Creating, configuring, selecting, and remove a virtual device

- Creating, configuring, and removing a security zone
- Configuring resource-based packet filtering within the same virtual device
- Configuring object-based packet filtering among different virtual devices
- ASPF (filtering for ICMP packets and non-SYN TCP initial packets)

Configuration Examples

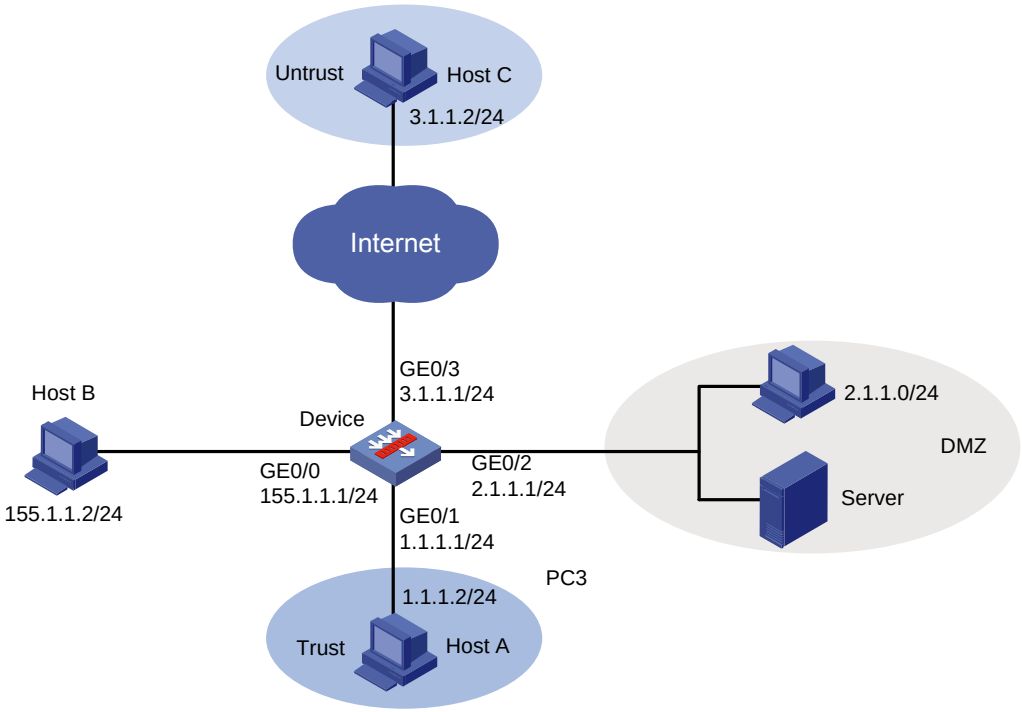
Network Requirements

Note

This configuration example is applicable to SecPath F5000-A5, SecPath F1000E, and SecPath UTM 200-A/200-M/200-S, and uses the F1000E to show how to configure the virtual device and security zone.

As shown in Figure 1, the interfaces of the Device connect to different other devices. GE 0/1 connects to Host A in zone **Trust**, GE 0/2 connects to the devices in the DMZ zone, and GE 0/3 connects to Host C in zone **Untrust**. Use the following network diagram to test how to create, edit and remove virtual devices and security zones.

Figure 1 Network diagram



Configuration Considerations

- Create and configure a virtual device
- Remove a virtual device
- Create and configure a security zone
- Remove a security zone

Software Version Used

SecPath F1000E: V300R001B01 R3166 series and V300R001B01 F3166 series

SecPath F5000-A5 V300R002B01 R3206 series

SecPath UTM 200-A/200-M/200-S V500R001B01 R5116 series

Basic Configurations

CLI Configurations

Interface configuration

From the navigation tree, select **Device Management** > **Interface** to enter the interface management page.

GE 0/0, GE 0/1, GE 0/2, and GE 0/3 are Layer 3 interfaces. Configure their IP addresses according to Figure 2.

Security zone configuration

On the web interface, select **Device Management** > **Zone** from the navigation tree, and add the interfaces to corresponding security zones, as shown in Figure 2.

- Add GE 0.0 to the management zone (default)
- Add GE 0/1 to the Trust zone of virtual device **root**
- Add GE 0/2 to the DMZ zone of virtual device **root**
- Add GE 0/3 to the Untrust zone of virtual device **root**

Figure 2 Interface configuration

Name	IP Address	Mask	Security Zone
Aux0			-
GigabitEthernet0/0	155.1.1.1	255.255.255.0	-
GigabitEthernet0/2	2.1.1.1	255.255.255.0	DMZ
GigabitEthernet0/1	1.1.1.1	255.255.255.0	Trust
NULL0			-
GigabitEthernet0/3	3.1.1.1	255.255.255.0	Untrust

Username and password configuration

The device has the default username and password. Please consult the factory default configuration. You can also use the following commands to configure a new user and its password.

```
local-user admin
```

```
password simple admin
service-type telnet
level 3
```

Feature Configurations

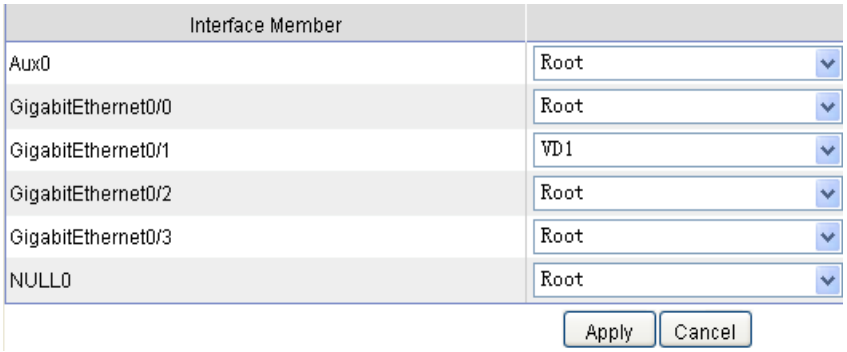
Creating, Configuring, Selecting, and Remove a Virtual Device

Requirements

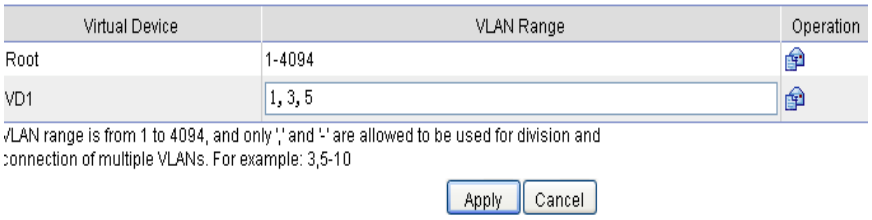
Create, configure, select, and remove a virtual device.

Configuration procedures

1) Enter **http://155.1.1.1** in the address bar on Host B to enter the login page. Type username **admin** and password **admin**, and click **Login** to log in to the web interface. The current virtual device is root.
2) From the navigation tree, select **Device Management** > **Virtual Device** to enter the virtual device management page. Click **Add** to add a device, and configure its ID as 2, and name as VD1.
3) Enter the interface member configuration page, and configure the member interfaces for the virtual device. By default, all interfaces belong to virtual device **root**. Select the dropdown list right to GigabitEthernet 0/1, select **VD1**, and click **Apply** to add GigabitEthernet 0/1 to virtual device **VD1**, as shown in the following figure:



4) Enter the VLAN member configuration page, and configure the member interfaces for the virtual device. Click the edit button in the **Operation** column corresponding to **VD1**, type 1, 3, and 5 in the text box, and click **Apply** to configure member VLANs for the virtual device.



5) To select the virtual device, enter the virtual device selection page, and select the option button in the **Operation** column corresponding to **VD1**.

Virtual Device Name	Operation
Root	○
VD1	◉

6) To remove the virtual device, enter the virtual device configuration page, and click **Remove** corresponding to **VD1**. It is not allowed to remove virtual device **root**.

Verification

The virtual device can be created, configured, selected, and removed successfully.

Remarks

After finishing this example, remove the configuration made in this example.

Creating, Configuring, and Removing a Security Zone

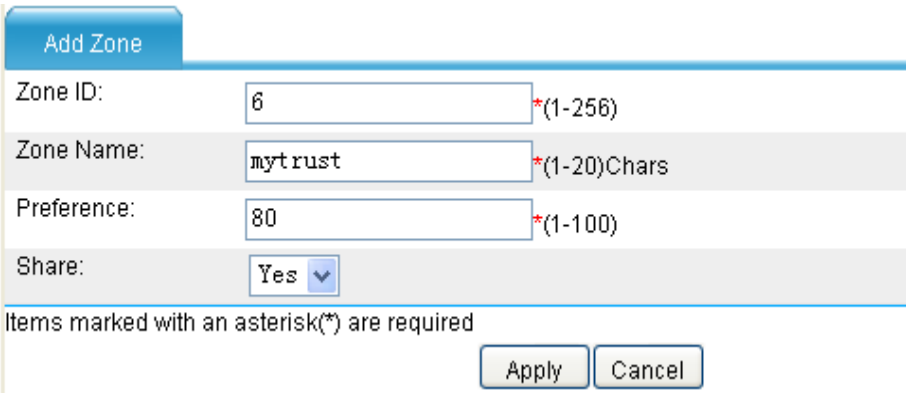
Requirements

Create, configure, and remove a security zone.

Configuration procedures

1) Enter **http://155.1.1.1** in the address bar on Host B to enter the login page. Type username **admin** and password **admin**, and click **Login** to log in to the web interface. The current virtual device is root.
2) From the navigation tree, select **Device Management** > **Zone** to enter the security zone configuration page. Click **Add** and configure the zone as follows:

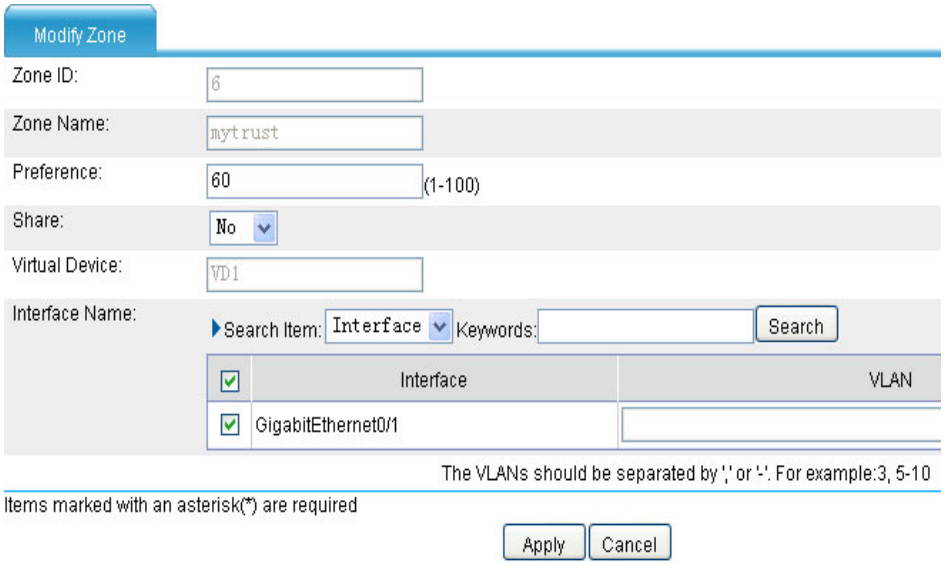
- Security ID: 6
- Zone name: mytrust
- Preference: 80
- Share: Yes



3) On the security zone configuration page, click the edit button right corresponding to **mytrust**, and configure the preference, share attribute, and interfaces of the zone as follows:

- Preference: 60
- Share: No

- Interface name: GigabitEthernet0/1



After the above configuration, click **Apply**.

4) To remove the security zone, click **Remove** corresponding to **mytrust** on the security zone configuration page.

Verification

The security zone can be create, configured, and removed successfully.

Remarks

- After finishing this example, remove the configuration made in this example.
- The default security zone can exist in virtual device **root** only, and cannot be removed.
- It is not allowed to add interfaces to the local zone. It is only allowed to configure interfaces for the management zone, and the zone does not belong to any virtual device.

Resource-Based Packet Filtering Within the Same Virtual Device

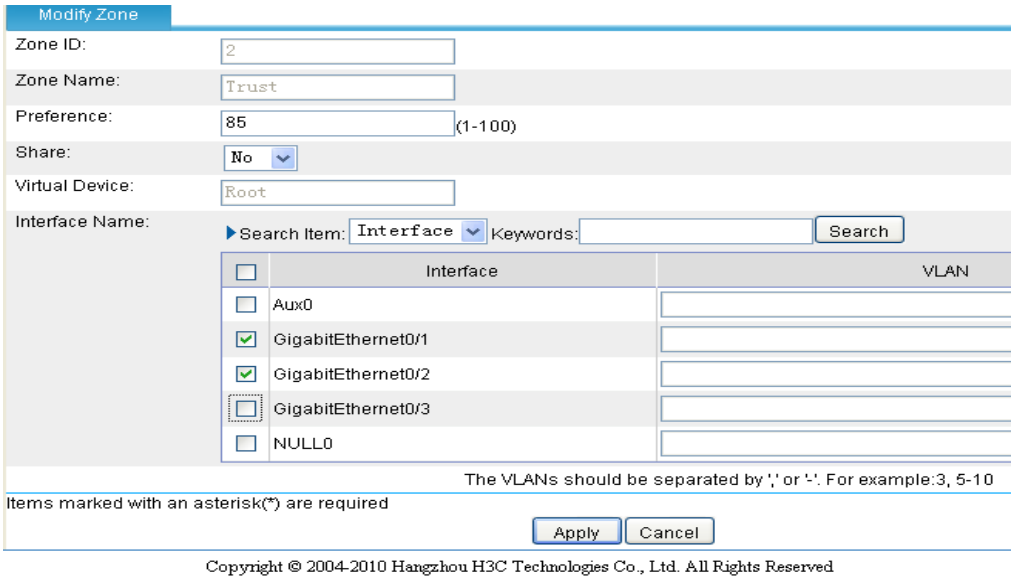
Requirements

For resource-based packet filtering, configure address resources, address group resources, service resources, and service group resources, and configure the default interzone policy.

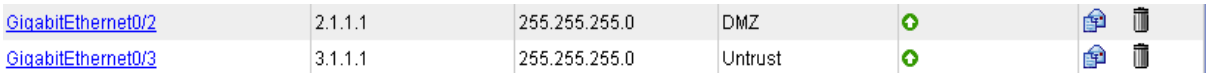
Configuration procedures

1) Enable FTP server on the server, configure the route to network segment 3.1.1.0/24, and set the gateway address to 2.1.1.1.
2) On Host C, which acts as the FTP client, configure the route to network segment 2.1.1.0/24, and configure the gateway address to 3.1.1.1.
3) Enter **http://155.1.1.1** in the address bar on Host B to enter the login page. Type username **admin** and password **admin**, and click **Login** to log in to the web interface. The current virtual device is root.

4) For packet filtering within the same security zone, add GE 0/2 and GE 0/3 to zone **Trust**, and perform the following configuration, as shown in the figure. Result 1) is expected.



5) For packet filtering among different zones without interzone policies, add GE 0/2 to zone **DMZ**, and add GE 0/3 to zone **Untrust**. The server and Host C ping each other, and result 2) is expected.

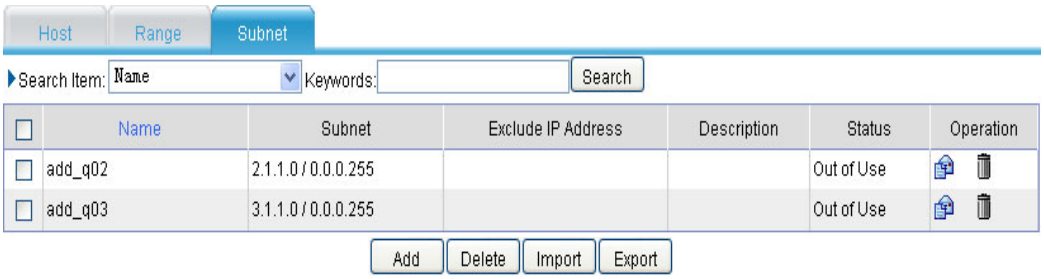


6) For packet filtering among different zones with interzone policies configured, add GE 0/2 to zone **DMZ**, add GE 0/3 to zone **Untrust**, and configure an interzone policy with source zone as **Untrust** and destination zone as **DMZ**, so that Host C can access the server. The following detailed configurations cover resource configuration and policy configuration.

- Resource configuration

Configure address resources: select **Resource** > **Address** > **IP Address** from the navigation tree, and then click **Add**. Add the two following address resource:

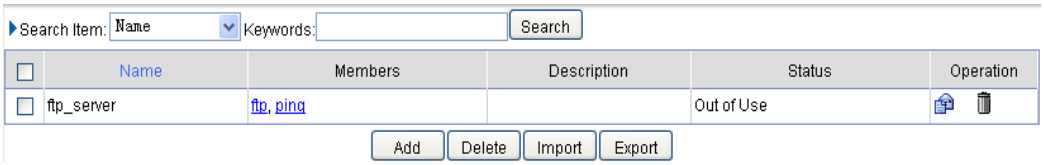
Resource	IP address/wildcard
add_q02	2.1.1.0/0.0.0.255
add_q03	3.1.1.0/0.0.0.255



Configure an address group resource: Select **Resource** > **Address** > **Address Group** from the navigation tree, and then click **Add**. Add an address group named **addz_q**, and add address resources **add_q02** and **add_q03** to the group.

Configure service resources and a service group resource: Select **Resource** > **Service** > **Default Service** from the navigation tree. The default services include ping and ftp, so you only need to create a service group containing the ping and ftp services.

To create a service group, select **Resource** > **Service** > **Service Group** from the navigation tree, and click **Add**. Add a service group named **ftp_server**, and add the ping and ftp services to the group.

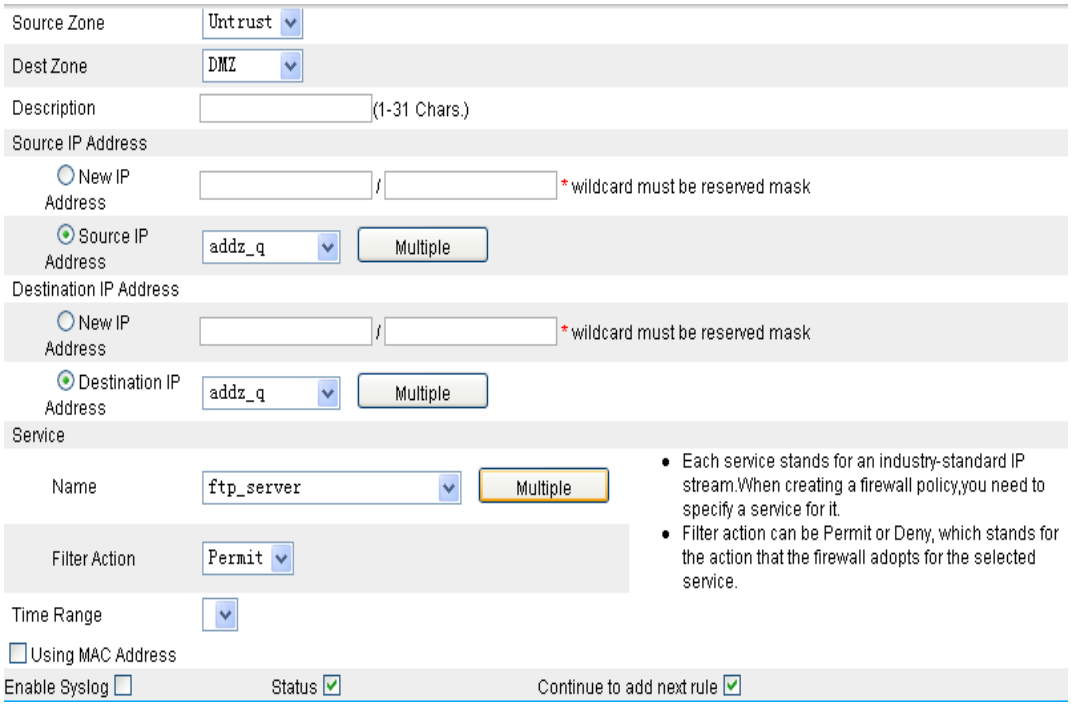


- Policy configuration

Select **Firewall** > **Security Policy** > **Interzone Policy** from the navigation tree, and then click **Add**. Add an interzone policy with source zone as **Untrust** and destination zone as DMZ, and configure the other parameters as follows:

Item	Value
Address group	Select **addz_q** for the source address group and destination address group
Service group	ftp_server
Filter action	permit

Adopt the default settings for the other items, and click **Apply**.



The server and Host C ping each other. Result 3) is expected.

Verification

1) Packet filtering results in the case that the involved interfaces are in the same zone.

- The server and Host C can ping each other.
- Host C can log into the server through FTP.
- Select **Firewall** > **Session Table** > **Session Summary** from the navigation tree. On the session table list, you can see the session from 2.1.1.2 to 3.1.1.2.

	Init Src IP	Init Dest IP	Init VPN VPN / VLAN / INLINE	Resp Src IP	Resp Dest IP	Resp VPN VPN / VLAN / INLINE	Protocol	Session Status	Lifetime (s)	Operation
	3.1.1.2:1024	2.1.1.2:21	---	2.1.1.2:21	3.1.1.2:1024	---	TCP	TCP-EST	3581	
	155.1.1.2:2006	155.1.1.1:80	---	155.1.1.1:80	155.1.1.2:2006	---	TCP	TCP-EST	3600	

2) Packet filtering results in the case that the involved interfaces are in different zones without interzone policies configured

- The server can ping Host C. The security zone with a higher precedence can access the security zone with a lower precedence.
- Host C cannot ping the server. The security zone with a lower precedence can access the security zone with a higher precedence.
- Host C cannot log into the server through FTP.

3) Packet filtering results in the case that the involved interfaces are in different zones with interzone policies configured

- The server can ping Host C. The security zone with a higher precedence can access the security zone with a lower precedence.
- Host C can ping the server, because an interzone policy (permit) is configured for the access direction from zone **Untrust** to zone **DMZ**.
- Host C can log into the server through FTP.
- When Host C logs into the server, display the session table. There is a session from 3.1.1.2 to 2.1.1.2.

	Init Src IP	Init Dest IP	Init VPN VPN / VLAN / INLINE	Resp Src IP	Resp Dest IP	Resp VPN VPN / VLAN / INLINE	Protocol	Session Status	Lifetime (s)	Operation
	155.1.1.2:2078	155.1.1.1:80	---	155.1.1.1:80	155.1.1.2:2078	---	TCP	TCP-EST	3600	
	3.1.1.2:1024	2.1.1.2:21	---	2.1.1.2:21	3.1.1.2:1024	---	TCP	TCP-EST	1570	
	3.1.1.2:2048	2.1.1.2:0	---	2.1.1.2:0	3.1.1.2:0	---	ICMP	ICMP-OPEN	60	
	2.1.1.2:1024	3.1.1.2:1025	---	3.1.1.2:1025	2.1.1.2:1024	---	UDP	UDP-OPEN	27	
	2.1.1.2:2048	3.1.1.2:0	---	3.1.1.2:0	2.1.1.2:0	---	ICMP	ICMP-OPEN	60	
	198.19.1.2:1024	198.19.1.1:1025	---	0.0.0.0:0	0.0.0.0:0	---	UDP	UDP-OPEN	1	

Remarks

- After finishing this example, remove the configuration made in this example.
- Use reversed mask when setting an address resource.

Resource-Based Packet Filtering Among Different Virtual Devices

Requirements

Configure packet filtering among different virtual devices, for which the destination virtual device must contain a shared zone. By default, there is an interzone policy (permit) between a zone on the source virtual device and the shared zone on the destination virtual device. Configure an interzone policy on the source virtual device as needed.

Configuration procedures

1) Enter **http://155.1.1.1** in the address bar on Host B to enter the login page. Type username **admin** and password **admin**, and click **Login** to log in to the web interface. The current virtual device is root.
2) Enable FTP server on the server, configure the route to network segment 3.1.1.0/24, and set the gateway address to 2.1.1.1.
3) On Host C, which acts as the FTP client, configure the route to network segment 2.1.1.0/24, and configure the gateway address to 3.1.1.1.
4) Configure packet filtering among different virtual devices without shared zone:

Add GE 0/2 to zone **mytrust** in virtual device **VD1**, and add GE 0/3 to zone **Untrust** in virtual device **root**. Zones **mytrust** and **Untrust** are private security zones. The server and Host C ping each other. Result 1) is expected.

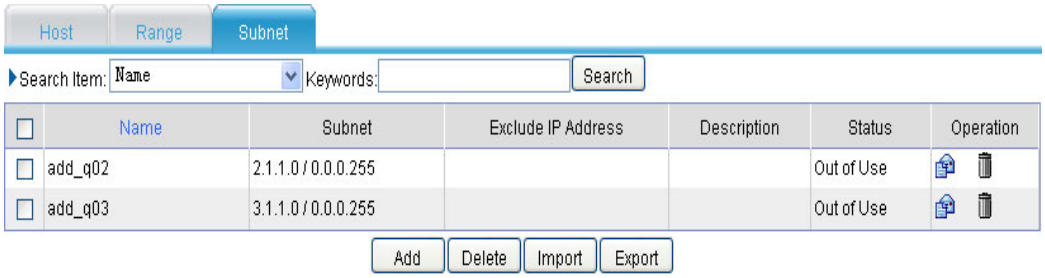
5) Configure packet filtering among different virtual devices with a shared zone: Add GE 0/2 to zone **mytrust** in virtual device **VD1**, and configure zone **mytrust** as the shared zone. Add GE 0/3 zone **Untrust** in virtual device **root**. Zone **Untrust** is a private security zone. The server and Host C ping each other. Result 2) is expected.

6) Configure a shared zone among different virtual devices, and configure packet filtering based on interzone policy: Add GE 0/2 to virtual device **VD1** and zone **mytrust**, and configure zone **mytrust** as the shared zone. Add GE 0/3 zone **Untrust** in virtual device **root**. Configure an interzone policy between zones **Untrust** and **mytrust**, to make Host C unable to access the server. The following detailed configurations cover resource configuration and policy configuration.

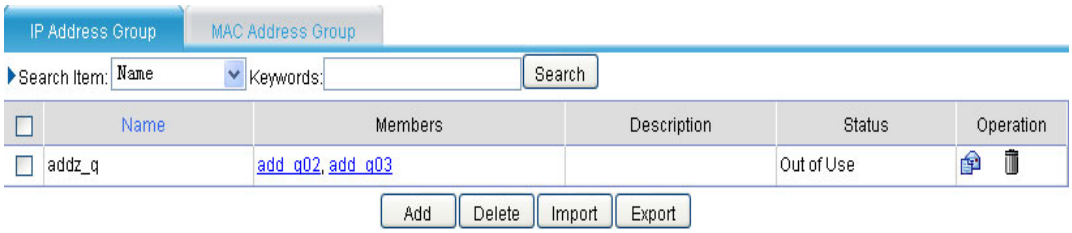
- Resource configuration

To configure an address resource, select **Resource** > **Address** > **IP Address** from the navigation tree, and then click **Add**. Add the two following address resource:

Resource	IP address/wildcard
add_q02	2.1.1.0/0.0.0.255
add_q03	3.1.1.0/0.0.0.255

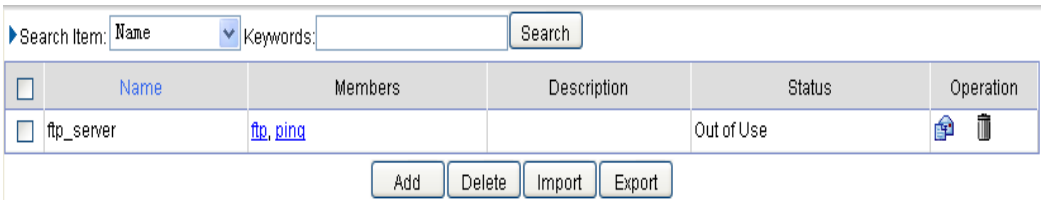


To configure an address group resource, select **Resource** > **Address** > **Address Group** from the navigation tree, and then click **Add**. Add an address group named **addz_q**, and add address resources **add_q02** and **add_q03** to the group.



To configure a service resource and a service group resource, select **Resource** > **Service** > **Default Service** from the navigation tree. The default services include ping and ftp, so you only need to create a service group containing the ping and ftp services.

To create a service group, select **Resource** > **Service** > **Service Group** from the navigation tree, and click **Add**. Add a service group named **ftp_server**, and add the ping and ftp services to the group.

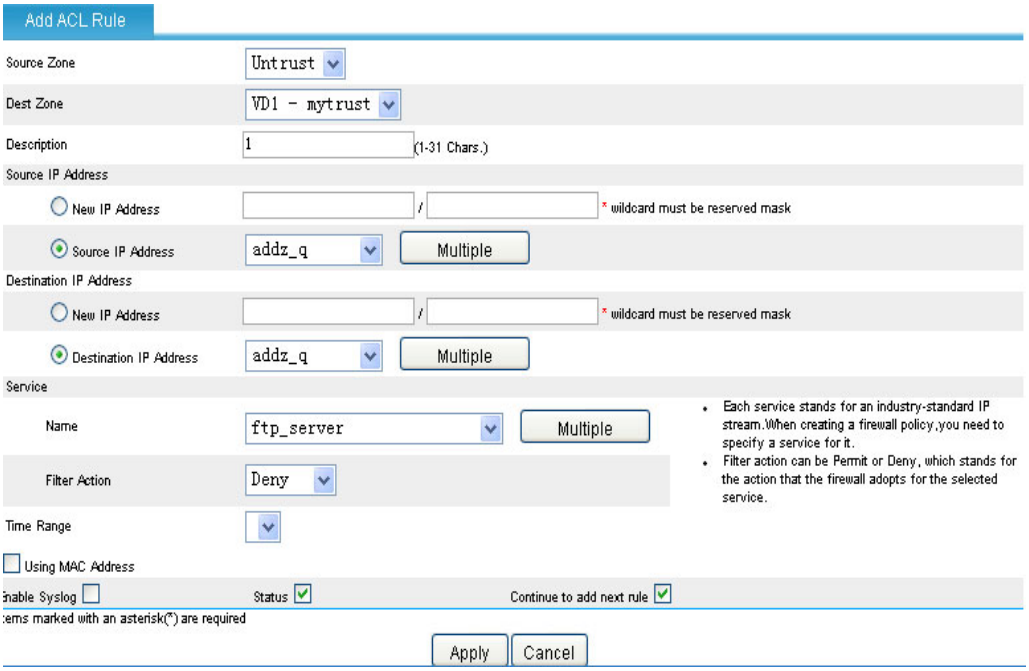


- Policy configuration

Select **Firewall** > **Security Policy** > **Interzone Policy** from the navigation tree, and then click **Add**. Add an interzone policy with source zone as **Untrust** and destination zone as **VD1-mytrust**, and configure the other parameters as follows:

Item	Value
Address group	Select **addz_q** for the source address group and destination address group
Service group	ftp_server
Filter action	deny

Adopt the default settings for the other items, and click **Apply**.



Host C tries to logs into the server, and Host C and the server ping each other. Result 3) is expected.

verification

1) The server and Host C cannot ping each other, because the zones not shared between two virtual devices cannot access each other.
2) The verification concludes:

- The server cannot ping Host C, because a private security zone cannot be accessed by the security zones of other virtual devices.
- Host C can ping the server, because the server belongs to the shared zone, which can be accessed by the security zones of other virtual devices.
- Host C can log into the server through FTP, because the server belongs to the shared zone.

After Host C logs in successfully, display the session table. You can see an FTP session from 3.1.1.2 to 2.1.1.2 in virtual device **root**.

☐	3.1.1.2:1028	2.1.1.2:21	---	2.1.1.2:21	3.1.1.2:1028	---	TCP	TCP-EST	3586	

3) The verification concludes:

- The server and Host C cannot ping each other, which means that the policy is effective.
- Host C cannot log into the server through FTP, which means the interzone policy (deny) is effective.
- Display the session table. There is no session from 3.1.1.2 to 2.1.1.2.

Remarks

After finishing this example, remove the configuration made in this example.

ASPF (Filtering for ICMP Packets and Non-SYN TCP Initial Packets)

Requirements

Configure filtering for ICMP error packets and non-SYN TCP packets with ASPF, that is, using ASPF to allow or deny ICMP error packets and non-SYN TCP initial packets.

Configuration procedures

1) Enter **http://155.1.1.1** in the address bar on Host B to enter the login page. Type username **admin** and password **admin**, and click **Login** to log in to the web interface. The current virtual device is root.
2) Connect GE 0/2 and GE 0/3 of the device to port A and port B of the SMB respectively. Set the IP address of port A to 2.1.1.2/24 and that of port B to 3.1.1.2/24.
3) Configure packet filtering among different security zones: Add GE 0/2 to zone **Untrust**, and GE 0/3 to zone **Trust**.
4) Do not configure ASPF between zones **Trust** and **Untrust**: By default, the system allows ICMP error packets and non-SYN TCP initial packets to pass. Send ICMP error packets and non-SYN TCP initial packets with source IP address as 3.1.1.2 and destination IP address as 2.1.1.2 to port A of the SMB through port A. Result 1) is expected.
5) Configure ASPF policy between zones **Trust** and **Untrust**: Select **Firewall** > **Session Table** > **Advanced** from the navigation, click the **ASPF** tab to enter the ASPF policy list page, and then click **Add** to add an ASPF policy. Select **Discard ICMP error packets** and **Discard non-SYN initial TCP packets**, and click **Apply**. Send ICMP error packets and non-SYN TCP initial packets with source IP address as 3.1.1.2 and destination IP address as 2.1.1.2 to port A of the SMB through port A. Result 2) is expected.

Verification

1) Port B cannot receive the packets.
2) Port B cannot receive the packets. Display the ASPF statistics from zone **Trust** to zone **Untrust** and you can see there are no allowed packets but denied packets.

Remarks

After finishing this example, remove the configuration made in this example.

Related Documentation

Test Report for Virtual Device, Security Zone, Session Management, and Packet Filtering

Virtual Device Management in the Web configuration documentation set

Session Management in the Web configuration documentation set

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