Virtual Private Network

FAQs

Issue 01

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1 FAQs - S2C Enterprise Edition VPN

1.1 Popular Questions

1.1.1 What Devices Can Be Connected to Huawei Cloud Through a VPN?

VPN supports the standard Internet Protocol Security (IPsec) protocol. A device in your on-premises data center can connect to the cloud if the device meets the following requirements:

1. Supports IPsec VPN.
2. Has a fixed public IP address, which can be statically configured, or translated through NAT in NAT traversal scenarios (your device is deployed behind a NAT gateway).

Most devices are routers and firewalls. For details about the interconnection configuration, see Administrator Guide.

NOTE

- Common home broadband routers, Windows hosts providing VPN services (such as L2TP), and personal mobile terminals cannot connect to the cloud through a VPN.
- The following products can connect to the cloud through VPNs:
  - Devices: Huawei firewalls and access routers (ARs), Hillstone firewalls, and Check Point firewalls
  - Cloud services: Alibaba Cloud, Tencent Cloud, Amazon Web Services (AWS), and Microsoft Azure
  - Software: strongSwan
- The IPsec protocol is a standard IETF protocol. Devices that support IPsec can interconnect with the cloud through a VPN.

  Most enterprise-class routers and firewalls support the IPsec protocol.
- Some devices support IPsec VPN only after you purchase required software licenses.

  Your on-premises data center administrator can check with the device vendor whether a license is required based on the device model.

1.1.2 What Are VPN Negotiation Parameters? What Are Their Default Values?

Table 1-1 VPN negotiation parameters

Protocol	Parameter	Value
IKE	Authentication Algorithm	• MD5 (This algorithm is insecure. Exercise caution when using this algorithm.) • SHA1 (This algorithm is insecure. Exercise caution when using this algorithm.) • SHA2-256 (default value) • SHA2-384 • SHA2-512
	Encryption Algorithm	• 3DES (This algorithm is insecure. Exercise caution when using this algorithm.) • AES-128 (default value) • AES-192 • AES-256 • AES-256-GCM-16
	DH Algorithm	• Group 1 (This algorithm is insecure. Exercise caution when using this algorithm.) • Group 2 (This algorithm is insecure. Exercise caution when using this algorithm.) • Group 5 (This algorithm is insecure. Exercise caution when using this algorithm.) • Group 14 (This algorithm is insecure. Exercise caution when using this algorithm.) • Group 15 (default value) • Group 16 • Group 19 • Group 20 • Group 21
	Version	• v1 (not recommended due to security risks) • v2 (default value)

Protocol	Parameter	Value
	Lifetime (s)	**86400** (default value) Unit: second Value range: **60** to **604800**
	Local ID	• IP Address The local IP address is automatically displayed as the EIP of the VPN gateway, removing the need to manually configure it. • FQDN By default, the local ID type is IP address and the local ID value is the EIP of the VPN gateway.
	Customer ID	• IP Address • FQDN By default, the customer ID type is IP address and the customer ID value is the public IP address of the customer gateway.
IPsec	Authentication Algorithm	• SHA1 (This algorithm is insecure. Exercise caution when using this algorithm.) • MD5 (This algorithm is insecure. Exercise caution when using this algorithm.) • SHA2-256 (default value) • SHA2-384 • SHA2-512
	Encryption Algorithm	• AES-128 (default value) • AES-192 • AES-256 • 3DES (This algorithm is insecure. Exercise caution when using this algorithm.) • AES-256-GCM-16

Protocol	Parameter	Value
	PFS	• Disable (not recommended due to security risks) • DH group 1 (This algorithm is insecure. Exercise caution when using this algorithm.) • DH group 2 (This algorithm is insecure. Exercise caution when using this algorithm.) • DH group 5 (This algorithm is insecure. Exercise caution when using this algorithm.) • DH group 14 (This algorithm is insecure. Exercise caution when using this algorithm.) • DH group 15 (default value) • DH group 16 • DH group 19 • DH group 20 • DH group 21
	Transfer Protocol	• ESP (default value)
	Lifetime (s)	**3600** (default value) Unit: second Value range: **30** to **604800**

NOTE

- Perfect Forward Secrecy (PFS) is a security feature.

  IKE negotiation has two phases, phase one and phase two. The key of phase two (IPsec SA) is derived from the key generated in phase one. Once the key in phase one is disclosed, the security of the IPsec VPN may be adversely affected. To improve the key security, IKE provides PFS. When PFS is enabled, an additional DH exchange will be performed during IPsec SA negotiation to generate a new IPsec SA key, improving IPsec SA security.
- For security purposes, PFS is enabled on the cloud side by default. Ensure that PFS is also enabled on the gateway device in your on-premises data center and the PFS settings on both ends are the same. Otherwise, the negotiation will fail.
- The cloud side does not support the configuration of the traffic-based IPsec SA lifetime. That is, IPsec SAs are not aged based on traffic on the cloud side.

1.1.3 Can I Deploy an Application on the Cloud and a Database in an On-premises Data Center and Connect Them Through a VPN Gateway?

Yes.

A VPN connects a VPC and an on-premises data center.

After a VPN is set up, service traffic can be transmitted between the VPC and on-premises data center. For an application server on the cloud, access to an on-premises database is logically the same as access to other hosts in the same LAN. Given this, it is feasible to use a VPN to connect an application on the cloud to a database in an on-premises data center.

This is a typical IPsec VPN scenario.

Additionally, there are no limitations on the service initiator. That is, service requests can be initiated from the cloud or the on-premises data center.

NOTICE

- After a VPN is set up, check the network latency and packet loss rate to ensure smooth service running.
- It is recommended that you run the ping command to check the packet loss and network latency details.

1.1.4 Can I Visit Websites Across International Borders Using a VPN?

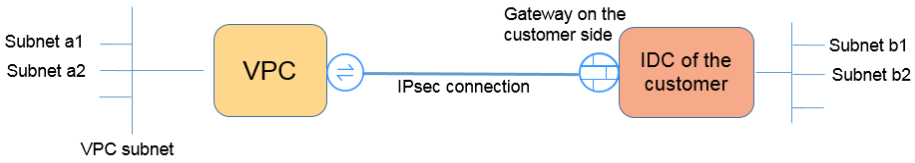
No.

VPN enables site-to-site connections by connecting the network of an on-premises data center to a VPC on the cloud.

1.1.5 What Is a VPN Connection? How Do I Set the Number of VPN Connections When Buying a VPN Gateway?

A VPN connection is an IPsec connection established between a VPN gateway and an independent public IP address of an on-premises data center. You can configure multiple local subnets (VPC subnets) and customer subnets (on-premises subnets) for one VPN connection.

The number of VPN connections to be created is determined by the number of on-premises data centers. Each VPN connection can connect a VPC to only one on-premises data center.



NOTE

In the preceding figure, if subnets a1 and a2 on the cloud need to communicate with subnets b1 and b2 on the on-premises network, you only need to create one VPN connection, with source CIDR blocks set to a1 and a2 and destination CIDR blocks set to b1 and b2.

1.1.6 Will I Be Notified If a VPN Connection Is Interrupted?

The VPN connection status can be monitored. After a VPN connection is created, the VPN service reports the connection status information to Cloud Eye, but does not send alarm notifications to you. To receive notifications, create alarm rules and enable **Alarm Notification** on the Cloud Eye console.

1.1.7 Are a Username and Password Required for Creating an IPsec VPN Connection?

No. IPsec VPN uses a pre-shared key (PSK) for authentication. The PSK is configured on a VPN gateway, and a connection will be established after VPN negotiation is complete. Therefore, no username or password is required for creating an IPsec VPN connection. Generally, SSL, PPTP, and L2TP VPNs use usernames and passwords for authentication.

NOTE

IPsec XAUTH provides extended authentication for IPsec VPN. It requires users to enter their usernames and passwords during VPN negotiation.

Currently, VPN does not support IPsec XAUTH.

1.1.8 What Are the Differences Between IPsec VPN and SSL VPN in Application Scenarios and Connection Modes?

Application Scenarios

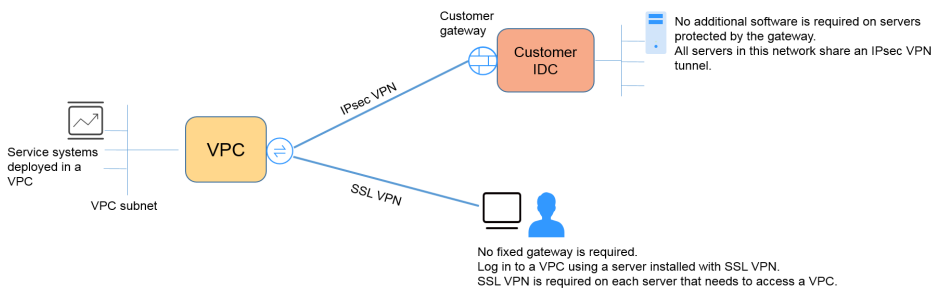
IPsec VPN connects two LANs, such as a branch and its headquarters (or a VPC), or an on-premises data center and a VPC.

SSL VPN connects a client to a LAN. For example, the portable computer of an employee on a business trip accesses the internal network of the company.

Connection Modes

IPsec VPN requires fixed gateways, such as firewalls or routers, at both ends. The administrator needs to configure gateways at both ends to enable them to complete IPsec VPN negotiation.

SSL VPN requires a specific client program installed on hosts. Users need to enter usernames and password to connect the hosts to SSL servers.



NOTE

IPsec VPN and SSL VPN are supported.

1.1.9 Is an IPsec VPN Connection Automatically Established?

Yes. An IPsec VPN connection is automatically established.

1.1.10 Can the EIP of a VPN Gateway Be Retained After the VPN Gateway Is Deleted?

If a pay-per-use EIP is bound to a pay-per-use VPN gateway, deleting the VPN gateway will also delete the bound EIP.

To retain such a pay-per-use EIP, unbind it before deleting the VPN gateway.

1.1.11 What VPN Resources Can Be Monitored?

VPN gateway

The following bandwidth information of a VPN gateway IP address can be monitored: inbound traffic, inbound bandwidth, outbound traffic, outbound bandwidth, and outbound bandwidth usage.

To view the monitoring information, click  in the **Gateway IP Address** column in the VPN gateway list.

VPN connection

The following information about a VPN connection can be monitored: VPN connection status, average link round-trip time (RTT), maximum link RTT, link packet loss rate, average tunnel RTT, maximum tunnel RTT, and tunnel packet loss rate.

To monitor average link RTT, maximum link RTT, link packet loss rate, average tunnel RTT, maximum tunnel RTT, and tunnel packet loss rate, click the VPN connection name and click **Add** in the **Health Check** area on the **Summary** tab page to add health check items. Private network metrics can be configured only when the VPN connection uses the static routing mode and the NQA function is enabled.

To view the status of a VPN connection, click  in the **Monitoring** column of the VPN connection.

1.1.12 In Which Direction Is the VPN Bandwidth Limited? What Is the Unit of Bandwidth?

Your purchased VPN gateway bandwidth applies to the outbound direction of the cloud. To achieve a balance between bandwidths in the inbound and outbound directions, the bandwidth in the inbound direction is limited as follows:

- If the purchased bandwidth is 10 Mbit/s or less, the bandwidth in the inbound direction is limited to 10 Mbit/s.
- If the purchased bandwidth is greater than 10 Mbit/s, the bandwidth in the inbound direction is the same as the purchased bandwidth.

The unit of bandwidth is Mbit/s and that of traffic is GB.

1.1.13 How Is the Network Speed of a VPN Connection Tested?

Test environment: A VPN connection has been created. ECSs have been created on the local subnets of VPCs at the two ends of the VPN connection. The ECSs can ping each other.

When the bandwidth of a purchased VPN gateway is 200 Mbit/s:

1. When the ECSs at the two ends of the VPN connection run Windows, iPerf3 and FileZilla (a free FTP application for file upload and download) are used to test the network speed. The test result is 180 Mbit/s, meeting requirements.

   NOTE

   The TCP-based FTP protocol has a congestion control mechanism, and the IPsec protocol adds new headers to original packets. As such, it is normal in the industry, to have a network speed deviation of about 10%.

   Figure 1-1 shows the result of testing the 200 Mbit/s bandwidth on the iPerf3 client.

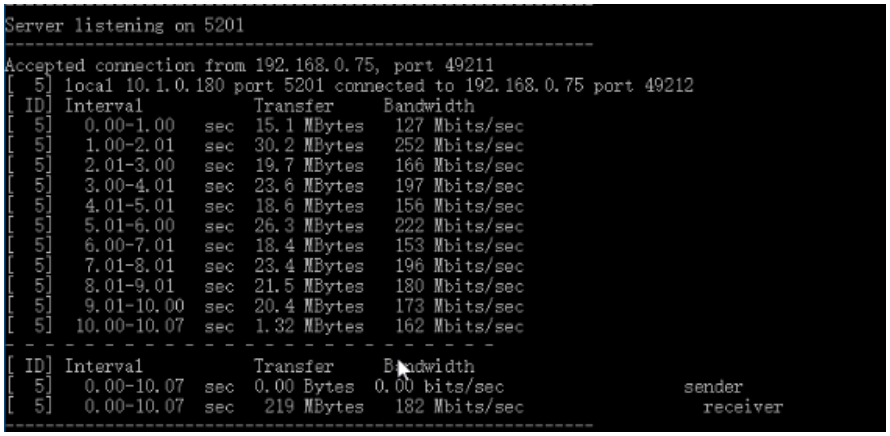
   Figure 1-1 Test result for 200 Mbit/s bandwidth (iPerf3 client)

   ```
   C:\Windows>iperf3 -c 10.1.0.180 -i 1 -w 1M
   Connecting to host 10.1.0.180, port 5201
   [  4] local 192.168.0.75 port 49212 connected to 10.1.0.180 port 5201
   [ ID] Interval           Transfer     Bandwidth
   [  4]   0.00-1.01   sec  17.1 MBytes   142 Mbits/sec
   [  4]   1.01-2.00   sec  30.0 MBytes   253 Mbits/sec
   [  4]   2.00-3.01   sec  19.8 MBytes   165 Mbits/sec
   [  4]   3.01-4.01   sec  23.2 MBytes   194 Mbits/sec
   [  4]   4.01-5.00   sec  18.9 MBytes   161 Mbits/sec
   [  4]   5.00-6.01   sec  26.2 MBytes   219 Mbits/sec
   [  4]   6.01-7.01   sec  18.4 MBytes   153 Mbits/sec
   [  4]   7.01-8.01   sec  23.2 MBytes   195 Mbits/sec
   [  4]   8.01-9.00   sec  21.1 MBytes   180 Mbits/sec
   [  4]   9.00-10.01  sec  21.0 MBytes   174 Mbits/sec
   - - - - - - - - - - - - - - - - - - - - - - - - -
   [ ID] Interval           Transfer     Bandwidth
   [  4]   0.00-10.01  sec   219 MBytes   183 Mbits/sec                  sender
   [  4]   0.00-10.01  sec   219 MBytes   183 Mbits/sec                  receiver

   iperf Done.
   ```

   Figure 1-2 shows the result of testing the 200 Mbit/s bandwidth on the iPerf3 server.

Figure 1-2 Test result for 200 Mbit/s bandwidth (iPerf3 server)

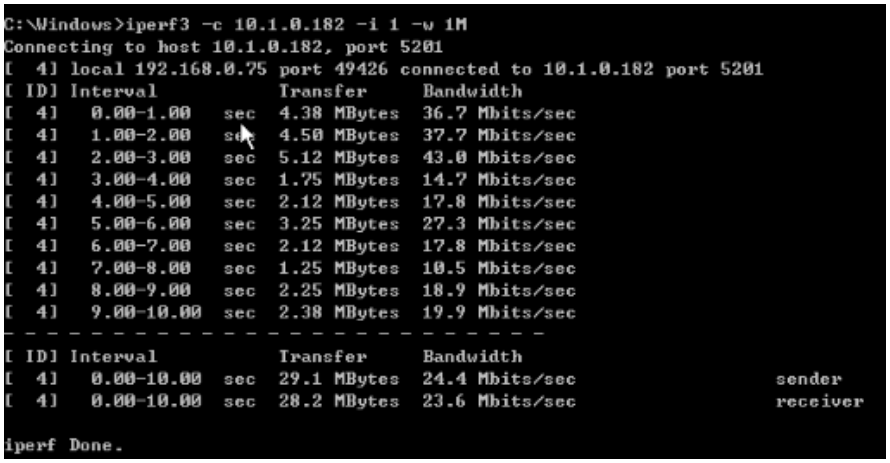


2. When the ECSs at the two ends of the VPN connection run CentOS 7, iPerf3 is used to test the network speed. The test result is 180 Mbit/s, meeting requirements.
3. When the ECS functioning as a server runs CentOS 7 and the ECS functioning as a client runs Windows, iPerf3 and FileZilla are used to test the network speed. The test result is 20 Mbit/s, failing to meet requirements.

   This is because TCP implementations on Windows and Linux are different.

   Figure 1-3 shows the result of using iPerf3 to test the network speed between two ECSs running different operating systems.

Figure 1-3 Test result on iPerf3



When the bandwidth of a purchased VPN gateway is 1000 Mbit/s:

NOTE

Some regions support only 300 Mbit/s bandwidth by default. If higher bandwidth is required, select 300 Mbit/s bandwidth and then **submit a service ticket** for capacity expansion.

The VPN gateway bandwidth is shared by all of its VPN connections. To fully use the large bandwidth of 1000 Mbit/s, deploy multiple ECSs with high specifications as the forwarding performance of a single ECS is limited. ECSs with their NICs supporting the bandwidth of 2 Gbit/s or higher are recommended.

Conclusions: Based on the preceding test results, bandwidths of VPN gateways meet requirements. To fully use your purchased bandwidth, you are advised to use servers running the same operating system and using NICs meeting certain requirements at the two ends of a VPN connection.

1.1.14 Can a VPN Billed by Traffic Use a Shared Data Package?

Yes.

The VPN service fee includes the EIP fee. An EIP can use a shared data package.

1.1.15 How Do I Change the Billing Mode of a VPN Gateway from Pay-Per-Use to Yearly/Monthly?

Prerequisites

- A pay-per-use VPN gateway is billed by bandwidth.
- To change the billing mode of a VPN gateway billed by traffic from pay-per-use to yearly/monthly, first change the VPN gateway from being billed by traffic to being billed by bandwidth and then from pay-per-use to yearly/monthly.

Procedure

Perform the following operations:

1. Log in to the management console.
2. Click  in the upper left corner and select the desired region and project.
3. Click **Service List** and choose **Networking** > **Virtual Private Network**.
4. In the navigation pane on the left, choose **Virtual Private Network** > **Enterprise – VPN Gateways**.
5. On the **VPN Gateways** page, locate the row that contains the target VPN gateway, choose **More** > **Change Billing Mode** in the **Operation** column.
6. In the **Change Billing Mode** dialog box, click **OK**.

   NOTE

   The billing mode of a VPN gateway cannot be changed from yearly/monthly to pay-per-use. The resource quotas of a yearly/monthly VPN gateway can be decreased upon a renewal.
7. Confirm the VPN gateway information, set a renewal duration, and click **Pay**.
8. On the payment page, confirm the order information, select a coupon or discount, select a payment method, and click **Pay**.

   NOTE

   Changing the billing mode of a VPN gateway from pay-per-use to yearly/monthly will not affect your services.

1.1.16 What Are the Relationships Between a VPC, a VPN Gateway, and a VPN Connection?

When your on-premises data center needs to access ECSs in a VPC, you can create a VPN gateway to establish a VPN connection between your on-premises data center and the VPC.

- VPC
  - A VPC is a private network on the cloud. Multiple VPCs can be created in the same region while they are isolated from each other. A VPC can be divided into multiple subnets.
  - You can use the VPN service to securely access ECSs in a VPC.
- VPN gateway
  - A VPN gateway is created in a VPC and is the access point of a VPN connection. One VPC can have multiple VPN gateways, and one VPN gateway can have multiple VPN connections.
  - With a VPN gateway, a secure, reliable, and encrypted connection can be established between a VPC and an on-premises data center or between VPCs in different regions.
- VPN connection

  A VPN connection is created for a VPN gateway and connects a VPC to an on-premises data center (or a VPC in another region).

  NOTE

  The number of VPN connections is irrelevant to the number of local subnets or the number of customer subnets. It is only related to the number of on-premises data centers (or VPCs in other regions) to be connected to your VPC. The created VPN connections are displayed in the VPN connection list. You can also view the number of VPN connections created for each VPN gateway.

1.1.17 What Are a Customer Gateway and a Customer Subnet in a VPN Connection?

A VPN connection is created on the cloud. As such, a subnet of a VPC is a local subnet, and a VPN gateway created on the cloud is a local gateway. The subnet and gateway in an on-premises data center connected to the VPC are a customer subnet and a customer gateway, respectively.

A customer gateway's IP address is a public IP address.

1.1.18 How Many VPN Connections Do I Need to Connect Multiple On-premises Servers to the Cloud?

VPN uses the IPsec technology to connect your on-premises data center to a VPC on the cloud. As such, the number of VPN connections is related to the number of data centers where the servers to be connected to the cloud are located, but not to the number of servers.

Two EIPs can be bound to a VPN gateway for communication with a customer gateway.

- If an on-premises data center has only one egress gateway, all servers or hosts in the data center connect to the Internet through this gateway. In this case, you need to configure a VPN connection group consisting of two VPN connections. That is, configure a VPN connection for each of the two EIPs of the VPN gateway to communicate with the egress gateway in the on-premises data center.
- If an on-premises data center has two egress gateways, the servers or user hosts in the data center connect to the Internet through the two egress gateways. In this case, you need to configure two VPN connection groups, each of which consisting of two VPN connections. That is, configure a VPN connection for each of the two EIPs of each VPN gateway to communicate with both egress gateways in the on-premises data center.

1.1.19 Does a VPN Allow for Communications Between Two VPCs?

- If the two VPCs are in the same region, use a VPC peering connection to connect them.
- If the two VPCs are in different regions, use a VPN to connect them. The operations are as follows:
  a. Create a VPN gateway for each VPC, and create a VPN connection between the two VPN gateways.
  b. For the VPN connection, set the customer gateway to the EIP of the peer VPN gateway.
  c. For the VPN connection, set the customer subnet to the subnet of the peer VPC.
  d. Set the same pre-shared keys (PSKs) and algorithms for the two VPCs.

1.1.20 What Are the Impacts of a VPN on an On-premises Network? What Are the Changes to the Route for Accessing an ECS?

When configuring a VPN, you need to perform the following operations on the gateway in your on-premises data center:

- Configure IKE and IPsec policies.
- Set the connection mode to route-based or policy-based.
- Check the route configuration on the gateway to ensure that traffic destined for a VPC can be routed to the correct outbound interface (interface having an IPsec policy bound).

1.1.21 Can I Connect a Network with Two Egresses to a VPC Through Two VPN Connections?

Yes.

1.1.22 How Can I Prevent VPN Disconnections?

VPN connections are renegotiated when the IPsec SA lifetime is about to expire or the data transmitted through a VPN connection exceeds 20 GB. Usually, renegotiation does not interrupt VPN connections.

Most disconnections are caused by incorrect configurations at the two ends of the VPN connection or renegotiation failures due to Internet exceptions.

Common causes of disconnections are as follows:

- ACLs at both ends of the VPN connection do not match.
- SA lifetime settings at both ends of the VPN connection are different.
- Dead Peer Detection (DPD) is not configured on the device in your on-premises data center.
- Configuration is modified when the VPN connection is in use.
- Jitter occurs on the carrier's network.

As such, ensure that the following VPN configurations are correct to keep VPN connections alive:

- At the two ends of the VPN connection, the local and customer subnet configurations are reversed.
- SA lifetime settings at both ends of the VPN connection are the same.
- DPD is enabled on the on-premises gateway device, and the number of detection times is 3 or more.
- Parameters are modified at both ends of the VPN connection during the use of the VPN connection.
- Set TCP MAX-MSS to 1300 for the on-premises gateway device.
- The bandwidth of the on-premises gateway device is large enough for the VPN connection.
- VPN connection negotiation can be triggered by both ends and active negotiation has been enabled on the on-premises gateway device.

1.1.23 What Do I Do If a VPN Connection Fails to Be Established?

1. Log in to the management console, and choose **Virtual Private Network** > **Enterprise – VPN Connections**.
2. In the VPN connection list, locate the target VPN connection, and choose **More** > **Modify Policy Settings** on the right to view IKE and IPsec policies of the VPN connection.
3. Check the IKE and IPsec policies to see whether the negotiation modes and encryption algorithms at both ends of the VPN connection are the same.

   If the IKE SA has been set up in phase 1 but no IPsec SA has been established in phase 2, the IPsec policies at both ends of the VPN connection may be inconsistent.
4. Check whether the ACL configurations are correct.

   If the subnets of your on-premises data center are 192.168.3.0/24 and 192.168.4.0/24, and the VPC subnets are 192.168.1.0/24 and 192.168.2.0/24,

configure the ACL rules for each on-premises subnet to allow communication with the VPC subnets. The following provides an example of ACL configurations:

```
rule 1 permit ip source 192.168.3.0 0.0.0.255 destination 192.168.1.0 0.0.0.255
rule 2 permit ip source 192.168.3.0 0.0.0.255 destination 192.168.2.0 0.0.0.255
rule 3 permit ip source 192.168.4.0 0.0.0.255 destination 192.168.1.0 0.0.0.255
rule 4 permit ip source 192.168.4.0 0.0.0.255 destination 192.168.2.0 0.0.0.255
```

5. Ping the two ends of the VPN connection from each other to check whether the VPN connection is normal.

1.1.24 Can EIPs Be Used as VPN Gateway IP Addresses?

In Enterprise Edition VPN, EIPs can be used as VPN gateway IP addresses.

When creating a VPN gateway, you can bind EIPs as the gateway IP addresses.

1.1.25 Why Is a VPN Connection Always in Not Connected State After Its Configuration Is Complete?

The configuration may be incorrect.

1. At the two ends (cloud and on-premises data center) of the VPN connection, ensure that the pre-shared keys (PSKs) and negotiation information are consistent, the local and remote subnets are reversed, and the local and remote gateways are also reversed.
2. Ensure that routes, NAT, and security policies are correctly configured on the device in your on-premises data center.

1.1.26 Do I Need to Configure ACL Rules on the Console After I Configure ACL Rules on the On-premises Gateway Device?

You need to configure policy rules (ACL rules) for a VPN connection on the management console only when **VPN Type** is set to **Policy-based**.

1.1.27 How Do I Determine Which EIP Is Used for Transmitting Service Traffic That Leaves the Cloud?

- If the HA mode of a VPN gateway is active/standby:

  The outgoing traffic from the VPN gateway to the customer subnet is preferentially transmitted through the VPN connection set up between the customer subnet and the active EIP.
- If the HA mode of a VPN gateway is active-active:
  - When **Associate With** is set to **Enterprise Router**, the outgoing traffic from the VPN gateway to the customer subnet is load balanced among all VPN connections set up with the customer subnet.
  - When **Associate With** is set to **VPC**, the outgoing traffic from the VPN gateway to the customer subnet is preferentially forwarded through the VPN connection that is first set up between the customer subnet and an EIP.
- You can perform the following operations to check the VPN connection through which traffic leaves the cloud:

a. Log in to the management console.

b. Click  in the upper left corner of the page, select a region, and choose **Management & Governance** > **Cloud Eye**.

c. Choose **Cloud Service Monitoring** from the navigation tree. The **Cloud Service Dashboards** page is displayed.

d. Click **Virtual Private Network VPN** in the **Dashboard** column. The **Details** page is displayed.

e. Choose **S2C VPN Connection**, click the **Resources** tab, and click **View Metric** in the **Operation** column of the target VPN connection.

Check the metrics of the VPN connection. If the value of the **Traffic Send Rate** metric is not 0, the traffic is transmitted through this connection.

1.2 General Consulting

1.2.1 What Are the Typical Scenarios of IPsec VPN?

A VPN is a point-to-point connection that implements private network access between two points.

- Applicable scenarios:
  - A VPN is created between different regions to enable cross-region VPC communications.
  - A VPN hub is used together with VPC peering connections and Cloud Connect connections to enable communications between an on-premises data center and multiple VPCs on the cloud.
  - A VPN is used together with source NAT to enable access to specific IP addresses across clouds.
  - A VPN can be used between the cloud and your home network that uses PPPoE dial-up.
  - A VPN can be used between the cloud and 4G/5G routers.
  - A VPN can be used between the cloud and your personal terminals.
- Not applicable scenarios:
  - A VPN cannot be used to connect VPCs in the same region. It is recommended that you use VPC peering connections to enable communications between VPCs in the same region.

1.2.2 What Are a VPC, a VPN Gateway, and a VPN Connection?

VPC enables you to create private, isolated virtual networks. You can use VPN to securely access ECSs in VPCs.

A VPN gateway is an egress gateway for a VPC. With a VPN gateway, you can create a secure, reliable, and encrypted connection between a VPC and an on-premises data center or between two VPCs in different regions.

A VPN connection is a secure and reliable IPsec encrypted communications tunnel established between a VPN gateway and the customer gateway in an on-premises data center.

To create a VPN on the cloud, perform the following operations:

1. Create a VPN gateway. You need to specify the VPC to be connected, as well as the bandwidth and EIPs of the VPN gateway.
2. Create a VPN connection. You need to specify the gateway EIP used to connect to the customer gateway, subnets, and negotiation policies.

1.2.3 What Are the Relationships Between a VPC, a VPN Gateway, and a VPN Connection?

When your on-premises data center needs to access ECSs in a VPC, you can create a VPN gateway to establish a VPN connection between your on-premises data center and the VPC.

- VPC
  - A VPC is a private network on the cloud. Multiple VPCs can be created in the same region while they are isolated from each other. A VPC can be divided into multiple subnets.
  - You can use the VPN service to securely access ECSs in a VPC.
- VPN gateway
  - A VPN gateway is created in a VPC and is the access point of a VPN connection. One VPC can have multiple VPN gateways, and one VPN gateway can have multiple VPN connections.
  - With a VPN gateway, a secure, reliable, and encrypted connection can be established between a VPC and an on-premises data center or between VPCs in different regions.
- VPN connection

  A VPN connection is created for a VPN gateway and connects a VPC to an on-premises data center (or a VPC in another region).

  NOTE

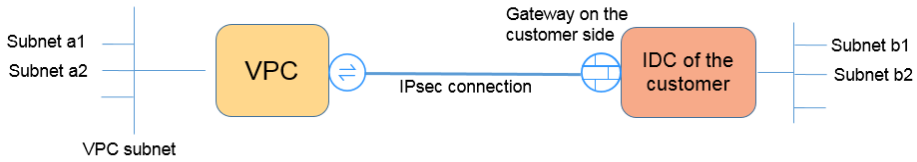
  The number of VPN connections is irrelevant to the number of local subnets or the number of customer subnets. It is only related to the number of on-premises data centers (or VPCs in other regions) to be connected to your VPC. The created VPN connections are displayed in the VPN connection list. You can also view the number of VPN connections created for each VPN gateway.

1.2.4 What Is a VPN Connection? How Do I Set the Number of VPN Connections When Buying a VPN Gateway?

A VPN connection is an IPsec connection established between a VPN gateway and an independent public IP address of an on-premises data center. You can configure multiple local subnets (VPC subnets) and customer subnets (on-premises subnets) for one VPN connection.

The number of VPN connections to be created is determined by the number of on-premises data centers. Each VPN connection can connect a VPC to only one on-premises data center.

If you choose to buy a yearly/monthly VPN gateway, set the number of VPN connections based on the number of on-premises data centers to be connected.



NOTE

In the preceding figure, if subnets a1 and a2 on the cloud need to communicate with subnets b1 and b2 on the on-premises network, you only need to create one VPN connection, with source CIDR blocks set to a1 and a2 and destination CIDR blocks set to b1 and b2.

1.2.5 What Are a Customer Gateway and a Customer Subnet in a VPN Connection?

A VPN connection is created on the cloud. As such, a subnet of a VPC is a local subnet, and a VPN gateway created on the cloud is a local gateway. The subnet and gateway in an on-premises data center connected to the VPC are a customer subnet and a customer gateway, respectively.

A customer gateway's IP address is a public IP address.

1.2.6 How Do I Plan CIDR Blocks for Access to a VPC Through a VPN Connection?

- The CIDR blocks of a VPC cannot conflict with on-premises CIDR blocks.
- To avoid conflicts with cloud service addresses, do not use 127.0.0.0/8, 169.254.0.0/16, 224.0.0.0/3, 100.64.0.0/10, 100.64.0.0/12, and 214.0.0.0/8 for your on-premises network.

  If you need to use 100.64.0.0/10 or 100.64.0.0/12, **submit a service ticket**.

1.2.7 Is an IPsec VPN Connection Automatically Established?

Yes. An IPsec VPN connection is automatically established.

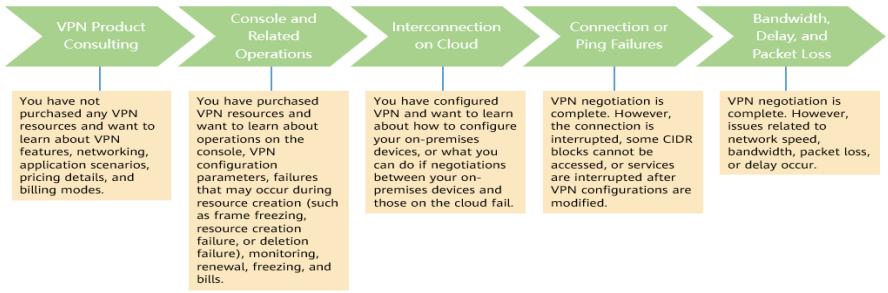
1.2.8 What Types of VPN Service Tickets Are There? How Do I Create a VPN Service Ticket?

1. Log in to the management console.
2. Choose **Service Tickets** > **Create Service Ticket** in the upper right corner.
3. Search for "VPN" and choose **Virtual Private Network (VPN)**.
4. Select an issue category.

NOTE

When you **submit a service ticket**, select an issue category to facilitate problem handling.

Figure 1-4 Issue category and classification basis



1.2.9 What Devices Can Be Connected to Huawei Cloud Through a VPN?

VPN supports the standard Internet Protocol Security (IPsec) protocol. A device in your on-premises data center can connect to the cloud if the device meets the following requirements:

1. Supports IPsec VPN.
2. Has a fixed public IP address, which can be statically configured, or translated through NAT in NAT traversal scenarios (your device is deployed behind a NAT gateway).

Most devices are routers and firewalls.

NOTE

- Common home broadband routers, Windows hosts providing VPN services (such as L2TP), and personal mobile terminals cannot connect to the cloud through a VPN.
- The following products can connect to the cloud through VPNs:
  - Devices: Huawei firewalls and access routers (ARs), Hillstone firewalls, and Check Point firewalls
  - Cloud services: Alibaba Cloud, Tencent Cloud, Amazon Web Services (AWS), and Microsoft Azure
  - Software: strongSwan
- The IPsec protocol is a standard IETF protocol. Devices that support IPsec can interconnect with the cloud through a VPN.

  Most enterprise-class routers and firewalls support the IPsec protocol.
- Some devices support IPsec VPN only after you purchase required software licenses.

  Your on-premises data center administrator can check with the device vendor whether a license is required based on the device model.

1.2.10 What Are VPN Negotiation Parameters? What Are Their Default Values?

Table 1-2 VPN negotiation parameters

Protocol	Parameter	Value
IKE	Version	• v1 (v1 has low security. If the device supports v2, v2 is recommended.) • v2 (default value)
	Negotiation Mode	• Main (default value) • Aggressive
	Authentication Algorithm	• MD5 (This algorithm is insecure. Exercise caution when using this algorithm.) • SHA1 (This algorithm is insecure. Exercise caution when using this algorithm.) • SHA2-256 (default value) • SHA2-384 • SHA2-512
	Encryption Algorithm	• 3DES (This algorithm is insecure. Exercise caution when using this algorithm.) • AES-128 (default value) • AES-192 (This algorithm is insecure. Exercise caution when using this algorithm.) • AES-256 (This algorithm is insecure. Exercise caution when using this algorithm.)

Protocol	Parameter	Value
	DH Algorithm	• Group 1 (This algorithm is insecure. Exercise caution when using this algorithm.) • Group 2 (This algorithm is insecure. Exercise caution when using this algorithm.) • Group 5 (This algorithm is insecure. Exercise caution when using this algorithm.) • Group 14 (default value) • Group 15 • Group 16 • Group 19 • Group 20 • Group 21
	Lifetime (s)	**86400** (default value) Unit: second Value range: **60** to **604800**
	Local ID	• IP Address The local IP address is automatically displayed as the EIP of the VPN gateway, removing the need to manually configure it. • FQDN By default, the local ID type is IP address and the local ID value is the EIP of the VPN gateway.
	Customer ID	• IP Address • FQDN By default, the customer ID type is IP address and the customer ID value is the public IP address of the customer gateway.
IPsec	Authentication Algorithm	• SHA1 (This algorithm is insecure. Exercise caution when using this algorithm.) • MD5 (This algorithm is insecure. Exercise caution when using this algorithm.) • SHA2-256 (default value) • SHA2-384 • SHA2-512

Protocol	Parameter	Value
	Encryption Algorithm	• AES-128 (default value) • AES-192 (This algorithm is insecure. Exercise caution when using this algorithm.) • AES-256 (This algorithm is insecure. Exercise caution when using this algorithm.) • 3DES (This algorithm is insecure. Exercise caution when using this algorithm.) • AES-128-GCM-16 • AES-256-GCM-16
	PFS	• DH group 1 (This algorithm is insecure. Exercise caution when using this algorithm.) • DH group 2 (This algorithm is insecure. Exercise caution when using this algorithm.) • DH group 5 (This algorithm is insecure. Exercise caution when using this algorithm.) • DH group 14 (default value) • DH group 15 • DH group 16 • DH group 19 • DH group 20 • DH group 21 • Disable (not recommended due to security risks)
	Transfer Protocol	• ESP (default value)
	Lifetime (s)	**3600** (default value) Unit: second Value range: **30** to **604800**

NOTE

- Perfect Forward Secrecy (PFS) is a security feature.

  IKE negotiation has two phases, phase one and phase two. The key of phase two (IPsec SA) is derived from the key generated in phase one. Once the key in phase one is disclosed, the security of the IPsec VPN may be adversely affected. To improve the key security, IKE provides PFS. When PFS is enabled, an additional DH exchange will be performed during IPsec SA negotiation to generate a new IPsec SA key, improving IPsec SA security.
- For security purposes, PFS is enabled on the cloud side by default. Ensure that PFS is also enabled on the gateway device in your on-premises data center and the PFS settings on both ends are the same. Otherwise, the negotiation will fail.
- The cloud side does not support the configuration of the traffic-based IPsec SA lifetime. That is, IPsec SAs are not aged based on traffic on the cloud side.

1.2.11 Are a Username and Password Required for Creating an IPsec VPN Connection?

No. IPsec VPN uses a pre-shared key (PSK) for authentication. The PSK is configured on a VPN gateway, and a connection will be established after VPN negotiation is complete. Therefore, no username or password is required for creating an IPsec VPN connection. Generally, SSL, PPTP, and L2TP VPNs use usernames and passwords for authentication.

NOTE

IPsec XAUTH provides extended authentication for IPsec VPN. It requires users to enter their usernames and passwords during VPN negotiation.

Currently, VPN does not support IPsec XAUTH.

1.2.12 How Do I Allow Specific Hosts to Access a VPC Subnet Through a Created VPN Connection?

Restrictions in the on-premises data center:

- Access control policies on the VPN device
- ACL rules on the router or switch

Restrictions at the cloud side:

- Security group rules that permit access only from specified IP addresses
- ACL rules

NOTE

You are advised not to change the local or customer subnet to control access.

1.2.13 What VPN Resources Can Be Monitored?

VPN gateway

The following bandwidth information of a VPN gateway IP address can be monitored: inbound traffic, inbound bandwidth, outbound traffic, outbound bandwidth, and outbound bandwidth usage.

VPN connection

The following information about a VPN connection can be monitored: VPN connection status, average link round-trip time (RTT), maximum link RTT, link packet loss rate, average tunnel RTT, maximum tunnel RTT, and tunnel packet loss rate.

To monitor average link RTT, maximum link RTT, link packet loss rate, average tunnel RTT, maximum tunnel RTT, and tunnel packet loss rate, click the VPN connection name and click **Add** in the **Health Check** area on the **Summary** tab page to add health check items. Private network metrics can be configured only when the VPN connection uses the static routing mode and the NQA function is enabled.

1.2.14 Can EIPs Be Used as VPN Gateway IP Addresses?

Yes.

When creating a VPN gateway, you can bind EIPs as the gateway IP addresses.

1.2.15 Do I Need to Purchase EIPs for Hosts to Communicate with Each Other Through a VPN?

If your on-premises hosts need to access an ECS on the cloud through a VPN, you do not need to purchase any EIPs for the ECS.

If an ECS needs to provide services accessible from the Internet, you need to purchase an EIP for the ECS.

1.2.16 Are SSL VPNs Supported?

Currently, SSL VPNs are supported.

1.2.17 How Long Does It Take for Delivered VPN Configurations to Take Effect?

It takes 1–5 minutes for the VPN configurations to take effect.

NOTE

After VPN configurations take effect, configure your gateway device on your on-premises network to complete tunnel negotiation with the VPN gateway.

1.2.18 Does VPN Support IPv6?

Yes.

Currently, VPN supports both IPv4 and IPv6.

No.

1.2.19 How Do I Determine My VPN Bandwidth?

Consider the following when you determine the bandwidth:

- Amount of data transmitted over a VPN tunnel in a period of time (Reserve enough bandwidth to prevent link congestion.)

- Egress bandwidths at the two ends of a VPN connection: The egress bandwidth at the cloud side must be less than that at the on-premises side.

1.2.20 Does a VPN Connection Support SM Series Cryptographic Algorithms?

Yes.

Use the algorithms provided on the management console for VPN negotiation. Additionally, ensure that the two ends of a VPN connection use the same algorithms.

1.2.21 Which IKE Version Should I Select When I Create a VPN Connection?

IKEv2 is recommended because IKEv1 is not secure. In addition, IKEv2 outperforms IKEv1 in connection negotiation and establishment, authentication methods, dead peer detection (DPD) timeout processing, and security association (SA) timeout processing.

IKEv2 will be widely used, and IKEv1 will gradually phase out.

Introduction to IKEv1 and IKEv2

- As a hybrid protocol, IKEv1 brings some security and performance defects due to its complexity. As such, it has become a bottleneck in the IPsec system.
- IKEv2 addresses the issues of IKEv1 while retaining basic functions of IKEv1. IKEv2 is more simplified, efficient, secure, and robust than IKEv1. Additionally, IKEv2 is defined by RFC 4306 in a single document, whereas IKEv1 are defined in multiple documents. By minimizing core functions and default password algorithms, IKEv2 greatly improves interoperability between different IPsec VPNs.

Security Risks of IKEv1

- The cryptographic algorithms supported by IKEv1 have not been updated for more than 10 years. In addition, IKEv1 does not support strong cryptographic algorithms such as AES-GCM and ChaCha20-Poly1305. For IKEv1, the E (Encryption) bit in the ISALMP header specifies that the payloads following the ISALMP header are encrypted, but any data integrity verification of those payloads is handled by a separate hash payload. This separation of encryption from data integrity protection prevents the use of authenticated encryption (AES-GCM) with IKEv1.
- IKEv1 is vulnerable to DoS amplification attacks and half-open connection attacks. After responding to spoofed packets, the responder maintains initiator-responder relationships, consuming a large number of system resources.

  This defect is inherent to IKEv1 and is addressed in IKEv2.
- The aggressive mode of IKEv1 is not secure. In this mode, information packets are not encrypted, posing risks of information leakage. There are also brute-force attacks targeting at the aggressive mode, such as man-in-the-middle attacks.

Differences Between IKEv1 and IKEv2

- **Negotiation process**
  - IKEv1 is complex and consumes a large amount of bandwidth. IKEv1 SA negotiation consists of two phases. In IKEv1 phase 1, an IKE SA is established in either main mode or aggressive mode. Main mode requires three exchanges between peers totaling six ISAKMP messages, whereas aggressive mode requires two exchanges totaling three ISAKMP messages. Aggressive mode is faster, but does not provide identity protection for peers as key exchange and identity authentication are performed simultaneously. In IKEv1 phase 2, IPsec SAs are established through three ISAKMP messages in quick mode.
  - Compared with IKEv1, IKEv2 simplifies the SA negotiation process. IKEv2 requires only two exchanges, totaling four messages, to establish an IKE SA and a pair of IPsec SAs. To create multiple pairs of IPsec SAs, only one additional exchange is needed for each additional pair of SAs.

    NOTE

    For IKEv1 negotiation, its main mode involves nine (6+3) messages, and its aggressive mode involves six (3+3) messages. In contrast, IKEv2 negotiation requires only four (2+2) messages.
- **Authentication methods**
  - Only IKEv1 (requiring an encryption card) supports digital envelope authentication (HSS-DE).
  - IKEv2 supports Extensible Authentication Protocol (EAP) authentication. IKEv2 can use an AAA server to remotely authenticate mobile and PC users and assign private IP addresses to these users. IKEv1 does not provide this function and must use L2TP to assign private IP addresses.
  - Only IKEv2 supports IKE SA integrity algorithms.
- **DPD timeout processing**
  - Only IKEv1 supports the **retry-interval** parameter. If a device sends a DPD packet but receives no reply within the specified retry-interval, the device records a DPD failure event. When the number of DPD failure events reaches 5, both the IKE SA and IPsec SAs are deleted. IKE SA negotiation will start again only when there is traffic to be transmitted over the IPsec tunnel.
  - In IKEv2, the retransmission interval increases from 1, 2, 4, 8, 16, 32 to 64, in seconds. If no reply is received within eight consecutive transmissions, the peer end is considered dead, and the IKE SA and IPsec SAs are deleted.
- **IKE SA timeout processing and IPsec SA timeout processing**

  In IKEv2, the IKE SA soft lifetime is 9/10 of the IKE SA hard lifetime plus or minus a random number. This reduces the likelihood that two ends initiate renegotiation simultaneously. Therefore, you do not manually set the soft lifetime in IKEv2.

Advantages of IKEv2 over IKEv1

- Simplifies the SA negotiation process, improving efficiency.
- Fixes many cryptographic security vulnerabilities, improving security.

- Supports EAP authentication, improving authentication flexibility and scalability.

  EAP is an authentication protocol that supports multiple authentication methods. The biggest advantage of EAP is its scalability. That is, new authentication methods can be added without changing the original authentication system. EAP authentication has been widely used in dial-up access networks.
- Employs an Encrypted Payload on basis of ESP. This payload contains both an encryption algorithm and a data integrity algorithm. AES-GCM ensures confidentiality, integrity, and authentication, and works well with IKEv2.

1.2.22 How Many Bits Do the DH Groups Used by VPN Have?

Diffie-Hellman (DH) groups determine the strength of the key used in the key exchange process. Higher DH group numbers are usually more secure, but more time is required to calculate the key.

Table 1-3 lists the number of bits corresponding to the DH groups used by VPN.

Table 1-3 Number of bits corresponding to each DH group

DH Group	Modulus
1	768 bits
2	1024 bits
5	1536 bits
14	2048 bits
15	3072 bits
16	4096 bits
19	256 bits (ECP)
20	384 bits (ECP)
21	521 bits (ECP)

NOTE

The following DH algorithms have security risks and are not recommended: DH group 1, DH group 2, and DH group 5.

1.2.23 Can I Visit Websites Across International Borders Using a VPN?

No.

VPN enables site-to-site connections by connecting the network of an on-premises data center to a VPC on the cloud.

1.2.24 Can I Deploy an Application on the Cloud and a Database in an On-premises Data Center and Connect Them Through a VPN?

Yes.

A VPN connects a VPC and an on-premises data center.

After a VPN is set up, service traffic can be transmitted between the VPC and on-premises data center. For an application server on the cloud, access to an on-premises database is logically the same as access to other hosts in the same LAN. Given this, it is feasible to use a VPN to connect an application on the cloud to a database in an on-premises data center.

This is a typical IPsec VPN scenario.

Additionally, there are no limitations on the service initiator. That is, service requests can be initiated from the cloud or the on-premises data center.

NOTICE

- After a VPN is set up, check the network latency and packet loss rate to ensure smooth service running.
- It is recommended that you run the ping command to check the packet loss and network latency details.

1.2.25 What Are the Differences Between IPsec VPN and SSL VPN in Application Scenarios and Connection Modes?

Application Scenarios

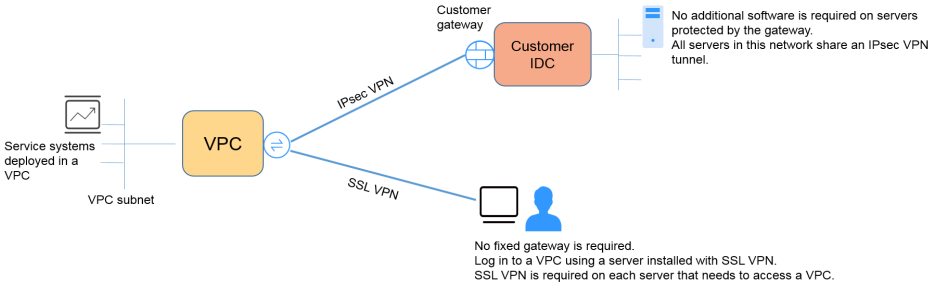
IPsec VPN connects two LANs, such as a branch and its headquarters (or a VPC), or an on-premises data center and a VPC.

SSL VPN connects a client to a LAN. For example, the portable computer of an employee on a business trip accesses the internal network of the company.

Connection Modes

IPsec VPN requires fixed gateways, such as firewalls or routers, at both ends. The administrator needs to configure gateways at both ends to enable them to complete IPsec VPN negotiation.

SSL VPN requires a specific client program installed on hosts. Users need to enter usernames and password to connect the hosts to SSL servers.



1.2.26 What Are the Differences Between Billing the VPN Gateway EIP Bandwidth by Bandwidth and by Traffic?

The VPN gateway EIP bandwidth can be billed by bandwidth or by traffic.

The differences are as follows:

- Billed by bandwidth: The billing cycle is 1 hour. The generated fee depends on the bandwidth.
- Billed by traffic: The fee is calculated based on the outgoing traffic of a VPC generated every hour, which is not affected by the bandwidth.

If you select the more cost-effective yearly/monthly billing mode, VPN gateways can only be billed by bandwidth.

1.2.27 Can a VPN Billed by Traffic Use a Shared Data Package?

Yes.

The VPN service fee includes the EIP fee. An EIP can use a shared data package.

1.2.28 Can the EIP of a VPN Gateway Be Retained After the VPN Gateway Is Deleted?

If a pay-per-use EIP is bound to a pay-per-use VPN gateway, deleting the VPN gateway will also delete the bound EIP.

To retain such a pay-per-use EIP, unbind it before deleting the VPN gateway.

1.2.29 Where Can I Add Routes to Customer Subnets on the VPN Console?

When a VPN connection is created, routes to customer subnets are automatically delivered.

1.2.30 Will I Be Notified If a VPN Connection Is Interrupted?

The VPN connection status can be monitored. After a VPN connection is created, the VPN service reports the connection status information to Cloud Eye, but does not send alarm notifications to you. To receive notifications, create alarm rules and enable **Alarm Notification** on the Cloud Eye console.

1.2.31 What Do I Do If a VPN Connection Fails to Be Established?

1. Log in to the management console and choose **Virtual Private Network** > **Enterprise – VPN Connections**.
2. In the VPN connection list, locate the target VPN connection, and choose **More** > **Modify Policy Settings** on the right to view IKE and IPsec policies of the VPN connection.
3. Check the IKE and IPsec policies to see whether the negotiation modes and encryption algorithms at both ends of the VPN connection are the same.

   If the IKE SA has been set up in phase 1 but no IPsec SA has been established in phase 2, the IPsec policies at both ends of the VPN connection may be inconsistent.
4. Check whether the ACL configurations are correct.

   If the subnets of your on-premises data center are 192.168.3.0/24 and 192.168.4.0/24, and the VPC subnets are 192.168.1.0/24 and 192.168.2.0/24, configure the ACL rules for each on-premises subnet to allow communication with the VPC subnets. The following provides an example of ACL configurations:

   ```
   rule 1 permit ip source 192.168.3.0 0.0.0.255 destination 192.168.1.0 0.0.0.255
   rule 2 permit ip source 192.168.3.0 0.0.0.255 destination 192.168.2.0 0.0.0.255
   rule 3 permit ip source 192.168.4.0 0.0.0.255 destination 192.168.1.0 0.0.0.255
   rule 4 permit ip source 192.168.4.0 0.0.0.255 destination 192.168.2.0 0.0.0.255
   ```
5. Ping the two ends of the VPN connection from each other to check whether the VPN connection is normal.

1.2.32 In Which Direction Is the VPN Bandwidth Limited? What Is the Unit of Bandwidth?

Your purchased VPN gateway bandwidth applies to the outbound direction of the cloud. To achieve a balance between bandwidths in the inbound and outbound directions, the bandwidth in the inbound direction is limited as follows:

- If the purchased bandwidth is 10 Mbit/s or less, the bandwidth in the inbound direction is limited to 10 Mbit/s.
- If the purchased bandwidth is greater than 10 Mbit/s, the bandwidth in the inbound direction is the same as the purchased bandwidth.

The unit of bandwidth is Mbit/s and that of traffic is GB.

1.2.33 Can the Specification of a VPN Gateway Be Changed (for Example, from Professional 1 to Professional 2)?

You can change the specification of a VPN gateway on the VPN gateway page. The following specification changes are subject to the console.

- The specification of a VPN gateway can be changed between Basic and Professional 1.
- The specification of a VPN gateway can be changed between Professional 1 and Professional 2.

- The specification of a VPN gateway cannot be changed from Professional 3 supporting access via non-fixed IP addresses to Professional 3, from Professional 2 supporting access via non-fixed IP addresses to Professional 2, or from Professional 1 supporting access via non-fixed IP addresses to Professional 1.
- When **Network Type** is set to **Public network** and **Billing Mode** is set to **Yearly/Monthly**, the specification of a VPN gateway can be changed from Professional 3 to Professional 3 supporting access via non-fixed IP addresses, from Professional 2 to Professional 2 supporting access via non-fixed IP addresses, or from Professional 1 to Professional 1 supporting access via non-fixed IP addresses.

1.2.34 Can Pay-per-Use EIPs Be Bound to a Yearly/Monthly VPN Gateway? What About EIPs Using a Shared Data Package?

Both pay-per-use EIPs and EIPs using a shared data package can be bound to yearly/monthly VPN gateways. When you subscribe to pay-per-use EIPs billed by traffic and buy a shared data package, the EIPs will use the shared data package. After the package quota is used up or if the package expires, the EIPs will continue to be billed on a pay-per-use basis. Note the EIP type (static BGP or dynamic BGP) during the binding.

1.3 Networking and Application Scenarios

1.3.1 Can I Visit Websites Across International Borders Using a VPN?

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VPN enables site-to-site connections by connecting the network of an on-premises data center to a VPC on the cloud.

1.3.2 Can I Deploy an Application on the Cloud and a Database in an On-premises Data Center and Connect Them Through a VPN?

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After a VPN is set up, service traffic can be transmitted between the VPC and on-premises data center. For an application server on the cloud, access to an on-premises database is logically the same as access to other hosts in the same LAN. Given this, it is feasible to use a VPN to connect an application on the cloud to a database in an on-premises data center.

This is a typical IPsec VPN scenario.

Additionally, there are no limitations on the service initiator. That is, service requests can be initiated from the cloud or the on-premises data center.

NOTICE

- After a VPN is set up, check the network latency and packet loss rate to ensure smooth service running.
- It is recommended that you run the ping command to check the packet loss and network latency details.

1.3.3 How Many VPN Connections Do I Need to Connect Multiple On-premises Servers to the Cloud?

VPN uses the IPsec technology to connect your on-premises data center to a VPC on the cloud. As such, the number of VPN connections is related to the number of data centers where the servers to be connected to the cloud are located, but not to the number of servers.

Two EIPs can be bound to a VPN gateway for communication with a customer gateway.

- If an on-premises data center has only one egress gateway, all servers or hosts in the data center connect to the Internet through this gateway. In this case, you need to configure a VPN connection group consisting of two VPN connections. That is, configure a VPN connection for each of the two EIPs of the VPN gateway to communicate with the egress gateway in the on-premises data center.
- If an on-premises data center has two egress gateways, the servers or user hosts in the data center connect to the Internet through the two egress gateways. In this case, you need to configure two VPN connection groups, each of which consisting of two VPN connections. That is, configure a VPN connection for each of the two EIPs of each VPN gateway to communicate with both egress gateways in the on-premises data center.

1.3.4 What Are the Differences Between IPsec VPN and SSL VPN in Application Scenarios and Connection Modes?

Application Scenarios

IPsec VPN connects two LANs, such as a branch and its headquarters (or a VPC), or an on-premises data center and a VPC.

SSL VPN connects a client to a LAN. For example, the portable computer of an employee on a business trip accesses the internal network of the company.

Connection Modes

IPsec VPN requires fixed gateways, such as firewalls or routers, at both ends. The administrator needs to configure gateways at both ends to enable them to complete IPsec VPN negotiation.

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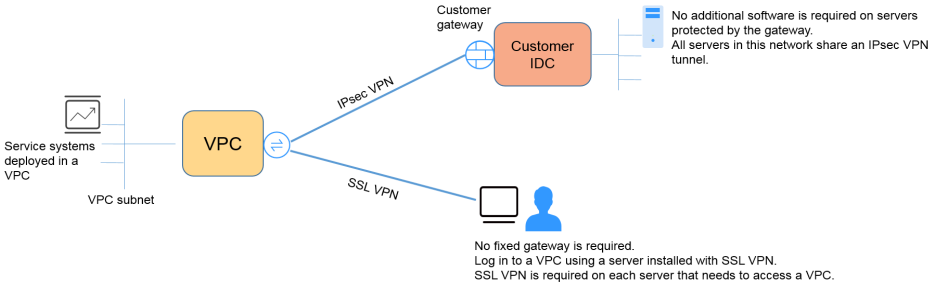


1.3.5 Does a VPN Allow for Communications Between Two VPCs?

- If the two VPCs are in the same region, use a VPC peering connection to connect them.
- If the two VPCs are in different regions, use a VPN to connect them. The operations are as follows:
  a. Create a VPN gateway for each VPC, and create a VPN connection between the two VPN gateways.
  b. For the VPN connection, set the customer gateway to the EIP of the peer VPN gateway.
  c. For the VPN connection, set the customer subnet to the subnet of the peer VPC.
  d. Set the same pre-shared keys (PSKs) and algorithms for the two VPCs.

1.3.6 What Are the Impacts of a VPN on an On-premises Network? What Are the Changes to the Route for Accessing an ECS?

When configuring a VPN, you need to perform the following operations on the gateway in your on-premises data center:

- Configure IKE and IPsec policies.
- Configure a VPN connection in static routing, BGP routing, or policy-based mode.
- Check the route configuration on the gateway to ensure that traffic destined for a VPC can be routed to the correct outbound interface (interface having an IPsec policy bound).

1.3.7 What Configurations Are Required at Both Ends of a VPN That Connects an On-premises Data Center to a VPC?

To implement the VPN interconnection, create a VPN on the cloud and configure the VPN device in the on-premises data center.

- Create a VPN on the cloud.
  - Buy a VPN gateway, and configure the billing mode, bandwidth, and interconnected VPC.

  - Create a customer gateway and configure the routing mode.
  - Buy a VPN connection, and configure the gateway IP addresses and subnets at both ends, as well as negotiation policies.
- Configure the VPN device in the on-premises data center.
  a. Configure the public IP address used by the on-premises data center to connect to the cloud, and complete the configurations of IPsec negotiation phase 1 and phase 2 on the VPN device.
  b. Configure routes, NAT, and security policies on the VPN device.

1.3.8 Can I Connect a Network with Two Egresses to a VPC Through Two VPN Connections?

Yes.

1.3.9 Can I Connect Two VPCs in the Same Region Through a VPN?

No.

You can use a VPC peering connection or Cloud Connect connection to connect two VPCs in the same region.

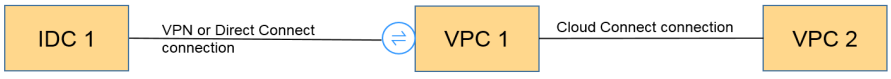
1.3.10 How Can I Connect Two VPCs in the Same Region?

You can use a VPC peering connection or Cloud Connect connection to connect two VPCs in the same region. VPC peering can only connect VPCs in the same region; Cloud Connect can also connect VPCs in different regions.

1.3.11 How Do I Enable Communications Between Two VPCs and an On-premises Network?

Network Topology

IDC–VPC 1–VPC 2



IDC indicates an on-premises data center. A VPN connection is established between VPC 1 and the IDC.

Procedure

1. Check whether the two VPCs are in the same region.
   - If so, use a VPC peering connection or Cloud Connect connection to connect the two VPCs. Such a connection is free of charge.
   - If not, use a Cloud Connect connection to connect the two VPCs. You need to pay for the Cloud Connect bandwidth.

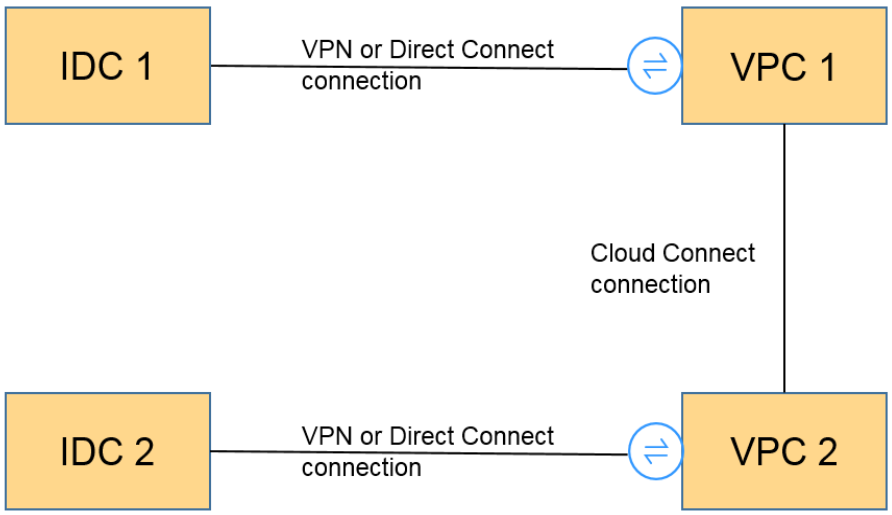
2. Establish a VPN connection between the IDC and one VPC (VPC 1 in this example).

   In the on-premises data center, set subnets of VPC 1 and VPC 2 as customer subnets. The local subnet of VPC 1 must contain the subnet connected through a VPC peering connection or Cloud Connect connection. The subnet route of the VPC peering connection or Cloud Connect connection needs to destine for the on-premises subnet.

1.3.12 How Do I Connect Four Subnets?

Figure 1-5 shows the network topology.

Figure 1-5 Network topology



1. Use a VPN connection or Direct Connect connection to connect IDC 1 to VPC 1.
2. Use a Cloud Connect connection to connect VPC 1 to VPC 2. (You can also use a VPC peering connection to connect VPC 1 to VPC 2 if they are in the same region.)
3. Use a VPN connection or Direct Connect connection to connect VPC 2 to IDC 2.
4. Update VPN subnets, Cloud Connect subnet routes, and Direct Connect subnet routes. Then, the four subnets are reachable to reach other.

1.3.13 Do I Need Two VPN Connections to Connect Four Subnets of Two Regions If Each Region Has Two Subnets?

No.

Only one VPN connection is required between two regions. The subnets can all be added to the VPN connection.

In this scenario, if you attempt to create a second VPN connection, the management console displays a message indicating that a conflict occurs because the two connections have the same customer gateway address.

1.3.14 Can I Access OBS Through a VPN?

Yes.

1. With the help of the VPC endpoint service, you can access OBS through a VPN. You need to create two VPC endpoints for the private DNS server and OBS, respectively.
2. Configure the private DNS server and routes in your on-premises data center.

1.3.15 How Do I Connect My Personal Computer to the Cloud Through a VPN?

Common home broadband routers, Windows hosts providing VPN services (such as L2TP), and personal mobile terminals cannot connect to the cloud through a VPN.

To use VPN, on-premises devices must support the standard IPsec protocol.

1.3.16 How Do I Access ECSs at Home When My Enterprise Network Has Been Connected to the Cloud Through a VPN?

A VPN is an IPsec VPN that connects an on-premises LAN to a VPC on the cloud. Your home network is not a part of your enterprise LAN, so you cannot directly connect to the VPC on the cloud at home.

If your host at home needs to access VPC resources on the cloud, your host can directly access the EIP of the corresponding service. Alternatively, your host can connect to the LAN of your enterprise through SSL VPN (if supported), and then access VPC resources on the cloud through the LAN.

1.3.17 How Do I Establish a VPN Connection Temporarily If No IPsec-Capable On-Premises Device Is Available After I Purchase a VPN Gateway and VPN Connection?

To establish a VPN connection with the cloud, you must have an on-premises device that supports the standard IPsec protocol and have a fixed public IP address.

If the preceding requirements are not met, you can install third-party IPsec software on a host to temporarily connect to the cloud.

Recommended third-party IPsec software includes strongSwan, Openswan, and TheGreenBow. For details about the interconnection, see .

1.3.18 How Do I Select a Proper Region on the Cloud When I Buy a VPN Gateway?

You can select a VPC in any region when you buy a VPN gateway.

It is recommended that you select the region nearest to your on-premises data center to minimize the impact of the Internet on the VPN.

- To connect to multiple VPCs in the same region, you can use VPN and Direct Connect.
- To connect to multiple VPCs in different regions, you can use VPN and Cloud Connect.

1.4 Billing and Payments

1.4.1 What Are the Differences Between Billing the VPN Gateway EIP Bandwidth by Bandwidth and by Traffic?

The VPN gateway EIP bandwidth can be billed by bandwidth or by traffic.

The differences are as follows:

- Billed by bandwidth: The billing cycle is 1 hour. The generated fee depends on the bandwidth.
- Billed by traffic: The fee is calculated based on the outgoing traffic of a VPC generated every hour, which is not affected by the bandwidth.

If you select the more cost-effective yearly/monthly billing mode, VPN gateways can only be billed by bandwidth.

1.4.2 Can a VPN Billed by Traffic Use a Shared Data Package?

In Enterprise Edition VPN, EIPs can be used as VPN gateway IP addresses.

The VPN service fee includes the EIP fee. An EIP can use a shared data package.

1.4.3 For How Many VPN Connections Will I Be Charged to Connect VPCs in Different Regions of Huawei Cloud?

VPNs can be used to connect VPCs in different regions. The VPN bandwidth and connections of each region will be billed independently. Therefore, when calculating the estimated fees, you need to check the total number of regions and their connection relationships.

For example, assume that Region A needs to establish a VPN connection with Region B and Region C, respectively. The VPN gateway of Region A has two connections; the VPN gateway of Region B has one connection; and the VPN gateway of Region C has one connection.

In this case, you will be charged for four VPN connections.

1.4.4 When Will My VPN Resources Be Frozen? How Can I Unfreeze the VPN Resources?

- If pay-per-use VPN resources are in arrears, the resources enter the grace period, during which you can still access and use the resources. If the grace period ends and you have not paid off the arrears, the resources enter the retention period, during which the resources are frozen. Frozen resources are unavailable and cannot be modified or deleted. If the retention period ends and you still have not topped up your account and paid off the arrears, the

resources will be released and cannot be restored. To ensure that resources are available, top up your account and pay off the arrears before the resources expire.

- The impact of shared bandwidth freezing on EIPs is subject to the EIP documentation. For details, see **Why My EIPs Are Frozen? How Do I Unfreeze My EIPs?**.
- Frozen VPN resources will become available after you renew them or top up your account.

1.5 Operations on the Console

1.5.1 What Are the Relationships Between a VPC, a VPN Gateway, and a VPN Connection?

When your on-premises data center needs to access ECSs in a VPC, you can create a VPN gateway to establish a VPN connection between your on-premises data center and the VPC.

- VPC
  - A VPC is a private network on the cloud. Multiple VPCs can be created in the same region while they are isolated from each other. A VPC can be divided into multiple subnets.
  - You can use the VPN service to securely access ECSs in a VPC.
- VPN gateway
  - A VPN gateway is created in a VPC and is the access point of a VPN connection. One VPC can have multiple VPN gateways, and one VPN gateway can have multiple VPN connections.
  - With a VPN gateway, a secure, reliable, and encrypted connection can be established between a VPC and an on-premises data center or between VPCs in different regions.
- VPN connection

  A VPN connection is created for a VPN gateway and connects a VPC to an on-premises data center (or a VPC in another region).

  NOTE

  The number of VPN connections is irrelevant to the number of local subnets or the number of customer subnets. It is only related to the number of on-premises data centers (or VPCs in other regions) to be connected to your VPC. The created VPN connections are displayed in the VPN connection list. You can also view the number of VPN connections created for each VPN gateway.

1.5.2 How Long Does It Take for Delivered VPN Configurations to Take Effect?

It takes 1–5 minutes for the VPN configurations to take effect.

NOTE

After VPN configurations take effect, configure your gateway device on your on-premises network to complete tunnel negotiation with the VPN gateway.

1.5.3 Why Is a VPN Connection Always in Not Connected State After Its Configuration Is Complete?

The configuration may be incorrect.

1. At the two ends (cloud and on-premises data center) of the VPN connection, ensure that the pre-shared keys (PSKs) and negotiation information are consistent, the local and remote subnets are reversed, and the local and remote gateways are also reversed.
2. Ensure that routes, NAT, and security policies are correctly configured on the device in your on-premises data center.

1.5.4 Can the EIP of a VPN Gateway Be Retained After the VPN Gateway Is Deleted?

If a pay-per-use EIP is bound to a pay-per-use VPN gateway, deleting the VPN gateway will also delete the bound EIP.

To retain such a pay-per-use EIP, unbind it before deleting the VPN gateway.

1.5.5 What Information About a Created VPN Can Be Modified and What Information Cannot Be Modified?

- VPN gateway
  - You can modify the following information:
    - Name
    - Local subnet
    - Billing mode (yearly/monthly or pay-per-use)
    - Active and standby EIPs
      - To modify the active or standby EIP, unbind the original EIP and bind a new one.

        If a VPN connection has been created for an EIP, the EIP cannot be unbound.
      - You can modify EIP attributes, such as the name, type, and bandwidth. For details, see the **EIP service documentation**.
    - Specification

      The supported specifications are subject to those displayed on the management console.
    - Number of VPN connection groups

      The number of VPN connection groups needs to be specified only when **Billing Mode** is set to **Yearly/Monthly**.

  - You cannot modify the following information:
    - Region
    - Association mode (VPC or enterprise router)
    - Enterprise router

      The associated enterprise router needs to be specified only when **Associate With** is set to **Enterprise Router**.
    - VPC
    - Interconnection subnet
    - BGP ASN
    - AZ
- Customer gateway
  - You can modify the following information:
    - Name
  - You cannot modify the following information:
    - BGP ASN

      The BGP ASN needs to be specified only when **Routing Mode** is set to **Dynamic (BGP)**.
    - Gateway IP address
- VPN connection
  - You can modify the following information:
    - Name
    - Billing mode. Only pay-per-use billing can be changed to yearly/monthly billing.
    - Local interface address
    - Customer gateway
    - Customer subnet
    - Policy configuration, including IKE and IPsec policies
    - PSK
    - Branch interconnection
  - You cannot modify the following information:
    - VPN gateway
    - EIP
    - VPN type (route-based or policy-based)

- Routing mode (static or BGP)

  The routing mode needs to be specified only when **VPN Type** is set to **Route-based**.

- Link detection configuration

  The link detection configuration is available only when **VPN Type** is set to **Route-based**.

- Policy configuration, including the source and destination CIDR blocks

  The policy configuration is available only when **VPN Type** is set to **Policy-based**.

1.5.6 Do I Need to Configure ACL Rules on the Console After I Configure ACL Rules on the On-premises Gateway Device?

You need to configure policy rules (ACL rules) for a VPN connection on the management console only when **VPN Type** is set to **Policy-based**.

1.5.7 What Do I Do If an Exception Occurs When I Add a Customer Subnet During VPN Connection Creation?

Check whether this customer subnet is involved in a route of a VPC peering, Cloud Connect, or Direct Connect connection. If so, a route conflict occurs and you need to delete the route and create a new one to prevent the conflict.

1.5.8 Where Can I Configure Routes to Customer Subnets on the VPN Console?

When a VPN connection is created, routes to customer subnets are automatically delivered.

1.5.9 Can I Call APIs to Manage Huawei Cloud VPN Resources?

Yes.

1.5.10 What Are a Customer Gateway and a Customer Subnet in a VPN Connection?

A VPN connection is created on the cloud. As such, a subnet of a VPC is a local subnet, and a VPN gateway created on the cloud is a local gateway. The subnet and gateway in an on-premises data center connected to the VPC are a customer subnet and a customer gateway, respectively.

A customer gateway's IP address is a public IP address.

1.5.11 How Do I Disable PFS When Creating a VPN Connection?

- Cloud side

In the VPN connection configuration, set **PFS** in the IPsec policy to **Disable**. By default, PFS is enabled on the cloud side.

- Customer gateway in your on-premises data center

  By default, PFS is disabled on some vendors' devices. For details about how to disable PFS, see the corresponding product documentation.

NOTE

Ensure that the PFS settings on the cloud side and the customer gateway are consistent. Otherwise, the negotiation will fail.

For security purposes, you are advised to enable PFS on both the cloud side and the customer gateway.

1.5.12 How Many Local and Customer Subnets Can I Add to a VPN?

- You can configure a maximum of 50 local subnets for each VPN gateway.
- You can configure a maximum of 50 customer subnets for each VPN connection.
- You can configure a maximum of five policy rules for each VPN connection.

  You can configure 1 source CIDR block and 50 destination CIDR blocks in each policy rule.

1.5.13 What Are the Precautions for Configuring the Local and Customer Subnets for a VPN Connection?

- The number of local subnets and the number of customer subnets are limited. If the number of local or customer subnets exceeds the upper limit, aggregate the subnets.
  - Maximum number of local subnets for each VPN gateway: 50
  - Maximum number of customer subnets for each VPN connection: 50
- A local subnet cannot include the CIDR block of a customer subnet, whereas a customer subnet can include the CIDR block of a local subnet.
- There are routes pointing to the local subnets in the VPC where the VPN gateway resides.
- If there are two connections (connection A and connection B) created for a VPN gateway, and the customer subnet of connection A is within that of connection B, when the destination network to be accessed belongs to the overlapped CIDR block, the connection created first is matched first, regardless of the connection status. (Mask length match is not used for VPN connections created in policy-based mode.)

1.5.14 Why Is a VPN Connection in Not Connected State on the Management Console When It Is Already Available?

There is a certain delay in updating the VPN connection state on the management console.

If the service access is normal, the VPN connection has been established. The state of the VPN connection will be updated to **Connected** after several minutes.

1.5.15 What Can I Do If a Message Is Displayed Indicating That the VPN Connection Does Not Exist After Negotiation Policies Are Modified?

This problem is caused by the page refresh interval.

When you modify advanced policy settings, the system deletes the VPN connection and then creates one. If the page temporarily displays a message indicating that the connection is being deleted or created, do not create the same connection with the same local subnet, customer subnet, and customer gateway again.

If the page remains in the connection deleting or creating state for a long time, **submit a service ticket**.

1.5.16 What Is the Maximum Bandwidth Supported by a VPN Gateway?

- The maximum bandwidth supported by a VPN gateway of the Basic specification is 100 Mbit/s.
- The maximum bandwidth supported by a VPN gateway of the Profession 1 specification is 300 Mbit/s.
- The maximum bandwidth supported by a VPN gateway of the Profession 2 specification is 1 Gbit/s.
- The maximum bandwidth supported by a VPN gateway of the Profession 3 specification is 5 Gbit/s.

1.5.17 Which IKE Version Should I Select When I Create a VPN Connection?

IKEv2 is recommended because IKEv1 is not secure. In addition, IKEv2 outperforms IKEv1 in connection negotiation and establishment, authentication methods, dead peer detection (DPD) timeout processing, and security association (SA) timeout processing.

IKEv2 will be widely used, and IKEv1 will gradually phase out.

Introduction to IKEv1 and IKEv2

- As a hybrid protocol, IKEv1 brings some security and performance defects due to its complexity. As such, it has become a bottleneck in the IPsec system.
- IKEv2 addresses the issues of IKEv1 while retaining basic functions of IKEv1. IKEv2 is more simplified, efficient, secure, and robust than IKEv1. Additionally, IKEv2 is defined by RFC 4306 in a single document, whereas IKEv1 are defined in multiple documents. By minimizing core functions and default password algorithms, IKEv2 greatly improves interoperability between different IPsec VPNs.

Security Risks of IKEv1

- The cryptographic algorithms supported by IKEv1 have not been updated for more than 10 years. In addition, IKEv1 does not support strong cryptographic

algorithms such as AES-GCM and ChaCha20-Poly1305. For IKEv1, the E (Encryption) bit in the ISALMP header specifies that the payloads following the ISALMP header are encrypted, but any data integrity verification of those payloads is handled by a separate hash payload. This separation of encryption from data integrity protection prevents the use of authenticated encryption (AES-GCM) with IKEv1.

- IKEv1 is vulnerable to DoS amplification attacks and half-open connection attacks. After responding to spoofed packets, the responder maintains initiator-responder relationships, consuming a large number of system resources.

  This defect is inherent to IKEv1 and is addressed in IKEv2.
- The aggressive mode of IKEv1 is not secure. In this mode, information packets are not encrypted, posing risks of information leakage. There are also brute-force attacks targeting at the aggressive mode, such as man-in-the-middle attacks.

Differences Between IKEv1 and IKEv2

- **Negotiation process**
  - IKEv1 is complex and consumes a large amount of bandwidth. IKEv1 SA negotiation consists of two phases. In IKEv1 phase 1, an IKE SA is established in either main mode or aggressive mode. Main mode requires three exchanges between peers totaling six ISAKMP messages, whereas aggressive mode requires two exchanges totaling three ISAKMP messages. Aggressive mode is faster, but does not provide identity protection for peers as key exchange and identity authentication are performed simultaneously. In IKEv1 phase 2, IPsec SAs are established through three ISAKMP messages in quick mode.
  - Compared with IKEv1, IKEv2 simplifies the SA negotiation process. IKEv2 requires only two exchanges, totaling four messages, to establish an IKE SA and a pair of IPsec SAs. To create multiple pairs of IPsec SAs, only one additional exchange is needed for each additional pair of SAs.

    NOTE

    For IKEv1 negotiation, its main mode involves nine (6+3) messages, and its aggressive mode involves six (3+3) messages. In contrast, IKEv2 negotiation requires only four (2+2) messages.
- **Authentication methods**
  - Only IKEv1 (requiring an encryption card) supports digital envelope authentication (HSS-DE).
  - IKEv2 supports Extensible Authentication Protocol (EAP) authentication. IKEv2 can use an AAA server to remotely authenticate mobile and PC users and assign private IP addresses to these users. IKEv1 does not provide this function and must use L2TP to assign private IP addresses.
  - Only IKEv2 supports IKE SA integrity algorithms.
- **DPD timeout processing**
  - Only IKEv1 supports the **retry-interval** parameter. If a device sends a DPD packet but receives no reply within the specified retry-interval, the device records a DPD failure event. When the number of DPD failure events reaches 5, both the IKE SA and IPsec SAs are deleted. IKE SA

negotiation will start again only when there is traffic to be transmitted over the IPsec tunnel.

- In IKEv2, the retransmission interval increases from 1, 2, 4, 8, 16, 32 to 64, in seconds. If no reply is received within eight consecutive transmissions, the peer end is considered dead, and the IKE SA and IPsec SAs are deleted.

- **IKE SA timeout processing and IPsec SA timeout processing**

  In IKEv2, the IKE SA soft lifetime is 9/10 of the IKE SA hard lifetime plus or minus a random number. This reduces the likelihood that two ends initiate renegotiation simultaneously. Therefore, you do not manually set the soft lifetime in IKEv2.

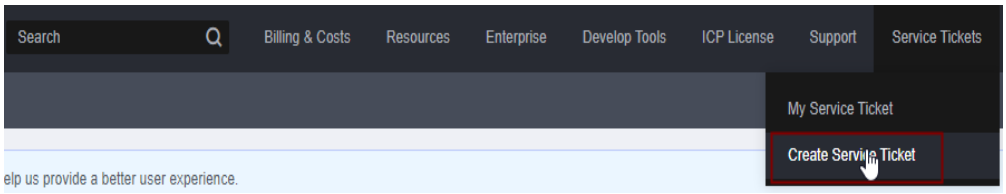
Advantages of IKEv2 over IKEv1

- Simplifies the SA negotiation process, improving efficiency.
- Fixes many cryptographic security vulnerabilities, improving security.
- Supports EAP authentication, improving authentication flexibility and scalability.
- EAP is an authentication protocol that supports multiple authentication methods. The biggest advantage of EAP is its scalability. That is, new authentication methods can be added without changing the original authentication system. EAP authentication has been widely used in dial-up access networks.
- Employs an Encrypted Payload on basis of ESP. This payload contains both an encryption algorithm and a data integrity algorithm. AES-GCM ensures confidentiality, integrity, and authentication, and works well with IKEv2.

1.5.18 What Types of VPN Service Tickets Are There? How Do I Create a VPN Service Ticket?

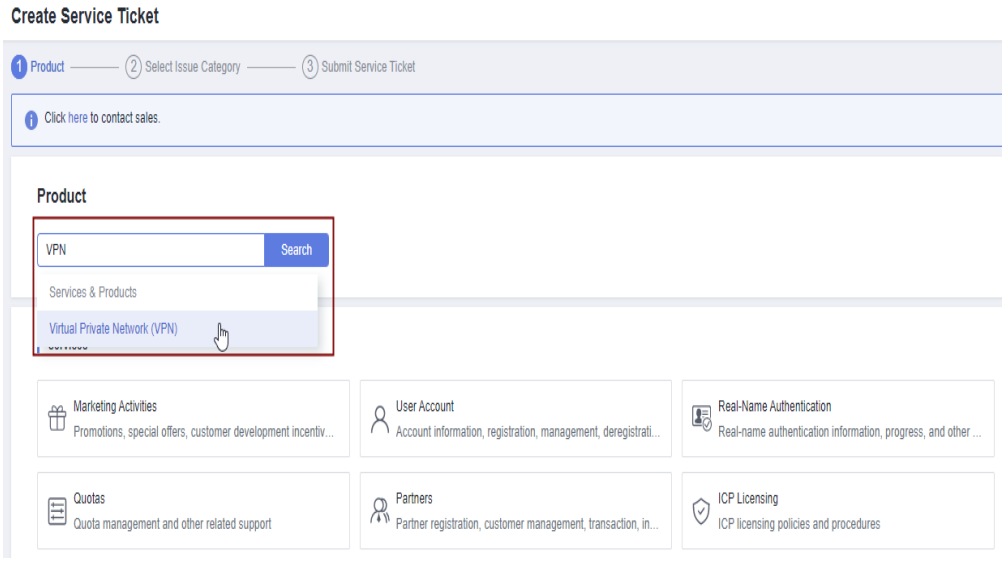
1. Log in to the management console.
2. In the upper right corner of the management console, choose **Service Tickets** > **Create Service Ticket**.

   Figure 1-6 Create Service Ticket

3. Search for **VPN** and select **Virtual Private Network (VPN)**.

Figure 1-7 Selecting **Virtual Private Network (VPN)**



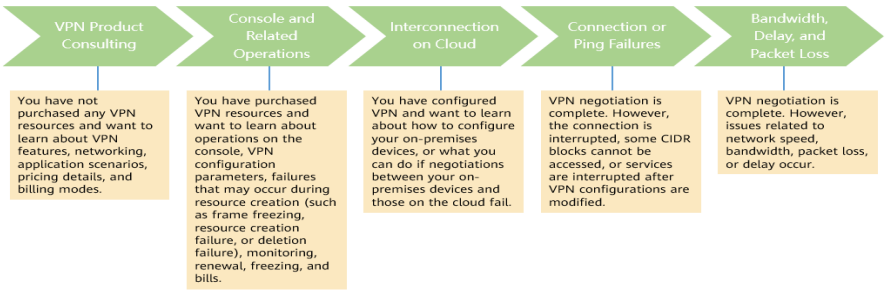
4. Select an issue category.

Figure 1-8 Select Issue Category

NOTE

When you , select an issue category to facilitate problem handling.

Figure 1-9 Issue category and classification basis



1.5.19 Are a Username and Password Required for Creating an IPsec VPN Connection?

No. IPsec VPN uses a pre-shared key (PSK) for authentication. The PSK is configured on a VPN gateway, and a connection will be established after VPN negotiation is complete. Therefore, no username or password is required for creating an IPsec VPN connection. Generally, SSL, PPTP, and L2TP VPNs use usernames and passwords for authentication.

NOTE

IPsec XAUTH provides extended authentication for IPsec VPN. It requires users to enter their usernames and passwords during VPN negotiation.

Currently, VPN does not support IPsec XAUTH.

1.5.20 What VPN Resources Can Be Monitored?

VPN gateway

The following bandwidth information of a VPN gateway IP address can be monitored: inbound traffic, inbound bandwidth, outbound traffic, outbound bandwidth, and outbound bandwidth usage.

VPN connection

The following information about a VPN connection can be monitored: VPN connection status, average link round-trip time (RTT), maximum link RTT, link packet loss rate, average tunnel RTT, maximum tunnel RTT, and tunnel packet loss rate.

To monitor average link RTT, maximum link RTT, link packet loss rate, average tunnel RTT, maximum tunnel RTT, and tunnel packet loss rate, click the VPN connection name and click **Add** in the **Health Check** area on the **Summary** tab page to add health check items. Private network metrics can be configured only when the VPN connection uses the static routing mode and the NQA function is enabled.

1.5.21 Will I Be Notified If a VPN Connection Is Interrupted?

The VPN connection status can be monitored. After a VPN connection is created, the VPN service reports the connection status information to Cloud Eye, but does not send alarm notifications to you. To receive notifications, create alarm rules and enable **Alarm Notification** on the Cloud Eye console.

1.6 VPN Negotiation and Interconnection

1.6.1 What Devices Can Be Connected to Huawei Cloud Through a VPN?

VPN supports the standard Internet Protocol Security (IPsec) protocol. A device in your on-premises data center can connect to the cloud if the device meets the following requirements:

1. Supports IPsec VPN.
2. Has a fixed public IP address, which can be statically configured, or translated through NAT in NAT traversal scenarios (your device is deployed behind a NAT gateway).

NOTE

- Common home broadband routers, Windows hosts providing VPN services (such as L2TP), and personal mobile terminals cannot connect to the cloud through a VPN.
- The following products can connect to the cloud through VPNs:
  - Devices: Huawei firewalls and access routers (ARs), Hillstone firewalls, and Check Point firewalls
  - Cloud services: Alibaba Cloud, Tencent Cloud, Amazon Web Services (AWS), and Microsoft Azure
  - Software: strongSwan
- The IPsec protocol is a standard IETF protocol. Devices that support IPsec can interconnect with the cloud through a VPN.

  Most enterprise-class routers and firewalls support the IPsec protocol.
- Some devices support IPsec VPN only after you purchase required software licenses.

  Your on-premises data center administrator can check with the device vendor whether a license is required based on the device model.

1.6.2 What Are VPN Negotiation Parameters? What Are Their Default Values?

Table 1-4 VPN negotiation parameters

Protocol	Parameter	Value
IKE	Authentication Algorithm	• MD5(Insecure. Not recommended.) • SHA1(Insecure. Not recommended.) • SHA2-256 • SHA2-384 • SHA2-512 The default value is **SHA2-256**.
	Encryption Algorithm	• 3DES (Insecure. Not recommended.) • AES-128(Insecure. Not recommended.) • AES-192(Insecure. Not recommended.) • AES-256(Insecure. Not recommended.) • AES-128-GCM-16 • AES-256-GCM-16 The default value is **AES-128**.

Protocol	Parameter	Value
	DH Algorithm	• Group 1(Insecure. Not recommended.) • Group 2(Insecure. Not recommended.) • Group 5(Insecure. Not recommended.) • Group 14(Insecure. Not recommended.) • Group 15 • Group 16 • Group 19 • Group 20 • Group 21 The default value is **Group 15**.
	Version	• v1 (For security reasons, IKEv1 is not recommended. If your devices support IKEv2, select IKEv2.) • v2 The default value is **v2**.
	Lifetime (s)	**86400** (default value) Unit: second Value range: **60** to **604800**
	Local ID	• IP Address The local IP address is automatically displayed as the EIP of the VPN gateway, removing the need to manually configure it. • FQDN By default, the local ID type is IP address and the local ID value is the EIP of the VPN gateway.
	Customer ID	• IP Address • FQDN By default, the customer ID type is IP address and the customer ID value is the public IP address of the customer gateway.

Protocol	Parameter	Value
IPsec	Authentication Algorithm	• SHA1(Insecure. Not recommended.) • MD5(Insecure. Not recommended.) • SHA2-256 • SHA2-384 • SHA2-512 The default value is **SHA2-256**.
	Encryption Algorithm	• 3DES (Insecure. Not recommended.) • AES-128(Insecure. Not recommended.) • AES-192(Insecure. Not recommended.) • AES-256(Insecure. Not recommended.) • AES-128-GCM-16 • AES-256-GCM-16 The default value is **AES-128**.
	PFS	• Disable(Insecure. Not recommended.) • DH group 1(Insecure. Not recommended.) • DH group 2(Insecure. Not recommended.) • DH group 5(Insecure. Not recommended.) • DH group 14(Insecure. Not recommended.) • DH group 15 • DH group 16 • DH group 19 • DH group 20 • DH group 21 The default value is **Group 15**.
	Transfer Protocol	ESP (default value)
	Lifetime (s)	**3600** (default value) Unit: second Value range: **30** to **604800**

NOTE

- Perfect Forward Secrecy (PFS) is a security feature.

  IKE negotiation has two phases, phase one and phase two. The key of phase two (IPsec SA) is derived from the key generated in phase one. Once the key in phase one is disclosed, the security of the IPsec VPN may be adversely affected. To improve the key security, IKE provides PFS. When PFS is enabled, an additional DH exchange will be performed during IPsec SA negotiation to generate a new IPsec SA key, improving IPsec SA security.
- For security purposes, PFS is enabled on the cloud side by default. Ensure that PFS is also enabled on the gateway device in your on-premises data center and the PFS settings on both ends are the same. Otherwise, the negotiation will fail.
- The cloud side does not support the configuration of the traffic-based IPsec SA lifetime. That is, IPsec SAs are not aged based on traffic on the cloud side.

1.6.3 Is an IPsec VPN Connection Automatically Established?

Yes. An IPsec VPN connection is automatically established.

1.6.4 How Do I Configure a VPN on an On-premises Device? (Example of Configuring VPN on a Huawei USG6600 Series Firewall)

VPN settings on the device in your on-premises data center must be consistent with those on the cloud. Otherwise, the VPN cannot be established.

To set up a VPN, you also need to configure an IPsec VPN tunnel on the router or firewall in your on-premises data center. The configuration method varies according to your network device in use. For details, see the configuration guide of your network device.

The following uses a Huawei USG6600 series firewall running V100R001C30SPC300 as an example to describe how to configure a VPN on an on-premises device.

Assume that the subnets of an on-premises data center are 192.168.3.0/24 and 192.168.4.0/24, and the public IP address of the IPsec tunnel egress in the on-premises data center is 1.1.1.2. The subnets of a VPC are 192.168.1.0/24 and 192.168.2.0/24, and the public IP address of the IPsec tunnel egress in the VPC is 1.1.1.1.

Procedure

1. Log in to the command line interface (CLI) of the firewall.
2. Check firewall version information.

```
display version
17:20:502017/03/09
Huawei Versatile Security Platform Software
Software Version: USG6600 V100R001C30SPC300 (VRP (R) Software, Version 5.30)
```

3. Create an ACL.

```
acl number 3065 vpn-instance vpn64
rule 1 permit ip source 192.168.3.0 0.0.0.255 destination 192.168.1.0 0.0.0.255
rule 2 permit ip source 192.168.3.0 0.0.0.255 destination 192.168.2.0 0.0.0.255
rule 3 permit ip source 192.168.4.0 0.0.0.255 destination 192.168.1.0 0.0.0.255
rule 4 permit ip source 192.168.4.0 0.0.0.255 destination 192.168.2.0 0.0.0.255
q
```


4. Create an IKE proposal.

```
ike proposal 64
dh group5
authentication-algorithm sha1
integrity-algorithm hmac-sha2-256
sa duration 3600
q
```

5. Create an IKE peer and bind it to the created IKE proposal. The peer IP address is 1.1.1.1.

```
ike peer vpnikepeer_64
pre-shared-key ******** (******** indicates a pre-shared key.)
ike-proposal 64
undo version 2
remote-address vpn-instance vpn64 1.1.1.1
sa binding vpn-instance vpn64
q
```

6. Configure an IPsec proposal.

```
IPsec proposal IPsecpro64
encapsulation-mode tunnel
esp authentication-algorithm sha1
q
```

7. Configure an IPsec policy and bind the IPsec proposal to it.

```
IPsec policy vpnIPsec64 1 isakmp
security acl 3065
pfs dh-group5
ike-peer vpnikepeer_64
proposal IPsecpro64
local-address 1.1.1.2
q
```

8. Apply the IPsec policy to the corresponding sub-interface.

```
interface GigabitEthernet0/0/2.64
IPsec policy vpnIPsec64
q
```

9. Test connectivity.

   Test the connectivity between your ECS on the cloud and a host in your on-premises data center, as shown in **Figure 1-10**.

Figure 1-10 Connectivity test

```
root@i-psiybqhh:/home/ubuntu# ifconfig
eth0      Link encap:Ethernet  HWaddr 52:54:7c:ba:bf:cc
          inet addr:192.168.3.2  Bcast:192.168.3.255  Mask:255.255.255.0
          inet6 addr: fe80::5054:7cff:feba:bfcc/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:23 errors:0 dropped:0 overruns:0 frame:0
          TX packets:34 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:2304 (2.3 KB)  TX bytes:3404 (3.4 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:16 errors:0 dropped:0 overruns:0 frame:0
          TX packets:16 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:1296 (1.2 KB)  TX bytes:1296 (1.2 KB)

root@i-psiybqhh:/home/ubuntu# ping 192.168.1.2
PING 192.168.1.2 (192.168.1.2) 56(84) bytes of data.
64 bytes from 192.168.1.2: icmp_req=1 ttl=62 time=4.55 ms
64 bytes from 192.168.1.2: icmp_req=2 ttl=62 time=1.27 ms
64 bytes from 192.168.1.2: icmp_req=3 ttl=62 time=1.25 ms
64 bytes from 192.168.1.2: icmp_req=4 ttl=62 time=0.871 ms
64 bytes from 192.168.1.2: icmp_req=5 ttl=62 time=0.886 ms
64 bytes from 192.168.1.2: icmp_req=6 ttl=62 time=0.676 ms
64 bytes from 192.168.1.2: icmp_req=7 ttl=62 time=1.06 ms
^C
--- 192.168.1.2 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6008ms
rtt min/avg/max/mdev = 0.676/1.510/4.554/1.258 ms
```

1.6.5 Does VPN Support Interconnection with a Customer Gateway Through a Domain Name?

No. VPN supports interconnection with a customer gateway only through the public IP address of the customer gateway.

1.6.6 How Many Tunnels Does My VPN Connection Have?

Number of tunnels in a VPN connection = Number of local subnets x Number of customer subnets

- An IPsec tunnel is in Active state when data traffic is transmitted between two subnets at the two ends of the IPsec tunnel.
- A VPN connection is in Connected state as long as one of its tunnels is in Active state.

1.6.7 How Do I Allow Specific Hosts to Access a VPC Subnet Through a Created VPN Connection?

Restrictions in the on-premises data center:

- Access control policies on the VPN device
- ACL rules on the router or switch

Restrictions at the cloud side:

- Security group rules that permit access only from specified IP addresses
- ACL rules configurations

NOTE

You are advised not to change the local or customer subnet to control access.

1.6.8 Do VPNs Have the DPD Function Enabled?

Yes.

By default, the dead peer detection (DPD) function is enabled for VPNs to detect the state of the IKE process in an on-premises data center.

After three consecutive detection failures, the IKE process in the on-premises data center is considered abnormal, and the tunnel on the cloud is automatically deleted.

The DPD protocol does not require that the peer end also be configured with DPD, but it requires that the peer end be able to respond to DPD detections. To ensure consistent tunnel states at the two ends, it is recommended that you enable DPD on your on-premises gateway to detect the IKE process state of the VPN service.

NOTE

Deleting the tunnel in the case of DPD detection failures will not affect service stability.

1.6.9 How Can I Use Security Groups to Prevent VPN Access to Some ECSs in a VPC to Implement Security Isolation?

You can configure security groups to allow access only to specific CIDR blocks or ECSs in a VPC through a VPN.

Configuration example: Prevent the customer subnet 192.168.1.0/24 from accessing ECSs in the VPC subnet 10.1.0.0/24.

Procedure:

1. Create security groups 1 and 2.
2. Configure security group 1 to deny access from subnet 192.168.1.0/24.
3. Configure security group 2 to permit access from subnet 192.168.1.0/24.
4. Associate ECSs in subnet 10.1.0.0/24 with security group 1 and associate other ECSs in the VPC with security group 2.

1.6.10 Will a VPN Connection Be Re-established After Its Configuration Is Modified?

A VPN connection consists of local subnets, customer subnets, customer gateway, pre-shared keys (PSKs), IKE negotiation policy, and IPsec negotiation policy. A VPN connection is modified if any of the following happens:

- If the local and customer subnets are modified, the connection ID will remain unchanged. If not all subnets are updated, the established tunnel between subnets will not be re-established.
- If the IP address of the customer gateway is changed, the connection ID will remain unchanged, but the VPN connection will be re-established.

- If only the PSKs are changed, the connection ID and status will remain unchanged. The PSK will be checked again during renegotiation. If the PSKs do not match, the renegotiation fails.
- If a negotiation policy is modified (PSK verification is required), the connection ID will be changed and the connection needs to be re-established.

1.6.11 Why Cannot I Initiate Negotiation from Amazon Web Services to Huawei Cloud After They Are Interconnected?

After a VPN connection is established between Amazon Web Services (AWS) and Huawei Cloud, AWS works in Response mode and does not initiate negotiation. As such, SA establishment will not be triggered when an AWS EC2 accesses a Huawei Cloud ECS.

According to the AWS documentation, the customer side (the cloud connected to AWS) initiates negotiation by default, and you can also enable the AWS side to initiate negotiation.

1.6.12 How Do I Configure DPD for Interconnection with the Cloud?

By default, DPD is enabled on the cloud side and cannot be disabled.

You can configure DPD as follows:

- DPD-type: on-demand
- DPD idle-time: 30s
- DPD retransmit-interval: 15s
- DPD retry-limit: 3
- DPD msg: seq-hash-notify

The **DPD msg** format at both ends of the VPN connection must be the same, but the DPD type, idle time, retransmission interval, and retry limit can be different.

1.6.13 What Should I Do If My Firewall Cannot Receive Response Packets from the VPN Gateway in IKE Phase 1?

1. Check whether the public IP addresses of the two ends can communicate with each other by running the ping command. By default, the VPN gateway EIPs can be pinged.
2. Verify that the on-premises gateway (firewall) and VPN gateway can exchange packets with UDP ports 500 and 4500.
3. Verify that the source port number is not translated when the on-premises gateway connects to the VPN gateway. In a NAT traversal scenario, ensure that the source port number is not changed after NAT traversal.
4. Verify that IKE negotiation parameter settings are consistent at the two ends of the VPN.

   In a NAT traversal scenario, set the customer ID type to IP address and the value to the post-NAT public IP address of the on-premises gateway.

1.6.14 What Should I Do If My Firewall Cannot Receive Response Packets from a VPN Subnet?

1. Check the routes, security policies, NAT configuration, interesting traffic, and negotiation policies for phase 2 negotiation on the on-premises gateway device.
   - Route configurations: Route the data for accessing cloud subnets to tunnels.
   - Security policies: Allow traffic from on-premises subnets to cloud subnets.
   - NAT policies: Do not perform source NAT on the traffic originated from on-premises subnets to cloud subnets.
   - Interesting traffic: The interesting traffic configurations at both ends are reversed at the two ends of a VPN connection. The address object name cannot be used for the interesting traffic configured using IKEv2.
   - Negotiation policies: Ensure the negotiations policies, especially PFS, at both ends are the same.
2. After confirming that both phase 1 and phase 2 negotiations are normal, ensure that the security groups on the cloud permit ICMP packets originated from on-premises subnets to cloud subnets.

1.6.15 How Many Bits Do the DH Groups Used by VPN Have?

Diffie-Hellman (DH) groups determine the strength of the key used in the key exchange process. Higher DH group numbers are usually more secure, but more time is required to calculate the key.

Table 1-5 lists the number of bits corresponding to the DH groups used by VPN.

Table 1-5 Number of bits corresponding to each DH group

DH Group	Modulus
1	768 bits
2	1024 bits
5	1536 bits
14	2048 bits
15	3072 bits
16	4096 bits
19	256 bits (ECP)
20	384 bits (ECP)
21	521 bits (ECP)

NOTE

The following DH algorithms have security risks and are not recommended: DH group 1, DH group 2, and DH group 5.

1.7 Connection or Ping Failure

1.7.1 Why Is a VPN Connection Always in Not Connected State After Its Configuration Is Complete?

The configuration may be incorrect.

1. At the two ends (cloud and on-premises data center) of the VPN connection, ensure that the pre-shared keys (PSKs) and negotiation information are consistent, the local and remote subnets are reversed, and the local and remote gateways are also reversed.
2. Ensure that routes, NAT, and security policies are correctly configured on the device in your on-premises data center.

1.7.2 How Can I Prevent VPN Disconnections?

VPN connections are renegotiated when the IPsec SA lifetime is about to expire or the data transmitted through a VPN connection exceeds 20 GB. Usually, renegotiation does not interrupt VPN connections.

Most disconnections are caused by incorrect configurations at the two ends of the VPN connection or renegotiation failures due to Internet exceptions.

Common causes of disconnections are as follows:

- ACLs at both ends of the VPN connection do not match.
- SA lifetime settings at both ends of the VPN connection are different.
- Dead Peer Detection (DPD) is not configured on the device in your on-premises data center.
- Configuration is modified when the VPN connection is in use.
- Jitter occurs on the carrier's network.

As such, ensure that the following VPN configurations are correct to keep VPN connections alive:

- At the two ends of the VPN connection, the local and customer subnet configurations are reversed.
- SA lifetime settings at both ends of the VPN connection are the same.
- DPD is enabled on the on-premises gateway device, and the number of detection times is 3 or more.
- Parameters are modified at both ends of the VPN connection during the use of the VPN connection.
- Set TCP MAX-MSS to 1300 for the on-premises gateway device.
- The bandwidth of the on-premises gateway device is large enough for the VPN connection.

- VPN connection negotiation can be triggered by both ends and active negotiation has been enabled on the on-premises gateway device.

1.7.3 How Do I Quickly Restore an Interrupted IPsec VPN Connection?

1. If negotiation cannot be triggered, check connectivity between the public IP addresses of gateways at both ends of the IPsec VPN connection. For example, you can run the ping command to check the connectivity. By default, a VPN gateway responds to ICMP packets.
2. If connectivity is normal, check whether link switching occurs between outbound interfaces. That is, check whether the traffic for access to the VPN gateway is forwarded out from a non-negotiated interface.
3. If traffic is forwarded through the correct link, change the PSKs at both ends of the IPsec VPN connection to trigger re-negotiation.
4. If re-negotiation fails, check whether the negotiation policies configured at both ends are consistent and whether the interesting traffic configurations at both ends are reversed (same number of configurations and same subnets).
5. If the negotiation policies and interesting traffic configurations are correct, disable the VPN connection on the on-premises device. After the VPN connection state changes to **Not connected**, enable the VPN connection on the on-premises device and trigger a data flow.
6. If negotiation still fails, perform the following operations:
   a. Record the negotiation policies, PSK, local subnets, customer gateway, and customer subnets of the VPN connection.
   b. Use the existing VPN gateway to create another VPN connection. The negotiation policies, PSK, and local subnets are the same as those of the original VPN connection. The customer gateway and customer subnets can be configured randomly.
   c. After the new VPN connection is created, delete the original VPN connection, and change the customer gateway and customer subnets of the new VPN connection to be the same as those of the original VPN connection.
   d. Trigger the negotiation again.

If the fault persists, **submit a service ticket** to customer service personnel.

1.7.4 What Will Happen If Traffic Exceeds the Bandwidth of a VPN Gateway?

The VPN gateway bandwidth applies to traffic in the outbound direction of a VPC. If outbound traffic in the VPC exceeds the bandwidth, network congestion will occur, some subnets cannot be accessed, or even the VPN connection will be interrupted due to VPN detection timeout.

In this case, you are advised to increase the VPN gateway bandwidth.

NOTE

- The maximum bandwidth supported by a VPN gateway of the Basic specification is 100 Mbit/s.
- The maximum bandwidth supported by a VPN gateway of the Profession 1 specification is 300 Mbit/s.
- The maximum bandwidth supported by a VPN gateway of the Profession 2 specification is 1 Gbit/s.
- The maximum bandwidth supported by a VPN gateway of the Profession 3 specification is 5 Gbit/s.

1.7.5 Is an IPsec VPN Connection Automatically Established?

Yes. An IPsec VPN connection is automatically established.

1.7.6 Why Cannot ECSs at the Two Ends of a Normal Cross-Region VPN Connection Ping Each Other?

By default, a security group permits outbound traffic with any port number. To allow inbound traffic, add inbound rules to the security group. Ensure that the security group associated with the ECS that needs to receive ping packets allows inbound ICMP requests.

1.7.7 Why Cannot Subnets at the Two Ends of a Normal VPN Connection Access Each Other?

The VPN connection is normal, indicating that the negotiation parameters at both ends of the VPN connection are correct. You need to perform the following operations:

- Verify that routes to the VPN device in your on-premises data center are correctly configured.
- Verify that inter-subnet data exchange is allowed on the VPN device.
- Verify that NAT is not performed on the on-premises subnets that need to access the cloud.
- Verify that mutual access between the public IP addresses of the VPN gateway and customer gateway is permitted.

1.7.8 What Do I Do If a VPN Connection Is Interrupted and a Message Indicating Data Flow Mismatch Is Displayed?

This is usually caused by ACL configuration mismatch between the local and customer gateways.

1. Verify that at the two ends of the VPN connection, the local and remote subnets are reversed and the ACL configurations are also reversed.
2. Use the subnet/mask format when you configure interesting traffic in your on-premises data center. Do not use the address object mode since it may cause incompatibility issues.

1.7.9 What Do I Do If a VPN Connection Is Interrupted and a Message Indicating DPD Timeout Is Displayed?

This happens because there is no data exchange over the VPN connection. When the SA lifetime ends, the VPN connection is deleted as the peer end does not respond to the dead peer detection (DPD).

Solution

1. Enable DPD on the on-premises gateway device, and verify that data flows from both ends can trigger connection establishment.
2. Deploy a ping shell script on the servers at both ends. Alternatively, configure a keepalive function (for example, NQA) on the on-premises gateway device to keep the connection alive.

1.7.10 Why Is a VPN Connection in Not Connected State on the Management Console When It Is Already Available?

There is a certain delay in updating the VPN connection state on the management console.

If the service access is normal, the VPN connection has been established.

1.7.11 Will I Be Notified If a VPN Connection Is Interrupted?

The VPN connection status can be monitored. After a VPN connection is created, the VPN service reports the connection status information to Cloud Eye, but does not send alarm notifications to you. To receive notifications, create alarm rules and enable **Alarm Notification** on the Cloud Eye console.

1.7.12 What Do I Do If a VPN Connection Fails to Be Established?

1. Log in to the management console, and choose **Virtual Private Network** > **Enterprise – VPN Connections**.
2. In the VPN connection list, locate the target VPN connection, and choose **More** > **Modify Policy Settings** on the right to view IKE and IPsec policies of the VPN connection.
3. Check the IKE and IPsec policies to see whether the negotiation modes and encryption algorithms at both ends of the VPN connection are the same.

   If the IKE SA has been set up in phase 1 but no IPsec SA has been established in phase 2, the IPsec policies at both ends of the VPN connection may be inconsistent.
4. Check whether the ACL configurations are correct.

   If the subnets of your on-premises data center are 192.168.3.0/24 and 192.168.4.0/24, and the VPC subnets are 192.168.1.0/24 and 192.168.2.0/24, configure the ACL rules for each on-premises subnet to allow communication with the VPC subnets. The following provides an example of ACL configurations:

   ```
   rule 1 permit ip source 192.168.3.0 0.0.0.255 destination 192.168.1.0 0.0.0.255
   rule 2 permit ip source 192.168.3.0 0.0.0.255 destination 192.168.2.0 0.0.0.255
   ```



```
rule 3 permit ip source 192.168.4.0 0.0.0.255 destination 192.168.1.0 0.0.0.255
rule 4 permit ip source 192.168.4.0 0.0.0.255 destination 192.168.2.0 0.0.0.255
```

5. Ping the two ends of the VPN connection from each other to check whether the VPN connection is normal.

1.7.13 What Should I Do If I Cannot Access the Cloud from My On-premises Data Center or LAN After the VPN Connection Has Been Set Up?

The security group denies access from all sources by default. If you want to access your ECSs, configure security group rules to permit access from your on-premises subnets.

1.7.14 Why Is the State of a Successfully Created VPN Connection Displayed as Not Connected?

There is a delay in updating the state of a VPN connection on the management console. Please refresh the page in about 2 minutes.

1.7.15 Do VPNs Have the DPD Function Enabled?

Yes.

By default, the dead peer detection (DPD) function is enabled for VPNs to detect the state of the IKE process in an on-premises data center.

After three consecutive detection failures, the IKE process in the on-premises data center is considered abnormal, and the tunnel on the cloud is automatically deleted.

The DPD protocol does not require that the peer end also be configured with DPD, but it requires that the peer end be able to respond to DPD detections. To ensure consistent tunnel states at the two ends, it is recommended that you enable DPD on your on-premises gateway to detect the IKE process state of the VPN service.

NOTE

Deleting the tunnel in the case of DPD detection failures will not affect service stability.

DPD can detect exceptions in the IKE process at the peer end in time and reset the tunnel to ensure tunnel synchronization between the two ends. After a tunnel is deleted, if there is traffic transmitted over the tunnel, the tunnel can be re-established through negotiation.

1.8 Public Addresses

1.8.1 Can the EIP of a VPN Gateway Be Retained After the VPN Gateway Is Deleted?

If a pay-per-use EIP is bound to a pay-per-use VPN gateway, deleting the VPN gateway will also delete the bound EIP.

To retain such a pay-per-use EIP, unbind it before deleting the VPN gateway.

1.8.2 Can EIPs Be Used as VPN Gateway IP Addresses?

Yes.

When creating a VPN gateway, you can bind EIPs as the gateway IP addresses.

1.8.3 Do I Need to Purchase EIPs for Hosts to Communicate with Each Other Through a VPN?

If your on-premises hosts need to access an ECS on the cloud through a VPN, you do not need to purchase any EIPs for the ECS.

If an ECS needs to provide services accessible from the Internet, you need to purchase an EIP for the ECS.

1.8.4 Why Does an ECS Have EIP Access Information After I Enable a VPN?

A possible cause is that the ECS has an EIP bound before the VPN is used. In this scenario, you can access the ECS through both the VPN and the EIP.

To allow only hosts on the VPN to access the ECS, unbind the EIP from the ECS after the VPN connection is established.

1.8.5 Can My On-premises Gateway Have a Non-fixed Public IP Address?

Yes.

If the VPN gateway that you purchased supports access via non-fixed IP addresses, your customer gateway device in the on-premises data center can use a non-fixed IP address to connect to the cloud.

NOTE

Whether a VPN gateway supports access via non-fixed IP addresses depends on the region selected on the management console.

1.9 Route Configurations

1.9.1 What Are a Customer Gateway and a Customer Subnet in a VPN Connection?

A VPN connection is created on the cloud. As such, a subnet of a VPC is a local subnet, and a VPN gateway created on the cloud is a local gateway. The subnet and gateway in an on-premises data center connected to the VPC are a customer subnet and a customer gateway, respectively.

A customer gateway's IP address is a public IP address.

1.9.2 Where Can I Add Routes to Customer Subnets on the VPN Console?

When a VPN connection is created, routes to customer subnets are automatically delivered.

1.9.3 Do I Need to Add a Route for an ECS with Multiple NICs to Reach the On-premises Network?

- If the primary network interface card (NIC) is used to establish a VPN connection with the on-premises network, no route needs to be added.
- If a non-primary NIC is used to establish a VPN connection with the on-premises network, add a route to the on-premises network with the gateway address of the non-primary NIC as the next hop.

1.9.4 Huawei Cloud VPN NQA

What Is NQA?

Network Quality Analysis (NQA) is a technology to measure network performance and collect statistics on network indicators such as delay, jitter, and packet loss rate. It helps administrators learn network service quality in real time and effectively diagnose and locate network faults.

NQA Fundamentals

Figure 1-11 NQA test

In an NQA test, the source is called an NQA client, and the destination is called an NQA server. To enable an NQA client to initiate an NQA test, you need to create a test instance of a specific type on the NQA client. The NQA client then constructs packets that comply with the corresponding protocol, adds timestamps to the packets, and sends the packets to the server.

An NQA server listens to the NQA test packets with the specified IP address and port number and responds to the test accordingly. The client then calculates performance indicators, such as the connectivity, delay, and packet loss rate, based on statistics about the sent and received packets.

Processing Mechanism of NQA Tests

In an ICMP test, ICMP packets are sent to check reachability of the destination and calculate the network response time and packet loss rate.

A source constructs an ICMP Echo Request packet and sends it to a destination. When receiving the packet, the destination returns an ICMP Echo Reply packet to the source.

Upon receipt of the ICMP Echo Reply packet, the source calculates the time between when it sends the ICMP Echo Request packet and when it receives the ICMP Echo Reply packet. The test result reflects network performance and connectivity.

The NQA detection interval is 10s, and three ICMP requests are sent within 10s.

Why Do We Need NQA?

As value-added services develop, users and carriers demand higher quality of service (QoS). Especially after voice and video services are provisioned on conventional IP networks, carriers and users reach service level agreements (SLAs) to implement QoS guaranteed services.

To provide committed bandwidth for users, carriers need to collect statistics about network indicators such as the delay, jitter, and packet loss rate, and analyze the statistics to obtain network performance. Conventional network performance analysis methods (such as ping and tracert) cannot meet carriers' requirements for real-time monitoring on diverse services. Against this backdrop, NQA can be deployed to accurately test the network running status and export statistics. NQA can measure the performance of various protocols running on the network. This facilitates real-time collection of different network performance indicators, such as the total HTTP connection delay, TCP connection delay, DNS resolution delay, file transfer rate, FTP connection delay, and DNS resolution error rate. Network carriers control these indicators to provide users with network services of various grades. In addition, NQA is an effective tool to diagnose and locate faults on the network.

NQA for Static Routes

- Static routes do not have a dedicated detection mechanism. If an indirect link fails, a network administrator must manually delete the corresponding static route from the IP routing table. This process delays link switchover and causes service interruption for a significant amount of time.
- When creating VPN connections in static routing mode, you can enable NQA to detect faults in links for static routes. This prevents the preceding problems and ensures stability of VPN connections. When using NQA, ensure that the customer gateway device supports ICMP and is correctly configured with the customer tunnel interface IP addresses of the VPN connections. Otherwise, traffic will fail to be forwarded.
- If NQA detection fails for a VPN connection in static routing mode, the corresponding route is withdrawn. The customer gateway needs to permit ICMP traffic from the local tunnel interface address to the remote tunnel interface address of the VPN connection.
- The NQA detection results of VPN connections in health check are reported only to Cloud Eye. There is no impact if the detection fails. The customer gateway needs to permit ICMP traffic from the public IP addresses of the VPN gateway to the public IP address of the customer gateway.

1.10 Subnet Configurations

1.10.1 What Are the Precautions for Configuring the Local and Customer Subnets for a VPN Connection?

- The number of local subnets and the number of customer subnets are limited. If the number of local or customer subnets exceeds the upper limit, aggregate the subnets.
  - Maximum number of local subnets for each VPN gateway: 50
  - Maximum number of customer subnets for each VPN connection: 50
- A local subnet cannot include the CIDR block of a customer subnet, whereas a customer subnet can include the CIDR block of a local subnet.
- There are routes pointing to the local subnets in the VPC where the VPN gateway resides.
- If there are two connections (connection A and connection B) created for a VPN gateway, and the customer subnet of connection A is within that of connection B, when the destination network to be accessed belongs to the overlapped CIDR block, the connection created first is matched first, regardless of the connection status. (Mask length match is not used for VPN connections created in policy-based mode.)

1.10.2 How Many Local and Customer Subnets Can I Add to a VPN?

- You can configure a maximum of 50 local subnets for each VPN gateway.
- You can configure a maximum of 50 customer subnets for each VPN connection.

1.10.3 What Do I Do If an Exception Occurs When I Add a Customer Subnet During VPN Connection Creation?

Check whether this customer subnet is involved in a route of a VPC peering, Cloud Connect, or Direct Connect connection. If so, a route conflict occurs and you need to delete the route and create a new one to prevent the conflict.

1.10.4 Can the EIP of a VPN Gateway Be Retained After the VPN Gateway Is Deleted?

If a pay-per-use EIP is bound to a pay-per-use VPN gateway, deleting the VPN gateway will also delete the bound EIP.

To retain such a pay-per-use EIP, unbind it before deleting the VPN gateway.

1.10.5 How Do I Plan CIDR Blocks for Access to a VPC Through a VPN Connection?

- The CIDR blocks of a VPC cannot conflict with on-premises CIDR blocks.
- To avoid conflicts with cloud service addresses, do not use 127.0.0.0/8, 169.254.0.0/16, 224.0.0.0/3, 100.64.0.0/10, 100.64.0.0/12, and 214.0.0.0/8 for your on-premises network.

  If you need to use 100.64.0.0/10 or 100.64.0.0/12, **submit a service ticket**.

1.10.6 How Is a VPN Gateway IP Address Allocated?

VPN gateway IP addresses are a group of IP addresses planned before VPN gateways are purchased. These IP addresses are preset with VPN configurations.

When you buy a VPN gateway, the system randomly assigns an IP address and binds it to the VPC you selected. This IP address can be bound to only one VPC.

You cannot change the IP address of a VPN gateway as this IP address has preset configurations. When a VPN gateway is deleted, the binding relationship between the gateway IP address and the gateway VPC is released. When a new VPN gateway is purchased, the system randomly allocates a new gateway IP address.

1.11 VPN Interesting Traffic

1.11.1 Do I Need to Configure ACL Rules on the Console After I Configure ACL Rules on the On-premises Gateway Device?

You need to configure policy rules (ACL rules) for a VPN connection on the management console only when **VPN Type** is set to **Policy-based**.

1.11.2 How Do I Configure and Modify the Interesting Traffic of a VPN on the Cloud?

The number of rules that specify interesting traffic is the product of the number of local subnets and the number of customer subnets. For example, when there are local subnets A and B and customer subnets C, D, and E, the following six ACL rules need to be configured to specify interesting traffic:

```
rule 1 permit ip source A destination C
rule 2 permit ip source A destination D
rule 3 permit ip source A destination E
rule 4 permit ip source B destination C
rule 5 permit ip source B destination D
rule 6 permit ip source B destination E
```

If you modify the local or customer subnets on the management console, the interesting traffic configuration is automatically updated. That is, ACL rules on the cloud are modified.

1.12 Keeping VPN Connections Alive

1.12.1 How Can I Prevent VPN Disconnections?

VPN connections are renegotiated when the IPsec SA lifetime is about to expire or the data transmitted through a VPN connection exceeds 20 GB. Usually, renegotiation does not interrupt VPN connections.

Most disconnections are caused by incorrect configurations at the two ends of the VPN connection or renegotiation failures due to Internet exceptions.

Common causes of disconnections are as follows:

- ACLs at both ends of the VPN connection do not match.
- SA lifetime settings at both ends of the VPN connection are different.
- Dead Peer Detection (DPD) is not configured on the device in your on-premises data center.
- Configuration is modified when the VPN connection is in use.
- Jitter occurs on the carrier's network.

As such, ensure that the following VPN configurations are correct to keep VPN connections alive:

- At the two ends of the VPN connection, the local and customer subnet configurations are reversed.
- SA lifetime settings at both ends of the VPN connection are the same.
- DPD is enabled on the on-premises gateway device, and the number of detection times is 3 or more.
- Parameters are modified at both ends of the VPN connection during the use of the VPN connection.
- Set TCP MAX-MSS to 1300 for the on-premises gateway device.
- The bandwidth of the on-premises gateway device is large enough for the VPN connection.
- VPN connection negotiation can be triggered by both ends and active negotiation has been enabled on the on-premises gateway device.

1.13 Monitoring

1.13.1 What VPN Resources Can Be Monitored?

VPN gateway

The following bandwidth information of a VPN gateway IP address can be monitored: inbound traffic, inbound bandwidth, outbound traffic, outbound bandwidth, and outbound bandwidth usage.

VPN connection

The following information about a VPN connection can be monitored: VPN connection status, average link round-trip time (RTT), maximum link RTT, link packet loss rate, average tunnel RTT, maximum tunnel RTT, and tunnel packet loss rate.

To monitor average link RTT, maximum link RTT, link packet loss rate, average tunnel RTT, maximum tunnel RTT, and tunnel packet loss rate, click the VPN connection name and click **Add** in the **Health Check** area on the **Summary** tab page to add health check items. Private network metrics can be configured only when the VPN connection uses the static routing mode and the NQA function is enabled.

1.13.2 Will I Be Notified If a VPN Connection Is Interrupted?

The VPN connection status can be monitored. After a VPN connection is created, the VPN service reports the connection status information to Cloud Eye, but does not send alarm notifications to you. To receive notifications, create alarm rules and enable **Alarm Notification** on the Cloud Eye console.

1.13.3 Can I View the Traffic of Each VPN Connection?

No. VPN traffic is monitored on a per-VPN gateway basis. You can view the inbound and outbound traffic as well as the inbound and outbound bandwidths of a VPN gateway, but cannot view the traffic statistics of a specific VPN connection.

1.13.4 Will I Be Notified of Abnormal VPN Monitoring Results?

Yes.

You can configure, on the Simple Message Notification (SMN) and Cloud Eye consoles, to receive notifications if abnormal VPN monitoring results occur.

1.14 Bandwidth and Network Speed

1.14.1 How Is the Network Speed of a VPN Connection Tested?

Test environment: A VPN connection has been created. ECSs have been created on the local subnets of VPCs at the two ends of the VPN connection. The ECSs can ping each other.

When the bandwidth of a purchased VPN gateway is 200 Mbit/s:

1. When the ECSs at the two ends of the VPN connection run Windows, iPerf3 and FileZilla (a free FTP application for file upload and download) are used to test the network speed. The test result is 180 Mbit/s, meeting requirements.

   NOTE

   The TCP-based FTP protocol has a congestion control mechanism, and the IPsec protocol adds new headers to original packets. As such, it is normal in the industry, to have a network speed deviation of about 10%.

   Figure 1-12 shows the result of testing the 200 Mbit/s bandwidth on the iPerf3 client.

Figure 1-12 Test result for 200 Mbit/s bandwidth (iPerf3 client)

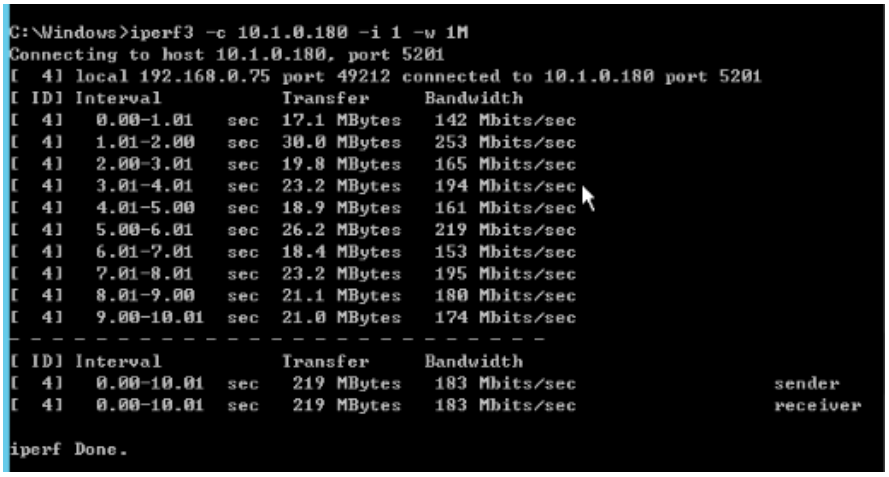
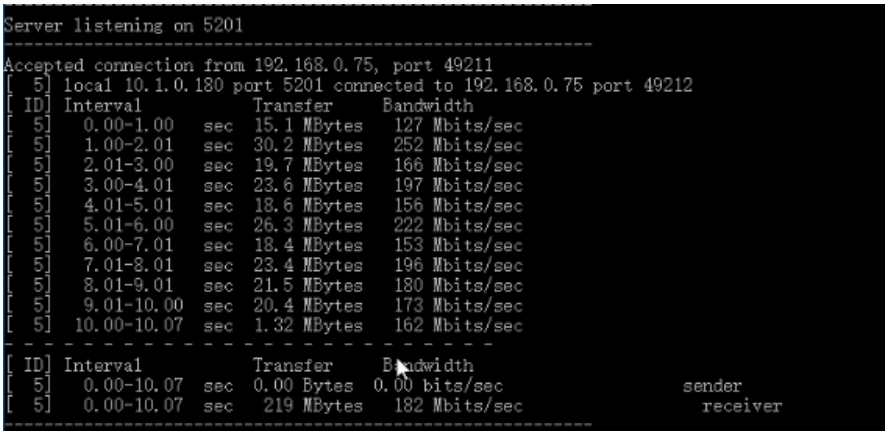


Figure 1-13 shows the result of testing the 200 Mbit/s bandwidth on the iPerf3 server.

Figure 1-13 Test result for 200 Mbit/s bandwidth (iPerf3 server)

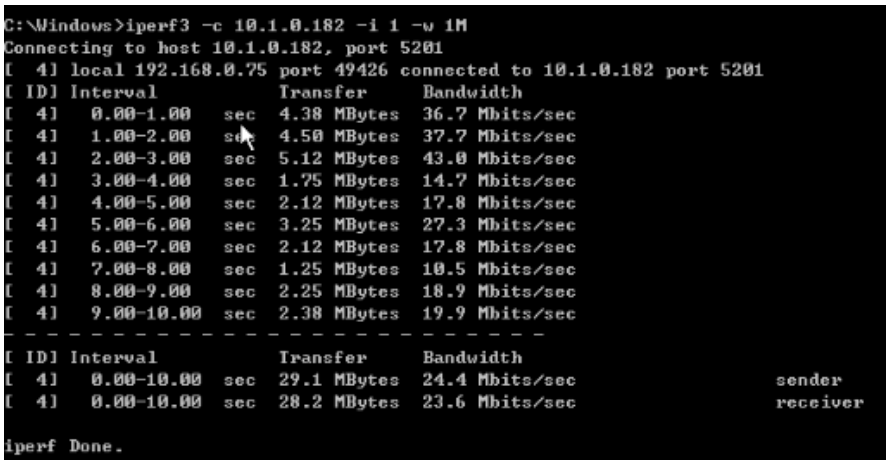


2. When the ECSs at the two ends of the VPN connection run CentOS 7, iPerf3 is used to test the network speed. The test result is 180 Mbit/s, meeting requirements.
3. When the ECS functioning as a server runs CentOS 7 and the ECS functioning as a client runs Windows, iPerf3 and FileZilla are used to test the network speed. The test result is 20 Mbit/s, failing to meet requirements.

   This is because TCP implementations on Windows and Linux are different.

   Figure 1-14 shows the result of using iPerf3 to test the network speed between two ECSs running different operating systems.

Figure 1-14 Test result on iPerf3



When the bandwidth of a purchased VPN gateway is 1000 Mbit/s:

NOTE

Some regions support only 300 Mbit/s bandwidth by default. If higher bandwidth is required, select 300 Mbit/s bandwidth and then **submit a service ticket** for capacity expansion.

The VPN gateway bandwidth is shared by all of its VPN connections. To fully use the large bandwidth of 1000 Mbit/s, deploy multiple ECSs with high specifications as the forwarding performance of a single ECS is limited. ECSs with their NICs supporting the bandwidth of 2 Gbit/s or higher are recommended.

Conclusions: Based on the preceding test results, bandwidths of VPN gateways meet requirements. To fully use your purchased bandwidth, you are advised to use servers running the same operating system and using NICs meeting certain requirements at the two ends of a VPN connection.

1.14.2 In Which Direction Is the VPN Bandwidth Limited? What Is the Unit of Bandwidth?

Your purchased VPN gateway bandwidth applies to the outbound direction of the cloud. To achieve a balance between bandwidths in the inbound and outbound directions, the bandwidth in the inbound direction is limited as follows:

- If the purchased bandwidth is 10 Mbit/s or less, the bandwidth in the inbound direction is limited to 10 Mbit/s.
- If the purchased bandwidth is greater than 10 Mbit/s, the bandwidth in the inbound direction is the same as the purchased bandwidth.

The unit of bandwidth is Mbit/s and that of traffic is GB.

1.14.3 How Do I Change the VPN Bandwidth?

1. In the VPN gateway list, click the name of a VPN gateway. The gateway details page is displayed.
2. In the **EIP** area, click **Change** next to **Bandwidth**.
3. Change the EIP bandwidth.

When changing the EIP bandwidth, follow the EIP bandwidth configuration requirements. For details, see **Modifying an EIP Bandwidth**.

NOTE

The EIP bandwidth cannot exceed the VPN bandwidth.

1.14.4 What Will Happen If Traffic Exceeds the Bandwidth of a VPN Gateway?

The VPN gateway bandwidth applies to traffic in the outbound direction of a VPC. If outbound traffic in the VPC exceeds the bandwidth, network congestion will occur, some subnets cannot be accessed, or even the VPN connection will be interrupted due to VPN detection timeout.

In this case, you are advised to increase the VPN gateway bandwidth.

NOTE

- The maximum bandwidth supported by a VPN gateway of the Basic specification is 100 Mbit/s.
- The maximum bandwidth supported by a VPN gateway of the Profession 1 specification is 300 Mbit/s.
- The maximum bandwidth supported by a VPN gateway of the Profession 2 specification is 1 Gbit/s.
- The maximum bandwidth supported by a VPN gateway of the Profession 3 specification is 5 Gbit/s.

1.14.5 Why Does the VPN Bandwidth Change Not Take Effect?

There is a delay for the VPN bandwidth change to take effect.

Test the bandwidth 5 minutes after you change the bandwidth.

NOTE

Changing the VPN bandwidth will not interrupt services on networks.

1.14.6 What Are the Differences Between the Bandwidth of a VPN Connection and That of a Direct Connect Connection?

Concepts

- The bandwidth of a Direct Connect connection is the bandwidth of the physical connection created by a user.
- The bandwidth of a VPN connection applies to the outbound direction of the cloud.

Maximum Bandwidth

- By default, the maximum bandwidth of a Direct Connect connection is 1000 Mbit/s. When you create a connection on the management console and set **Port Type** to **10GE single-mode optical port**, the maximum bandwidth is 10 Gbit/s.

- The maximum bandwidth supported by a VPN gateway is as follows:
  - The maximum bandwidth supported by a VPN gateway of the Basic specification is 100 Mbit/s.
  - The maximum bandwidth supported by a VPN gateway of the Profession 1 specification is 300 Mbit/s.
  - The maximum bandwidth supported by a VPN gateway of the Profession 2 specification is 1 Gbit/s.
  - The maximum bandwidth supported by a VPN gateway of the Profession 3 specification is 5 Gbit/s.

Network Quality

- A Direct Connect user has a dedicated connection with high network quality.
- VPN connections share the bandwidth of their VPN gateway. That is, the total bandwidth of VPN connections cannot exceed the bandwidth of the corresponding VPN gateway. The network quality will be affected by the Internet quality.

1.14.7 How Do I Determine My VPN Bandwidth?

Consider the following when you determine the bandwidth:

- Amount of data transmitted over a VPN tunnel in a period of time (Reserve enough bandwidth to prevent link congestion.)
- Egress bandwidths at the two ends of a VPN connection: The egress bandwidth at the cloud side must be less than that at the on-premises side.

1.15 Quotas

1.15.1 What Quotas Does a VPN Have?

Resource Types

VPN resources include VPN gateways, VPN connections, and customer gateways. The total quota of each resource type varies according to regions.

1.15.2 How Many VPN Gateways and VPN Connections Can I Create By Default?

By default, each user can create a maximum of 50 VPN gateways and 100 customer gateways. Each VPN gateway can have a maximum of 100 connection groups. When two EIPs of a VPN gateway are connected to the same public IP address of a customer gateway, one VPN connection group is used. When two EIPs of a VPN gateway are connected to two customer gateways or two public IP addresses of the same customer gateway, two VPN connection groups are used.

Before purchasing VPN gateways, check your available quota. If the quota is insufficient, **submit a service ticket** to increase the quota.

1.15.3 How Do I Change My VPN Gateway and Connection Quotas?

1. Log in to the management console, and choose **Service Tickets** > **Create Service Ticket** in the menu bar.
2. On the **Create Service Ticket** page, click **Quotas** in the **Services** area.
3. Click **Quota Application** under **Issue Categories**.
4. Click **Create Now**.

   Enter required information and click **Submit**.

1.15.4 How Many IPsec VPNs Can I Have?

By default, each user can create a maximum of 50 VPN gateways and 100 customer gateways. Each VPN gateway can have a maximum of 100 connection groups. When two EIPs of a VPN gateway are connected to the same public IP address of a customer gateway, one VPN connection group is used. When two EIPs of a VPN gateway are connected to two customer gateways or two public IP addresses of the same customer gateway, two VPN connection groups are used.

Before purchasing VPN gateways, check your available quota. If the quota is insufficient, **submit a service ticket** to increase the quota.

1.16 Account Permissions

1.16.1 Are a Username and Password Required for Creating an IPsec VPN Connection?

No. IPsec VPN uses a pre-shared key (PSK) for authentication. The PSK is configured on a VPN gateway, and a connection will be established after VPN negotiation is complete. Therefore, no username or password is required for creating an IPsec VPN connection. Generally, SSL, PPTP, and L2TP VPNs use usernames and passwords for authentication.

NOTE

IPsec XAUTH provides extended authentication for IPsec VPN. It requires users to enter their usernames and passwords during VPN negotiation.

Currently, VPN does not support IPsec XAUTH.

1.16.2 What Should I Do If the System Displays a Message Indicating that I Do Not Have the Permissions to Create a VPN?

- Check whether your account is an IAM account.
- Ensure that your IAM account has the **VPN FullAccess** permission. For details, see **Creating a User Group and Assigning Permissions** and **Adding Users to or Removing Users from a User Group**.

1.16.3 How Do I Determine that a VPN Cannot Be Created in My Account Due to Insufficient Permissions?

If the system displays a message indicating that you do not have the permissions to create a VPN gateway or VPN connection, add the required permissions.

For details about the permissions required for using the VPN service, see **IAM-based Permissions Management**.

2 FAQs - P2C VPN

2.1 How Do I Test the Bandwidth of a P2C VPN Gateway?

You are advised to use the iPerf3 tool to test the bandwidth of P2C VPN gateways. Using commands such as FTP and SCP commands for file transfer is not recommended, because the file transfer rate is affected by the disk read/write speed and the bandwidth test result is not accurate.

Prerequisites

- The VPN gateway and server have been configured, and clients can connect to the VPN gateway.

  In this example, the specification of the VPN gateway is Professional 1 (maximum forwarding bandwidth: 300 Mbit/s).
- Three ECS instances have been deployed in the VPC where the VPN gateway is located to simulate resource nodes on the cloud.

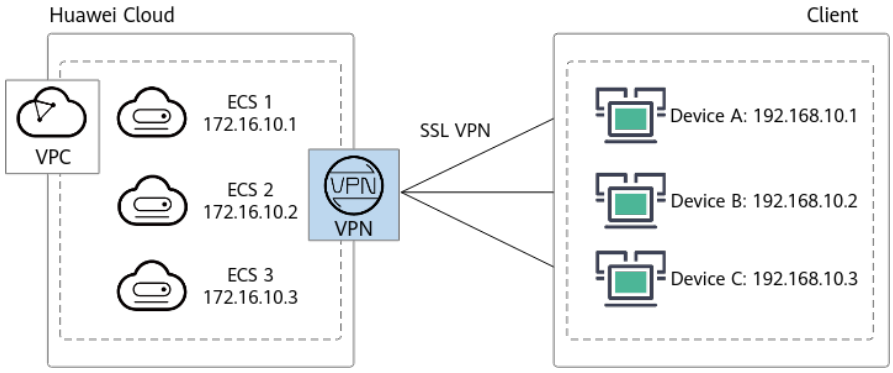
  In this example, the flavor of each ECS is c6.large.2 (2 vCPUs, 4 GB memory, CentOS 8.0 - 64-bit system image).
- Three on-premises devices have been prepared to simulate clients.

  In this example, device A and device B are Linux servers (4U8G, running the ubuntu-20.04.6-live-server-amd64 operating system), and device C is a PC (i7 processor, running the Windows 10 operating system).
- The bandwidth capabilities of on-premises devices, ECS interfaces, and networks meet the following requirements: The upstream and downstream bandwidths are greater than or equal to 100 Mbit/s.
- The quality of the network between on-premises devices and the VPN gateway is good.

Networking Scenario

This section describes how to use the iPerf3 tool to test the VPN gateway bandwidth. **Figure 2-1** shows the networking diagram.

Figure 2-1 Networking diagram



Installing iPerf3

The following describes how to install iPerf3 on the on-premises devices used in this test.

Installing iPerf3 on Linux

1. Open the CLI.
2. Run the following command to install iPerf3:

   yum install -y iperf3
3. Run the following command to check whether the installation is successful:

   iperf3 -v

   If the iPerf version is displayed, the installation is successful.

Installing iPerf3 on Windows

Download the iPerf3 software package based on the operating system version from the iPerf3 official website.

Using iPerf3 to Test the Bandwidth of a VPN Gateway

Overview of iPerf3

Table 2-1 describes the key parameters of iPerf3.

Table 2-1 Key parameters of iPerf3

Parameter	Description
-s	Specifies that iPerf3 runs in server mode.
-c	Specifies that iPerf3 runs in client mode.
-p	Specifies the listening port of the server, that is, the server port to which a client needs to connect. (The settings on the server and client must be the same.)
-i	Specifies the interval for sending data, in seconds.

Parameter	Description
-l	Specifies the length of the buffer to read or write. You are advised to set this parameter to 1300 to simulate service data whose payload length is 1300 bytes.
-P	Specifies the number of threads. If this parameter is not specified, a single thread is used by default.

On-premises Devices Functioning as Servers

1. Run the following commands on on-premises devices to start the iPerf3 process in server mode, with different listening ports specified. The following is an example:
   - Device A (Linux)

     iperf3 -s -p 20001
   - Device B (Linux)

     iperf3 -s -p 20002
   - Device C (Windows)

     iperf3.exe -s -p 20003
2. Run the following command on the three ECSs to start the iPerf3 process in client mode, with the server listening port of the on-premises device specified.

   iperf3 -c *server-ip* **-p** *server-port* **-l 1300 -P 10**

   The following is an example:

   ```
   iperf3 -c 192.168.10.1 -p 20001 -l 1300 -P 10
   iperf3 -c 192.168.10.2 -p 20002 -l 1300 -P 10
   iperf3 -c 192.168.10.3 -p 20003 -l 1300 -P 10
   ```

On-premises Devices Functioning as Clients

1. Run the following command on the three ECSs to start the iPerf3 process in server mode, with different listening ports specified.

   iperf3 -s -p *server-port*

   The following is an example:

   ```
   iperf3 -s -p 20001
   iperf3 -s -p 20002
   iperf3 -s -p 20003
   ```
2. Run the following commands on on-premises devices to start the iPerf3 process in client mode, with different server listening ports specified. The following is an example:
   - Device A

     iperf3 -c 172.16.10.1 -p 20001 -l 1300 -P 10
   - Device B

     iperf3 -c 172.16.10.2 -p 20002 -l 1300 -P 10
   - Device C

     iperf3.exe -c 172.16.10.3 -p 20003 -l 1300 -P 10

Test Result

After the iPerf3 process is executed, the following information is displayed:

```
Connecting to host 172.16.10.1, port 20001
[  4] local 192.168.10.1 port 20001 connected to 172.16.10.1 port 20001
[ ID] Interval           Transfer     Bandwidth
[  4]   0.00-1.00   sec  8.62 MBytes  72.1 Mbits/sec
[  4]   1.00-2.01   sec  9.88 MBytes  82.2 Mbits/sec
[  4]   2.01-3.01   sec  9.88 MBytes  82.9 Mbits/sec
[  4]   3.01-4.00   sec  9.50 MBytes  80.4 Mbits/sec
[  4]   4.00-5.01   sec  9.88 MBytes  82.1 Mbits/sec
[  4]   5.01-6.01   sec  9.62 MBytes  81.2 Mbits/sec
[  4]   6.01-7.00   sec  9.12 MBytes  77.0 Mbits/sec
[  4]   7.00-8.01   sec  10.0 MBytes  83.2 Mbits/sec
[  4]   8.01-9.01   sec  9.50 MBytes  79.9 Mbits/sec
[  4]   9.01-10.01  sec  8.62 MBytes  72.4 Mbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bandwidth
[  4]   0.00-10.01  sec  94.6 MBytes  79.3 Mbits/sec                  sender
[  4]   0.00-10.01  sec  94.6 MBytes  79.3 Mbits/sec                  receiver
```

According to the preceding iPerf3 test result, the transmission rate from 192.168.10.1 to 172.16.10.1 is about 79.3 Mbit/s. The test lasted for 10 seconds, during which 94.6 MB data is sent.

2.2 Does a P2C VPN Gateway Support Domain Name Access?

A P2C VPN gateway supports domain name access. This means users can use domain names to access cloud services.

2.3 Failed to Upload Certificates to CCM

2.3.1 Error Message "The certificate chain length must be greater than 1." Is Displayed During Certificate Upload

Symptom

When a certificate is uploaded to CCM, the error message "The certificate chain length must be greater than 1." is displayed.

Possible Causes

The upper-level CA certificate is not uploaded together with the current certificate.

Constraints

Before uploading certificates to CCM, ensure that the server certificate, CA certificate, and server private key have been generated. For details about how to generate certificates, see **Using Easy-RSA to Issue Certificates (Server and Client Sharing a CA Certificate)**.

Procedure

Step 1 Log in to the management console.

Step 2 Click in the upper left corner and select the desired region and project.

Step 3 Click in the upper left corner, and choose **Networking** > **Virtual Private Network**.

Step 4 In the navigation pane on the left, choose **Virtual Private Network** > **Enterprise – VPN Gateways**.

Step 5 Click the **P2C VPN Gateways** tab. In the P2C VPN gateway list, locate the target P2C VPN gateway, and click **View Server** in the **Operation** column.

Step 6 On the **Server** tab page, set **Server Certificate** to **Existing certificate**, and click **Upload** in the drop-down list box. The **Cloud Certificate & Manager** page is displayed.

Step 7 On the **SSL Certificate Manager** page, click the **Hosted Certificates** tab and then click **Upload Certificate**.

Step 8 Use Notepad or Notepad++ to open the server certificate.

Step 9 Copy the certificate content to the **Certificate File** text box.

The certificate file format is as follows:

```
-----BEGIN CERTIFICATE-----
Server certificate content
-----END CERTIFICATE-----
```

Step 10 Use Notepad or Notepad++ to open the CA certificate used to issue the server certificate.

Step 11 Copy the certificate content to the **Certificate File** text box.

The certificate file format is as follows:

```
-----BEGIN CERTIFICATE-----
Server certificate content
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
CA certificate content
-----END CERTIFICATE-----
```

Step 12 Use Notepad or Notepad++ to open the private key of the server certificate.

Step 13 Copy the private key content to the **Private Key** text box.

The private key format is as follows:

```
-----BEGIN PRIVATE KEY-----
Server private key content
-----END PRIVATE KEY-----
```

Step 14 Click **Submit**. The certificates are uploaded.

----End

2.3.2 Error Message "Incorrect format of the domain bound to the certificate to be uploaded." Is Displayed During Certificate Upload

Symptom

When a certificate is uploaded to CCM, the error message "Incorrect format of the domain bound to the certificate to be uploaded." is displayed.

Possible Causes

The domain name format of the certificate is incorrect. The correct format is xxx.com or xxx.cn.

Procedure

Step 1 Re-generate certificates with the correct domain name format. For details, see **Using Easy-RSA to Issue Certificates (Server and Client Sharing a CA Certificate)**.

Step 2 Log in to the management console.

Step 3 Go to the CCM console and upload the certificates.

For details, see **Using the CCM to Manage a Server Certificate**.

----End

2.4 When a Client Fails to Connect to a VPN Gateway, No Error Information Is Displayed and the Client Is Always in Connecting State.

Symptom

When a client fails to connect to a vpn gateway, no error information is displayed and the client is always in connecting state.

Possible Causes

- The client device cannot access the Internet.
- The client version does not meet the requirements.

Procedure

1. Verify that the client can ping the EIPs of the VPN gateway.
2. If the client runs on the Windows operating system, disable the firewall function and try again.
3. Use OpenVPN 2.5 or later.

If the problem persists, **submit a service ticket** to contact Huawei technical support.

