Amazon Virtual Private Cloud Network Administrator Guide



Amazon Virtual Private Cloud: Network Administrator Guide

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Welcome

Welcome to the *Amazon Virtual Private Cloud Network Administrator Guide*. This guide is for customers who plan to use an IPsec hardware VPN with their virtual private cloud (VPC). The topics in this guide help you configure your customer gateway, which is the device on your side of the VPN connection.

The VPN connection lets you bridge your VPC and IT infrastructure, and extend your existing security and management policies to EC2 instances in your VPC as if they were running within your own infrastructure.

For more information, see the following topics:

- Your Customer Gateway (p. 2)
- Example: Check Point Device with Border Gateway Protocol (p. 13)
- Example: Check Point Device without Border Gateway Protocol (p. 23)
- Example: Cisco ASA Device (p. 35)
- Example: Cisco IOS Device (p. 43)
- Example: Cisco IOS Device without Border Gateway Protocol (p. 54)
- Example: Dell SonicWALL SonicOS Device Without Border Gateway Protocol (p. 71)
- Example: Dell SonicWALL Device (p. 63)
- Example: Juniper J-Series JunOS Device (p. 91)
- Example: Juniper SRX JunOS Device (p. 103)
- Example: Juniper ScreenOS Device (p. 115)
- Example: Palo Alto Networks Device (p. 125)
- Example: Yamaha Device (p. 135)
- Example: Generic Customer Gateway Using Border Gateway Protocol (p. 145)
- Example: Generic Customer Gateway without Border Gateway Protocol (p. 153)
- Configuring Windows Server 2008 R2 as a Customer Gateway (p. 188)
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Your Customer Gateway

Topics

- Your Role (p. 2)
- What Is a Customer Gateway? (p. 2)
- Summary of What You Need to Do (p. 4)
- Determining Your Network Information (p. 4)
- Four Main Parts to Customer Gateway Configuration (p. 5)
- AWS VPN CloudHub and Redundant Customer Gateways (p. 6)
- Configuring Multiple VPN Connections to Your Amazon VPC (p. 6)
- Customer Gateway Devices We've Tested (p. 7)
- Requirements for Your Customer Gateway (p. 8)
- If You Have a Firewall Between the Internet and Your Customer Gateway (p. 10)

Your Role

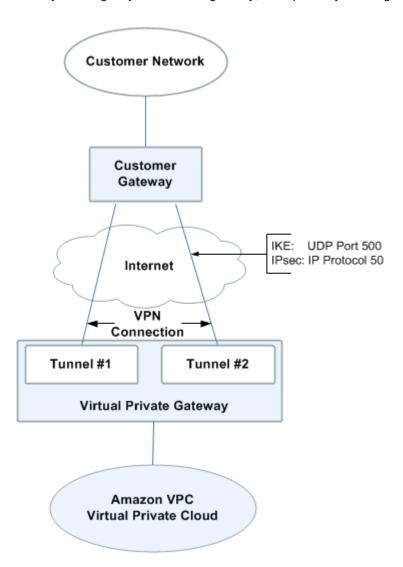
Throughout this guide, we refer to your company's *integration team*, which is the person (or persons) at your company working to integrate your infrastructure with Amazon VPC. This team might consist of just you, or might not include you at all, depending on how your company allocates network engineering resources. The important thing to know is that someone at your company must use the AWS Management Console to get the information that you need to configure your customer gateway, and someone must actually configure the customer gateway. Your company might have a separate team for each task (an integration team that uses the AWS Management Console, and a separate network engineering group that has access to network devices and configures the customer gateway). Or your company might have a single person who does both tasks, or some other arrangement entirely. This guide assumes that you're someone in the network engineering group who receives information from your company's integration team so you can then configure the customer gateway device.

What Is a Customer Gateway?

Your company has decided to use an optional Amazon VPC VPN connection that links your data center (or network) to your Amazon VPC virtual private cloud (VPC). A *customer gateway* is the anchor on your side of that connection. It can be a physical or software appliance. The anchor on the AWS side of the VPN connection is called a *virtual private gateway*.

The following diagram shows your network, the customer gateway, the VPN connection that goes to the virtual private gateway, and the VPC. There are two lines between the customer gateway and

virtual private gateway because the VPN connection consists of two tunnels. We chose this design to provide increased availability for the Amazon VPC service. If there's a device failure within AWS, your VPN connection automatically fails over to the second tunnel so that your access isn't interrupted. When you configure your customer gateway, it's important you configure both tunnels.



The address of the external interface for your customer gateway must be a static address. Your customer gateway may reside behind a device performing network address translation (NAT). To ensure that NAT traversal (NAT-T) can function, you must adjust your firewall rules to unblock UDP port 4500. You can create additional VPN connections to other VPCs using the same customer gateway device. You can reuse the same customer gateway IP address for each of those VPN connections.

From time to time, AWS performs routine maintenance on the virtual private gateway. This maintenance may disable one of the two tunnels of your VPN connection for a brief period of time. Your VPN connection automatically fails over to the second tunnel while this maintenance is performed. To ensure uninterrupted service, it's important that you configure both tunnels.

When you create a VPN connection, the VPN tunnel comes up when traffic is generated from your side of the VPN connection. The virtual private gateway is not the initiator; your customer gateway must initiate the tunnels.

Amazon Virtual Private Cloud Network Administrator Guide Summary of What You Need to Do

For more information about the requirements for a VPN connection, see What You Need for a VPN Connection in the *Amazon VPC User Guide*.

To protect against a loss of connectivity if your customer gateway becomes unavailable, you can set up a second VPN connection. For more information, see Using Redundant VPN Connections to Provide Failover.

Summary of What You Need to Do

The overall process of setting up the VPN connection is covered in the topic Adding a Hardware Virtual Private Gateway to Your VPC in the *Amazon VPC User Guide*. One task in the process is to configure the customer gateway. The following table summarizes what you need to do to configure the customer gateway.

Process for Configuring the Customer Gateway

1	Designate an appliance to act as your customer gateway (for more information, see Customer Gateway Devices We've Tested (p. 7) and Requirements for Your Customer Gateway (p. 8)).
2	Determine the following information about the customer gateway: The vendor (for example, Cisco Systems), the platform (for example, ISR Series Routers), and the software version (for example, IOS 12.4) The Internet-routable IP address for the customer gateway device interface
	We assume that the BGP ASN for the customer gateway is 65000.
3	Give the preceding information to your integration team. The integration team creates your VPN connection and gets the information that you need to configure the customer gateway.
4	Get the configuration information from the integration team.
5	Configure your customer gateway using the configuration information that you received from the integration team.
6	Notify your integration team when you're done configuring the customer gateway.

Determining Your Network Information

The first task for your integration team is to determine the set of information in the following table. This table includes example values for some of the items. You can use the example values or determine real values. You must obtain real values for all the other items.

Tip

You can print the table and fill in the values you plan to use in the column on the far right.

Item	How Used	Comments	Your Value
VPC CIDR block	Used in a customer gateway configuration.	Example: 10.0.0.0/16	
Subnet #1 CIDR block (can be same as the		Example: 10.0.1.0/24	

Amazon Virtual Private Cloud Network Administrator Guide Four Main Parts to Customer Gateway Configuration

Item	How Used	Comments	Your Value
CIDR block for the VPC)			
(Optional) Subnet #2 CIDR block		Example: 10.0.2.0/24	
(Optional) Subnet #N CIDR block			
Customer gateway type (for example, Cisco ISR, Juniper J-Series, or Juniper SSG)	Used in an API call to specify the format of the returned information that you use to configure the customer gateway		
Internet-routable IP address of the customer gateway's external interface	Used in customer gateway configuration (referred to as YOUR_UPLINK_ADDRE	The value must be static.	
(Optional) Border Gateway Protocol (BGP) Autonomous System Number (ASN) of the customer gateway	Used in customer gateway configuration for devices that use BGP (referred to as YOUR_BGP_ASN)	You can use an existing ASN assigned to your network. If you don't have one, you can use a private ASN (in the 64512–65534 range). For more information about ASNs, go to the Wikipedia article.	

If you have a firewall between your customer gateway and the Internet, see If You Have a Firewall Between the Internet and Your Customer Gateway (p. 10).

Four Main Parts to Customer Gateway Configuration

There are four main parts to the configuration of your customer gateway. Throughout this guide, we use a special symbol for each of these parts to help you understand what you need to do. The following table shows the four parts and the corresponding symbols.

IKE	IKE Security Association (required to exchange keys used to establish the IPsec security association)
IPsec	IPsec Security Association (handles the tunnel's encryption, authentication, and so on.)
Tunnel	Tunnel interface (receives traffic going to and from the tunnel)

Optional



BGP peering (exchanges routes between the customer gateway and the virtual private gateway) for devices that use BGP

AWS VPN CloudHub and Redundant Customer Gateways

You can establish multiple VPN connections to a single virtual private gateway from multiple customer gateways. This configuration can be used in different ways; you can have redundant customer gateways between your data center and your VPC, or you can have multiple locations connected to the AWS VPN CloudHub.

If you have redundant customer gateways, each customer gateway advertises the same prefix (for example, 0.0.0.0/0) to the virtual private gateway. We use BGP routing to determine the path for traffic. If one customer gateway fails, the virtual private gateway directs all traffic to the working customer gateway.

If you use the AWS VPN CloudHub configuration, multiple sites can access your VPC or securely access each other using a simple hub-and-spoke model. You configure each customer gateway to advertise a site-specific prefix (such as 10.0.0.0/24, 10.0.1.0/24) to the virtual private gateway. The virtual private gateway routes traffic to the appropriate site and advertises the reachability of one site to all other sites.

To configure the AWS VPN CloudHub, use the Amazon VPC console to create multiple customer gateways, each with the public IP address of the gateway. You can use the same Border Gateway Protocol (BGP) Autonomous System Number (ASN) for each, or if you prefer, you can use a unique ASN for each. Then create a VPN connection from each customer gateway to a common VPN gateway. Use the instructions that follow to configure each customer gateway to connect to the virtual private gateway.

To enable instances in your VPC to reach the virtual private gateway (and then your customer gateways), you must configure routes in your VPC routing tables. For complete instructions, see the Amazon VPC User Guide. For AWS VPN CloudHub, you can configure an aggregate route in your VPC routing table (for example, 10.0.0.0/16), and use more specific prefixes between customer gateways and the virtual private gateway.

Configuring Multiple VPN Connections to Your Amazon VPC

You can create up to ten VPN connections for your VPC. You can use multiple VPN connections to link your remote offices to the same VPC. For example, if you have offices in Los Angeles, Chicago, New York, and Miami, you can link each of these offices to your VPC. You can also use multiple VPN connections to establish redundant customer gateways from a single location.

Note

If you need more than ten VPN connections, complete the Request to Increase Amazon VPC Limits form to request an increased limit.

When you create multiple VPN connections, the virtual private gateway sends network traffic to the appropriate VPN connection using statically assigned routes or BGP route advertisements, depending

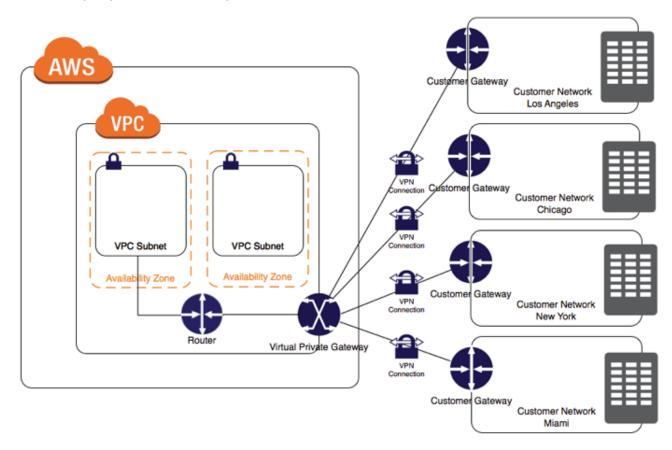
upon how the VPN connection was configured. Statically assigned routes are preferred over BGP advertised routes in cases where identical routes exist in the virtual private gateway.

When you have customer gateways at multiple geographic locations, each customer gateway should advertise a unique set of IP ranges specific to the location. When you establish redundant customer gateways at a single location, both gateways should advertise the same IP ranges.

The virtual private gateway receives routing information from all customer gateways and calculates the set of preferred paths using the BGP best path selection algorithm. The rules of that algorithm, as it applies to VPC, are:

- 1. The most specific IP prefix is preferred (for example, 10.0.0.0/24 is preferable to 10.0.0.0/16). For more information, see Route Priority in the *Amazon VPC User Guide*.
- 2. When the prefixes are the same, statically configured VPN connections, if they exist, are preferred. For matching prefixes where each VPN connection uses BGP, the AS PATH is compared and the prefix with the shortest AS PATH is preferred. Alternatively, you can prepend AS_PATH, so that the path is less preferred.
- When the AS PATHs are the same length, the path origin is compared. Prefixes with an Interior Gateway Protocol (IGP) origin are preferred to Exterior Gateway Protocol (EGP) origins, which are preferred to unknown origins.

The following diagram shows the configuration of multiple VPNs.



Customer Gateway Devices We've Tested

Your customer gateway can be a physical or software appliance.

Amazon Virtual Private Cloud Network Administrator Guide Requirements for Your Customer Gateway

For information about the specific routers that we've tested, see What customer gateway devices are known to work with Amazon VPC? in the Amazon VPC FAQ.

This guide presents information about how to configure the following devices:

- Check Point Security Gateway running R77.10 (or later) software
- Cisco ASA running Cisco ASA 8.2 (or later) software
- Cisco IOS running Cisco IOS 12.4 (or later) software
- Dell SonicWALL running SonicOS 5.9 (or later) software
- Fortinet Fortigate 40+ Series running FortiOS 4.0 (or later) software
- Juniper J-Series running JunOS 9.5 (or later) software
- Juniper SRX running JunOS 11.0 (or later) software
- Juniper SSG running ScreenOS 6.1, or 6.2 (or later) software
- Juniper ISG running ScreenOS 6.1, or 6.2 (or later) software
- Palo Alto Networks PANOS 4.1.2 (or later) software
- Yamaha RT107e, RTX1200, RTX1500, RTX3000 and SRT100 routers
- Microsoft Windows Server 2008 R2 (or later) software
- · Microsoft Windows Server 2012 R2 (or later) software

If you have one of these devices, but configure it for IPsec in a different way than presented in this guide, feel free to alter our suggested configuration to match your particular needs.

Requirements for Your Customer Gateway

If you have a device that isn't in the preceding list of tested devices, this section describes the requirements the device must meet for you to use it with Amazon VPC. The following table lists the requirement the customer gateway must adhere to, the related RFC (for reference), and comments about the requirement. For an example of the configuration information if your device isn't one of the tested Cisco or Juniper devices, see Example: Generic Customer Gateway Using Border Gateway Protocol (p. 145).

To provide context for the following requirements, think of each VPN connection as consisting of 2 separate tunnels. Each tunnel contains an IKE Security Association, an IPsec Security Association, and a BGP Peering. You are limited to 1 unique Security Association (SA) pair per tunnel (1 inbound and 1 outbound), and therefore 2 unique SA pairs in total for 2 tunnels (4 SAs). Some devices use policy-based VPN and will create as many SAs as ACL entries. Therefore, you may need to consolidate your rules and then filter so you don't permit unwanted traffic.

The VPN tunnel comes up when traffic is generated from your side of the VPN connection. The AWS endpoint is not the initiator; your customer gateway must initiate the tunnels.

Requirement	RFC	Comments
Establish IKE Security Association using Pre- Shared Keys IKE	RFC 2409	The IKE Security Association is established first between the virtual private gateway and customer gateway using the Pre-Shared Key as the authenticator. Upon establishment, IKE negotiates an ephemeral key to secure future IKE messages. Proper establishment of an IKE Security Association requires complete agreement among the parameters, including encryption and authentication parameters.

Amazon Virtual Private Cloud Network Administrator Guide Requirements for Your Customer Gateway

Requirement	RFC	Comments
Establish IPsec Security Associations in Tunnel mode IPsec	RFC 4301	Using the IKE ephemeral key, keys are established between the virtual private gateway and customer gateway to form an IPsec Security Association (SA). Traffic between gateways is encrypted and decrypted using this SA. The ephemeral keys used to encrypt traffic within the IPsec SA are automatically rotated by IKE on a regular basis to ensure confidentiality of communications.
Utilize the AES 128-bit encryption or AES 256-bit encryption function	RFC 3602	The encryption function is used to ensure privacy among both IKE and IPsec Security Associations.
Utilize the SHA-1 or SHA-256 hashing function	RFC 2404	This hashing function is used to authenticate both IKE and IPsec Security Associations.
Utilize Diffie-Hellman Perfect Forward Secrecy. The following groups are supported:	RFC 2409	IKE uses Diffie-Hellman to establish ephemeral keys to secure all communication between customer gateways and VPN gateways.
 Phase 1 groups: 2, 14-18, 22, 23, and 24 Phase 2 groups: 2, 5, 14-18, 22, 23, and 24 		
Utilize IPsec Dead Peer Detection	RFC 3706	The use of Dead Peer Detection enables the VPN devices to rapidly identify when a network condition prevents delivery of packets across the Internet. When this occurs, the gateways delete the Security Associations and attempt to create new associations. During this process, the alternate IPsec tunnel is utilized if possible.
Bind tunnel to logical interface (route-based VPN)	None	Your gateway must support the ability to bind the IPsec tunnel to a logical interface. The logical interface contains an IP address used to establish BGP peering to the virtual private gateway. This logical interface should perform no additional encapsulation (for example, GRE, IP in IP). Your interface should be set to a 1399 byte Maximum Transmission Unit (MTU).
Fragment IP packets before encryption	RFC 4459	When packets are too large to be transmitted, they must be fragmented. We will not reassemble fragmented encrypted packets. Therefore, your VPN device must fragment packets <i>before</i> encapsulating with the VPN headers. The fragments are individually transmitted to the remote host, which reassembles them. For more information about fragmentation, see the Wikipedia article on IP fragmentation.
(Optional) Establish BGP peerings	RFC 4271	BGP is used to exchange routes between the customer gateway and virtual private gateway for devices that use BGP. All BGP traffic is encrypted and transmitted via the IPsec Security Association. BGP is required for both gateways to exchange the IP prefixes reachable through the IPsec SA.

Amazon Virtual Private Cloud Network Administrator Guide If You Have a Firewall Between the Internet and Your Customer Gateway

We recommend you use the techniques listed in the following table to minimize problems related to the amount of data that can be transmitted through the IPsec tunnel. Because the connection encapsulates packets with additional network headers (including IPsec), the amount of data that can be transmitted in a single packet is reduced.

Technique	RFC	Comments
Adjust the maximum segment size of TCP packets entering the VPN tunnel	RFC 4459	TCP packets are often the most prevalent type of packet across IPsec tunnels. Some gateways have the ability to change the TCP Maximum Segment Size parameter. This causes the TCP endpoints (clients, servers) to reduce the amount of data sent with each packet. This is an ideal approach, as the packets arriving at the VPN devices are small enough to be encapsulated and transmitted.
Reset the "Don't Fragment" flag on packets	RFC 791	Some packets carry a flag, known as the Don't Fragment (DF) flag, that indicates that the packet should not be fragmented. If the packets carry the flag, the gateways generate an ICMP Path MTU Exceeded message. In some cases, applications do not contain adequate mechanisms for processing these ICMP messages and reducing the amount of data transmitted in each packet. Some VPN devices have the ability to override the DF flag and fragment packets unconditionally as required. If your customer gateway has this ability, we recommend that you use it as appropriate.

If You Have a Firewall Between the Internet and Your Customer Gateway

To use this service, you must have an Internet-routable IP address to use as the endpoint for the IPsec tunnels connecting your customer gateway to the virtual private gateway. If a firewall is in place between the Internet and your gateway, the rules in the following tables must be in place to establish the IPsec tunnels. The virtual private gateway addresses are in the configuration information that you'll get from the integration team.

Inbound (from the Internet)

Input Rule I1		
Source IP	Virtual Private Gateway 1	
Dest IP	Customer Gateway	
Protocol	UDP	
Source Port	500	
Destination	500	
Input Rule I2		
Source IP	Virtual Private Gateway 2	
Dest IP	Customer Gateway	

Amazon Virtual Private Cloud Network Administrator Guide If You Have a Firewall Between the Internet and Your Customer Gateway

Protocol	UDP
Source Port	500
Destination Port	500
Input Rule I3	
Source IP	Virtual Private Gateway 1
Dest IP	Customer Gateway
Protocol	IP 50 (ESP)
Input Rule I4	
Source IP	Virtual Private Gateway 2
Dest IP	Customer Gateway
Protocol	IP 50 (ESP)

Outbound (to the Internet)

Output Rule O1			
Source IP	Customer Gateway		
Dest IP	Virtual Private Gateway 1		
Protocol	UDP		
Source Port	500		
Destination Port	500		
Output Rule O2			
Source IP	Customer Gateway		
Dest IP	Virtual Private Gateway 2		
Protocol	UDP		
Source Port	500		
Destination Port	500		
Output Rule O3			
Source IP	Customer Gateway		
Dest IP	Virtual Private Gateway 1		
Protocol	IP 50 (ESP)		
Output Rule O4			
Source IP	Customer Gateway		
Dest IP	Virtual Private Gateway 2		
Protocol	IP 50 (ESP)		

Amazon Virtual Private Cloud Network Administrator Guide If You Have a Firewall Between the Internet and Your Customer Gateway

Rules I1, I2, O1, and O2 enable the transmission of IKE packets. Rules I3, I4, O3, and O4 enable the transmission of IPsec packets containing the encrypted network traffic.

If you are using NAT traversal (NAT-T) on your device, then you must include rules that allow UDP access over port 4500. Check if your device is advertising NAT-T.

Example: Check Point Device with Border Gateway Protocol

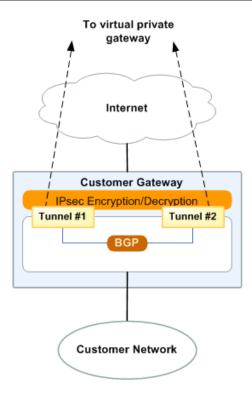
This section has example configuration information provided by your integration team if your customer gateway is a Check Point Security Gateway device running R77.10 or above, and using the Gaia operating system.

Topics

- High-Level View of the Customer Gateway (p. 13)
- Configuration File (p. 14)
- Configuring the Check Point Device (p. 15)
- How to Test the Customer Gateway Configuration (p. 20)

High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels. Using redundant tunnels ensures continuous availability in the case that a device fails.



Configuration File

Your integration team will provide you with a configuration file with the values you need in order to configure each tunnel and the IKE and IPsec settings for your VPN device. The configuration file includes instructions on how to use the Gaia web portal and Check Point SmartDashboard to configure your device. The same steps are provided in the next section.

The following is an extract of an example configuration file. The file contains two sections: IPSec Tunnel #1 and IPSec Tunnel #2. You must use the values provided in each section to configure each tunnel.

```
! Amazon Web Services
! Virtual Private Cloud

! AWS uses unique identifiers to manipulate the configuration of
! a VPN connection. Each VPN connection is assigned an identifier and is
! associated with two other identifiers, namely the
! customer gateway identifier and virtual private gateway identifier.
!
! Your VPN connection ID : vpn-12345678
! Your virtual private gateway ID : vgw-12345678
! Your customer gateway ID : cgw-12345678
!
! This configuration consists of two tunnels. Both tunnels must be
! configured on your customer gateway.
!
```

Amazon Virtual Private Cloud Network Administrator Guide Configuring the Check Point Device

```
! IPSec Tunnel #1
! #1: Tunnel Interface Configuration
...
!
! IPSec Tunnel #2
! #1: Tunnel Interface Configuration
...
```

Configuring the Check Point Device

The following procedures demonstrate how to configure the VPN tunnels, network objects, and security for your VPN connection. You must replace the example values in the procedures with the values that are provided in the configuration file.

Note

For more information, go to the Amazon Web Services (AWS) VPN BGP article on the Check Point Support Center.

Topics

- Step 1: Configure the Tunnel Interfaces (p. 15)
- Step 2: Configure BGP (p. 16)
- Step 3: Create Network Objects (p. 17)
- Step 4: Create a VPN Community and Configure IKE and IPsec (p. 18)
- Step 5: Configure the Firewall (p. 19)
- (Optional) Step 6: Enable Dead Peer Detection and TCP MSS Clamping (p. 20)

Step 1: Configure the Tunnel Interfaces

The first step to create the VPN tunnels and provide the private (inside) IP addresses of the customer gateway and virtual private gateway for each tunnel. For the first tunnel, use the information provided under the IPSec Tunnel #1 section of the configuration file. For the second tunnel, use the values provided in the IPSec Tunnel #2 section of the configuration file.

To configure the tunnel interface

- 1. Connect to your security gateway over SSH. If you're using the non-default shell, change to clish by running the following command: clish
- Set the customer gateway ASN (the ASN that was provided when the customer gateway was created in AWS) by running the following command:

```
set as 65000
```

3. Create the tunnel interface for the first tunnel, using the information provided under the IPSec Tunnel #1 section of the configuration file. Provide a unique name for your tunnel, such as AWS_VPC_Tunnel_1.

```
add vpn tunnel 1 type numbered local 169.254.44.234 remote 169.254.44.233 peer AWS_VPC_Tunnel_1 set interface vpnt1 state on set interface vpnt1 mtu 1436
```

4. Repeat these commands to create the second tunnel, using the information provided under the IPSec Tunnel #2 section of the configuration file. Provide a unique name for your tunnel, such as AWS_VPC_Tunnel_2.

```
add vpn tunnel 1 type numbered local 169.254.44.38 remote 169.254.44.37 peer AWS_VPC_Tunnel_2 set interface vpnt2 state on set interface vpnt2 mtu 1436
```

Set the virtual private gateway ASN:

```
set bgp external remote-as 7224 on
```

6. Configure the BGP for the first tunnel, using the information provided IPSec Tunnel #1 section of the configuration file:

```
set bgp external remote-as 7224 peer 169.254.44.233 on set bgp external remote-as 7224 peer 169.254.44.233 holdtime 30 set bgp external remote-as 7224 peer 169.254.44.233 keepalive 10
```

7. Configure the BGP for the second tunnel, using the information provided IPSec Tunnel #2 section of the configuration file:

```
set bgp external remote-as 7224 peer 169.254.44.37 on set bgp external remote-as 7224 peer 169.254.44.37 holdtime 30 set bgp external remote-as 7224 peer 169.254.44.37 keepalive 10
```

8. Save the configuration:

```
save config
```

Step 2: Configure BGP

In this step, you create a BGP policy that allows the import of routes that are advertised by AWS, and then configure your customer gateway to advertise its local routes to AWS.

To create a BGP policy

- In the Gaia WebUI, choose Advanced Routing, Inbound Route Filters. Choose Add, and select Add BGP Policy (Based on AS).
- 2. For **Add BGP Policy**, select a value between 512 and 1024 in the first field, and enter the virtual private gateway ASN in the second field; for example, 7224.
- 3. Choose Save.

The following steps are for distributing local interface routes. You can also redistribute routes from different sources; for example, static routes, or routes obtained through dynamic routing protocols. For more information, go to the Gaia Advanced Routing R77 Versions Administration Guide.

To advertise local routes

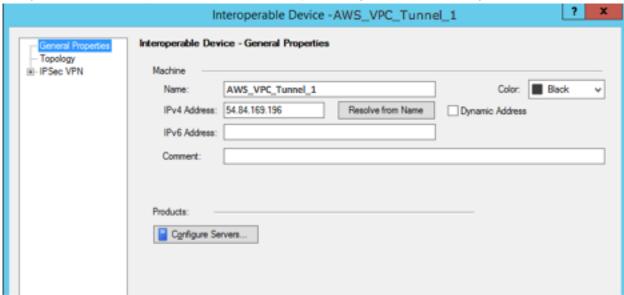
- In the Gaia WebUI, choose Advanced Routing, Routing Redistribution. Choose Add Redistribution From and select Interface.
- 2. For **To Protocol**, select the virtual private gateway ASN; for example, 7224.
- 3. For Interface, select an internal interface. Choose Save.

Step 3: Create Network Objects

In this step, you create a network object for each VPN tunnel, specifying the public (outside) IP addresses for the virtual private gateway. You later add these network objects as satellite gateways for your VPN community. You also need to create an empty group to act as a placeholder for the VPN domain.

To define a new network object

- 1. Open the Check Point SmartDashboard.
- For Groups, open the context menu and choose Groups, Simple Group. You can use the same group for each network object.
- For Network Objects, open the context (right-click) menu and choose New, Interoperable Device.
- 4. For **Name**, enter the name you provided for your tunnel in step 1, for example, AWS_VPC_Tunnel_1 or AWS_VPC_Tunnel_2.
- 5. For **IPv4 Address**, enter the outside IP address of the virtual private gateway provided in the configuration file, for example, 54.84.169.196. Save your settings and close the dialog box.



- 6. In the left category pane, choose **Topology**.
- 7. In the **VPN Domain** section, choose **Manually defined**, and browse to and select the empty simple group that you created in step 2. Choose **OK**.
- 8. Repeat these steps to create a second network object, using the information under the IPSec Tunnel #2 section of the configuration file.

Amazon Virtual Private Cloud Network Administrator Guide Step 4: Create a VPN Community and Configure IKE and IPsec

- 9. Go to your gateway network object, open your gateway or cluster object, and choose **Topology**.
- In the VPN Domain section, choose Manually defined, and browse to and select the empty simple group that you created in step 2. Choose OK

Note

You can keep any existing VPN domain that you've configured; however, ensure that the hosts and networks that are used or served by the new VPN connection are not declared in that VPN domain, especially if the VPN domain is automatically derived.

Note

If you're using clusters, then edit the topology and define the interfaces as cluster interfaces. Use the IP addresses specified in the configuration file.

Step 4: Create a VPN Community and Configure IKE and IPsec

In this step, you create a VPN community on your Check Point gateway, to which you add the network objects (interoperable devices) for each tunnel. You also configure the Internet Key Exchange (IKE) and IPsec settings.

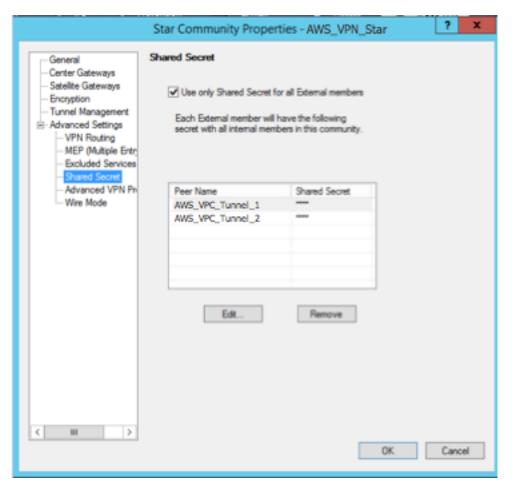
To create and configure the VPN community, IKE, and IPsec settings

- 1. From your gateway properties, choose **IPSec VPN** in the category pane.
- 2. Choose Communities, New, Star Community.
- 3. Provide a name for your community (for example, AWS_VPN_Star), and then choose **Center Gateways** in the category pane.
- 4. Choose Add, and add your gateway or cluster to the list of participant gateways.
- 5. In the category pane, choose **Satellite Gateways**, **Add**, and add the interoperable devices you created earlier (AWS_VPC_Tunnel_1 and AWS_VPC_Tunnel_2) to the list of participant gateways.
- In the category pane, choose Encryption. In the Encryption Method section, choose IKEv1 for IPv4 and IKEv2 for IPv6. In the Encryption Suite section, choose Custom, Custom Encryption.

Note

You must select the **IKEv1 for IPv4 and IKEv2 for IPv6** option for IKEv1 functionality; however, IKEv2 and IPv6 are currently not supported.

- In the dialog box, configure the encryption properties as follows, and choose **OK** when you're done:
 - IKE Security Association (Phase 1) Properties:
 - Perform key exchange encryption with: AES-128
 - Perform data integrity with: SHA1
 - IPsec Security Association (Phase 2) Properties:
 - Perform IPsec data encryption with: AES-128
 - Perform data integrity with: SHA-1
- In the category pane, choose Tunnel Management. Choose Set Permanent Tunnels, On all tunnels in the community. In the VPN Tunnel Sharing section, choose One VPN tunnel per subnet pair.
- 9. In the category pane, expand **Advanced Settings**, and choose **Shared Secret**.
- 10. Select the peer name for the first tunnel, choose **Edit**, and enter the pre-shared key as specified in the configuration file in the IPSec Tunnel #1 section.
- 11. Select the peer name for the second tunnel, choose **Edit**, and enter the pre-shared key as specified in the configuration file in the IPSec Tunnel #2 section.



- 12. Still in the Advanced Settings category, choose Advanced VPN Properties, configure the properties as follows, and choose OK when you're done:
 - IKE (Phase 1):
 - Use Diffie-Hellman group: Group 2 (1024 bit)
 - Renegotiate IKE security associations every 480 minutes
 - IPsec (Phase 2):
 - Choose Use Perfect Forward Secrecy
 - Use Diffie-Hellman group: Group 2 (1024 bit)
 - Renegotiate IPsec security associations every 3600 seconds

Step 5: Configure the Firewall

In this step, you configure a policy with firewall rules and directional match rules that allow communication between the VPC and the local network. You then install the policy on your gateway.

To create firewall rules

- In the SmartDashboard, choose Global Properties for your gateway. In the category pane, expand VPN, and choose Advanced.
- 2. Choose Enable VPN Directional Match in VPN Column, and choose OK.
- 3. In the SmartDashboard, choose Firewall, and create a policy with the following rules:

Amazon Virtual Private Cloud Network Administrator Guide (Optional) Step 6: Enable Dead Peer Detection and TCP MSS Clamping

- Allow the VPC subnet to communicate with the local network over the required protocols.
- Allow the local network to communicate with the VPC subnet over the required protocols.
- 4. Open the context menu for the cell in the VPN column, and choose Edit Cell.
- 5. In the **VPN Match Conditions** dialog box, choose **Match traffic in this direction only**. Create the following directional match rules by choosing **Add** for each, and choose **OK** when you're done:
 - internal_clear > VPN community (The VPN star community you created earlier, for example, AWS_VPN_Star)
 - VPN community > VPN community
 - VPN community > internal_clear
- 6. In the SmartDashboard, choose **Policy**, **Install**.
- 7. In the dialog box, choose your gateway and choose **OK** to install the policy.

(Optional) Step 6: Enable Dead Peer Detection and TCP MSS Clamping

Your Check Point gateway can use Dead Peer Detection (DPD) to identify when an IKE association is down.

To enable DPD, run the following from the command line interface in expert mode:

```
ckp_regedit -a SOFTWARE/CheckPoint/VPN1 forceSendDPDPayload -n 1
```

To disable DPD, run the following command:

```
ckp_regedit -d SOFTWARE/CheckPoint/VPN1 forceSendDPDPayload
```

TCP MSS clamping reduces the maximum segment size of TCP packets to prevent packet fragmentation.

To enable TCP MSS clamping

- Navigate to the following directory: C:\Program Files (x86)\CheckPoint\SmartConsole \R77.10\PROGRAM\.
- 2. Open the Check Point Database Tool by running the Guidbedit.exe file.
- 3. Choose Table, Global Properties, properties.
- 4. For $fw_clamp_tcp_mss$, choose Edit. Change the value to true and choose OK.

How to Test the Customer Gateway Configuration

You can test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

- 1. On your customer gateway, determine whether the BGP status is Active. It takes approximately 30 seconds for a BGP peering to become active.
- 2. Ensure that the customer gateway is advertising a route to the virtual private gateway. The route may be the default route (0.0.0.0/0) or a more specific route you prefer.

Amazon Virtual Private Cloud Network Administrator Guide How to Test the Customer Gateway Configuration

When properly established, your BGP peering should be receiving one route from the virtual private gateway corresponding to the prefix that your VPC integration team specified for the VPC (for example, 10.0.0.0/24). If the BGP peering is established, you are receiving a prefix, and you are advertising a prefix, your tunnel is configured correctly. Make sure that both tunnels are in this state.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- · Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection: your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the *Amazon VPC User Guide*.

To test the end-to-end connectivity of each tunnel

- 1. Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs are listed in the launch wizard when you launch an instance from the Amazon EC2 Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

 (Optional) To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway, and repeat the above step. You cannot disable a tunnel on the AWS side of the VPN connection.

On the Check Point gateway side, you can verify the tunnel status by running the following command from the command line tool in expert mode:

```
vpn tunnelutil
```

In the options that display, choose 1 to verify the IKE associations and 2 to verify the IPsec associations.

Amazon Virtual Private Cloud Network Administrator Guide How to Test the Customer Gateway Configuration

You can also use the Check Point Smart Tracker Log to verify that packets over the connection are being encrypted. For example, the following log indicates that a packet to the VPC was sent over tunnel 1 and was encrypted.

Log info		Rule	
Product	Security Gateway/Management	Action Rule	Encrypt 4
Date	4Nov2015	Current Rule Number	•
Time	9:42:01	Rule Name	
Number	21254	User	
Туре	■ Log		
Origin	cpgw-997695	More	
Traffic		Rule UID	{0AA18015-FF7B-4650-B0 3989E658CF04}
Source	Management_PC (192.168.1.116)	Community	AWS_VPN_Star
		Encryption Scheme	ĭKE
Destination	1 0.28.13.28	Data Encryption	ESP: AES-128 + SHA1 + P
Service	***	Methods VPN Peer Gateway	(group 2)
Protocol	<u>©™</u> icmp		AWS_VPC_Tunnel_1 (54.84.169.196)
Interface	⊕ eth0	Subproduct	① VPN
Source Port		VPN Feature	VPN
Policy		Product Family	Network
Policy Name	Standard	Information	service_id: icmp-proto ICMP: Echo Request ICMP Type: 8 ICMP Code: 0
Policy Date	Tue Nov 03 11:33:45 2015		
Policy Management	cpgw-997695		

Example: Check Point Device without Border Gateway Protocol

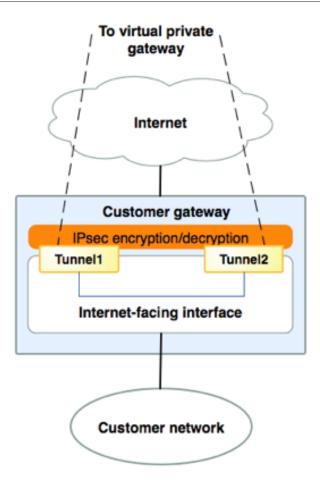
This section has example configuration information provided by your integration team if your customer gateway is a Check Point Security Gateway device running R77.10 or above, and using the Gaia operating system.

Topics

- High-Level View of the Customer Gateway (p. 23)
- Configuration File (p. 24)
- Configuring the Check Point Device (p. 25)
- How to Test the Customer Gateway Configuration (p. 32)

High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels. Using redundant tunnels ensures continuous availability in the case that a device fails.



Configuration File

Your integration team will provide you with a configuration file with the values you need in order to configure each tunnel and the IKE and IPsec settings for your VPN device. The configuration file includes instructions on how to use the Gaia web portal and Check Point SmartDashboard to configure your device. The same steps are provided in the next section.

The following is an extract of an example configuration file. The file contains two sections: IPSec Tunnel #1 and IPSec Tunnel #2. You must use the values provided in each section to configure each tunnel.

```
! Amazon Web Services
! Virtual Private Cloud

! AWS uses unique identifiers to manipulate the configuration of
! a VPN connection. Each VPN connection is assigned an identifier and is
! associated with two other identifiers, namely the
! customer gateway identifier and virtual private gateway identifier.
!
! Your VPN connection ID : vpn-12345678
! Your virtual private gateway ID : vgw-12345678
! Your customer gateway ID : cgw-12345678
!
```

Amazon Virtual Private Cloud Network Administrator Guide Configuring the Check Point Device

```
! This configuration consists of two tunnels. Both tunnels must be
! configured on your customer gateway.
!
! IPSec Tunnel #1
!
! #1: Tunnel Interface Configuration
...
!
! IPSec Tunnel #2
! #1: Tunnel Interface Configuration
...
```

Configuring the Check Point Device

The following procedures demonstrate how to configure the VPN tunnels, network objects, and security for your VPN connection. You must replace the example values in the procedures with the values that are provided in the configuration file.

Note

For more information, go to the Check Point Security Gateway IPsec VPN to Amazon Web Services VPC article on the Check Point Support Center.

Topics

- Step 1: Configure Tunnel Interface (p. 25)
- Step 2: Configure the Static Route (p. 27)
- Step 3: Create Network Objects (p. 28)
- Step 4: Create a VPN Community and Configure IKE and IPsec (p. 29)
- Step 5: Configure the Firewall (p. 31)
- (Optional) Step 6: Enable Dead Peer Detection and TCP MSS Clamping (p. 31)

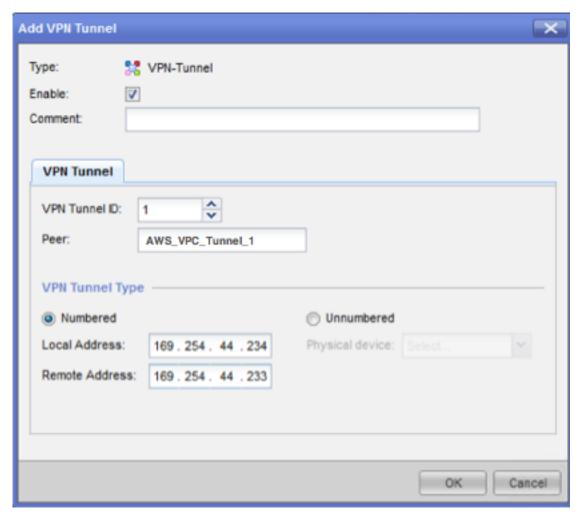
Step 1: Configure Tunnel Interface

The first step is to create the VPN tunnels and provide the private (inside) IP addresses of the customer gateway and virtual private gateway for each tunnel. To create the first tunnel, use the information provided under the IPSec Tunnel #1 section of the configuration file. To create the second tunnel, use the values provided in the IPSec Tunnel #2 section of the configuration file.

To configure the tunnel interface

- 1. Open the Gaia portal of your Check Point Security Gateway device.
- 2. Choose Network Interfaces, Add, VPN tunnel.
- 3. In the dialog box, configure the settings as follows, and choose **OK** when you are done:

- For VPN Tunnel ID, enter any unique value, such as 1.
- For **Peer**, enter a unique name for your tunnel, such as AWS_VPC_Tunnel_1 or AWS_VPC_Tunnel_2.
- Ensure that **Numbered** is selected, and for **Local Address**, enter the IP address specified for CGW Tunnel IP in the configuration file, for example, 169.254.44.234.
- For **Remote Address**, enter the IP address specified for VGW Tunnel IP in the configuration file, for example, 169.254.44.233.



- 4. Connect to your security gateway over SSH. If you're using the non-default shell, change to clish by running the following command: clish
- 5. For tunnel 1, run the following command:

```
set interface vpnt1 mtu 1436
```

For tunnel 2, run the following command:

```
set interface vpnt2 mtu 1436
```

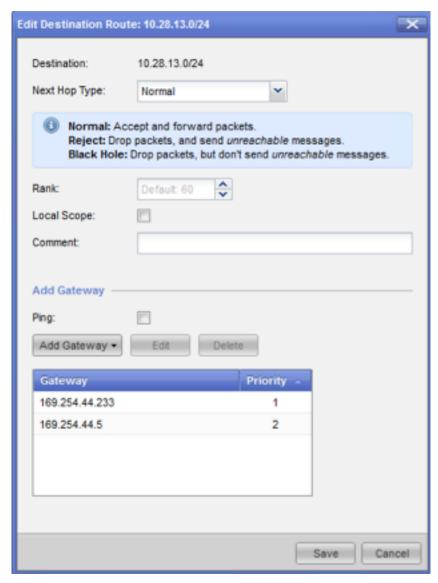
6. Repeat these steps to create a second tunnel, using the information under the IPSec Tunnel #2 section of the configuration file.

Step 2: Configure the Static Route

In this step, you'll specify the static route to the subnet in the VPC for each tunnel to enable you to send traffic over the tunnel interfaces. The second tunnel enables failover in case there is an issue with the first tunnel — if an issue is detected, the policy-based static route is removed from the routing table, and the second route is activated. You must also enable the Check Point gateway to ping the other end of the tunnel to check if the tunnel is up.

To configure the static routes

- 1. In the Gaia portal, choose IPv4 Static Routes, Add.
- 2. Specify the CIDR of your subnet, for example, 10.28.13.0/24.
- 3. Choose Add Gateway, IP Address.
- 4. Enter the IP address specified for VGW Tunnel IP in the configuration file (for example, 169.254.44.233), and specify a priority of 1.
- 5. Select Ping.
- 6. Repeat steps 3 and 4 for the second tunnel, using the VGW Tunnel IP value under the IPSec Tunnel #2 section of the configuration file. Specify a priority of 2.



7. Choose Save.

If you're using a cluster, repeat the steps above for the other members of the cluster.

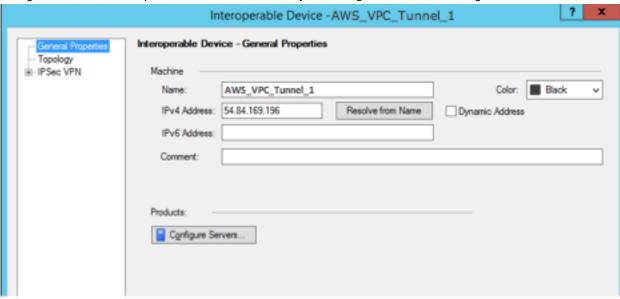
Step 3: Create Network Objects

In this step, you create a network object for each VPN tunnel, specifying the public (outside) IP addresses for the virtual private gateway. You later add these network objects as satellite gateways for your VPN community. You also need to create an empty group to act as a placeholder for the VPN domain.

To define a new network object

- 1. Open the Check Point SmartDashboard.
- 2. For **Groups**, open the context menu and choose **Groups**, **Simple Group**. You can use the same group for each network object.
- For Network Objects, open the context (right-click) menu and choose New, Interoperable Device.

- For Name, enter the name you provided for your tunnel, for example, AWS_VPC_Tunnel_1 or AWS_VPC_Tunnel_2.
- 5. For **IPv4 Address**, enter the outside IP address of the virtual private gateway provided in the configuration file, for example, 54.84.169.196. Save your settings and close the dialog box.



- In the SmartDashboard, open your gateway properties and in the category pane, choose Topology.
- 7. To retrieve the interface configuration, choose **Get Topology**.
- 8. In the **VPN Domain** section, choose **Manually defined**, and browse to and select the empty simple group that you created in step 2. Choose **OK**.

Note

You can keep any existing VPN domain that you've configured; however, ensure that the hosts and networks that are used or served by the new VPN connection are not declared in that VPN domain, especially if the VPN domain is automatically derived.

9. Repeat these steps to create a second network object, using the information under the IPSec Tunnel #2 section of the configuration file.

Note

If you're using clusters, then edit the topology and define the interfaces as cluster interfaces. Use the IP addresses specified in the configuration file.

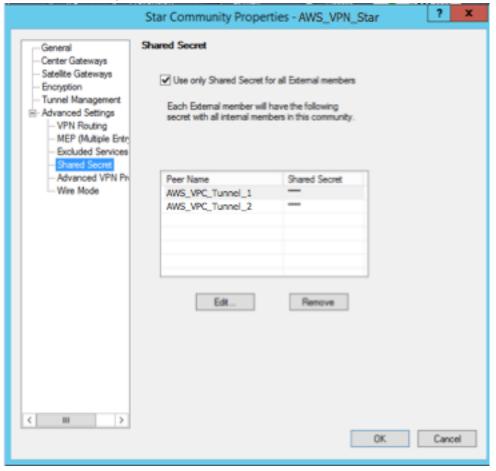
Step 4: Create a VPN Community and Configure IKE and IPsec

In this step, you create a VPN community on your Check Point gateway, to which you add the network objects (interoperable devices) for each tunnel. You also configure the Internet Key Exchange (IKE) and IPsec settings.

To create and configure the VPN community, IKE, and IPsec settings

- 1. From your gateway properties, choose **IPSec VPN** in the category pane.
- 2. Choose Communities, New, Star Community.
- 3. Provide a name for your community (for example, AWS_VPN_Star), and then choose **Center Gateways** in the category pane.

- 4. Choose Add, and add your gateway or cluster to the list of participant gateways.
- 5. In the category pane, choose **Satellite Gateways**, **Add**, and add the interoperable devices you created earlier (AWS_VPC_Tunnel_1 and AWS_VPC_Tunnel_2) to the list of participant gateways.
- In the category pane, choose Encryption. In the Encryption Method section, choose IKEv1 only. In the Encryption Suite section, choose Custom, Custom Encryption.
- In the dialog box, configure the encryption properties as follows, and choose **OK** when you're done:
 - IKE Security Association (Phase 1) Properties:
 - Perform key exchange encryption with: AES-128
 - · Perform data integrity with: SHA1
 - IPsec Security Association (Phase 2) Properties:
 - Perform IPsec data encryption with: AES-128
 - Perform data integrity with: SHA-1
- 8. In the category pane, choose **Tunnel Management**. Choose **Set Permanent Tunnels**, **On all tunnels in the community**. In the **VPN Tunnel Sharing** section, choose **One VPN tunnel per Gateway pair**.
- 9. In the category pane, expand Advanced Settings, and choose Shared Secret.
- 10. Select the peer name for the first tunnel, choose **Edit**, and enter the pre-shared key as specified in the configuration file in the IPSec Tunnel #1 section.
- 11. Select the peer name for the second tunnel, choose **Edit**, and enter the pre-shared key as specified in the configuration file in the IPSec Tunnel #2 section.



- 12. Still in the Advanced Settings category, choose Advanced VPN Properties, configure the properties as follows, and choose OK when you're done:
 - IKE (Phase 1):
 - Use Diffie-Hellman group: Group 2
 - Renegotiate IKE security associations every 480 minutes
 - IPsec (Phase 2):
 - Choose Use Perfect Forward Secrecy
 - Use Diffie-Hellman group: Group 2
 - Renegotiate IPsec security associations every 3600 seconds

Step 5: Configure the Firewall

In this step, you configure a policy with firewall rules and directional match rules that allow communication between the VPC and the local network. You then install the policy on your gateway.

To create firewall rules

- In the SmartDashboard, choose Global Properties for your gateway. In the category pane, expand VPN, and choose Advanced.
- 2. Choose Enable VPN Directional Match in VPN Column, and save your changes.
- 3. In the SmartDashboard, choose Firewall, and create a policy with the following rules:
 - Allow the VPC subnet to communicate with the local network over the required protocols.
 - Allow the local network to communicate with the VPC subnet over the required protocols.
- 4. Open the context menu for the cell in the VPN column, and choose Edit Cell.
- 5. In the **VPN Match Conditions** dialog box, choose **Match traffic in this direction only**. Create the following directional match rules by choosing **Add** for each, and choose **OK** when you're done:
 - internal_clear > VPN community (The VPN star community you created earlier, for example, AWS_VPN_Star)
 - VPN community > VPN community
 - VPN community > internal_clear
- 6. In the SmartDashboard, choose Policy, Install.
- 7. In the dialog box, choose your gateway and choose **OK** to install the policy.

(Optional) Step 6: Enable Dead Peer Detection and TCP MSS Clamping

Your Check Point gateway can use Dead Peer Detection (DPD) to identify when an IKE association is down.

To enable DPD, run the following from the command line interface in expert mode:

```
ckp_regedit -a SOFTWARE/CheckPoint/VPN1 forceSendDPDPayload -n 1
```

To disable DPD, run the following command:

```
ckp_regedit -d SOFTWARE/CheckPoint/VPN1 forceSendDPDPayload
```

TCP MSS clamping reduces the maximum segment size of TCP packets to prevent packet fragmentation.

To enable TCP MSS clamping

- Navigate to the following directory: C:\Program Files (x86)\CheckPoint\SmartConsole \R77.10\PROGRAM\.
- 2. Open the Check Point Database Tool by running the GuidBEdit.exe file.
- 3. Choose Table, Global Properties, properties.
- 4. For fw_clamp_tcp_mss, choose Edit. Change the value to true and choose OK.

How to Test the Customer Gateway Configuration

You can test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

- 1. Ensure that the customer gateway has a static route to your VPC, as suggested in the configuration templates provided by AWS.
- 2. Ensure that a static route has been added to the VPN connection so that traffic can get back to your customer gateway. For example, if your local subnet prefix is 198.10.0.0/16, you need to add a static route with that CIDR range to your VPN connection. Make sure that both tunnels have a static route to your VPC.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the *Amazon VPC User Guide*.

To test the end-to-end connectivity of each tunnel

- Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs are listed in the launch wizard when you launch an instance from the AWS Management Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
```

```
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:

Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

 (Optional) To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway, and repeat the above step. You cannot disable a tunnel on the AWS side of the VPN connection.

On the Check Point gateway side, you can verify the tunnel status by running the following command from the command line tool in expert mode:

```
vpn tunnelutil
```

In the options that display, choose 1 to verify the IKE associations and 2 to verify the IPsec associations.

You can also use the Check Point Smart Tracker Log to verify that packets over the connection are being encrypted. For example, the following log indicates that a packet to the VPC was sent over tunnel 1 and was encrypted.

Log Info		Rule	
Product	Security Gateway/Management	Action Rule	Encrypt 4
Date	4Nov2015	Current Rule Number	
Time	9:42:01	Rule Name	4-Standard
Number	21254	User	
Туре	■ Log		
Origin	cpgw-997695	More	
Traffic		Rule UID	{0AA18015-FF7B-4650-B0 3989E658CF04}
Source	Management_PC (192.168.1.116)	Community	AWS_VPN_Star
		Encryption Scheme	ĭKE
Destination	1 0.28.13.28	Data Encryption Methods	ESP: AES-128 + SHA1 + PF (group 2)
Service	***		
Protocol	(01P icmp	VPN Peer Gateway	AWS_VPC_Tunnel_1 (54.84.169.196)
Interface	⊕ eth0	Subproduct	 ○ VPN
Source Port	***	VPN Feature	VPN
Policy		Product Family	Network
Policy Name	Standard	Information	service_id: icmp-proto ICMP: Echo Request ICMP Type: 8 ICMP Code: 0
Policy Date	Tue Nov 03 11:33:45 2015		
Policy Management	cpgw-997695		

Example: Cisco ASA Device

Topics

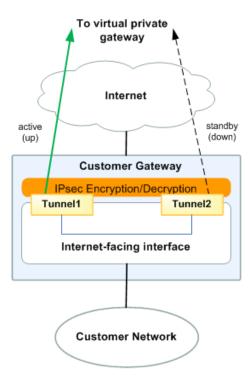
- A High-Level View of the Customer Gateway (p. 35)
- An Example Configuration (p. 36)
- How to Test the Customer Gateway Configuration (p. 41)

In this section we walk you through an example of the configuration information provided by your integration team if your customer gateway is a Cisco ASA device running Cisco ASA 8.2+ software.

The diagram shows the high-level layout of the customer gateway. You should use the real configuration information that you receive from your integration team and apply it to your customer gateway.

A High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels. Using redundant tunnels ensures continuous availability in the case that a device fails.



Please note that some Cisco ASAs only support Active/Standby mode. When you use these Cisco ASAs, you can have only one active tunnel at a time. The other standby tunnel becomes active if the first tunnel becomes unavailable. With this redundancy, you should always have connectivity to your VPC through one of the tunnels.

An Example Configuration

The configuration in this section is an example of the configuration information your integration team should provide. The example configuration contains a set of information for each of the tunnels that you must configure.

The example configuration includes example values to help you understand how configuration works. For example, we provide example values for the VPN connection ID (vpn-12345678) and virtual private gateway ID (vgw-12345678), and placeholders for the AWS endpoints (AWS_ENDPOINT_1 and AWS_ENDPOINT_2). You'll replace these example values with the actual values from the configuration information that you receive.

In addition, you must:

- · Configure the outside interface.
- Ensure that the Crypto ISAKMP Policy Sequence number is unique.
- Ensure that the Crypto List Policy Sequence number is unique.
- Ensure that the Crypto IPsec Transform Set and the Crypto ISAKMP Policy Sequence are harmonious with any other IPsec tunnels configured on the device.
- Ensure that the SLA monitoring number is unique.

 Configure all internal routing that moves traffic between the customer gateway and your local network.

Warning

The following configuration information is an example of what you can expect your integration team to provide. Many of the values in the following example will be different from the actual configuration information that you receive. You must use the actual values and not the example values shown here, or your implementation will fail.

```
! Amazon Web Services
! Virtual Private Cloud
1
! AWS utilizes unique identifiers to manipulate the configuration of
! a VPN Connection. Each VPN Connection is assigned an identifier and is
! associated with two other identifiers, namely the
! Customer Gateway Identifier and Virtual Private Gateway Identifier.
! Your VPN Connection ID
                                        : vpn-12345678
! Your Virtual Private Gateway ID
                                        : vgw-12345678
! Your Customer Gateway ID
                                        : cgw-12345678
! This configuration consists of two tunnels. Both tunnels must be
! configured on your Customer Gateway. Only a single tunnel will be up at a
! time to the VGW.
! You may need to populate these values throughout the config based on your
setup:
! outside_interface - External interface of the ASA
! outside access in - Inbound ACL on the external interface
! amzn_vpn_map - Outside crypto map
! vpc_subnet and vpc_subnet_mask - VPC address range
! local_subnet and local_subnet_mask - Local subnet address range
! sla_monitor_address - Target address that is part of acl-amzn to run SLA
monitoring
!
           _____
! IPSec Tunnels
1
! #1: Internet Key Exchange (IKE) Configuration
! A policy is established for the supported ISAKMP encryption,
! authentication, Diffie-Hellman, lifetime, and key parameters.
!
! Note that there are a global list of ISAKMP policies, each identified by
! sequence number. This policy is defined as #201, which may conflict with
! an existing policy using the same or lower number depending on
! the encryption type. If so, we recommend changing the sequence number to
! avoid conflicts and overlap.
! Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
! You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
! The address of the external interface for your customer gateway must be a
static address.
```

```
! Your customer gateway may reside behind a device performing network address
translation (NAT).
! To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
crypto isakmp identity address
crypto isakmp enable outside_interface
crypto isakmp policy 201
 encryption aes
 authentication pre-share
 group 2
 lifetime 28800
 hash sha
exit
! The tunnel group sets the Pre Shared Key used to authenticate the
! tunnel endpoints.
tunnel-group AWS_ENDPOINT_1 type ipsec-121
tunnel-group AWS_ENDPOINT_1 ipsec-attributes
  pre-shared-key password_here
! This option enables IPSec Dead Peer Detection, which causes periodic
! messages to be sent to ensure a Security Association remains operational.
  isakmp keepalive threshold 10 retry 3
exit
!
tunnel-group AWS_ENDPOINT_2 type ipsec-121
tunnel-group AWS_ENDPOINT_2 ipsec-attributes
  pre-shared-key password_here
! This option enables IPSec Dead Peer Detection, which causes periodic
! messages to be sent to ensure a Security Association remains operational.
  isakmp keepalive threshold 10 retry 3
exit
    -----
! #2: Access List Configuration
! Access lists are configured to permit creation of tunnels and to send
applicable traffic over them.
! This policy may need to be applied to an inbound ACL on the outside
interface that is used to manage control-plane traffic.
! This is to allow VPN traffic into the device from the Amazon endpoints.
access-list outside_access_in extended permit ip host AWS_ENDPOINT_1
host YOUR_UPLINK_ADDRESS
access-list outside_access_in extended permit ip host AWS_ENDPOINT_2
host YOUR_UPLINK_ADDRESS
! The following access list named acl-amzn specifies all traffic that needs
to be routed to the VPC. Traffic will
! be encrypted and transmitted through the tunnel to the VPC. Association
with the IPSec security association
! is done through the "crypto map" command.
```

```
! This access list should contain a static route corresponding to your VPC
CIDR and allow traffic from any subnet.
! If you do not wish to use the "any" source, you must use a single access-
list entry for accessing the VPC range.
! If you specify more than one entry for this ACL without using "any" as the
source, the VPN will function erratically.
! The any rule is also used so the security association will include the ASA
outside interface where the SLA monitor
! traffic will be sourced from.
! See section #4 regarding how to restrict the traffic going over the tunnel
access-list acl-amzn extended permit ip any vpc_subnet vpc_subnet_mask
! #3: IPSec Configuration
! The IPSec transform set defines the encryption, authentication, and IPSec
! mode parameters.
! Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
crypto ipsec ikev1 transform-set transform-amzn esp-aes esp-sha-hmac
! The crypto map references the IPSec transform set and further defines
! the Diffie-Hellman group and security association lifetime. The mapping is
created
! as #1, which may conflict with an existing crypto map using the same
! number. If so, we recommend changing the mapping number to avoid conflicts.
crypto map amzn_vpn_map 1 match address acl-amzn
crypto map amzn_vpn_map 1 set pfs group2
crypto map amzn_vpn_map 1 set peer AWS_ENDPOINT_1 AWS_ENDPOINT_2
crypto map amzn_vpn_map 1 set transform-set transform-amzn
crypto map amzn_vpn_map 1 set security-association lifetime seconds 3600
! Only set this if you do not already have an outside crypto map, and it is
not applied:
crypto map amzn_vpn_map interface outside_interface
! Additional parameters of the IPSec configuration are set here. Note that
! these parameters are global and therefore impact other IPSec
! associations.
! This option instructs the firewall to clear the "Don't Fragment"
! bit from packets that carry this bit and yet must be fragmented, enabling
! them to be fragmented.
crypto ipsec df-bit clear-df outside_interface
! This configures the gateway's window for accepting out of order
! IPSec packets. A larger window can be helpful if too many packets
! are dropped due to reordering while in transit between gateways.
crypto ipsec security-association replay window-size 128
```

```
! This option instructs the firewall to fragment the unencrypted packets
! (prior to encryption).
crypto ipsec fragmentation before-encryption outside_interface
! This option causes the firewall to reduce the Maximum Segment Size of
! TCP packets to prevent packet fragmentation.
sysopt connection tcpmss 1387
! In order to keep the tunnel in an active or always up state, the ASA needs
to send traffic to the subnet
! defined in acl-amzn. SLA monitoring can be configured to send pings to a
destination in the subnet and
! will keep the tunnel active. This traffic needs to be sent to a target that
will return a response.
! This can be manually tested by sending a ping to the target from the ASA
sourced from the outside interface.
! A possible destination for the ping is an instance within the VPC. For
redundancy multiple SLA monitors
! can be configured to several instances to protect against a single point of
failure.
! The monitor is created as #1, which may conflict with an existing monitor
using the same
! number. If so, we recommend changing the sequence number to avoid
conflicts.
!
sla monitor 1
   type echo protocol ipIcmpEcho sla_monitor_address
interface outside_interface
  frequency 5
exit
sla monitor schedule 1 life forever start-time now
! The firewall must allow icmp packets to use "sla monitor"
icmp permit any outside_interface
! #4: VPN Filter
! The VPN Filter will restrict traffic that is permitted through the tunnels.
By default all traffic is denied.
! The first entry provides an example to include traffic between your VPC
Address space and your office.
! You may need to run 'clear crypto isakmp sa', in order for the filter to
take effect.
! access-list amzn-filter extended permit
ip vpc_subnet vpc_subnet_mask local_subnet local_subnet_mask
access-list amzn-filter extended deny ip any any
group-policy filter internal
group-policy filter attributes
vpn-filter value amzn-filter
tunnel-group AWS_ENDPOINT_1 general-attributes
default-group-policy filter
tunnel-group AWS_ENDPOINT_2 general-attributes
default-group-policy filter
exit
```

```
! #5: NAT Exemption
! If you are performing NAT on the ASA you will have to add a nat exemption rule.
! This varies depending on how NAT is set up. It should be configured along the lines of:
! object network obj-SrcNet
! subnet 0.0.0.0 0.0.0.0
! object network obj-amzn
! subnet vpc_subnet vpc_subnet_mask
! nat (inside,outside) 1 source static obj-SrcNet obj-SrcNet destination static obj-amzn obj-amzn
! If using version 8.2 or older, the entry would need to look something like this:
! nat (inside) 0 access-list acl-amzn
! Or, the same rule in acl-amzn should be included in an existing no nat ACL.
```

How to Test the Customer Gateway Configuration

When using Cisco ASA as a customer gateway, only one tunnel will be in the UP state. The second tunnel should be configured, but will only be used if the first tunnel goes down. The second tunnel cannot be in the UP state when the first tunnel is in the UP state. Your console will display that only one tunnel is up and it will show the second tunnel as down. This is expected behavior for Cisco ASA customer gateway tunnels because ASA as a customer gateway only supports a single tunnel being up at one time.

You can test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

- 1. Ensure that the customer gateway has a static route to your VPC, as suggested in the configuration templates provided by AWS.
- 2. Ensure that a static route has been added to the VPN connection so that traffic can get back to your customer gateway. For example, if your local subnet prefix is 198.10.0.0/16, you need to add a static route with that CIDR range to your VPN connection. Make sure that both tunnels have a static route to your VPC.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the Amazon VPC User Guide.

To test the end-to-end connectivity of each tunnel

- 1. Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs are listed in the launch wizard when you launch an instance from the AWS Management Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.

3. On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

4. (Optional) To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway, and repeat the above step. You cannot disable a tunnel on the AWS side of the VPN connection.

If your tunnels do not test successfully, see Troubleshooting Cisco ASA Customer Gateway Connectivity (p. 161).

Example: Cisco IOS Device

Topics

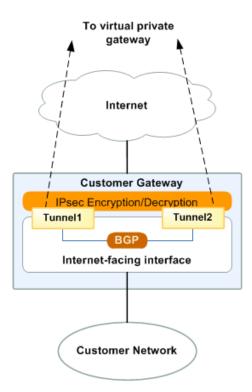
- A High-Level View of the Customer Gateway (p. 44)
- A Detailed View of the Customer Gateway and an Example Configuration (p. 45)
- How to Test the Customer Gateway Configuration (p. 52)

In this section we walk you through an example of the configuration information provided by your integration team if your customer gateway is a Cisco IOS device running Cisco IOS 12.4 (or later) software.

Two diagrams illustrate the example configuration. The first diagram shows the high-level layout of the customer gateway, and the second diagram shows details from the example configuration. You should use the real configuration information that you receive from your integration team and apply it to your customer gateway.

A High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels. Using redundant tunnels ensures continuous availability in the case that a device fails.



A Detailed View of the Customer Gateway and an Example Configuration

The diagram in this section illustrates an example Cisco IOS customer gateway. Following the diagram is a corresponding example of the configuration information your integration team should provide. The example configuration contains a set of information for each of the tunnels that you must configure.

In addition, the example configuration refers to these items that you must provide:

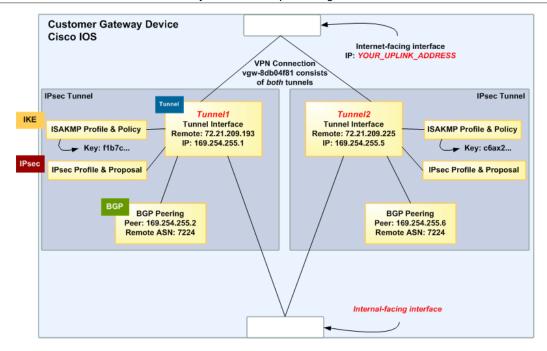
- YOUR_UPLINK_ADDRESS—The IP address for the Internet-routable external interface on the customer gateway. The address must be static, and may be behind a device performing network address translation (NAT). To ensure that NAT traversal (NAT-T) can function, you must adjust your firewall rules to unblock UDP port 4500.
- YOUR_BGP_ASN—The customer gateway's BGP ASN (we use 65000 by default)

The example configuration includes several example values to help you understand how configuration works. For example, we provide example values for the VPN connection ID (vpn-44a8938f), virtual private gateway ID (vgw-8db04f81), the IP addresses (72.21.209.*, 169.254.255.*), and the remote ASN (7224). You'll replace these example values with the actual values from the configuration information that you receive.

In addition, you must:

- · Configure the outside interface
- Configure the tunnel interface IDs (referred to as <u>Tunnel1</u> and <u>Tunnel2</u> in the example configuration).
- Ensure that the Crypto ISAKMP Policy Sequence number is unique.
- Ensure that the Crypto IPsec Transform Set and the Crypto ISAKMP Policy Sequence are harmonious with any other IPsec tunnels configured on the device.
- Configure all internal routing that moves traffic between the customer gateway and your local network.

In the following diagram and example configuration, you must replace the items in red italics with values that apply to your particular configuration.



Warning

The following configuration information is an example of what you can expect your integration team to provide. Many of the values in the following example will be different from the actual configuration information that you receive. You must use the actual values and not the example values shown here, or your implementation will fail.

```
! Amazon Web Services
! Virtual Private Cloud
! AWS utilizes unique identifiers to manipulate the configuration of
! a VPN Connection. Each VPN Connection is assigned an identifier
! and is associated with two other identifiers, namely the
! Customer Gateway Identifier and Virtual Private Gateway Identifier.
! Your VPN Connection ID
                                    : vpn-44a8938f
! Your Virtual Private Gateway ID : vgw-8db04f81
                                    : cqw-b4dc3961
! Your Customer Gateway ID
!
!
! This configuration consists of two tunnels. Both tunnels must be
! configured on your Customer Gateway.
1
!
 IPsec Tunnel #1
 IKE
! #1: Internet Key Exchange (IKE) Configuration
!
! A policy is established for the supported ISAKMP encryption,
! authentication, Diffie-Hellman, lifetime, and key parameters.
!
```

```
! Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
! You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
! The address of the external interface for your customer gateway must be a
static address.
! Your customer gateway may reside behind a device performing network address
translation (NAT).
! To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
! Note that there are a global list of ISAKMP policies, each identified by
! sequence number. This policy is defined as #200, which may conflict with
! an existing policy using the same number. If so, we recommend changing
! the sequence number to avoid conflicts.
crypto isakmp policy 200
  encryption aes 128
  authentication pre-share
   group 2
  lifetime 28800
  hash sha
! The ISAKMP keyring stores the Pre Shared Key used to authenticate the
! tunnel endpoints.
crypto keyring keyring-vpn-44a8938f-0
   local-address YOUR_UPLINK_ADDRESS
  pre-shared-key address 72.21.209.225 key plain-text-password1
exit
! An ISAKMP profile is used to associate the keyring with the particular
! endpoint.
crypto isakmp profile isakmp-vpn-44a8938f-0
  local-address YOUR_UPLINK_ADDRESS
  match identity address 72.21.209.225
  keyring keyring-vpn-44a8938f-0
exit
 IPsec
! #2: IPsec Configuration
! The IPsec transform set defines the encryption, authentication, and IPsec
! mode parameters.
! Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
crypto ipsec transform-set ipsec-prop-vpn-44a8938f-0 esp-aes 128 esp-sha-
hmac
  mode tunnel
exit
! The IPsec profile references the IPsec transform set and further defines
! the Diffie-Hellman group and security association lifetime.
```

```
crypto ipsec profile ipsec-vpn-44a8938f-0
  set pfs group2
  set security-association lifetime seconds 3600
  set transform-set ipsec-prop-vpn-44a8938f-0
exit
! Additional parameters of the IPsec configuration are set here. Note that
! these parameters are global and therefore impact other IPsec
! associations.
! This option instructs the router to clear the "Don't Fragment"
! bit from packets that carry this bit and yet must be fragmented, enabling
! them to be fragmented.
crypto ipsec df-bit clear
! This option enables IPsec Dead Peer Detection, which causes periodic
! messages to be sent to ensure a Security Association remains operational.
crypto isakmp keepalive 10 10 on-demand
! This configures the gateway's window for accepting out of order
! IPsec packets. A larger window can be helpful if too many packets
! are dropped due to reordering while in transit between gateways.
crypto ipsec security-association replay window-size 128
! This option instructs the router to fragment the unencrypted packets
! (prior to encryption).
crypto ipsec fragmentation before-encryption
 Tunnel
! #3: Tunnel Interface Configuration
! A tunnel interface is configured to be the logical interface associated
! with the tunnel. All traffic routed to the tunnel interface will be
! encrypted and transmitted to the VPC. Similarly, traffic from the VPC
! will be logically received on this interface.
! Association with the IPsec security association is done through the
! "tunnel protection" command.
! The address of the interface is configured with the setup for your
! Customer Gateway. If the address changes, the Customer Gateway and VPN
! Connection must be recreated with Amazon VPC.
interface Tunnel1
  ip address 169.254.255.2 255.255.255.252
  ip virtual-reassembly
  tunnel source YOUR_UPLINK_ADDRESS
  tunnel destination 72.21.209.225
  tunnel mode ipsec ipv4
  tunnel protection ipsec profile ipsec-vpn-44a8938f-0
  ! This option causes the router to reduce the Maximum Segment Size of
  ! TCP packets to prevent packet fragmentation.
  ip tcp adjust-mss 1387
```

no shutdown exit

BGP

```
! #4: Border Gateway Protocol (BGP) Configuration
! BGP is used within the tunnel to exchange prefixes between the
! Virtual Private Gateway and your Customer Gateway. The Virtual Private
! will announce the prefix corresponding to your VPC.
! Your Customer Gateway may announce a default route (0.0.0.0/0),
! which can be done with the 'network' statement and
! 'default-originate' statements.
!
! The BGP timers are adjusted to provide more rapid detection of outages.
! The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN) is configured
! as part of your Customer Gateway. If the ASN must be changed, the
! Customer Gateway and VPN Connection will need to be recreated with AWS.
router bgp YOUR_BGP_ASN
  neighbor 169.254.255.1 remote-as 7224
  neighbor 169.254.255.1 activate
  neighbor 169.254.255.1 timers 10 30 30
  address-family ipv4 unicast
     neighbor 169.254.255.1 remote-as 7224
     neighbor 169.254.255.1 timers 10 30 30
     neighbor 169.254.255.1 default-originate
     neighbor 169.254.255.1 activate
     neighbor 169.254.255.1 soft-reconfiguration inbound
! To advertise additional prefixes to Amazon VPC, copy the 'network'
statement
! and identify the prefix you wish to advertise. Make sure the prefix is
! in the routing table of the device with a valid next-hop.
     network 0.0.0.0
  exit
exit.
! ------
! IPsec Tunnel #2
  IKE
! #1: Internet Key Exchange (IKE) Configuration
! A policy is established for the supported ISAKMP encryption,
! authentication, Diffie-Hellman, lifetime, and key parameters.
! Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
! You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
```

```
! The address of the external interface for your customer gateway must be a
static address.
! Your customer gateway may reside behind a device performing network address
translation (NAT).
! To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
! Note that there are a global list of ISAKMP policies, each identified by
! sequence number. This policy is defined as #201, which may conflict with
! an existing policy using the same number. If so, we recommend changing
! the sequence number to avoid conflicts.
crypto isakmp policy 201
  encryption aes 128
  authentication pre-share
  group 2
  lifetime 28800
  hash sha
exit
! The ISAKMP keyring stores the Pre Shared Key used to authenticate the
! tunnel endpoints.
crypto keyring keyring-vpn-44a8938f-1
  local-address YOUR UPLINK ADDRESS
  pre-shared-key address 72.21.209.193 key plain-text-password2
exit
! An ISAKMP profile is used to associate the keyring with the particular
! endpoint.
crypto isakmp profile isakmp-vpn-44a8938f-1
  local-address YOUR_UPLINK_ADDRESS
  match identity address 72.21.209.193
  keyring keyring-vpn-44a8938f-1
exit
IPsec
! #2: IPsec Configuration
! The IPsec transform set defines the encryption, authentication, and IPsec
! mode parameters.
! Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
crypto ipsec transform-set ipsec-prop-vpn-44a8938f-1 esp-aes 128 esp-sha-
hmac
  mode tunnel
exit
! The IPsec profile references the IPsec transform set and further defines
! the Diffie-Hellman group and security association lifetime.
crypto ipsec profile ipsec-vpn-44a8938f-1
  set pfs group2
  set security-association lifetime seconds 3600
```

```
set transform-set ipsec-prop-vpn-44a8938f-1
exit
! Additional parameters of the IPsec configuration are set here. Note that
! these parameters are global and therefore impact other IPsec
! associations.
! This option instructs the router to clear the "Don't Fragment"
! bit from packets that carry this bit and yet must be fragmented, enabling
! them to be fragmented.
crypto ipsec df-bit clear
! This option enables IPsec Dead Peer Detection, which causes periodic
! messages to be sent to ensure a Security Association remains operational.
crypto isakmp keepalive 10 10 on-demand
! This configures the gateway's window for accepting out of order
! IPsec packets. A larger window can be helpful if too many packets
! are dropped due to reordering while in transit between gateways.
crypto ipsec security-association replay window-size 128
! This option instructs the router to fragment the unencrypted packets
! (prior to encryption).
crypto ipsec fragmentation before-encryption
 Tunnel
! #3: Tunnel Interface Configuration
! A tunnel interface is configured to be the logical interface associated
! with the tunnel. All traffic routed to the tunnel interface will be
! encrypted and transmitted to the VPC. Similarly, traffic from the VPC
! will be logically received on this interface.
! Association with the IPsec security association is done through the
! "tunnel protection" command.
! The address of the interface is configured with the setup for your
! Customer Gateway. If the address changes, the Customer Gateway and VPN
! Connection must be recreated with Amazon VPC.
interface Tunnel2
  ip address 169.254.255.6 255.255.255.252
  ip virtual-reassembly
  tunnel source YOUR UPLINK ADDRESS
  tunnel destination 72.21.209.193
  tunnel mode ipsec ipv4
  tunnel protection ipsec profile ipsec-vpn-44a8938f-1
  ! This option causes the router to reduce the Maximum Segment Size of
  ! TCP packets to prevent packet fragmentation.
  ip tcp adjust-mss 1387
  no shutdown
exit
```

BGP

```
#4: Border Gateway Protocol (BGP) Configuration
! BGP is used within the tunnel to exchange prefixes between the
! Virtual Private Gateway and your Customer Gateway. The Virtual Private
! will announce the prefix corresponding to your Cloud.
! Your Customer Gateway may announce a default route (0.0.0.0/0),
! which can be done with the 'network' statement and
! 'default-originate' statements.
! The BGP timers are adjusted to provide more rapid detection of outages.
1
! The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN) is configured
! as part of your Customer Gateway. If the ASN must be changed, the
! Customer Gateway and VPN Connection will need to be recreated with AWS.
router bgp YOUR_BGP_ASN
  neighbor 169.254.255.5 remote-as 7224
  neighbor 169.254.255.5 activate
  neighbor 169.254.255.5 timers 10 30 30
  address-family ipv4 unicast
     neighbor 169.254.255.5 remote-as 7224
     neighbor 169.254.255.5 timers 10 30 30
     neighbor 169.254.255.5 default-originate
     neighbor 169.254.255.5 activate
     neighbor 169.254.255.5 soft-reconfiguration inbound
! To advertise additional prefixes to Amazon VPC, copy the 'network'
statement
! and identify the prefix you wish to advertise. Make sure the prefix is
! in the routing table of the device with a valid next-hop.
      network 0.0.0.0
   exit
exit
```

How to Test the Customer Gateway Configuration

You can test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

- On your customer gateway, determine whether the BGP status is Active.
 It takes approximately 30 seconds for a BGP peering to become active.
- 2. Ensure that the customer gateway is advertising a route to the virtual private gateway. The route may be the default route (0.0.0.0/0) or a more specific route you prefer.

When properly established, your BGP peering should be receiving one route from the virtual private gateway corresponding to the prefix that your VPC integration team specified for the VPC (for example, 10.0.0.0/24). If the BGP peering is established, you are receiving a prefix, and you are advertising a prefix, your tunnel is configured correctly. Make sure that both tunnels are in this state.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection: your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the Amazon VPC User Guide.

To test the end-to-end connectivity of each tunnel

- 1. Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs are listed in the launch wizard when you launch an instance from the Amazon EC2 Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- 3. On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

4. (Optional) To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway, and repeat the above step. You cannot disable a tunnel on the AWS side of the VPN connection.

If your tunnels don't test successfully, see Troubleshooting Cisco IOS Customer Gateway Connectivity (p. 164).

Example: Cisco IOS Device without Border Gateway Protocol

Topics

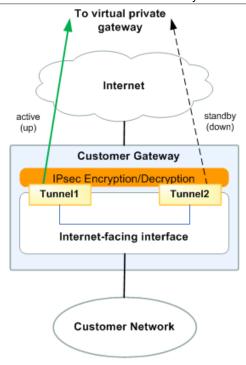
- A High-Level View of the Customer Gateway (p. 54)
- A Detailed View of the Customer Gateway and an Example Configuration (p. 55)
- How to Test the Customer Gateway Configuration (p. 61)

In this section we walk you through an example of the configuration information provided by your integration team if your customer gateway is a Cisco Integrated Services router running Cisco IOS software.

Two diagrams illustrate the example configuration. The first diagram shows the high-level layout of the customer gateway, and the second diagram shows details from the example configuration. You should use the real configuration information that you receive from your integration team, and apply it to your customer gateway.

A High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels. Using redundant tunnels ensures continuous availability in the case that a device fails.



A Detailed View of the Customer Gateway and an Example Configuration

The diagram in this section illustrates an example Cisco IOS customer gateway (without BGP). Following the diagram, there is a corresponding example of the configuration information that your integration team should provide. The example configuration contains a set of information for each of the tunnels that you must configure.

In addition, the example configuration refers to this item that you must provide:

YOUR_UPLINK_ADDRESS—The IP address for the Internet-routable external interface on the
customer gateway. The address must be static, and may be behind a device performing network
address translation (NAT). To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500.

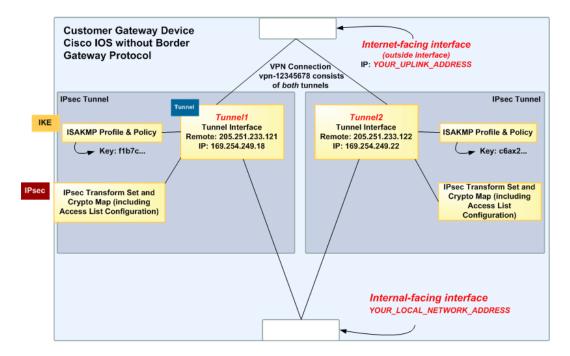
The example configuration includes several example values to help you understand how configuration works. For example, we provide example values for the VPN connection ID (vpn-1a2b3c4d), virtual private gateway ID (vgw-12345678), the IP addresses (205.251.233.*, 169.254.255.*). You'll replace these example values with the actual values from the configuration information that you receive.

In addition, you must:

- Configure the outside interface.
- Configure the tunnel interface IDs (referred to as <u>Tunnell</u> and <u>Tunnell</u> in the example configuration).

- Ensure that the Crypto ISAKMP Policy Sequence number is unique.
- Ensure that the Crypto IPsec Transform Set and the Crypto ISAKMP Policy Sequence are harmonious with any other IPsec tunnels configured on the device.
- Ensure that the SLA monitoring number is unique.
- Configure all internal routing that moves traffic between the customer gateway and your local network.

In the following diagram and example configuration, you must replace the items in red italics with values that apply to your particular configuration.



Warning

The following configuration information is an example of what you can expect your integration team to provide. Many of the values in the following example will be different from the actual configuration information that you receive. You must use the actual values and not the example values shown here, or your implementation will fail.

```
! IPSec Tunnel #1
!
! #1: Internet Key Exchange (IKE) Configuration
!
! A policy is established for the supported ISAKMP encryption,
! authentication, Diffie-Hellman, lifetime, and key parameters.
! Please note, these sample configurations are for the minimum requirement of AES128, SHA1, and DH Group 2.
! You will need to modify these sample configuration files to take advantage of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
! The address of the external interface for your customer gateway must be a static address.
! Your customer gateway may reside behind a device performing network address translation (NAT).
```

```
! To ensure that NAT traversal (NAT-T) can function, you must adjust your
 firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
! Note that there are a global list of ISAKMP policies, each identified by
! sequence number. This policy is defined as #200, which may conflict with
! an existing policy using the same number. If so, we recommend changing
! the sequence number to avoid conflicts.
crypto isakmp policy 200
  encryption aes 128
  authentication pre-share
  group 2
  lifetime 28800
 hash sha
exit
! The ISAKMP keyring stores the Pre Shared Key used to authenticate the
! tunnel endpoints.
crypto keyring keyring-vpn-1a2b3c4d-0
  local-address CUSTOMER_IP
 pre-shared-key address 205.251.233.121 key PASSWORD
! An ISAKMP profile is used to associate the keyring with the particular
! endpoint.
crypto isakmp profile isakmp-vpn-1a2b3c4d-0
 local-address CUSTOMER_IP
 match identity address 205.251.233.121
 keyring keyring-vpn-1a2b3c4d-0
exit
! #2: IPSec Configuration
! The IPSec transform set defines the encryption, authentication, and IPSec
! mode parameters.
! Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
crypto ipsec transform-set ipsec-prop-vpn-1a2b3c4d-0 esp-aes 128 esp-sha-
hmac
 mode tunnel
exit.
! The IPSec profile references the IPSec transform set and further defines
! the Diffie-Hellman group and security association lifetime.
crypto ipsec profile ipsec-vpn-1a2b3c4d-0
 set pfs group2
  set security-association lifetime seconds 3600
 set transform-set ipsec-prop-vpn-1a2b3c4d-0
! Additional parameters of the IPSec configuration are set here. Note that
! these parameters are global and therefore impact other IPSec
! associations.
```

```
! This option instructs the router to clear the "Don't Fragment"
! bit from packets that carry this bit and yet must be fragmented, enabling
! them to be fragmented.
crypto ipsec df-bit clear
! This option enables IPSec Dead Peer Detection, which causes periodic
! messages to be sent to ensure a Security Association remains operational.
crypto isakmp keepalive 10 10 on-demand
! This configures the gateway's window for accepting out of order
! IPSec packets. A larger window can be helpful if too many packets
! are dropped due to reordering while in transit between gateways.
crypto ipsec security-association replay window-size 128
! This option instructs the router to fragment the unencrypted packets
! (prior to encryption).
crypto ipsec fragmentation before-encryption
! #3: Tunnel Interface Configuration
!
! A tunnel interface is configured to be the logical interface associated
! with the tunnel. All traffic routed to the tunnel interface will be
! encrypted and transmitted to the VPC. Similarly, traffic from the VPC
! will be logically received on this interface.
! Association with the IPSec security association is done through the
! "tunnel protection" command.
! The address of the interface is configured with the setup for your
! Customer Gateway. If the address changes, the Customer Gateway and VPN
! Connection must be recreated with Amazon VPC.
interface Tunnel1
 ip address 169.254.249.18 255.255.255.252
 ip virtual-reassembly
 tunnel source CUSTOMER_IP
  tunnel destination 205.251.233.121
  tunnel mode ipsec ipv4
 tunnel protection ipsec profile ipsec-vpn-1a2b3c4d-0
  ! This option causes the router to reduce the Maximum Segment Size of
 ! TCP packets to prevent packet fragmentation.
 ip tcp adjust-mss 1387
 no shutdown
exit.
 ______
! #4 Static Route Configuration
! Your Customer Gateway needs to set a static route for the prefix
corresponding to your
! VPC to send traffic over the tunnel interface.
```

```
! An example for a VPC with the prefix 10.0.0.0/16 is provided below:
! ip route 10.0.0.0 255.255.0.0 Tunnel1 track 100
! SLA Monitor is used to provide a failover between the two tunnels. If the
primary tunnel fails, the redundant tunnel will automatically be used
! This sla is defined as #100, which may conflict with an existing sla using
same number.
! If so, we recommend changing the sequence number to avoid conflicts.
ip sla 100
  icmp-echo 169.254.249.17 source-interface Tunnell
  timeout 1000
  frequency 5
ip sla schedule 100 life forever start-time now
track 100 ip sla 100 reachability
! IPSec Tunnel #2
         ______
! #1: Internet Key Exchange (IKE) Configuration
! A policy is established for the supported ISAKMP encryption,
! authentication, Diffie-Hellman, lifetime, and key parameters.
! Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
! You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
! The address of the external interface for your customer gateway must be a
static address.
! Your customer gateway may reside behind a device performing network address
translation (NAT).
! To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
! Note that there are a global list of ISAKMP policies, each identified by
! sequence number. This policy is defined as #201, which may conflict with
! an existing policy using the same number. If so, we recommend changing
! the sequence number to avoid conflicts.
crypto isakmp policy 201
 encryption aes 128
 authentication pre-share
 group 2
 lifetime 28800
 hash sha
! The ISAKMP keyring stores the Pre Shared Key used to authenticate the
! tunnel endpoints.
crypto keyring keyring-vpn-1a2b3c4d-1
 local-address CUSTOMER_IP
 pre-shared-key address 205.251.233.122 key PASSWORD
exit
```

```
! An ISAKMP profile is used to associate the keyring with the particular
! endpoint.
crypto isakmp profile isakmp-vpn-1a2b3c4d-1
 local-address CUSTOMER_IP
 match identity address 205.251.233.122
 keyring keyring-vpn-1a2b3c4d-1
exit
! #2: IPSec Configuration
! The IPSec transform set defines the encryption, authentication, and IPSec
! mode parameters.
! Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
crypto ipsec transform-set ipsec-prop-vpn-1a2b3c4d-1 esp-aes 128 esp-sha-
hmac
 mode tunnel
exit
! The IPSec profile references the IPSec transform set and further defines
! the Diffie-Hellman group and security association lifetime.
crypto ipsec profile ipsec-vpn-1a2b3c4d-1
 set pfs group2
 set security-association lifetime seconds 3600
 set transform-set ipsec-prop-vpn-1a2b3c4d-1
exit
! Additional parameters of the IPSec configuration are set here. Note that
! these parameters are global and therefore impact other IPSec
! associations.
! This option instructs the router to clear the "Don't Fragment"
! bit from packets that carry this bit and yet must be fragmented, enabling
! them to be fragmented.
crypto ipsec df-bit clear
! This option enables IPSec Dead Peer Detection, which causes periodic
! messages to be sent to ensure a Security Association remains operational.
crypto isakmp keepalive 10 10 on-demand
! This configures the gateway's window for accepting out of order
! IPSec packets. A larger window can be helpful if too many packets
! are dropped due to reordering while in transit between gateways.
crypto ipsec security-association replay window-size 128
! This option instructs the router to fragment the unencrypted packets
! (prior to encryption).
crypto ipsec fragmentation before-encryption
```

```
! #3: Tunnel Interface Configuration
! A tunnel interface is configured to be the logical interface associated
! with the tunnel. All traffic routed to the tunnel interface will be
! encrypted and transmitted to the VPC. Similarly, traffic from the VPC
! will be logically received on this interface.
! Association with the IPSec security association is done through the
! "tunnel protection" command.
! The address of the interface is configured with the setup for your
! Customer Gateway. If the address changes, the Customer Gateway and VPN
! Connection must be recreated with Amazon VPC.
interface Tunnel2
 ip address 169.254.249.22 255.255.255.252
 ip virtual-reassembly
 tunnel source CUSTOMER_IP
 tunnel destination 205.251.233.122
 tunnel mode ipsec ipv4
 tunnel protection ipsec profile ipsec-vpn-1a2b3c4d-1
 ! This option causes the router to reduce the Maximum Segment Size of
 ! TCP packets to prevent packet fragmentation.
 ip tcp adjust-mss 1387
 no shutdown
exit
! #4 Static Route Configuration
! Your Customer Gateway needs to set a static route for the prefix
corresponding to your
! VPC to send traffic over the tunnel interface.
! An example for a VPC with the prefix 10.0.0.0/16 is provided below:
! ip route 10.0.0.0 255.255.0.0 Tunnel2 track 200
! SLA Monitor is used to provide a failover between the two tunnels. If the
primary tunnel fails, the redundant tunnel will automatically be used
! This sla is defined as #200, which may conflict with an existing sla using
same number.
! If so, we recommend changing the sequence number to avoid conflicts.
  icmp-echo 169.254.249.21 source-interface Tunnel2
  timeout 1000
  frequency 5
ip sla schedule 200 life forever start-time now
track 200 ip sla 200 reachability
                    _____
```

How to Test the Customer Gateway Configuration

You can test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

- 1. Ensure that the customer gateway has a static route to your VPC, as suggested in the configuration templates provided by AWS.
- 2. Ensure that a static route has been added to the VPN connection so that traffic can get back to your customer gateway. For example, if your local subnet prefix is 198.10.0.0/16, you need to add a static route with that CIDR range to your VPN connection. Make sure that both tunnels have a static route to your VPC.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- · Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the Amazon VPC User Guide.

To test the end-to-end connectivity of each tunnel

- Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs are listed in the launch wizard when you launch an instance from the AWS Management Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

 (Optional) To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway, and repeat the above step. You cannot disable a tunnel on the AWS side of the VPN connection.

If your tunnels don't test successfully, see Troubleshooting Cisco IOS Customer Gateway without Border Gateway Protocol Connectivity (p. 169).

Example: Dell SonicWALL Device

This topic provides an example of how to configure your router if your customer gateway is a Dell SonicWALL router.

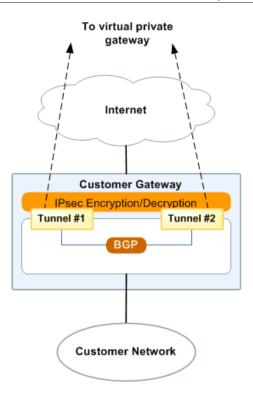
This section assumes that a VPN connection with static routing has been configured in the Amazon VPC console. For more information, see Adding a Hardware Virtual Private Gateway to Your VPC in the Amazon VPC User Guide.

Topics

- A High-Level View of the Customer Gateway (p. 63)
- Example Configuration File (p. 64)
- Configuring the SonicWALL Device Using the Management Interface (p. 68)
- How to Test the Customer Gateway Configuration (p. 68)

A High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels: *Tunnel 1* and *Tunnel 2*. Using redundant tunnels ensures continuous availability in the case that a device fails.



Example Configuration File

The configuration file that you download from the Amazon VPC console includes the values that you need in order to use the command line tools on OS 6.2 to configure each tunnel and the IKE and IPsec settings for your SonicWALL device.

Important

The following configuration information uses example values — you must use the actual values and not the example values shown here, or your implementation will fail.

```
! Amazon Web Services
! Virtual Private Cloud
! VPN Connection Configuration
_______
! AWS utilizes unique identifiers to manipulate the configuration of
! a VPN Connection. Each VPN Connection is assigned a VPN Connection
Identifier
! and is associated with two other identifiers, namely the
! Customer Gateway Identifier and the Virtual Private Gateway Identifier.
! Your VPN Connection ID
                                       : vpn-44a8938f
! Your Virtual Private Gateway ID
                                       : vgw-8db04f81
! Your Customer Gateway ID
                                       : cgw-ff628496
! This configuration consists of two tunnels. Both tunnels must be
! configured on your Customer Gateway.
! This configuration was tested on a SonicWALL TZ 600 running OS 6.2.5.1-26n
```

```
! You may need to populate these values throughout the config based on your
! <vpc_subnet> - VPC address range
! IPSec Tunnel !1
_____
  IKE
! #1: Internet Key Exchange (IKE) Configuration
! Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
! You can modify these sample configuration files to use AES128, SHA1,
AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
! The address of the external interface for your customer gateway must be a
static address.
! Your customer gateway may reside behind a device performing network address
translation (NAT).
! To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
config
address-object ipv4 AWSVPC network 172.30.0.0/16
vpn policy tunnel-interface vpn-44a8938f-1
gateway primary 72.21.209.193
bound-to interface X1
auth-method shared-secret
shared-secret PRE-SHARED-KEY-IN-PLAIN-TEXT
ike-id local ip your_customer_gateway_IP_address
ike-id peer ip 72.21.209.193
end
 IPsec
! #2: IPSec Configuration
! The IPSec (Phase 2) proposal defines the protocol, authentication,
! encryption, and lifetime parameters for our IPSec security association.
! Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
config
proposal ipsec lifetime 3600
proposal ipsec authentication shal
proposal ipsec encryption aes128
proposal ipsec perfect-forward-secrecy dh-group 2
proposal ipsec protocol ESP
keep-alive
enable
commit
end
!
!
```

```
! You can use other supported IPSec parameters for encryption such as AES256,
and other DH groups such as 2, 5, 14-18, 22, 23, and 24.
! IPSec Dead Peer Detection (DPD) will be enabled on the AWS Endpoint. We
! recommend configuring DPD on your endpoint as follows:
  - DPD Interval
                             : 120
  - DPD Retries
! To configure Dead Peer Detection for the SonicWall device, use the SonicOS
management interface.
 Tunnel
! #3: Tunnel Interface Configuration
! The tunnel interface is configured with the internal IP address.
! To establish connectivity between your internal network and the VPC, you
! must have an interface facing your internal network in the "Trust" zone.
!
config
tunnel-interface vpn T1
ip-assignment VPN static
ip 169.254.44.242 netmask 255.255.255.252
 BGP
! #4: Border Gateway Protocol (BGP) Configuration:
! BGP is used within the tunnel to exchange prefixes between the
! Virtual Private Gateway and your Customer Gateway. The Virtual Private
Gateway
! will announce the prefix corresponding to your VPC.
! The local BGP Autonomous System Number (ASN) (65000)
! is configured as part of your Customer Gateway. If the ASN must
! be changed, the Customer Gateway and VPN Connection will need to be
recreated with AWS.
!
routing
pab
configure terminal
router bgp YOUR_BGP_ASN
network < Local_subnet > /24
neighbor 169.254.44.242 remote-as 7224
neighbor 169.254.44.242 timers 10 30
neighbor 169.254.44.242 soft-reconfiguration inbound
exit
commit
end
! IPSec Tunnel #2
```

IKE

```
! #1: Internet Key Exchange (IKE) Configuration
! Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
! You can modify these sample configuration files to use AES128, SHA1,
AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
! The address of the external interface for your customer gateway must be a
static address.
! Your customer gateway may reside behind a device performing network address
translation (NAT).
! To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
config
address-object ipv4 AWSVPC network 172.30.0.0/16
vpn policy tunnel-interface vpn-44a8938f-1
gateway primary 72.21.209.225
bound-to interface X1
auth-method shared-secret
shared-secret PRE-SHARED-KEY-IN-PLAIN-TEXT
ike-id local ip your_customer_gateway_IP_address
ike-id peer ip 72.21.209.225
end
 IPsec
! #2: IPSec Configuration
! The IPSec (Phase 2) proposal defines the protocol, authentication,
! encryption, and lifetime parameters for our IPSec security association.
! Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
!
config
proposal ipsec lifetime 3600
proposal ipsec authentication shal
proposal ipsec encryption aes128
proposal ipsec perfect-forward-secrecy dh-group 2
proposal ipsec protocol ESP
keep-alive
enable
commit
end
! You can use other supported IPSec parameters for encryption such as AES256,
and other DH groups such as 2, 5, 14-18, 22, 23, and 24.
! IPSec Dead Peer Detection (DPD) will be enabled on the AWS Endpoint. We
! recommend configuring DPD on your endpoint as follows:
  - DPD Interval
                             : 120
  - DPD Retries
                             : 3
! To configure Dead Peer Detection for the SonicWall device, use the SonicOS
management interface.
 Tunnel
```

Amazon Virtual Private Cloud Network Administrator Guide Configuring the SonicWALL Device Using the Management Interface

```
! #3: Tunnel Interface Configuration
! The tunnel interface is configured with the internal IP address.
!
! To establish connectivity between your internal network and the VPC, you
! must have an interface facing your internal network in the "Trust" zone.
config
tunnel-interface vpn T2
ip-assignment VPN static
ip 169.254.44.114 netmask 255.255.255.252
 BGP
! #4: Border Gateway Protocol (BGP) Configuration:
! BGP is used within the tunnel to exchange prefixes between the
! Virtual Private Gateway and your Customer Gateway. The Virtual Private
! will announce the prefix corresponding to your VPC.
! The local BGP Autonomous System Number (ASN) (65000)
! is configured as part of your Customer Gateway. If the ASN must
! be changed, the Customer Gateway and VPN Connection will need to be
recreated with AWS.
routing
bgp
configure terminal
router bgp YOUR_BGP_ASN
network < Local_subnet > /24
neighbor 169.254.44.114 remote-as 7224
neighbor 169.254.44.114 timers 10 30
neighbor 169.254.44.114 soft-reconfiguration inbound
end
exit
commit
end
```

Configuring the SonicWALL Device Using the Management Interface

You can also configure the SonicWALL device using the SonicOS management interface. For more information, see Configuring the SonicWALL Device Using the Management Interface (p. 76).

You cannot configure BGP for the device using the management interface. Instead, use the command line instructions provided in the example configuration file above, under the section named **BGP**.

How to Test the Customer Gateway Configuration

You can test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

- On your customer gateway, determine whether the BGP status is Active.
 It takes approximately 30 seconds for a BGP peering to become active.
- 2. Ensure that the customer gateway is advertising a route to the virtual private gateway. The route may be the default route (0.0.0/0) or a more specific route you prefer.

When properly established, your BGP peering should be receiving one route from the virtual private gateway corresponding to the prefix that your VPC integration team specified for the VPC (for example, 10.0.0.0/24). If the BGP peering is established, you are receiving a prefix, and you are advertising a prefix, your tunnel is configured correctly. Make sure that both tunnels are in this state.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection: your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the *Amazon VPC User Guide*.

To test the end-to-end connectivity of each tunnel

- 1. Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs are listed in the launch wizard when you launch an instance from the Amazon EC2 Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

 (Optional) To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway, and repeat the above step. You cannot disable a tunnel on the AWS side of the VPN connection.

If your tunnels don't test successfully, see Troubleshooting Generic Device Customer Gateway Connectivity Using Border Gateway Protocol (p. 182).

Example: Dell SonicWALL SonicOS Device Without Border Gateway Protocol

This topic provides an example of how to configure your router if your customer gateway is a Dell SonicWALL router running SonicOS 5.9 or 6.2.

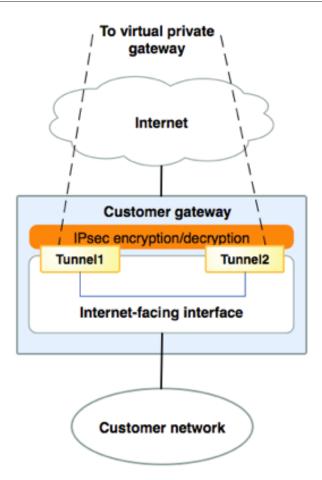
This section assumes that a VPN connection with static routing has been configured in the Amazon VPC console. For more information, see Adding a Hardware Virtual Private Gateway to Your VPC in the Amazon VPC User Guide.

Topics

- A High-Level View of the Customer Gateway (p. 71)
- Example Configuration File (p. 72)
- Configuring the SonicWALL Device Using the Management Interface (p. 76)
- How to Test the Customer Gateway Configuration (p. 77)

A High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels: *Tunnel 1* and *Tunnel 2*. Using redundant tunnels ensures continuous availability in the case that a device fails.



Example Configuration File

The configuration file that you download from the Amazon VPC console includes the values that you need in order to use the command line tools on OS 6.2 to configure each tunnel and the IKE and IPsec settings for your SonicWALL device.

Important

The following configuration information uses example values — you must use the actual values and not the example values shown here, or your implementation will fail.

```
! Your Customer Gateway ID
                                          : cgw-ff628496
! This configuration consists of two tunnels. Both tunnels must be
! configured on your customer gateway.
! This configuration was tested on a SonicWALL TZ 600 running OS 6.2.5.1-26n
! You may need to populate these values throughout the config based on your
! <vpc_subnet> - VPC IP address range
 _______
  IKE
! #1: Internet Key Exchange (IKE) Configuration
! These sample configurations are for the minimum requirement of AES128,
SHA1, and DH Group 2.
! You can modify these sample configuration files to use AES128, SHA1,
AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
! The address of the external interface for your customer gateway must be a
static address.
! Your customer gateway may reside behind a device performing network address
translation (NAT).
! To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
!
config
address-object ipv4 AWSVPC network 172.30.0.0/16
vpn policy tunnel-interface vpn-44a8938f-1
gateway primary 72.21.209.193
bound-to interface X1
auth-method shared-secret
shared-secret PRE-SHARED-KEY-IN-PLAIN-TEXT
ike-id local ip your_customer_gateway_IP_address
ike-id peer ip 72.21.209.193
end
 IPsec
! #2: IPSec Configuration
! The IPSec (Phase 2) proposal defines the protocol, authentication,
! encryption, and lifetime parameters for our IPSec security association.
! Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
config
proposal ipsec lifetime 3600
proposal ipsec authentication shal
proposal ipsec encryption aes128
proposal ipsec perfect-forward-secrecy dh-group 2
proposal ipsec protocol ESP
keep-alive
enable
commit
```

```
end
! You can use other supported IPSec parameters for encryption such as AES256,
and other DH groups such as 1,2, 5, 14-18, 22, 23, and 24.
! IPSec Dead Peer Detection (DPD) will be enabled on the AWS Endpoint. We
! recommend configuring DPD on your endpoint as follows:
                            : 120
! - DPD Interval
! - DPD Retries
                             : 3
! To configure Dead Peer Detection for the SonicWall device, use the SonicOS
management interface.
 Tunnel
! #3: Tunnel Interface Configuration
! The tunnel interface is configured with the internal IP address.
! To establish connectivity between your internal network and the VPC, you
! must have an interface facing your internal network in the "Trust" zone.
!
config
tunnel-interface vpn T1
ip-assignment VPN static
ip 169.254.255.6 netmask 255.255.255.252
exit
!
!
! #4 Static Route Configuration
! Create a firewall policy permitting traffic from your local subnet to the
VPC subnet and vice versa
! This example policy permits all traffic from the local subnet to the VPC
through the tunnel interface.
policy interface T1 metric 1 source any destination name AWSVPC service any
gateway 169.254.255.5
IPSec Tunnel !2
______
  IKE
! #1: Internet Key Exchange (IKE) Configuration
! These sample configurations are for the minimum requirement of AES128,
SHA1, and DH Group 2.
! You can modify these sample configuration files to use AES128, SHA1,
AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
! The address of the external interface for your customer gateway must be a
static address.
! Your customer gateway may reside behind a device performing network address
translation (NAT).
! To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
```

```
config
address-object ipv4 AWSVPC network 172.30.0.0/16
vpn policy tunnel-interface vpn-44a8938f-2
gateway primary 72.21.209.225
bound-to interface X1
auth-method shared-secret
shared-secret PRE-SHARED-KEY-IN-PLAIN-TEXT
ike-id local ip your_customer_gateway_IP_address
ike-id peer ip 72.21.209.225
end
!
 IPsec
! #2: IPSec Configuration
! The IPSec (Phase 2) proposal defines the protocol, authentication,
! encryption, and lifetime parameters for our IPSec security association.
! Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
config
proposal ipsec lifetime 3600
proposal ipsec authentication shal
proposal ipsec encryption aes128
proposal ipsec perfect-forward-secrecy dh-group 2
proposal ipsec protocol ESP
keep-alive
enable
commit
end
!
! You can use other supported IPSec parameters for encryption such as AES256,
and other DH groups such as 1,2, 5, 14-18, 22, 23, and 24.
! IPSec Dead Peer Detection (DPD) will be enabled on the AWS Endpoint. We
! recommend configuring DPD on your endpoint as follows:
! - DPD Interval
                              : 120
! - DPD Retries
                              : 3
! To configure Dead Peer Detection for the SonicWall device, use the SonicOS
management interface.
 Tunnel
! #3: Tunnel Interface Configuration
! The tunnel interface is configured with the internal IP address.
! To establish connectivity between your internal network and the VPC, you
! must have an interface facing your internal network in the "Trust" zone.
!
!
config
tunnel-interface vpn T2
ip-assignment VPN static
ip 169.254.255.2 netmask 255.255.255.252
```

Amazon Virtual Private Cloud Network Administrator Guide Configuring the SonicWALL Device Using the Management Interface

```
! #4 Static Route Configuration
!
! Create a firewall policy permitting traffic from your local subnet to the VPC subnet and vice versa
! This example policy permits all traffic from the local subnet to the VPC through the tunnel interface.
!
!
policy interface T2 metric 1 source any destination name AWSVPC service any gateway 169.254.255.1
```

Configuring the SonicWALL Device Using the Management Interface

The following procedure demonstrates how to configure the VPN tunnels on the SonicWALL device using the SonicOS management interface. You must replace the example values in the procedures with the values that are provided in the configuration file.

To configure the tunnels

- 1. Open the SonicWALL SonicOS management interface.
- 2. In the left pane, choose VPN, Settings. Under VPN Policies, choose Add....
- 3. In the VPN policy window on the **General** tab, complete the following information:
 - Policy Type: Choose Site to Site.
 - Authentication Method: Choose IKE using Preshared Secret.
 - Name: Enter a name for the VPN policy. We recommend that you use the name of the VPN ID, as provided in the configuration file.
 - IPsec Primary Gateway Name or Address: Enter the IP address of the virtual private gateway (AWS endpoint) as provided in the configuration file; for example, 72.21.209.193.
 - IPsec Secondary Gateway Name or Address: Leave the default value.
 - Shared Secret: Enter the pre-shared key as provided in the configuration file, and enter it again in Confirm Shared Secret.
 - Local IKE ID: Enter the IPv4 address of the customer gateway (the SonicWALL device).
 - Peer IKE ID: Enter the IPv4 address of the virtual private gateway (AWS endpoint).
- 4. On the **Network** tab, complete the following information:
 - Under **Local Networks**, choose **Any address**. We recommend this option to prevent connectivity issues from your local network.
 - Under **Remote Networks**, choose **Choose a destination network from list**. Create an address object with the CIDR of your VPC in AWS.
- 5. On the **Proposals** tab, complete the following information.
 - Under IKE (Phase 1) Proposal, do the following:
 - Exchange: Choose Main Mode.
 - **DH Group**: Enter a value for the Diffie-Hellman group; for example, 2.
 - Encryption: Choose AES-128 or AES-256.
 - Authentication: Choose SHA1 or SHA256.
 - Life Time: Enter 28800.
 - Under IKE (Phase 2) Proposal, do the following:

- Protocol: Choose ESP.
- Encryption: Choose AES-128 or AES-256.
- Authentication: Choose SHA1 or SHA256.
- Select the Enable Perfect Forward Secrecy check box, and choose the Diffie-Hellman group.
- Life Time: Enter 3600.

Important

If you created your virtual private gateway before October 2015, you must specify Diffie-Hellman group 2, AES-128, and SHA1 for both phases.

- 6. On the **Advanced** tab, complete the following information:
 - Select Enable Keep Alive.
 - Select Enable Phase2 Dead Peer Detection and enter the following:
 - For Dead Peer Detection Interval, enter 120 (this is the minimum that the SonicWALL device accepts).
 - For Failure Trigger Level, enter 2.
 - For VPN Policy bound to, select Interface X1. This is the interface that's typically designated for public IP addresses.
- 7. Choose **OK**. On the **Settings** page, the **Enable** check box for the tunnel should be selected by default. A green dot indicates that the tunnel is up.

How to Test the Customer Gateway Configuration

You must first test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

On your customer gateway, verify that you have added a static route to the VPC CIDR IP space to
use the tunnel interface.

Next, you must test the connectivity for each tunnel by launching an instance into your VPC and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux
- Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection; your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the Amazon VPC User Guide.

To test the end-to-end connectivity of each tunnel

- Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs
 are available in the Quick Start menu when you use the Launch Instances wizard in the AWS
 Management Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- 3. On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following:

```
PROMPT> ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

If your tunnels don't test successfully, see Troubleshooting Generic Device Customer Gateway Connectivity Using Border Gateway Protocol (p. 182).

Example: Fortinet Fortigate Device

Topics

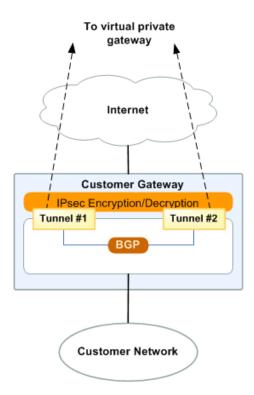
- A High-Level View of the Customer Gateway (p. 80)
- A Detailed View of the Customer Gateway and an Example Configuration (p. 80)
- How to Test the Customer Gateway Configuration (p. 89)

The following topic provides example configuration information provided by your integration team if your customer gateway is a Fortinet Fortigate 40+ device.

Two diagrams illustrate the example configuration. The first diagram shows the high-level layout of the customer gateway, and the second diagram shows the details of the example configuration. You should use the real configuration information that you receive from your integration team and apply it to your customer gateway.

A High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels. Using redundant tunnels ensures continuous availability in the case that a device fails.



A Detailed View of the Customer Gateway and an Example Configuration

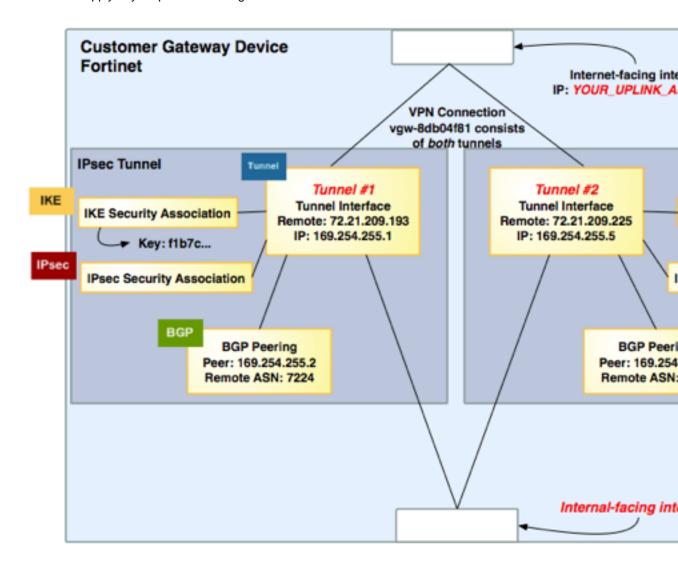
The diagram in this section illustrates an example Fortinet customer gateway. Following the diagram, there is a corresponding example of the configuration information your integration team should provide. The example configuration contains a set of information for each of the tunnels that you must configure.

In addition, the example configuration refers to these items that you must provide:

- YOUR_UPLINK_ADDRESS—The IP address for the Internet-routable external interface on the customer gateway (which must be static, and may be behind a device performing network address translation (NAT).
- YOUR_BGP_ASN—The customer gateway's BGP ASN (we use 65000 by default)

The example configuration includes several example values to help you understand how configuration works. For example, we provide example values for the VPN connection ID (vpn-44a8938f), virtual private gateway ID (vgw-8db04f81), the IP addresses (72.21.209.*, 169.254.255.*), and the remote ASN (7224). You'll replace these example values with the actual values from the configuration information that you receive.

In the following diagram and example configuration, you must replace the items in red italics with values that apply to your particular configuration.



Warning

The following configuration information is an example of what you can expect your integration team to provide. Many of the values in the following example will be different from the actual configuration information that you receive. You must use the actual values and not the example values shown here, or your implementation will fail.

```
! Amazon Web Services
! Virtual Private Cloud

! AWS utilizes unique identifiers to manipulate the configuration of
! a VPN Connection. Each VPN Connection is assigned an identifier and is
! associated with two other identifiers, namely the
! Customer Gateway Identifier and Virtual Private Gateway Identifier.
!
! Your VPN Connection ID : vpn-44a8938f
! Your Virtual Private Gateway ID : vgw-8db04f81
! Your Customer Gateway ID : cgw-b4dc3961
```

```
! This configuration consists of two tunnels. Both tunnels must be
! configured on your Customer Gateway.
!
! IPSec Tunnel #1
 IKE
! #1: Internet Key Exchange (IKE) Configuration
! A policy is established for the supported ISAKMP encryption,
! authentication, Diffie-Hellman, lifetime, and key parameters.
! Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
! You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
! The address of the external interface for your customer gateway must be a
static address.
! Your customer gateway may reside behind a device performing network address
translation (NAT).
! To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
! Configuration begins in root VDOM.
config vpn ipsec phasel-interface
edit vpn-44a8938f-0 ! Name must be shorter than 15 chars, best if shorter
than 12
 set interface "wan1"
! The IPSec Dead Peer Detection causes periodic messages to be
! sent to ensure a Security Association remains operational
 set dpd enable
 set local-gw YOUR_UPLINK_ADDRESS
 set dhgrp 2
 set proposal aes128-sha1
 set keylife 28800
 set remote-gw 72.21.209.193
 set psksecret plain-text-password1
 set dpd-retryinterval 10
next
end
IPsec
! #2: IPSec Configuration
```

! The IPSec transform set defines the encryption, authentication, and IPSec

```
! mode parameters.
! Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
config vpn ipsec phase2-interface
edit "vpn-44a8938f-0"
 set phaselname "vpn-44a8938f-0"
 set proposal aes128-sha1
 set dhgrp 2
 set keylifeseconds 3600
next
 Tunnel
        _____
! #3: Tunnel Interface Configuration
! A tunnel interface is configured to be the logical interface associated
! with the tunnel. All traffic routed to the tunnel interface will be
! encrypted and transmitted to the VPC. Similarly, traffic from the VPC
! will be logically received on this interface.
!
! The address of the interface is configured with the setup for your
! Customer Gateway. If the address changes, the Customer Gateway and VPN
! Connection must be recreated with Amazon VPC.
config system interface
edit "vpn-44a8938f-0"
 set vdom "root"
 set ip 169.254.255.2 255.255.255.255
 set allowaccess ping
 set type tunnel
 This option causes the router to reduce the Maximum Segment Size of
 TCP packets to prevent packet fragmentation.
 set tcp-mss 1387
 set remote-ip 169.254.255.1
 set mtu 1427
 set interface "wan1"
next
 BGP
! #4: Border Gateway Protocol (BGP) Configuration
```

```
! BGP is used within the tunnel to exchange prefixes between the
! Virtual Private Gateway and your Customer Gateway. The Virtual Private
! will announce the prefix corresponding to your VPC.
!
!
! The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN)
! is configured as part of your Customer Gateway. If the ASN must
! be changed, the Customer Gateway and VPN Connection will need to be
recreated with AWS.
config router bgp
set as YOUR_BGP_ASN
config neighbor
 edit 169.254.255.1
  set remote-as 7224
 end
! Your Customer Gateway may announce a default route (0.0.0.0/0) to us.
! This is done using prefix list and route-map in Fortigate.
config router bgp
config neighbor
 edit 169.254.255.1
  set capability-default-originate enable
  end
end
config router prefix-list
edit "default_route"
 config rule
  edit 1
   set prefix 0.0.0.0 0.0.0.0
  next
 end
set router-id YOUR_UPLINK_ADDRESS
config router route-map
edit "routemap1"
 config rule
  edit 1
   set match-ip-address "default_route"
  next
 end
next
end
! To advertise additional prefixes to Amazon VPC, add these prefixes to the
'network'
```

```
! statement and identify the prefix you wish to advertise. Make sure the
prefix is present
! in the routing table of the device with a valid next-hop. If you want to
advertise
! 192.168.0.0/16 to Amazon, this can be done using the following:
config router bgp
config network
edit 1
 set prefix 192.168.0.0 255.255.0.0
set router-id YOUR_UPLINK_ADDRESS
______
! #5 Firewall Policy Configuration
! Create a firewall policy permitting traffic from your local subnet to the
VPC subnet and vice versa
! This example policy permits all traffic from the local subnet to the VPC
! First, find the policies that exist
show firewall policy
! Next, create a new firewall policy starting with the next available policy
ID. If policies 1, 2, 3, and 4 were shown, then in this example the policy
created starts 5
config firewall policy
set srcintf "vpn-44a8938f-0"
set dstintf internal
set srcaddr all
set dstaddr all
set action accept
set schedule always
set service ANY
next
end
config firewall policy
edit 5
set srcintf internal
set dstintf "vpn-44a8938f-0"
set srcaddr all
set dstaddr all
set action accept
set schedule always
set service ANY
next
end
```

IKE

```
! IPSec Tunnel #2
! #1: Internet Key Exchange (IKE) Configuration
! A policy is established for the supported ISAKMP encryption,
! authentication, Diffie-Hellman, lifetime, and key parameters.
! The address of the external interface for your customer gateway must be a
static address.
! Your customer gateway may reside behind a device performing network address
translation (NAT).
! To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
! Configuration begins in root VDOM.
config vpn ipsec phasel-interface
edit vpn-44a8938f-1 ! Name must be shorter than 15 chars, best if shorter
 set interface "wan1"
! The IPSec Dead Peer Detection causes periodic messages to be
! sent to ensure a Security Association remains operational
 set dpd enable
 set local-gw YOUR_UPLINK_ADDRESS
 set dhgrp 2
 set proposal aes128-sha1
 set keylife 28800
 set remote-gw 72.21.209.225
 set psksecret plain-text-password2
 set dpd-retryinterval 10
next
end
 IPsec
! #2: IPSec Configuration
! The IPSec transform set defines the encryption, authentication, and IPSec
! mode parameters.
! Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
config vpn ipsec phase2-interface
edit "vpn-44a8938f-1"
 set phaselname "vpn-44a8938f-1"
 set proposal aes128-sha1
 set dhgrp 2
```

set keylifeseconds 3600

```
next
 Tunnel
______
! #3: Tunnel Interface Configuration
! A tunnel interface is configured to be the logical interface associated
! with the tunnel. All traffic routed to the tunnel interface will be
! encrypted and transmitted to the VPC. Similarly, traffic from the VPC
! will be logically received on this interface.
!
! The address of the interface is configured with the setup for your
! Customer Gateway. If the address changes, the Customer Gateway and VPN
! Connection must be recreated with Amazon VPC.
!
config system interface
edit "vpn-44a8938f-1"
 set vdom "root"
 set ip 169.254.255.6 255.255.255.255
 set allowaccess ping
 set type tunnel
 This option causes the router to reduce the Maximum Segment Size of
! TCP packets to prevent packet fragmentation.
 set tcp-mss 1387
 set remote-ip 169.254.255.5
 set mtu 1427
 set interface "wan1"
next
 BGP
     ______
! #4: Border Gateway Protocol (BGP) Configuration
! BGP is used within the tunnel to exchange prefixes between the
! Virtual Private Gateway and your Customer Gateway. The Virtual Private
! will announce the prefix corresponding to your VPC.
!
!
! The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN)
```

! is configured as part of your Customer Gateway. If the ASN must

```
! be changed, the Customer Gateway and VPN Connection will need to be
recreated with AWS.
config router bgp
set as YOUR_BGP_ASN
config neighbor
 edit 169.254.255.5
  set remote-as 7224
 end
! Your Customer Gateway may announce a default route (0.0.0.0/0) to us.
! This is done using prefix list and route-map in Fortigate.
config router bgp
config neighbor
 edit 169.254.255.5
  set capability-default-originate enable
  end
end
config router prefix-list
edit "default_route"
 config rule
  edit 1
   set prefix 0.0.0.0 0.0.0.0
  next
 end
set router-id YOUR_UPLINK_ADDRESS
end
config router route-map
edit "routemap1"
 config rule
  edit 1
   set match-ip-address "default_route"
  next
 end
next
end
! To advertise additional prefixes to Amazon VPC, add these prefixes to the
'network'
! statement and identify the prefix you wish to advertise. Make sure the
prefix is present
! in the routing table of the device with a valid next-hop. If you want to
advertise
! 192.168.0.0/16 to Amazon, this can be done using the following:
config router bgp
config network
edit 1
 set prefix 192.168.0.0 255.255.0.0
next
```

```
set router-id YOUR_UPLINK_ADDRESS
end
!
!
! #5 Firewall Policy Configuration
! Create a firewall policy permitting traffic from your local subnet to the
VPC subnet and vice versa
! This example policy permits all traffic from the local subnet to the VPC
! First, find the policies that exist
show firewall policy
! Next, create a new firewall policy starting with the next available policy
ID. If policies 1, 2, 3, and 4 were shown, then in this example the policy
created starts 5
config firewall policy
edit 5
set srcintf "vpn-44a8938f-1"
set dstintf internal
set srcaddr all
set dstaddr all
set action accept
set schedule always
set service ANY
next
end
config firewall policy
edit 5
set srcintf internal
set dstintf "vpn-44a8938f-1"
set srcaddr all
set dstaddr all
set action accept
set schedule always
set service ANY
next.
end
```

How to Test the Customer Gateway Configuration

You can test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

On your customer gateway, determine whether the BGP status is Active.
 It takes approximately 30 seconds for a BGP peering to become active.

2. Ensure that the customer gateway is advertising a route to the virtual private gateway. The route may be the default route (0.0.0/0) or a more specific route you prefer.

When properly established, your BGP peering should be receiving one route from the virtual private gateway corresponding to the prefix that your VPC integration team specified for the VPC (for example, 10.0.0.0/24). If the BGP peering is established, you are receiving a prefix, and you are advertising a prefix, your tunnel is configured correctly. Make sure that both tunnels are in this state.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection: your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the *Amazon VPC User Guide*.

To test the end-to-end connectivity of each tunnel

- 1. Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs are listed in the launch wizard when you launch an instance from the Amazon EC2 Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- 3. On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

 (Optional) To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway, and repeat the above step. You cannot disable a tunnel on the AWS side of the VPN connection.

Example: Juniper J-Series JunOS Device

Topics

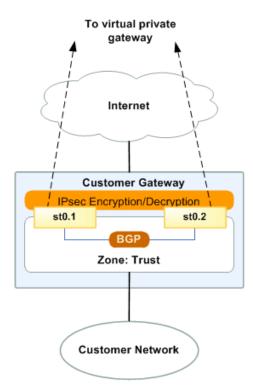
- A High-Level View of the Customer Gateway (p. 92)
- A Detailed View of the Customer Gateway and an Example Configuration (p. 93)
- How to Test the Customer Gateway Configuration (p. 100)

In this section we walk you through an example of the configuration information provided by your integration team if your customer gateway is a Juniper J-Series router running JunOS 9.5 (or later) software.

Two diagrams illustrate the example configuration. The first diagram shows the high-level layout of the customer gateway, and the second diagram shows details from the example configuration. You should use the real configuration information that you receive from your integration team and apply it to your customer gateway.

A High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels. Using redundant tunnels ensures continuous availability in the case that a device fails.



A Detailed View of the Customer Gateway and an Example Configuration

The diagram in this section illustrates an example Juniper JunOS customer gateway. Following the diagram, there is a corresponding example of the configuration information your integration team should provide. The example configuration contains a set of information for each of the tunnels that you must configure.

In addition, the example configuration refers to these items that you must provide:

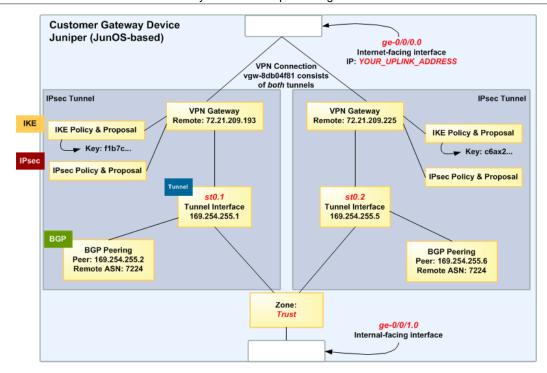
- YOUR_UPLINK_ADDRESS—The IP address for the Internet-routable external interface on the customer gateway. The address must be static, and may be behind a device performing network address translation (NAT). To ensure that NAT traversal (NAT-T) can function, you must adjust your firewall rules to unblock UDP port 4500.
- YOUR_BGP_ASN—The customer gateway's BGP ASN (we use 65000 by default)

The example configuration includes several example values to help you understand how configuration works. For example, we provide example values for the VPN connection ID (vpn-44a8938f), virtual private gateway ID (vgw-8db04f81), the IP addresses (72.21.209.*, 169.254.255.*), and the remote ASN (7224). You'll replace these example values with the actual values from the configuration information that you receive.

In addition, you must:

- Configure the outside interface (referred to as *ge-0/0/0.0* in the example configuration).
- Configure the tunnel interface IDs (referred to as st0.1 and st0.2 in the example configuration).
- Configure all internal routing that moves traffic between the customer gateway and your local network.
- Identify the security zone for the uplink interface (the following configuration information uses the default "untrust" zone).
- Identify the security zone for the inside interface (the following configuration information uses the default "trust" zone).

In the following diagram and example configuration, you must replace the items in red italics with values that apply to your particular configuration.



Warning

The following configuration information is an example of what you can expect your integration team to provide. Many of the values in the following example will be different from the actual configuration information that you receive. You must use the actual values and not the example values shown here, or your implementation will fail.

```
# Amazon Web Services
# Virtual Private Cloud
#
# AWS utilizes unique identifiers to manipulate the configuration of
# a VPN Connection. Each VPN Connection is assigned a VPN Connection
# Identifier and is associated with two other identifiers, namely the
# Customer Gateway Identifier and the Virtual Private Gateway Identifier.
# Your VPN Connection ID
                                  : vpn-44a8938f
# Your Virtual Private Gateway ID : vgw-8db04f81
# Your Customer Gateway ID
                                  : cgw-b4dc3961
#
# This configuration consists of two tunnels. Both tunnels must be
#
 configured on your Customer Gateway.
#
#
 IPsec Tunnel #1
 IKE
# #1: Internet Key Exchange (IKE) Configuration
#
# A proposal is established for the supported IKE encryption,
 authentication, Diffie-Hellman, and lifetime parameters.
#
```

```
# Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
# You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
# The address of the external interface for your customer gateway must be a
static address.
# To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
set security ike proposal ike-prop-vpn-44a8938f-1 authentication-method pre-
set security ike proposal ike-prop-vpn-44a8938f-1 authentication-algorithm
set security ike proposal ike-prop-vpn-44a8938f-1 encryption-algorithm
aes-128-cbc
set security ike proposal ike-prop-vpn-44a8938f-1 lifetime-seconds 28800
set security ike proposal ike-prop-vpn-44a8938f-1 dh-group group2
# An IKE policy is established to associate a Pre Shared Key with the
# defined proposal.
set security ike policy ike-pol-vpn-44a8938f-1 mode main
set security ike policy ike-pol-vpn-44a8938f-1 proposals ike-prop-
vpn-44a8938f-0
set security ike policy ike-pol-vpn-44a8938f-1 pre-shared-key ascii-
text plain-text-password1
# The IKE gateway is defined to be the Virtual Private Gateway. The gateway
# configuration associates a local interface, remote IP address, and
# IKE policy.
\# This example shows the outside of the tunnel as interface ge-0/0/0.0.
# This should be set to the interface that IP address YOUR_UPLINK_ADDRESS is
# associated with.
# This address is configured with the setup for your Customer Gateway.
# If the address changes, the Customer Gateway and VPN Connection must
# be recreated.
set security ike gateway gw-vpn-44a8938f-1 ike-policy ike-pol-vpn-44a8938f-0
set security ike gateway gw-vpn-\frac{44a8938f}{1}-1 external-interface \frac{ge-0/0/0.0}{1}
set security ike gateway gw-vpn-44a8938f-1 address 72.21.209.225
# Troubleshooting IKE connectivity can be aided by enabling IKE tracing.
# The configuration below will cause the router to log IKE messages to
# the 'kmd' log. Run 'show messages kmd' to retrieve these logs.
# set security ike traceoptions file kmd
# set security ike traceoptions file size 1024768
# set security ike traceoptions file files 10
# set security ike traceoptions flag all
IPsec
# #2: IPsec Configuration
# The IPsec proposal defines the protocol, authentication, encryption, and
```

lifetime parameters for our IPsec security association.

```
# Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
set security ipsec proposal ipsec-prop-vpn-44a8938f-1 protocol esp
set security ipsec proposal ipsec-prop-vpn-44a8938f-1 authentication-
algorithm hmac-shal-96
set security ipsec proposal ipsec-prop-vpn-44a8938f-1 encryption-algorithm
aes-128-cbc
set security ipsec proposal ipsec-prop-vpn-44a8938f-1 lifetime-seconds 3600
# The IPsec policy incorporates the Diffie-Hellman group and the IPsec
# proposal.
set security ipsec policy ipsec-pol-vpn-44a8938f-1 perfect-forward-secrecy
keys group2
set security ipsec policy ipsec-pol-vpn-44a8938f-1 proposals ipsec-prop-
vpn-44a8938f-0
# A security association is defined here. The IPsec Policy and IKE gateways
# are associated with a tunnel interface (st0.1).
# The tunnel interface ID is assumed; if other tunnels are defined on
# your router, you will need to specify a unique interface name
# (for example, st0.10).
set security ipsec vpn vpn-44a8938f-1 bind-interface st0.1
set security ipsec vpn vpn-44a8938f-1 ike gateway gw-vpn-44a8938f-0
set security ipsec vpn vpn-44a8938f-1 ike ipsec-policy ipsec-pol-
vpn-44a8938f-0
set security ipsec vpn vpn-44a8938f-1 df-bit clear
# This option enables IPsec Dead Peer Detection, which causes periodic
# messages to be sent to ensure a Security Association remains operational.
set security ike gateway gw-vpn-44a8938f-1 dead-peer-detection
 Tunnel
# #3: Tunnel Interface Configuration
# The tunnel interface is configured with the internal IP address.
set interfaces st0.1 family inet address 169.254.255.2/30
set interfaces st0.1 family inet mtu 1436
set security zones security-zone trust interfaces st0.1
# The security zone protecting external interfaces of the router must be
# configured to allow IKE traffic inbound.
set security zones security-zone untrust host-inbound-traffic system-services
# The security zone protecting internal interfaces (including the logical
# tunnel interfaces) must be configured to allow BGP traffic inbound.
set security zones security-zone trust host-inbound-traffic protocols bgp
```

```
# This option causes the router to reduce the Maximum Segment Size of
# TCP packets to prevent packet fragmentation.
set security flow tcp-mss ipsec-vpn mss 1387
 BGP
# #4: Border Gateway Protocol (BGP) Configuration
# BGP is used within the tunnel to exchange prefixes between the
# Virtual Private Gateway and your Customer Gateway. The Virtual Private
# will announce the prefix corresponding to your VPC.
# Your Customer Gateway may announce a default route (0.0.0.0/0),
# which can be done with the EXPORT-DEFAULT policy.
# To advertise additional prefixes to Amazon VPC, add additional prefixes to
the "default" term
# EXPORT-DEFAULT policy. Make sure the prefix is present in the routing table
of the device with
# a valid next-hop.
# The BGP timers are adjusted to provide more rapid detection of outages.
# The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN) is configured
# as part of your Customer Gateway. If the ASN must be changed, the
# Customer Gateway and VPN Connection will need to be recreated with AWS.
# We establish a basic route policy to export a default route to the
# Virtual Private Gateway.
set policy-options policy-statement EXPORT-DEFAULT term default from route-
filter 0.0.0.0/0 exact
set policy-options policy-statement EXPORT-DEFAULT term default then accept
set policy-options policy-statement EXPORT-DEFAULT term reject then reject
set protocols bgp group ebgp type external
set protocols bgp group ebgp neighbor 169.254.255.1 export EXPORT-DEFAULT
set protocols bgp group ebgp neighbor 169.254.255.1 peer-as 7224
set protocols bgp group ebgp neighbor 169.254.255.1 hold-time 30
set protocols bgp group ebgp neighbor 169.254.255.1 local-as YOUR_BGP_ASN
# IPsec Tunnel #2
# ------
 IKE
# #1: Internet Key Exchange (IKE) Configuration
# A proposal is established for the supported IKE encryption,
```

```
# authentication, Diffie-Hellman, and lifetime parameters.
# Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
# You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
# The address of the external interface for your customer gateway must be a
static address.
# To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
set security ike proposal ike-prop-vpn-44a8938f-2 authentication-method pre-
shared-keys
set security ike proposal ike-prop-vpn-44a8938f-2 authentication-algorithm
set security ike proposal ike-prop-vpn-44a8938f-2 encryption-algorithm
aes-128-cbc
set security ike proposal ike-prop-vpn-44a8938f-2 lifetime-seconds 28800
set security ike proposal ike-prop-vpn-44a8938f-2 dh-group group2
# An IKE policy is established to associate a Pre Shared Key with the
# defined proposal.
set security ike policy ike-pol-vpn-44a8938f-2 mode main
set security ike policy ike-pol-vpn-44a8938f-2 proposals ike-prop-
vpn-44a8938f-2
set security ike policy ike-pol-vpn-44a8938f-2 pre-shared-key ascii-
text plain-text-password2
# The IKE gateway is defined to be the Virtual Private Gateway. The gateway
# configuration associates a local interface, remote IP address, and
# IKE policy.
#
\# This example shows the outside of the tunnel as interface ge-0/0/0.0.
# This should be set to the interface that IP address YOUR_UPLINK_ADDRESS is
# associated with.
# This address is configured with the setup for your Customer Gateway.
# If the address changes, the Customer Gateway and VPN Connection must be
recreated.
set security ike gateway gw-vpn-44a8938f-2 ike-policy ike-pol-vpn-44a8938f-1
set security ike gateway gw-vpn-44a8938f-2 external-interface ge-0/0/0.0
set security ike gateway gw-vpn-44a8938f-2 address 72.21.209.193
# Troubleshooting IKE connectivity can be aided by enabling IKE tracing.
# The configuration below will cause the router to log IKE messages to
# the 'kmd' log. Run 'show messages kmd' to retrieve these logs.
# set security ike traceoptions file kmd
# set security ike traceoptions file size 1024768
# set security ike traceoptions file files 10
# set security ike traceoptions flag all
IPsec
# #2: IPsec Configuration
# The IPsec proposal defines the protocol, authentication, encryption, and
```

```
# lifetime parameters for our IPsec security association.
# Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
set security ipsec proposal ipsec-prop-vpn-44a8938f-2 protocol esp
set security ipsec proposal ipsec-prop-vpn-44a8938f-2 authentication-
algorithm hmac-sha1-96
set security ipsec proposal ipsec-prop-vpn-44a8938f-2 encryption-algorithm
aes-128-cbc
set security ipsec proposal ipsec-prop-vpn-44a8938f-2 lifetime-seconds 3600
# The IPsec policy incorporates the Diffie-Hellman group and the IPsec
# proposal.
set security ipsec policy ipsec-pol-vpn-44a8938f-2 perfect-forward-secrecy
keys group2
set security ipsec policy ipsec-pol-vpn-44a8938f-2 proposals ipsec-prop-
vpn-44a8938f-2
# A security association is defined here. The IPsec Policy and IKE gateways
# are associated with a tunnel interface (st0.2).
# The tunnel interface ID is assumed; if other tunnels are defined on
# your router, you will need to specify a unique interface name
# (for example, st0.20).
set security ipsec vpn vpn-44a8938f-2 bind-interface st0.2
set security ipsec vpn vpn-44a8938f-2 ike gateway gw-vpn-44a8938f-2
set security ipsec vpn vpn-44a8938f-2 ike ipsec-policy ipsec-pol-
vpn-44a8938f-2
set security ipsec vpn vpn-44a8938f-2 df-bit clear
# This option enables IPsec Dead Peer Detection, which causes periodic
# messages to be sent to ensure a Security Association remains operational.
set security ike gateway gw-vpn-44a8938f-2 dead-peer-detection
 Tunnel
# #3: Tunnel Interface Configuration
# The tunnel interface is configured with the internal IP address.
set interfaces st0.2 family inet address 169.254.255.6/30
set interfaces st0.2 family inet mtu 1436
set security zones security-zone trust interfaces st0.2
# The security zone protecting external interfaces of the router must be
# configured to allow IKE traffic inbound.
set security zones security-zone untrust host-inbound-traffic system-services
ike
# The security zone protecting internal interfaces (including the logical
# tunnel interfaces) must be configured to allow BGP traffic inbound.
set security zones security-zone trust host-inbound-traffic protocols bgp
```

```
# This option causes the router to reduce the Maximum Segment Size of
# TCP packets to prevent packet fragmentation.
set security flow tcp-mss ipsec-vpn mss 1387
 BGP
# #4: Border Gateway Protocol (BGP) Configuration
# BGP is used within the tunnel to exchange prefixes between the
# Virtual Private Gateway and your Customer Gateway. The Virtual Private
Gateway
# will announce the prefix corresponding to your VPC.
\# Your Customer Gateway may announce a default route (0.0.0.0/0),
# which can be done with the EXPORT-DEFAULT policy.
# To advertise additional prefixes to Amazon VPC, add additional prefixes to
the "default" term
# EXPORT-DEFAULT policy. Make sure the prefix is present in the routing table
of the device with
# a valid next-hop.
# The BGP timers are adjusted to provide more rapid detection of outages.
# The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN) is configured
# as part of your Customer Gateway. If the ASN must be changed, the
# Customer Gateway and VPN Connection will need to be recreated with AWS.
# We establish a basic route policy to export a default route to the
# Virtual Private Gateway.
set policy-options policy-statement EXPORT-DEFAULT term default from route-
filter 0.0.0.0/0 exact
set policy-options policy-statement EXPORT-DEFAULT term default then accept
set policy-options policy-statement EXPORT-DEFAULT term reject then reject
set protocols bgp group ebgp type external
set protocols bgp group ebgp neighbor 169.254.255.5 export EXPORT-DEFAULT
set protocols bgp group ebgp neighbor 169.254.255.5 peer-as 7224
set protocols bgp group ebgp neighbor 169.254.255.5 hold-time 30
set protocols bgp group ebgp neighbor 169.254.255.5 local-as YOUR_BGP_ASN
```

How to Test the Customer Gateway Configuration

You can test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

- On your customer gateway, determine whether the BGP status is Active.
 It takes approximately 30 seconds for a BGP peering to become active.
- 2. Ensure that the customer gateway is advertising a route to the virtual private gateway. The route may be the default route (0.0.0.0/0) or a more specific route you prefer.

When properly established, your BGP peering should be receiving one route from the virtual private gateway corresponding to the prefix that your VPC integration team specified for the VPC (for example, 10.0.0.0/24). If the BGP peering is established, you are receiving a prefix, and you are advertising a prefix, your tunnel is configured correctly. Make sure that both tunnels are in this state.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection: your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the *Amazon VPC User Guide*.

To test the end-to-end connectivity of each tunnel

- 1. Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs are listed in the launch wizard when you launch an instance from the Amazon EC2 Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

 (Optional) To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway, and repeat the above step. You cannot disable a tunnel on the AWS side of the VPN connection.



Example: Juniper SRX JunOS Device

Topics

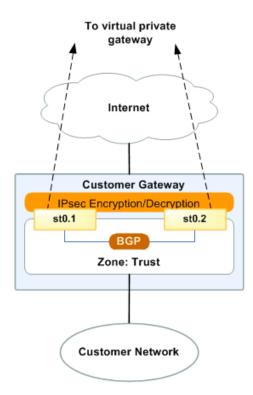
- A High-Level View of the Customer Gateway (p. 104)
- A Detailed View of the Customer Gateway and an Example Configuration (p. 105)
- How to Test the Customer Gateway Configuration (p. 112)

In this section we walk you through an example of the configuration information provided by your integration team if your customer gateway is a Juniper SRX router running JunOS 11.0 (or later) software.

Two diagrams illustrate the example configuration. The first diagram shows the high-level layout of the customer gateway, and the second diagram shows details from the example configuration. You should use the real configuration information that you receive from your integration team and apply it to your customer gateway.

A High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels. Using redundant tunnels ensures continuous availability in the case that a device fails.



A Detailed View of the Customer Gateway and an Example Configuration

The diagram in this section illustrates an example Juniper JunOS 11.0+ customer gateway. Following the diagram, there is a corresponding example of the configuration information your integration team should provide. The example configuration contains a set of information for each of the tunnels that you must configure.

In addition, the example configuration refers to these items that you must provide:

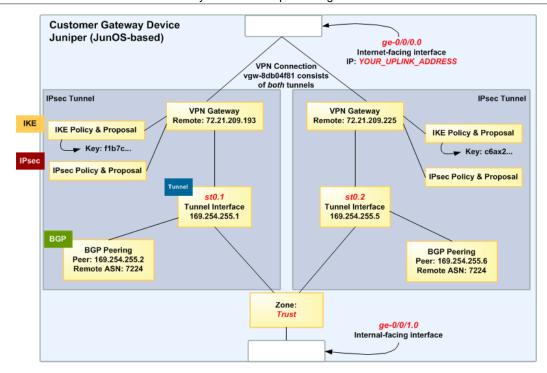
- YOUR_UPLINK_ADDRESS—The IP address for the Internet-routable external interface on the customer gateway. The address must be static, and may be behind a device performing network address translation (NAT). To ensure that NAT traversal (NAT-T) can function, you must adjust your firewall rules to unblock UDP port 4500.
- YOUR_BGP_ASN—The customer gateway's BGP ASN (we use 65000 by default)

The example configuration includes several example values to help you understand how configuration works. For example, we provide example values for the VPN connection ID (vpn-44a8938f), virtual private gateway ID (vgw-8db04f81), the IP addresses (72.21.209.*, 169.254.255.*), and the remote ASN (7224). You'll replace these example values with the actual values from the configuration information that you receive.

In addition, you must:

- Configure the outside interface (referred to as ge-0/0/0.0 in the example configuration).
- Configure the tunnel interface IDs (referred to as st0.1 and st0.2 in the example configuration).
- Configure all internal routing that moves traffic between the customer gateway and your local network.
- Identify the security zone for the uplink interface (the following configuration information uses the default "untrust" zone).
- Identify the security zone for the inside interface (the following configuration information uses the default "trust" zone).

In the following diagram and example configuration, you must replace the items in red italics with values that apply to your particular configuration.



Warning

The following configuration information is an example of what you can expect your integration team to provide. Many of the values in the following example will be different from the actual configuration information that you receive. You must use the actual values and not the example values shown here, or your implementation will fail.

```
# Amazon Web Services
# Virtual Private Cloud
#
# AWS utilizes unique identifiers to manipulate the configuration of
# a VPN Connection. Each VPN Connection is assigned a VPN Connection
# Identifier and is associated with two other identifiers, namely the
# Customer Gateway Identifier and the Virtual Private Gateway Identifier.
# Your VPN Connection ID
                                  : vpn-44a8938f
# Your Virtual Private Gateway ID : vgw-8db04f81
# Your Customer Gateway ID
                                  : cgw-b4dc3961
#
# This configuration consists of two tunnels. Both tunnels must be
#
 configured on your Customer Gateway.
#
#
 IPsec Tunnel #1
 IKE
# #1: Internet Key Exchange (IKE) Configuration
#
# A proposal is established for the supported IKE encryption,
 authentication, Diffie-Hellman, and lifetime parameters.
#
```

```
# Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
# You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
# The address of the external interface for your customer gateway must be a
static address.
# To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
set security ike proposal ike-prop-vpn-44a8938f-1 authentication-method pre-
set security ike proposal ike-prop-vpn-44a8938f-1 authentication-algorithm
set security ike proposal ike-prop-vpn-44a8938f-1 encryption-algorithm
aes-128-cbc
set security ike proposal ike-prop-vpn-44a8938f-1 lifetime-seconds 28800
set security ike proposal ike-prop-vpn-44a8938f-1 dh-group group2
# An IKE policy is established to associate a Pre Shared Key with the
# defined proposal.
set security ike policy ike-pol-vpn-44a8938f-1 mode main
set security ike policy ike-pol-vpn-44a8938f-1 proposals ike-prop-
vpn-44a8938f-1
set security ike policy ike-pol-vpn-44a8938f-1 pre-shared-key ascii-
text plain-text-password1
# The IKE gateway is defined to be the Virtual Private Gateway. The gateway
# configuration associates a local interface, remote IP address, and
# IKE policy.
\# This example shows the outside of the tunnel as interface ge-0/0/0.0.
# This should be set to the interface that IP address YOUR_UPLINK_ADDRESS is
# associated with.
# This address is configured with the setup for your Customer Gateway.
# If the address changes, the Customer Gateway and VPN Connection must
# be recreated.
set security ike gateway gw-vpn-44a8938f-1 ike-policy ike-pol-vpn-44a8938f-1
set security ike gateway gw-vpn-44a8938f-1 external-interface ge-0/0/0.0
set security ike gateway gw-vpn-44a8938f-1 address 72.21.209.225
set security ike gateway gw-vpn-44a8938f-1 no-nat-traversal
# Troubleshooting IKE connectivity can be aided by enabling IKE tracing.
# The configuration below will cause the router to log IKE messages to
# the 'kmd' log. Run 'show messages kmd' to retrieve these logs.
# set security ike traceoptions file kmd
# set security ike traceoptions file size 1024768
# set security ike traceoptions file files 10
# set security ike traceoptions flag all
IPsec
# #2: IPsec Configuration
# The IPsec proposal defines the protocol, authentication, encryption, and
# lifetime parameters for our IPsec security association.
```

```
# Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
set security ipsec proposal ipsec-prop-vpn-44a8938f-1 protocol esp
set security ipsec proposal ipsec-prop-vpn-44a8938f-1 authentication-
algorithm hmac-shal-96
set security ipsec proposal ipsec-prop-vpn-44a8938f-1 encryption-algorithm
aes-128-cbc
set security ipsec proposal ipsec-prop-vpn-44a8938f-1 lifetime-seconds 3600
# The IPsec policy incorporates the Diffie-Hellman group and the IPsec
# proposal.
set security ipsec policy ipsec-pol-vpn-44a8938f-1 perfect-forward-secrecy
keys group2
set security ipsec policy ipsec-pol-vpn-44a8938f-1 proposals ipsec-prop-
vpn-44a8938f-1
# A security association is defined here. The IPsec Policy and IKE gateways
# are associated with a tunnel interface (st0.1).
# The tunnel interface ID is assumed; if other tunnels are defined on
# your router, you will need to specify a unique interface name
# (for example, st0.10).
set security ipsec vpn vpn-44a8938f-1 bind-interface st0.1
set security ipsec vpn vpn-44a8938f-1 ike gateway gw-vpn-44a8938f-1
set security ipsec vpn vpn-44a8938f-1 ike ipsec-policy ipsec-pol-
vpn-44a8938f-1
set security ipsec vpn vpn-44a8938f-1 df-bit clear
# This option enables IPsec Dead Peer Detection, which causes periodic
# messages to be sent to ensure a Security Association remains operational.
set security ike gateway gw-vpn-44a8938f-1 dead-peer-detection
 Tunnel
# #3: Tunnel Interface Configuration
# The tunnel interface is configured with the internal IP address.
set interfaces st0.1 family inet address 169.254.255.2/30
set interfaces st0.1 family inet mtu 1436
set security zones security-zone trust interfaces st0.1
# The security zone protecting external interfaces of the router must be
# configured to allow IKE traffic inbound.
set security zones security-zone untrust host-inbound-traffic system-services
# The security zone protecting internal interfaces (including the logical
# tunnel interfaces) must be configured to allow BGP traffic inbound.
set security zones security-zone trust host-inbound-traffic protocols bgp
```

```
# This option causes the router to reduce the Maximum Segment Size of
# TCP packets to prevent packet fragmentation.
set security flow tcp-mss ipsec-vpn mss 1387
 BGP
# #4: Border Gateway Protocol (BGP) Configuration
# BGP is used within the tunnel to exchange prefixes between the
# Virtual Private Gateway and your Customer Gateway. The Virtual Private
# will announce the prefix corresponding to your VPC.
# Your Customer Gateway may announce a default route (0.0.0.0/0),
# which can be done with the EXPORT-DEFAULT policy.
# To advertise additional prefixes to Amazon VPC, add additional prefixes to
the "default" term
# EXPORT-DEFAULT policy. Make sure the prefix is present in the routing table
of the device with
# a valid next-hop.
# The BGP timers are adjusted to provide more rapid detection of outages.
# The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN) is configured
# as part of your Customer Gateway. If the ASN must be changed, the
# Customer Gateway and VPN Connection will need to be recreated with AWS.
# We establish a basic route policy to export a default route to the
# Virtual Private Gateway.
set policy-options policy-statement EXPORT-DEFAULT term default from route-
filter 0.0.0.0/0 exact
set policy-options policy-statement EXPORT-DEFAULT term default then accept
set policy-options policy-statement EXPORT-DEFAULT term reject then reject
set protocols bgp group ebgp type external
set protocols bgp group ebgp neighbor 169.254.255.1 export EXPORT-DEFAULT
set protocols bgp group ebgp neighbor 169.254.255.1 peer-as 7224
set protocols bgp group ebgp neighbor 169.254.255.1 hold-time 30
set protocols bgp group ebgp neighbor 169.254.255.1 local-as YOUR_BGP_ASN
# IPsec Tunnel #2
# ------
 IKE
# #1: Internet Key Exchange (IKE) Configuration
# A proposal is established for the supported IKE encryption,
```

```
# authentication, Diffie-Hellman, and lifetime parameters.
# Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
# You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
# The address of the external interface for your customer gateway must be a
static address.
# To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
set security ike proposal ike-prop-vpn-44a8938f-2 authentication-method pre-
shared-keys
set security ike proposal ike-prop-vpn-44a8938f-2 authentication-algorithm
set security ike proposal ike-prop-vpn-44a8938f-2 encryption-algorithm
aes-128-cbc
set security ike proposal ike-prop-vpn-44a8938f-2 lifetime-seconds 28800
set security ike proposal ike-prop-vpn-44a8938f-2 dh-group group2
# An IKE policy is established to associate a Pre Shared Key with the
# defined proposal.
set security ike policy ike-pol-vpn-44a8938f-2 mode main
set security ike policy ike-pol-vpn-44a8938f-2 proposals ike-prop-
vpn-44a8938f-2
set security ike policy ike-pol-vpn-44a8938f-2 pre-shared-key ascii-
text plain-text-password2
# The IKE gateway is defined to be the Virtual Private Gateway. The gateway
# configuration associates a local interface, remote IP address, and
# IKE policy.
#
\# This example shows the outside of the tunnel as interface ge-0/0/0.0.
# This should be set to the interface that IP address YOUR_UPLINK_ADDRESS is
# associated with.
# This address is configured with the setup for your Customer Gateway.
# If the address changes, the Customer Gateway and VPN Connection must be
recreated.
set security ike gateway gw-vpn-44a8938f-2 ike-policy ike-pol-vpn-44a8938f-2
set security ike gateway gw-vpn-44a8938f-2 external-interface ge-0/0/0.0
set security ike gateway gw-vpn-44a8938f-2 address 72.21.209.193
set security ike gateway gw-vpn-44a8938f-2 no-nat-traversal
# Troubleshooting IKE connectivity can be aided by enabling IKE tracing.
# The configuration below will cause the router to log IKE messages to
# the 'kmd' log. Run 'show messages kmd' to retrieve these logs.
# set security ike traceoptions file kmd
# set security ike traceoptions file size 1024768
# set security ike traceoptions file files 10
# set security ike traceoptions flag all
 IPsec
# #2: IPsec Configuration
```

```
# The IPsec proposal defines the protocol, authentication, encryption, and
# lifetime parameters for our IPsec security association.
# Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
set security ipsec proposal ipsec-prop-vpn-44a8938f-2 protocol esp
set security ipsec proposal ipsec-prop-vpn-44a8938f-2 authentication-
algorithm hmac-shal-96
set security ipsec proposal ipsec-prop-vpn-44a8938f-2 encryption-algorithm
aes-128-cbc
set security ipsec proposal ipsec-prop-vpn-44a8938f-2 lifetime-seconds 3600
# The IPsec policy incorporates the Diffie-Hellman group and the IPsec
# proposal.
set security ipsec policy ipsec-pol-vpn-44a8938f-2 perfect-forward-secrecy
keys group2
set security ipsec policy ipsec-pol-vpn-44a8938f-2 proposals ipsec-prop-
vpn-44a8938f-2
# A security association is defined here. The IPsec Policy and IKE gateways
# are associated with a tunnel interface (st0.2).
# The tunnel interface ID is assumed; if other tunnels are defined on
# your router, you will need to specify a unique interface name
# (for example, st0.20).
#
set security ipsec vpn vpn-44a8938f-2 bind-interface st0.2
set security ipsec vpn vpn-44a8938f-2 ike gateway gw-vpn-44a8938f-2
set security ipsec vpn vpn-44a8938f-2 ike ipsec-policy ipsec-pol-
vpn-44a8938f-2
set security ipsec vpn vpn-44a8938f-2 df-bit clear
# This option enables IPsec Dead Peer Detection, which causes periodic
# messages to be sent to ensure a Security Association remains operational.
set security ike gateway gw-vpn-44a8938f-2 dead-peer-detection
 Tunnel
# #3: Tunnel Interface Configuration
# The tunnel interface is configured with the internal IP address.
set interfaces st0.2 family inet address 169.254.255.6/30
set interfaces st0.2 family inet mtu 1436
set security zones security-zone trust interfaces st0.2
# The security zone protecting external interfaces of the router must be
# configured to allow IKE traffic inbound.
set security zones security-zone untrust host-inbound-traffic system-services
# The security zone protecting internal interfaces (including the logical
# tunnel interfaces) must be configured to allow BGP traffic inbound.
```

```
set security zones security-zone trust host-inbound-traffic protocols bgp
# This option causes the router to reduce the Maximum Segment Size of
# TCP packets to prevent packet fragmentation.
set security flow tcp-mss ipsec-vpn mss 1387
 BGP
# #4: Border Gateway Protocol (BGP) Configuration
# BGP is used within the tunnel to exchange prefixes between the
# Virtual Private Gateway and your Customer Gateway. The Virtual Private
# will announce the prefix corresponding to your VPC.
# Your Customer Gateway may announce a default route (0.0.0.0/0),
# which can be done with the EXPORT-DEFAULT policy.
# To advertise additional prefixes to Amazon VPC, add additional prefixes to
the "default" term
# EXPORT-DEFAULT policy. Make sure the prefix is present in the routing table
of the device with
# a valid next-hop.
# The BGP timers are adjusted to provide more rapid detection of outages.
# The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN) is configured
# as part of your Customer Gateway. If the ASN must be changed, the
# Customer Gateway and VPN Connection will need to be recreated with AWS.
# We establish a basic route policy to export a default route to the
# Virtual Private Gateway.
set policy-options policy-statement EXPORT-DEFAULT term default from route-
filter 0.0.0.0/0 exact
set policy-options policy-statement EXPORT-DEFAULT term default then accept
set policy-options policy-statement EXPORT-DEFAULT term reject then reject
set protocols bgp group ebgp type external
set protocols bgp group ebgp neighbor 169.254.255.5 export EXPORT-DEFAULT
set protocols bgp group ebgp neighbor 169.254.255.5 peer-as 7224
set protocols bgp group ebgp neighbor 169.254.255.5 hold-time 30
set protocols bgp group ebgp neighbor 169.254.255.5 local-as YOUR_BGP_ASN
```

How to Test the Customer Gateway Configuration

You can test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

- On your customer gateway, determine whether the BGP status is Active.
 It takes approximately 30 seconds for a BGP peering to become active.
- 2. Ensure that the customer gateway is advertising a route to the virtual private gateway. The route may be the default route (0.0.0.0/0) or a more specific route you prefer.

When properly established, your BGP peering should be receiving one route from the virtual private gateway corresponding to the prefix that your VPC integration team specified for the VPC (for example, 10.0.0.0/24). If the BGP peering is established, you are receiving a prefix, and you are advertising a prefix, your tunnel is configured correctly. Make sure that both tunnels are in this state.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection: your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the *Amazon VPC User Guide*.

To test the end-to-end connectivity of each tunnel

- 1. Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs are listed in the launch wizard when you launch an instance from the Amazon EC2 Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

 (Optional) To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway, and repeat the above step. You cannot disable a tunnel on the AWS side of the VPN connection.



Example: Juniper ScreenOS Device

Topics

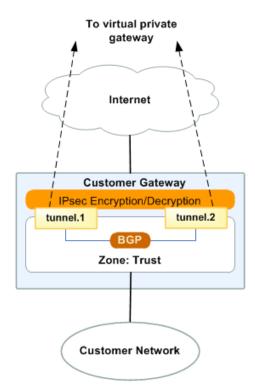
- A High-Level View of the Customer Gateway (p. 116)
- A Detailed View of the Customer Gateway and an Example Configuration (p. 117)
- How to Test the Customer Gateway Configuration (p. 123)

In this section we walk you through an example of the configuration information provided by your integration team if your customer gateway is a Juniper SSG or Netscreen series device running Juniper ScreenOS software.

Two diagrams illustrate the example configuration. The first diagram shows the high-level layout of the customer gateway, and the second diagram shows details from the example configuration. You should use the real configuration information that you receive from your integration team and apply it to your customer gateway.

A High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels. Using redundant tunnels ensures continuous availability in the case that a device fails.



A Detailed View of the Customer Gateway and an Example Configuration

The diagram in this section illustrates an example Juniper ScreenOS customer gateway. Following the diagram, there is a corresponding example of the configuration information your integration team should provide. The example configuration contains information for each of the tunnels that you must configure.

In addition, the example configuration refers to these items that you must provide:

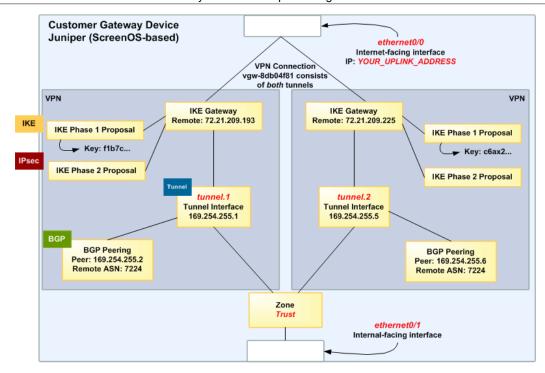
- YOUR_UPLINK_ADDRESS—The IP address for the Internet-routable external interface on the customer gateway. The address must be static, and may be behind a device performing network address translation (NAT). To ensure that NAT traversal (NAT-T) can function, you must adjust your firewall rules to unblock UDP port 4500.
- YOUR_BGP_ASN—The customer gateway's BGP ASN (we use 65000 by default)

The example configuration includes several example values to help you understand how configuration works. For example, we provide example values for the VPN connection ID (vpn-44a8938f), virtual private gateway ID (vgw-8db04f81), the IP addresses (72.21.209.*, 169.254.255.*), and the remote ASN (7224). You'll replace these example values with the actual values from the configuration information that you receive.

In addition, you must:

- Configure the outside interface (referred to as ethernet0/0 in the example configuration).
- Configure the tunnel interface IDs (referred to as tunnel.1 and tunnel.2 in the example configuration).
- Configure all internal routing that moves traffic between the customer gateway and your local network.

In the following diagram and example configuration, you must replace the items in red italics with values that apply to your particular configuration.



Warning

The following configuration information is an example of what you can expect your integration team to provide. Many of the values in the following example will be different from the configuration information that you receive. You must use the actual values and not the example values shown here, or your implementation will fail.

Important

The configuration below is appropriate for ScreenOS versions 6.2 and later. You can download a configuration that is specific to ScreenOS version 6.1. In the **Download Configuration** dialog box, select Juniper Networks, Inc. from the **Vendor** list, SSG and ISG Series Routers from the **Platform** list, and ScreenOS 6.1 from the **Software** list.

```
# Amazon Web Services
# Virtual Private Cloud
#
# AWS utilizes unique identifiers to manipulate the configuration of a VPN
# Connection. Each VPN Connection is assigned a VPN Connection Identifier
# and is associated with two other identifiers, namely the Customer Gateway
# Identifier and the Virtual Private Gateway Identifier.
# Your VPN Connection ID
                                  : vpn-44a8938f
# Your Virtual Private Gateway ID : vgw-8db04f81
# Your Customer Gateway ID
                                  : cgw-b4dc3961
# This configuration consists of two tunnels. Both tunnels must be configured
 on your Customer Gateway.
#
#
 This configuration was tested on a Juniper SSG-5 running ScreenOS 6.3R2.
#
# IPsec Tunnel #1
```

*

```
IKE
# #1: Internet Key Exchange (IKE) Configuration
# A proposal is established for the supported IKE encryption, authentication,
# Diffie-Hellman, and lifetime parameters.
# Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
# You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
# The address of the external interface for your customer gateway must be a
static address.
# Your customer gateway may reside behind a device performing network address
translation (NAT).
# To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
set ike p1-proposal ike-prop-vpn-44a8938f-1 preshare group2 esp aes128 sha-1
second 28800
# The IKE gateway is defined to be the Virtual Private Gateway. The gateway
configuration
# associates a local interface, remote IP address, and IKE policy.
# This example shows the outside of the tunnel as interface ethernet0/0. This
# should be set to the interface that IP address YOUR_UPLINK_ADDRESS is
# associated with.
# This address is configured with the setup for your Customer Gateway.
#If the address changes, the Customer Gateway and VPN Connection must be
recreated.
set ike gateway gw-vpn-44a8938f-1 address 72.21.209.225 id 72.21.209.225 main
outgoing-interface ethernet0/0 preshare "plain-text-password1" proposal ike-
prop-vpn-44a8938f-1
# Troubleshooting IKE connectivity can be aided by enabling IKE debugging.
# To do so, run the following commands:
# clear dbuf
                    -- Clear debug buffer
                    -- Enable IKE debugging
# debug ike all
# get dbuf stream
                    -- View debug messages
# undebug all
                    -- Turn off debugging
```

IPsec

```
# #2: IPsec Configuration
#
# The IPsec (Phase 2) proposal defines the protocol, authentication,
# encryption, and lifetime parameters for our IPsec security association.
# Please note, you may use these additionally supported IPSec parameters for encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
```

```
set ike p2-proposal ipsec-prop-vpn-44a8938f-1 group2 esp aes128 sha-1 second
3600
set ike gateway gw-vpn-44a8938f-1 dpd-liveness interval 10
set vpn IPSEC-vpn-44a8938f-1 gateway gw-vpn-44a8938f-1 replay tunnel proposal
ipsec-prop-vpn-44a8938f-1
 Tunnel
# #3: Tunnel Interface Configuration
# The tunnel interface is configured with the internal IP address.
# To establish connectivity between your internal network and the VPC, you
# must have an interface facing your internal network in the "Trust" zone.
set interface tunnel.1 zone Trust
set interface tunnel.1 ip 169.254.255.2/30
set interface tunnel.1 mtu 1436
set vpn IPSEC-vpn-44a8938f-1 bind interface tunnel.1
# By default, the router will block asymmetric VPN traffic, which may occur
# with this VPN Connection. This occurs, for example, when routing policies
# cause traffic to sent from your router to VPC through one IPsec tunnel
# while traffic returns from VPC through the other.
# This command allows this traffic to be received by your device.
set zone Trust asymmetric-vpn
# This option causes the router to reduce the Maximum Segment Size of TCP
# packets to prevent packet fragmentation.
set flow vpn-tcp-mss 1387
 BGP
# #4: Border Gateway Protocol (BGP) Configuration
# BGP is used within the tunnel to exchange prefixes between the Virtual
Private Gateway
# and your Customer Gateway. The Virtual Private Gateway will announce the
prefix
# corresponding to your VPC.
# Your Customer Gateway may announce a default route (0.0.0.0/0).
# The BGP timers are adjusted to provide more rapid detection of outages.
# The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN) is configured
# as part of your Customer Gateway. If the ASN must be changed, the
# Customer Gateway and VPN Connection will need to be recreated with AWS.
```

```
set vrouter trust-vr
set max-ecmp-routes 2
set protocol bgp YOUR_BGP_ASN
set hold-time 30
set network 0.0.0.0/0
# To advertise additional prefixes to Amazon VPC, copy the 'network'
statement and
# identify the prefix you wish to advertise (set ipv4 network X.X.X.X/X).
Make sure the
# prefix is present in the routing table of the device with a valid next-
set enable
set neighbor 169.254.255.1 remote-as 7224
set neighbor 169.254.255.1 enable
exit
exit
set interface tunnel.1 protocol bgp
# ------
# IPsec Tunnel #2
IKE
# #1: Internet Key Exchange (IKE) Configuration
# A proposal is established for the supported IKE encryption, authentication,
# Diffie-Hellman, and lifetime parameters.
# Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
# You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
# The address of the external interface for your customer gateway must be a
static address.
# Your customer gateway may reside behind a device performing network address
translation (NAT).
# To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall !rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
set ike p1-proposal ike-prop-vpn-44a8938f-2 preshare group2 esp aes128 sha-1
second 28800
# The IKE gateway is defined to be the Virtual Private Gateway. The gateway
configuration
# associates a local interface, remote IP address, and IKE policy.
# This example shows the outside of the tunnel as interface ethernet0/0. This
# should be set to the interface that IP address YOUR_UPLINK_ADDRESS is
# associated with.
# This address is configured with the setup for your Customer Gateway. If the
# address changes, the Customer Gateway and VPN Connection must be recreated.
#
```

```
Gateway and an Example Configuration
set ike gateway gw-vpn-44a8938f-2 address 72.21.209.193 id 72.21.209.193 main
outgoing-interface ethernet0/0 preshare "plain-text-password2" proposal ike-
prop-vpn-44a8938f-2
# Troubleshooting IKE connectivity can be aided by enabling IKE debugging.
# To do so, run the following commands:
                 -- Clear debug buffer
# clear dbuf
# debug ike all
                   -- Enable IKE debugging
# get dbuf stream -- View debug messages
                   -- Turn off debugging
# undebug all
IPsec
# #2: IPsec Configuration
# The IPsec (Phase 2) proposal defines the protocol, authentication,
# encryption, and lifetime parameters for our IPsec security association.
# Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
set ike p2-proposal ipsec-prop-vpn-44a8938f-2 group2 esp aes128 sha-1 second
set ike gateway gw-vpn-44a8938f-2 dpd-liveness interval 10
set vpn IPSEC-vpn-44a8938f-2 gateway gw-vpn-44a8938f-2 replay tunnel proposal
ipsec-prop-vpn-44a8938f-2
 Tunnel
# #3: Tunnel Interface Configuration
# The tunnel interface is configured with the internal IP address.
# To establish connectivity between your internal network and the VPC, you
# must have an interface facing your internal network in the "Trust" zone.
set interface tunnel.2 zone Trust
set interface tunnel.2 ip 169.254.255.6/30
set interface tunnel.2 mtu 1436
set vpn IPSEC-vpn-44a8938f-2 bind interface tunnel.2
# By default, the router will block asymmetric VPN traffic, which may occur
# with this VPN Connection. This occurs, for example, when routing policies
# cause traffic to sent from your router to VPC through one IPsec tunnel
# while traffic returns from VPC through the other.
# This command allows this traffic to be received by your device.
set zone Trust asymmetric-vpn
# This option causes the router to reduce the Maximum Segment Size of TCP
# packets to prevent packet fragmentation.
set flow vpn-tcp-mss 1387
```

BGP

```
#4: Border Gateway Protocol (BGP) Configuration
# BGP is used within the tunnel to exchange prefixes between the Virtual
Private Gateway
# and your Customer Gateway. The Virtual Private Gateway will announce the
prefix
# corresponding to your VPC.
# Your Customer Gateway may announce a default route (0.0.0.0/0).
# The BGP timers are adjusted to provide more rapid detection of outages.
# The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN) is configured
# as part of your Customer Gateway. If the ASN must be changed, the
# Customer Gateway and VPN Connection will need to be recreated with AWS.
#
set vrouter trust-vr
set max-ecmp-routes 2
set protocol bgp YOUR_BGP_ASN
set hold-time 30
set network 0.0.0.0/0
# To advertise additional prefixes to Amazon VPC, copy the 'network'
statement and
# identify the prefix you wish to advertise (set ipv4 network X.X.X.X/X).
Make sure the
# prefix is present in the routing table of the device with a valid next-
hop.
set enable
set neighbor 169.254.255.5 remote-as 7224
set neighbor 169.254.255.5 enable
exit
set interface tunnel.2 protocol bgp
```

How to Test the Customer Gateway Configuration

You can test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

- 1. On your customer gateway, determine whether the BGP status is Active. It takes approximately 30 seconds for a BGP peering to become active.
- 2. Ensure that the customer gateway is advertising a route to the virtual private gateway. The route may be the default route (0.0.0.0/0) or a more specific route you prefer.

When properly established, your BGP peering should be receiving one route from the virtual private gateway corresponding to the prefix that your VPC integration team specified for the VPC (for example, 10.0.0.0/24). If the BGP peering is established, you are receiving a prefix, and you are advertising a prefix, your tunnel is configured correctly. Make sure that both tunnels are in this state.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs
- Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection: your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the *Amazon VPC User Guide*.

To test the end-to-end connectivity of each tunnel

- 1. Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs are listed in the launch wizard when you launch an instance from the Amazon EC2 Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:

Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:

Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

 (Optional) To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway, and repeat the above step. You cannot disable a tunnel on the AWS side of the VPN connection.

If your tunnels don't test successfully, see Troubleshooting Juniper ScreenOS Customer Gateway Connectivity (p. 176).

Example: Palo Alto Networks Device

Topics

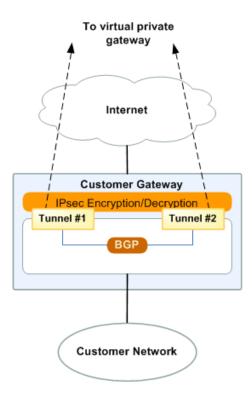
- A High-Level View of the Customer Gateway (p. 126)
- A Detailed View of the Customer Gateway and an Example Configuration (p. 126)
- How to Test the Customer Gateway Configuration (p. 133)

The following topic provides example configuration information provided by your integration team if your customer gateway is a Palo Alto Networks PANOS 4.1.2+ device.

Two diagrams illustrate the example configuration. The first diagram shows the high-level layout of the customer gateway, and the second diagram shows the details of the example configuration. You should use the real configuration information that you receive from your integration team and apply it to your customer gateway.

A High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels. Using redundant tunnels ensures continuous availability in the case that a device fails.



A Detailed View of the Customer Gateway and an Example Configuration

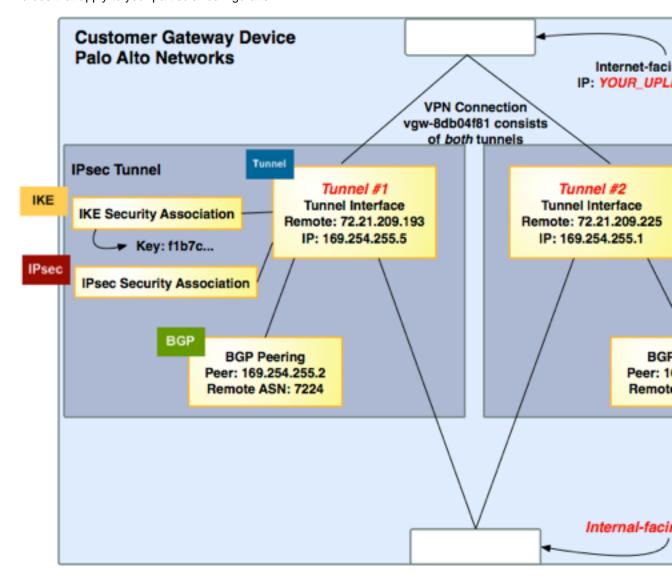
The diagram in this section illustrates an example Palo Alto customer gateway. Following the diagram, there is a corresponding example of the configuration information your integration team should provide. The example configuration contains a set of information for each of the tunnels that you must configure.

In addition, the example configuration refers to these items that you must provide:

- YOUR_UPLINK_ADDRESS—The IP address for the Internet-routable external interface on the customer gateway (which must be static, and may be behind a device performing network address translation (NAT); however, NAT traversal (NAT-T) is not supported).
- YOUR_BGP_ASN—The customer gateway's BGP ASN (we use 65000 by default)

The example configuration includes several example values to help you understand how configuration works. For example, we provide example values for the VPN connection ID (vpn-44a8938f), virtual private gateway ID (vgw-8db04f81), the IP addresses (72.21.209.*, 169.254.255.*), and the remote ASN (7224). You'll replace these example values with the actual values from the configuration information that you receive.

In the following diagram and example configuration, you must replace the items in red italics with values that apply to your particular configuration.



Warning

The following configuration information is an example of what you can expect your integration team to provide. Many of the values in the following example will be different from the actual configuration information that you receive. You must use the actual values and not the example values shown here, or your implementation will fail.

```
! Amazon Web Services
! Virtual Private Cloud

! AWS utilizes unique identifiers to manipulate the configuration of
! a VPN Connection. Each VPN Connection is assigned an identifier and is
! associated with two other identifiers, namely the
! Customer Gateway Identifier and Virtual Private Gateway Identifier.
!
! Your VPN Connection ID : vpn-44a8938f
! Your Virtual Private Gateway ID : vgw-8db04f81
```

```
Gateway and an Example Configuration
! Your Customer Gateway ID
                            : cgw-b4dc3961
! This configuration consists of two tunnels. Both tunnels must be
! configured on your Customer Gateway.
! IPSec Tunnel #1
  IKE
! #1: Internet Key Exchange (IKE) Configuration
! A policy is established for the supported ISAKMP encryption,
! authentication, Diffie-Hellman, lifetime, and key parameters.
! Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
! You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
! The address of the external interface for your customer gateway must be a
static address.
! Your customer gateway may reside behind a device performing network address
translation (NAT).
! To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
 configure
 edit network ike crypto-profiles ike-crypto-profiles ike-crypto-
vpn-44a8938f-0
 set dh-group group2
  set hash shal
  set lifetime seconds 28800
  set encryption aes128
  top
 edit network ike gateway ike-vpn-44a8938f-0
  set protocol ikev1 dpd interval 10 retry 3 enable yes
  set protocol ikev1 ike-crypto-profile ike-crypto-vpn-44a8938f-0 exchange-
mode main
  set authentication pre-shared-key key plain-text-password1
  set local-address ip YOUR UPLINK ADDRESS
  set local-address interface ethernet1/1
 set peer-address ip 72.21.209.193
 top
 IPsec
! #2: IPSec Configuration
```

! The IPSec transform set defines the encryption, authentication, and IPSec

```
! mode parameters.
! Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
edit network ike crypto-profiles ipsec-crypto-profiles ipsec-vpn-44a8938f-0
 set esp authentication shal
 set esp encryption aes128
 set dh-group group2 lifetime seconds 3600
top
 Tunnel
! #3: Tunnel Interface Configuration
! A tunnel interface is configured to be the logical interface associated
! with the tunnel. All traffic routed to the tunnel interface will be
! encrypted and transmitted to the VPC. Similarly, traffic from the VPC
! will be logically received on this interface.
! Association with the IPSec security association is done through the
! "tunnel protection" command.
!
! The address of the interface is configured with the setup for your
! Customer Gateway. If the address changes, the Customer Gateway and VPN
! Connection must be recreated with Amazon VPC.
!
edit network interface tunnel
 set ip 169.254.255.5/30
 set units tunnel.1
 set mtu 1427
top
edit network tunnel ipsec ipsec-tunnel-1
 set auto-key ike-gateway ike-vpn-44a8938f-0
 set auto-key ipsec-crypto-profile ipsec-vpn-44a8938f-0
 set tunnel-interface tunnel.1
 set anti-replay yes
 BGP
! #4: Border Gateway Protocol (BGP) Configuration
!
```

```
! BGP is used within the tunnel to exchange prefixes between the
! Virtual Private Gateway and your Customer Gateway. The Virtual Private
! will announce the prefix corresponding to your VPC.
!
! The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN)
! is configured as part of your Customer Gateway. If the ASN must
! be changed, the Customer Gateway and VPN Connection will need to be
recreated with AWS.
edit network virtual-router default protocol bgp
 set enable yes
 set router-id YOUR UPLINK ADDRESS
 set local-as YOUR_BGP_ASN
  edit peer-group AmazonBGP
   edit peer amazon-tunnel-44a8938f-0
    set connection-options keep-alive-interval 10
    set connection-options hold-time 30
    set enable yes
    set local-address ip 169.254.255.5/30
    set local-address interface tunnel.1
    set peer-as 7224
    set peer-address ip 169.254.255.2
    top
! Your Customer Gateway may announce a default route (0.0.0.0/0) to us.
edit network virtual-router default protocol bgp policy
 set export rules vr-export action allow
 set match address-prefix 0.0.0.0/0 exact yes
 set used-by AmazonBGP enable yes
top
! To advertise additional prefixes to Amazon VPC, add these prefixes to the
'address-prefix'
! statement and identify the prefix you wish to advertise. Make sure the
prefix is present
! in the routing table of the device with a valid next-hop. If you want to
advertise
! 192.168.0.0/16 to Amazon, this can be done using the following.
edit network virtual-router default protocol bgp policy
 set export rules vr-export action allow
 set match address-prefix 192.168.0.0/16 exact yes
 set used-by AmazonBGP enable yes
top
!
```

IKE

```
! IPSec Tunnel #2
! #1: Internet Key Exchange (IKE) Configuration
! A policy is established for the supported ISAKMP encryption,
! authentication, Diffie-Hellman, lifetime, and key parameters.
! Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
! You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
! The address of the external interface for your customer gateway must be a
static address.
! Your customer gateway may reside behind a device performing network address
translation (NAT).
! To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall !rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
configure
 edit network ike crypto-profiles ike-crypto-profiles ike-crypto-
vpn-44a8938f-1
  set dh-group group2
  set hash shal
  set lifetime seconds 28800
  set encryption aes128
  top
 edit network ike gateway ike-vpn-44a8938f-1
 set protocol ikev1 dpd interval 10 retry 3 enable yes
 set protocol ikev1 ike-crypto-profile ike-crypto-vpn-35a6445c-1 exchange-
mode main
 set authentication pre-shared-key key plain-text-password2
  set local-address ip YOUR_UPLINK_ADDRESS
  set local-address interface ethernet1/1
 set peer-address ip 72.21.209.225
 top
```

IPsec

```
! #2: IPSec Configuration
!
! The IPSec transform set defines the encryption, authentication, and IPSec
! mode parameters.
!
! Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
```

```
edit network ike crypto-profiles ipsec-crypto-profiles ipsec-vpn-44a8938f-1
  set esp authentication shal
 set esp encryption aes128
 set dh-group group2 lifetime seconds 3600
 Tunnel
! #3: Tunnel Interface Configuration
! A tunnel interface is configured to be the logical interface associated
! with the tunnel. All traffic routed to the tunnel interface will be
! encrypted and transmitted to the VPC. Similarly, traffic from the VPC
! will be logically received on this interface.
! Association with the IPSec security association is done through the
! "tunnel protection" command.
! The address of the interface is configured with the setup for your
! Customer Gateway. If the address changes, the Customer Gateway and \ensuremath{\mathtt{VPN}}
! Connection must be recreated with Amazon VPC.
edit network interface tunnel
 set ip 169.254.255.1/30
 set units tunnel.2
 set mtu 1427
 top
 edit network tunnel ipsec ipsec-tunnel-2
 set auto-key ike-gateway ike-vpn-44a8938f-1
  set auto-key ipsec-crypto-profile ipsec-vpn-44a8938f-1
  set tunnel-interface tunnel.2
  set anti-replay yes
 BGP
! #4: Border Gateway Protocol (BGP) Configuration
! BGP is used within the tunnel to exchange prefixes between the
! Virtual Private Gateway and your Customer Gateway. The Virtual Private
Gateway
! will announce the prefix corresponding to your VPC.
!
!
```

```
! The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN)
! is configured as part of your Customer Gateway. If the ASN must
! be changed, the Customer Gateway and VPN Connection will need to be
recreated with AWS.
edit network virtual-router default protocol bgp
 set enable yes
 set router-id YOUR_UPLINK_ADDRESS
 set local-as YOUR_BGP_ASN
  edit peer-group AmazonBGP
   edit peer amazon-tunnel-44a8938f-1
    set connection-options keep-alive-interval 10
    set connection-options hold-time 30
    set enable yes
    set local-address ip 169.254.255.1/30
    set local-address interface tunnel.2
    set peer-as 7224
    set peer-address ip 169.254.255.6.113
    top
! Your Customer Gateway may announce a default route (0.0.0.0/0) to us.
edit network virtual-router default protocol bgp policy
 set export rules vr-export action allow
 set match address-prefix 0.0.0.0/0 exact yes
 set used-by AmazonBGP enable yes
top
! To advertise additional prefixes to Amazon VPC, add these prefixes to the
'address-prefix'
! statement and identify the prefix you wish to advertise. Make sure the
prefix is present
! in the routing table of the device with a valid next-hop. If you want to
advertise
! 192.168.0.0/16 to Amazon, this can be done using the following.
edit network virtual-router default protocol bgp policy
 set export rules vr-export action allow
 set match address-prefix 192.168.0.0/16 exact yes
 set used-by AmazonBGP enable yes
top
!
```

How to Test the Customer Gateway Configuration

You can test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

- On your customer gateway, determine whether the BGP status is Active.
 It takes approximately 30 seconds for a BGP peering to become active.
- 2. Ensure that the customer gateway is advertising a route to the virtual private gateway. The route may be the default route (0.0.0.0/0) or a more specific route you prefer.

When properly established, your BGP peering should be receiving one route from the virtual private gateway corresponding to the prefix that your VPC integration team specified for the VPC (for example, 10.0.0.0/24). If the BGP peering is established, you are receiving a prefix, and you are advertising a prefix, your tunnel is configured correctly. Make sure that both tunnels are in this state.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection: your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the *Amazon VPC User Guide*.

To test the end-to-end connectivity of each tunnel

- 1. Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs are listed in the launch wizard when you launch an instance from the Amazon EC2 Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

 (Optional) To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway, and repeat the above step. You cannot disable a tunnel on the AWS side of the VPN connection.

Example: Yamaha Device

Topics

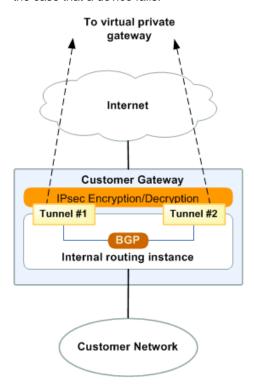
- A High-Level View of the Customer Gateway (p. 136)
- A Detailed View of the Customer Gateway and an Example Configuration (p. 136)
- How to Test the Customer Gateway Configuration (p. 143)

In this section we walk you through an example of the configuration information provided by your integration team if your customer gateway is a Yamaha RT107e, RTX1200, RTX1500, RTX3000, or SRT100 router.

Two diagrams illustrate the example configuration. The first diagram shows the high-level layout of the customer gateway, and the second diagram shows the details of the example configuration. You should use the real configuration information that you receive from your integration team and apply it to your customer gateway.

A High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels. Using redundant tunnels ensures continuous availability in the case that a device fails.



A Detailed View of the Customer Gateway and an Example Configuration

The diagram in this section illustrates an example Yamaha customer gateway. Following the diagram, there is a corresponding example of the configuration information your integration team should provide. The example configuration contains a set of information for each of the tunnels that you must configure.

In addition, the example configuration refers to these items that you must provide:

- YOUR_UPLINK_ADDRESS—The IP address for the Internet-routable external interface on the
 customer gateway. The address must be static, and may be behind a device performing network
 address translation (NAT). To ensure that NAT traversal (NAT-T) can function, you must adjust your
 firewall rules to unblock UDP port 4500.
- YOUR_LOCAL_NETWORK_ADDRESS—The IP address that is assigned to the LAN interface connected to your local network (most likely a private address such as 192.168.0.1)
- YOUR BGP ASN—The customer gateway's BGP ASN (we use 65000 by default)

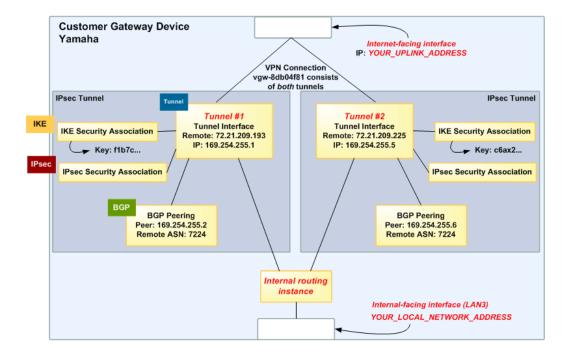
The example configuration includes several example values to help you understand how configuration works. For example, we provide example values for the VPN connection ID (vpn-44a8938f), virtual private gateway ID (vgw-8db04f81), the IP addresses (72.21.209.*, 169.254.255.*), and the remote

ASN (7224). You'll replace these example values with the actual values from the configuration information that you receive.

In addition, you must also:

- Configure the outside interface (referred to as LAN3 in the example configuration).
- Configure the tunnel interface IDs (referred to as *Tunnel #1* and *Tunnel #2* in the example configuration).
- Configure all internal routing that moves traffic between the customer gateway and your local network.

In the following diagram and example configuration, you must replace the items in red italics with values that apply to your particular configuration.



Warning

The following configuration information is an example of what you can expect your integration team to provide. Many of the values in the following example will be different from the actual configuration information that you receive. You must use the actual values and not the example values shown here, or your implementation will fail.

```
# Amazon Web Services
# Virtual Private Cloud
# AWS utilizes unique identifiers to manage the configuration of
# a VPN Connection. Each VPN Connection is assigned an identifier and is
# associated with two other identifiers, namely the
 Customer Gateway Identifier and Virtual Private Gateway Identifier.
#
# Your VPN Connection ID
                                    : vpn-44a8938f
 Your Virtual Private Gateway ID
                                    : vgw-8db04f81
 Your Customer Gateway ID
                                    : cgw-b4dc3961
#
#
#
```

```
Gateway and an Example Configuration
# This configuration consists of two tunnels. Both tunnels must be
# configured on your Customer Gateway.
#
# IPsec Tunnel #1
 IKE
# #1: Internet Key Exchange (IKE) Configuration
# A policy is established for the supported ISAKMP encryption,
# authentication, Diffie-Hellman, lifetime, and key parameters.
# Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
# You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
# The address of the external interface for your customer gateway must be a
static address.
# Your customer gateway may reside behind a device performing network address
translation (NAT).
# To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall !rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
tunnel select 1
ipsec ike encryption 1 aes-cbc
ipsec ike group 1 modp1024
ipsec ike hash 1 sha
# This line stores the Pre Shared Key used to authenticate the
# tunnel endpoints.
ipsec ike pre-shared-key 1 text plain-text-password1
IPsec
# #2: IPsec Configuration
# The IPsec policy defines the encryption, authentication, and IPsec
# mode parameters.
# Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
# Note that there are a global list of IPSec policies, each identified by
# sequence number. This policy is defined as #201, which may conflict with
# an existing policy using the same number. If so, we recommend changing
# the sequence number to avoid conflicts.
#
ipsec tunnel 201
ipsec sa policy 201 1 esp aes-cbc sha-hmac
```

```
# The IPsec profile references the IPsec policy and further defines
# the Diffie-Hellman group and security association lifetime.
ipsec ike duration ipsec-sa 1 3600
ipsec ike pfs 1 on
# Additional parameters of the IPsec configuration are set here. Note that
# these parameters are global and therefore impact other IPsec
# associations.
# This option instructs the router to clear the "Don't Fragment"
# bit from packets that carry this bit and yet must be fragmented, enabling
# them to be fragmented.
ipsec tunnel outer df-bit clear
# This option enables IPsec Dead Peer Detection, which causes periodic
# messages to be sent to ensure a Security Association remains operational.
ipsec ike keepalive use 1 on dpd 10 3
 Tunnel
# #3: Tunnel Interface Configuration
# A tunnel interface is configured to be the logical interface associated
# with the tunnel. All traffic routed to the tunnel interface will be
# encrypted and transmitted to the VPC. Similarly, traffic from the VPC
# will be logically received on this interface.
# The address of the interface is configured with the setup for your
# Customer Gateway. If the address changes, the Customer Gateway and VPN
# Connection must be recreated with Amazon VPC.
ipsec ike local address 1 YOUR_LOCAL_NETWORK_ADDRESS
ipsec ike remote address 1 72.21.209.225
ip tunnel address 169.254.255.2/30
ip tunnel remote address 169.254.255.1
# This option causes the router to reduce the Maximum Segment Size of
# TCP packets to prevent packet fragmentation
ip tunnel tcp mss limit 1387
tunnel enable 1
tunnel select none
ipsec auto refresh on
```

#4: Border Gateway Protocol (BGP) Configuration

```
# BGP is used within the tunnel to exchange prefixes between the
# Virtual Private Gateway and your Customer Gateway. The Virtual Private
Gateway
# will announce the prefix corresponding to your VPC.
# Your Customer Gateway may announce a default route (0.0.0.0/0),
# which can be done with the 'network' and 'default-originate' statements.
# The BGP timers are adjusted to provide more rapid detection of outages.
# The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN) is configured
# as part of your Customer Gateway. If the ASN must be changed, the
# Customer Gateway and VPN Connection will need to be recreated with AWS.
bgp use on
bgp autonomous-system YOUR_BGP_ASN
bgp neighbor 1 7224 169.254.255.1 hold-time=30 local-address=169.254.255.2
# To advertise additional prefixes to Amazon VPC, copy the 'network'
statement and
# identify the prefix you wish to advertise. Make sure the
# prefix is present in the routing table of the device with a valid next-hop.
# For example, the following two lines will advertise 192.168.0.0/16 and
10.0.0.0/16 to Amazon VPC
# bgp import filter 1 equal 10.0.0.0/16
# bgp import filter 1 equal 192.168.0.0/16
bgp import filter 1 equal 0.0.0.0/0
bgp import 7224 static filter 1
  IKE
# IPsec Tunnel #2
         ______
# #1: Internet Key Exchange (IKE) Configuration
# A policy is established for the supported ISAKMP encryption,
# authentication, Diffie-Hellman, lifetime, and key parameters.
# Please note, these sample configurations are for the minimum requirement of
AES128, SHA1, and DH Group 2.
# You will need to modify these sample configuration files to take advantage
of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.
# The address of the external interface for your customer gateway must be a
static address.
# Your customer gateway may reside behind a device performing network address
translation (NAT).
```

```
# To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500. If not behind NAT, we recommend
disabling NAT-T.
tunnel select 2
ipsec ike encryption 2 aes-cbc
ipsec ike group 2 modp1024
ipsec ike hash 2 sha
# This line stores the Pre Shared Key used to authenticate the
# tunnel endpoints.
ipsec ike pre-shared-key 2 text plain-text-password2
 IPsec
# #2: IPsec Configuration
# The IPsec policy defines the encryption, authentication, and IPsec
# mode parameters.
# Please note, you may use these additionally supported IPSec parameters for
encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.
# Note that there are a global list of IPsec policies, each identified by
# sequence number. This policy is defined as #202, which may conflict with
# an existing policy using the same number. If so, we recommend changing
# the sequence number to avoid conflicts.
ipsec tunnel 202
ipsec sa policy 202 2 esp aes-cbc sha-hmac
# The IPsec profile references the IPsec policy and further defines
# the Diffie-Hellman group and security association lifetime.
ipsec ike duration ipsec-sa 2 3600
ipsec ike pfs 2 on
# Additional parameters of the IPsec configuration are set here. Note that
# these parameters are global and therefore impact other IPsec
# associations.
# This option instructs the router to clear the "Don't Fragment"
# bit from packets that carry this bit and yet must be fragmented, enabling
# them to be fragmented.
ipsec tunnel outer df-bit clear
# This option enables IPsec Dead Peer Detection, which causes periodic
# messages to be sent to ensure a Security Association remains operational.
ipsec ike keepalive use 2 on dpd 10 3
```

Tunnel

```
# #3: Tunnel Interface Configuration
# A tunnel interface is configured to be the logical interface associated
# with the tunnel. All traffic routed to the tunnel interface will be
# encrypted and transmitted to the VPC. Similarly, traffic from the VPC
# will be logically received on this interface.
# Association with the IPsec security association is done through the
# "tunnel protection" command.
# The address of the interface is configured with the setup for your
# Customer Gateway. If the address changes, the Customer Gateway and VPN
# Connection must be recreated with Amazon VPC.
ipsec ike local address 2 YOUR_LOCAL_NETWORK_ADDRESS
ipsec ike remote address 2 72.21.209.193
ip tunnel address 169.254.255.6/30
ip tunnel remote address 169.254.255.5
# This option causes the router to reduce the Maximum Segment Size of
# TCP packets to prevent packet fragmentation
ip tunnel tcp mss limit 1387
tunnel enable 2
tunnel select none
ipsec auto refresh on
 BGP
      -----
# #4: Border Gateway Protocol (BGP) Configuration
# BGP is used within the tunnel to exchange prefixes between the
# Virtual Private Gateway and your Customer Gateway. The Virtual Private
Gateway
# will announce the prefix corresponding to your VPC.
# Your Customer Gateway may announce a default route (0.0.0.0/0),
# which can be done with the 'network' and 'default-originate' statements.
# The BGP timers are adjusted to provide more rapid detection of outages.
# The local BGP Autonomous System Number (ASN) (YOUR_BGP_ASN) is configured
# as part of your Customer Gateway. If the ASN must be changed, the
# Customer Gateway and VPN Connection will need to be recreated with AWS.
bgp use on
bgp autonomous-system YOUR_BGP_ASN
bgp neighbor 2 7224 169.254.255.5 hold-time=30 local-address=169.254.255.6
# To advertise additional prefixes to Amazon VPC, copy the 'network'
statement and
```

Amazon Virtual Private Cloud Network Administrator Guide How to Test the Customer Gateway Configuration

```
# identify the prefix you wish to advertise. Make sure the
# prefix is present in the routing table of the device with a valid next-hop.
# For example, the following two lines will advertise 192.168.0.0/16 and
10.0.0.0/16 to Amazon VPC
#
# bgp import filter 1 equal 10.0.0.0/16
# bgp import filter 1 equal 192.168.0.0/16
#
bgp import filter 1 equal 0.0.0.0/0
bgp import 7224 static filter 1
```

How to Test the Customer Gateway Configuration

You can test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

- On your customer gateway, determine whether the BGP status is Active.
 It takes approximately 30 seconds for a BGP peering to become active.
- 2. Ensure that the customer gateway is advertising a route to the virtual private gateway. The route may be the default route (0.0.0.0/0) or a more specific route you prefer.

When properly established, your BGP peering should be receiving one route from the virtual private gateway corresponding to the prefix that your VPC integration team specified for the VPC (for example, 10.0.0.0/24). If the BGP peering is established, you are receiving a prefix, and you are advertising a prefix, your tunnel is configured correctly. Make sure that both tunnels are in this state.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- · Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection: your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the Amazon VPC User Guide.

To test the end-to-end connectivity of each tunnel

- 1. Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs are listed in the launch wizard when you launch an instance from the Amazon EC2 Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:
```

Amazon Virtual Private Cloud Network Administrator Guide How to Test the Customer Gateway Configuration

```
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

 (Optional) To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway, and repeat the above step. You cannot disable a tunnel on the AWS side of the VPN connection.

If your tunnels don't test successfully, see Troubleshooting Yamaha Customer Gateway Connectivity (p. 179).

Example: Generic Customer Gateway Using Border Gateway Protocol

Topics

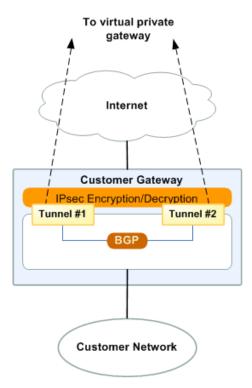
- A High-Level View of the Customer Gateway (p. 146)
- A Detailed View of the Customer Gateway and an Example Configuration (p. 146)
- How to Test the Customer Gateway Configuration (p. 151)

If your customer gateway isn't one of the types discussed earlier in this guide, your integration team will provide you with generic information that you can use to configure your customer gateway. This section contains an example of that information.

Two diagrams illustrate the example configuration. The first diagram shows the high-level layout of the customer gateway, and the second diagram shows details from the example configuration. You should use the real configuration information that you receive from your integration team and apply it to your customer gateway.

A High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels. Using redundant tunnels ensures continuous availability in the case that a device fails.



A Detailed View of the Customer Gateway and an Example Configuration

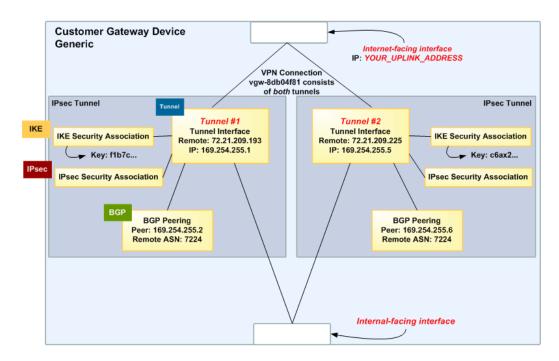
The diagram in this section illustrates an example generic customer gateway. Following the diagram, there is a corresponding example of the configuration information your integration team should provide. The example configuration contains a set of information for each of the tunnels that you must configure.

In addition, the example configuration refers to these items that you must provide:

- YOUR_UPLINK_ADDRESS—The IP address for the Internet-routable external interface on the
 customer gateway. The address must be static, and may be behind a device performing network
 address translation (NAT). To ensure that NAT traversal (NAT-T) can function, you must adjust your
 firewall rules to unblock UDP port 4500.
- YOUR_BGP_ASN—The customer gateway's BGP ASN (we use 65000 by default)

The example configuration includes several example values to help you understand how configuration works. For example, we provide example values for the VPN connection ID (vpn-44a8938f), virtual private gateway ID (vgw-8db04f81), the IP addresses (72.21.209.*, 169.254.255.*), and the remote ASN (7224). You'll replace these example values with the actual values from the configuration information that you receive.

In the following diagram and example configuration, you must replace the items in red italics with values that apply to your particular configuration.



Amazon Web Services Virtual Private Cloud

VPN Connection Configuration

AWS utilizes unique identifiers to manipulate the configuration of a VPN Connection. Each VPN Connection is assigned a VPN identifier and is associated with two other identifiers, namely the Customer Gateway Identifier and the Virtual Private Gateway Identifier.

Your VPN Connection ID : vpn-44a8938f
Your Virtual Private Gateway ID : vgw-8db04f81
Your Customer Gateway ID : cgw-b4dc3961

A VPN Connection consists of a pair of IPsec tunnel security associations (SAs).

It is important that both tunnel security associations be configured.

IPsec Tunnel #1

IKE

#1: Internet Key Exchange Configuration

Configure the IKE SA as follows:

Please note, these sample configurations are for the minimum requirement of AES128, SHA1, and DH Group 2.

You will need to modify these sample configuration files to take advantage of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.

The address of the external interface for your customer gateway must be a static address.

Your customer gateway may reside behind a device performing network address translation (NAT).

To ensure that NAT traversal (NAT-T) can function, you must adjust your firewall rules to unblock UDP port 4500. If not behind NAT, we recommend disabling NAT-T.

- Authentication Method : Pre-Shared Key
- Pre-Shared Key : plain-text-password1

- Authentication Algorithm : shal

Encryption Algorithm : aes-128-cbcLifetime : 28800 seconds

- Phase 1 Negotiation Mode : main

- Perfect Forward Secrecy : Diffie-Hellman Group 2

IPsec

#2: IPsec Configuration

Configure the IPsec SA as follows:

Please note, you may use these additionally supported IPSec parameters for encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.

- Protocol : esp

Authentication Algorithm : hmac-shal-96
Encryption Algorithm : aes-128-cbc
Lifetime : 3600 seconds

- Mode : tunnel

- Perfect Forward Secrecy : Diffie-Hellman Group 2

IPsec Dead Peer Detection (DPD) will be enabled on the AWS Endpoint. We recommend configuring DPD on your endpoint as follows:

- DPD Interval : 10 - DPD Retries : 3

IPsec ESP (Encapsulating Security Payload) inserts additional headers to transmit packets. These headers require additional space, which reduces the amount of space available to transmit application data. To limit the impact of this behavior, we recommend the following

configuration on your Customer Gateway:
- TCP MSS Adjustment : 1387 bytes
- Clear Don't Fragment Bit : enabled

- Fragmentation : Before encryption

Tunnel

#3: Tunnel Interface Configuration

Your Customer Gateway must be configured with a tunnel interface that is associated with the IPsec tunnel. All traffic transmitted to the tunnel interface is encrypted and transmitted to the Virtual Private Gateway.

The Customer Gateway and Virtual Private Gateway each have two addresses that relate

to this IPsec tunnel. Each contains an outside address, upon which encrypted traffic is exchanged. Each also contain an inside address associated with the tunnel interface.

Amazon Virtual Private Cloud Network Administrator Guide A Detailed View of the Customer

Gateway and an Example Configuration

The Customer Gateway outside IP address was provided when the Customer

was created. Changing the IP address requires the creation of a new Customer Gateway.

The Customer Gateway inside IP address should be configured on your tunnel interface.

Outside IP Addresses:

- Customer Gateway: : YOUR_UPLINK_ADDRESS

- Virtual Private Gateway : 72.21.209.193

Inside IP Addresses

- Customer Gateway : 169.254.255.6/30 - Virtual Private Gateway : 169.254.255.5/30

Configure your tunnel to fragment at the optimal size:

- Tunnel interface MTU : 1436 bytes

BGP

#4: Border Gateway Protocol (BGP) Configuration:

The Border Gateway Protocol (BGPv4) is used within the tunnel, between the

IP addresses, to exchange routes from the VPC to your home network. Each BGP router has an Autonomous System Number (ASN). Your ASN was provided to AWS when the Customer Gateway was created.

BGP Configuration Options:

- Customer Gateway ASN : YOUR_BGP_ASN

- Virtual Private Gateway ASN : 7224

- Neighbor IP Address : 169.254.255.1

- Neighbor Hold Time : 30

Configure BGP to announce routes to the Virtual Private Gateway. The gateway will announce prefixes to your customer gateway based upon the prefix you assigned to the VPC at creation time.

IPsec Tunnel #2

IKE

#1: Internet Key Exchange Configuration

Configure the IKE SA as follows:

Please note, these sample configurations are for the minimum requirement of AES128, SHA1, and DH Group 2.

You will need to modify these sample configuration files to take advantage of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.

The address of the external interface for your customer gateway must be a static address.

Your customer gateway may reside behind a device performing network address translation (NAT).

To ensure that NAT traversal (NAT-T) can function, you must adjust your firewall rules to unblock UDP port 4500. If not behind NAT, we recommend disabling NAT-T.

- Authentication Method : Pre-Shared Key

- Pre-Shared Key : plain-text-password2

- Authentication Algorithm : shal

- Encryption Algorithm : aes-128-cbc - Lifetime : 28800 seconds

- Phase 1 Negotiation Mode : main

- Perfect Forward Secrecy : Diffie-Hellman Group 2

IPsec

#2: IPsec Configuration

Configure the IPsec SA as follows:

Please note, you may use these additionally supported IPSec parameters for encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.

- Protocol : esp

Authentication Algorithm : hmac-shal-96Encryption Algorithm : aes-128-cbcLifetime : 3600 seconds

- Mode : tunnel

- Perfect Forward Secrecy : Diffie-Hellman Group 2

IPsec Dead Peer Detection (DPD) will be enabled on the AWS Endpoint. We recommend configuring DPD on your endpoint as follows:

- DPD Interval : 10 - DPD Retries : 3

IPsec ESP (Encapsulating Security Payload) inserts additional headers to transmit packets. These headers require additional space, which reduces the amount of space available to transmit application data. To limit the impact of this behavior, we recommend the following

configuration on your Customer Gateway:
- TCP MSS Adjustment : 1387 bytes
- Clear Don't Fragment Bit : enabled

- Fragmentation : Before encryption

Tunnel

#3: Tunnel Interface Configuration

Your Customer Gateway must be configured with a tunnel interface that is associated with the IPsec tunnel. All traffic transmitted to the tunnel interface is encrypted and transmitted to the Virtual Private Gateway.

The Customer Gateway and Virtual Private Gateway each have two addresses that relate

to this IPsec tunnel. Each contains an outside address, upon which encrypted traffic is exchanged. Each also contain an inside address associated with the tunnel interface.

The Customer Gateway outside IP address was provided when the Customer Gateway

was created. Changing the IP address requires the creation of a new Customer Gateway.

The Customer Gateway inside $\ensuremath{\mathsf{IP}}$ address should be configured on your tunnel interface.

Amazon Virtual Private Cloud Network Administrator Guide How to Test the Customer Gateway Configuration

Outside IP Addresses:

- Customer Gateway: : YOUR_UPLINK_ADDRESS

- Virtual Private Gateway : 72.21.209.193

Inside IP Addresses

- Customer Gateway : 169.254.255.6/30 - Virtual Private Gateway : 169.254.255.5/30

Configure your tunnel to fragment at the optimal size:

- Tunnel interface MTU : 1436 bytes

BGP

#4: Border Gateway Protocol (BGP) Configuration:

The Border Gateway Protocol (BGPv4) is used within the tunnel, between the inside

IP addresses, to exchange routes from the VPC to your home network. Each BGP router has an Autonomous System Number (ASN). Your ASN was provided to AWS when the Customer Gateway was created.

BGP Configuration Options:

- Customer Gateway ASN : YOUR_BGP_ASN

- Virtual Private Gateway ASN : 7224

- Neighbor IP Address : 169.254.255.5

- Neighbor Hold Time : 30

Configure BGP to announce routes to the Virtual Private Gateway. The gateway will announce prefixes to your customer gateway based upon the prefix you assigned to the VPC at creation time.

How to Test the Customer Gateway Configuration

You can test the gateway configuration for each tunnel.

To test the customer gateway configuration for each tunnel

- 1. On your customer gateway, determine whether the BGP status is Active. It takes approximately 30 seconds for a BGP peering to become active.
- 2. Ensure that the customer gateway is advertising a route to the virtual private gateway. The route may be the default route (0.0.0.0/0) or a more specific route you prefer.

When properly established, your BGP peering should be receiving one route from the virtual private gateway corresponding to the prefix that your VPC integration team specified for the VPC (for example, 10.0.0.0/24). If the BGP peering is established, you are receiving a prefix, and you are advertising a prefix, your tunnel is configured correctly. Make sure that both tunnels are in this state.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- · Configure your instance's security group and network ACL to enable inbound ICMP traffic.

Amazon Virtual Private Cloud Network Administrator Guide How to Test the Customer Gateway Configuration

• Ensure that you have configured routing for your VPN connection: your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the *Amazon VPC User Guide*.

To test the end-to-end connectivity of each tunnel

- 1. Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs are listed in the launch wizard when you launch an instance from the Amazon EC2 Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- 3. On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

 (Optional) To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway, and repeat the above step. You cannot disable a tunnel on the AWS side of the VPN connection.

If your tunnels don't test successfully, see Troubleshooting Generic Device Customer Gateway Connectivity Using Border Gateway Protocol (p. 182).

Example: Generic Customer Gateway without Border Gateway Protocol

Topics

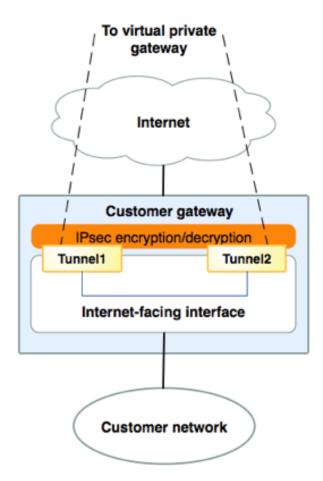
- A High-Level View of the Customer Gateway (p. 154)
- A Detailed View of the Customer Gateway and an Example Configuration (p. 154)
- How to Test the Customer Gateway Configuration (p. 159)

If your customer gateway isn't one of the types discussed earlier in this guide, your integration team will provide you with generic information that you can use to configure your customer gateway. This section contains an example of that information.

Two diagrams illustrate the example configuration. The first diagram shows the high-level layout of the customer gateway, and the second diagram shows details from the example configuration. You should use the real configuration information that you receive from your integration team and apply it to your customer gateway.

A High-Level View of the Customer Gateway

The following diagram shows the general details of your customer gateway. Note that the VPN connection consists of two separate tunnels: *Tunnel 1* and *Tunnel 2*. Using redundant tunnels ensures continuous availability in the case that a device fails.



A Detailed View of the Customer Gateway and an Example Configuration

The diagram in this section illustrates an example generic customer gateway (without BGP). Following the diagram, there is a corresponding example of the configuration information your integration team should provide. The example configuration contains a set of information for each of the tunnels that you must configure.

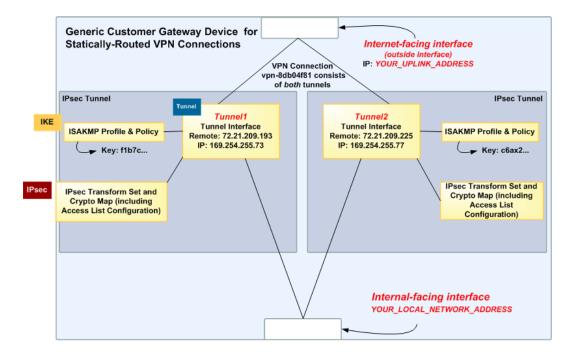
The diagram in this section illustrates a generic customer gateway that uses static routing for its VPN connection (meaning that it does not support dynamic routing, or Border Gateway Protocol (BGP). Following the diagram, there is a corresponding example of the configuration information your integration team should give you. The example configuration contains a set of information for each of the two tunnels you must configure.

In addition, the example configuration refers to one item that you must provide:

YOUR_UPLINK_ADDRESS—The IP address for the Internet-routable external interface on the
customer gateway. The address must be static, and may be behind a device performing network
address translation (NAT). To ensure that NAT traversal (NAT-T) can function, you must adjust your
firewall rules to unblock UDP port 4500.

The example configuration includes several example values to help you understand how configuration works. For example, we provide example values for the VPN connection ID (vpn-44a8938f), virtual private gateway ID (vgw-8db04f81), and the VGW IP addresses (72.21.209.*, 169.254.255.*). You'll replace these example values with the actual values from the configuration information that you receive.

In the following diagram and example configuration, you must replace the items in red italics with values that apply to your particular configuration.



Important

The following configuration information is an example of what you can expect an integration team to provide . Many of the values in the following example will be different from the actual configuration information that you receive. You must use the actual values and not the example values shown here, or your implementation will fail.

A VPN Connection consists of a pair of IPSec tunnel security associations (SAs).

It is important that both tunnel security associations be configured.

IPSec Tunnel #1

IKE

#1: Internet Key Exchange Configuration

Configure the IKE SA as follows

Please note, these sample configurations are for the minimum requirement of AES128, SHA1, and DH Group 2.

You will need to modify these sample configuration files to take advantage of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.

The address of the external interface for your customer gateway must be a static address.

Your customer gateway may reside behind a device performing network address translation (NAT).

To ensure that NAT traversal (NAT-T) can function, you must adjust your firewall rules to unblock UDP port 4500. If not behind NAT, we recommend disabling NAT-T.

Authentication Method : Pre-Shared KeyPre-Shared Key : PRE-SHARED-KEY-IN-PLAIN-TEXT

- Authentication Algorithm : shal

- Encryption Algorithm : aes-128-cbc - Lifetime : 28800 seconds

- Phase 1 Negotiation Mode : main

- Perfect Forward Secrecy : Diffie-Hellman Group 2

IPsec

#2: IPSec Configuration

Configure the IPSec SA as follows:

Please note, you may use these additionally supported IPSec parameters for encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.

- Protocol : esp

- Authentication Algorithm : hmac-shal-96 - Encryption Algorithm : aes-128-cbc - Lifetime : 3600 seconds

- Mode : tunnel

- Perfect Forward Secrecy : Diffie-Hellman Group 2

IPSec Dead Peer Detection (DPD) will be enabled on the AWS Endpoint. We recommend configuring DPD on your endpoint as follows:

: 10 - DPD Interval - DPD Retries

IPSec ESP (Encapsulating Security Payload) inserts additional headers to transmit packets. These headers require additional space, which reduces the amount of space available to transmit application data. To limit the impact of this behavior, we recommend the following

configuration on your Customer Gateway:

- TCP MSS Adjustment : 1387 bytes - Clear Don't Fragment Bit : enabled

Gateway and an Example Configuration

Before encryption

Tunnel

- Fragmentation

#3: Tunnel Interface Configuration

Your Customer Gateway must be configured with a tunnel interface that is associated with the IPSec tunnel. All traffic transmitted to the tunnel interface is encrypted and transmitted to the Virtual Private Gateway.

The Customer Gateway and Virtual Private Gateway each have two addresses that relate

to this IPSec tunnel. Each contains an outside address, upon which encrypted traffic is exchanged. Each also contain an inside address associated with the tunnel interface.

The Customer Gateway outside IP address was provided when the Customer Gateway

was created. Changing the IP address requires the creation of a new Customer Gateway.

The Customer Gateway inside IP address should be configured on your tunnel interface.

Outside IP Addresses:

- Customer Gateway : YOUR_UPLINK_ADDRESS

- Virtual Private Gateway : 72.21.209.193

Inside IP Addresses

- Customer Gateway : 169.254.255.74/30 - Virtual Private Gateway : 169.254.255.73/30

Configure your tunnel to fragment at the optimal size:

- Tunnel interface MTU : 1436 bytes

#4: Static Routing Configuration:

To route traffic between your internal network and your VPC, you will need a static route added to your router.

Static Route Configuration Options:

- Next hop : 169.254.255.73

You should add static routes towards your internal network on the VGW. The VGW will then send traffic towards your internal network over the tunnels.

IPSec Tunnel #2

IKE

#1: Internet Key Exchange Configuration

Configure the IKE SA as follows:

Please note, these sample configurations are for the minimum requirement of AES128, SHA1, and DH Group 2.

You will need to modify these sample configuration files to take advantage of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.

The address of the external interface for your customer gateway must be a static address.

Your customer gateway may reside behind a device performing network address translation (NAT).

To ensure that NAT traversal (NAT-T) can function, you must adjust your firewall rules to unblock UDP port 4500. If not behind NAT, we recommend disabling NAT-T.

- Authentication Method : Pre-Shared Key

- Pre-Shared Key : PRE-SHARED-KEY-IN-PLAIN-TEXT

Authentication Algorithm : shal
Encryption Algorithm : aes-128-cbc
Lifetime : 28800 seconds

- Phase 1 Negotiation Mode : main

- Perfect Forward Secrecy : Diffie-Hellman Group 2

IPsec

#2: IPSec Configuration

Configure the IPSec SA as follows:

Please note, you may use these additionally supported IPSec parameters for encryption like AES256 and other DH groups like 2, 5, 14-18, 22, 23, and 24.

- Protocol : esp

Authentication Algorithm : hmac-shal-96
 Encryption Algorithm : aes-128-cbc
 Lifetime : 3600 seconds

- Mode : tunnel

- Perfect Forward Secrecy : Diffie-Hellman Group 2

IPSec Dead Peer Detection (DPD) will be enabled on the AWS Endpoint. We recommend configuring DPD on your endpoint as follows:

- DPD Interval : 10 - DPD Retries : 3

IPSec ESP (Encapsulating Security Payload) inserts additional headers to transmit packets. These headers require additional space, which reduces the amount of space available to transmit application data. To limit the impact of this behavior, we recommend the following configuration on your Customer Gateway:

- TCP MSS Adjustment : 1387 bytes - Clear Don't Fragment Bit : enabled

- Fragmentation : Before encryption

Tunnel

#3: Tunnel Interface Configuration

Your Customer Gateway must be configured with a tunnel interface that is associated with the IPSec tunnel. All traffic transmitted to the tunnel interface is encrypted and transmitted to the Virtual Private Gateway.

The Customer Gateway and Virtual Private Gateway each have two addresses that relate

Amazon Virtual Private Cloud Network Administrator Guide How to Test the Customer Gateway Configuration

to this IPSec tunnel. Each contains an outside address, upon which encrypted traffic is exchanged. Each also contain an inside address associated with the tunnel interface. The Customer Gateway outside IP address was provided when the Customer was created. Changing the IP address requires the creation of a new Customer Gateway. The Customer Gateway inside IP address should be configured on your tunnel interface. Outside IP Addresses: - Customer Gateway : YOUR UPLINK ADDRESS - Virtual Private Gateway : 72.21.209.225 Inside IP Addresses - Customer Gateway : 169.254.255.78/30 - Virtual Private Gateway : 169.254.255.77/30 Configure your tunnel to fragment at the optimal size: - Tunnel interface MTU : 1436 bytes #4: Static Routing Configuration: To route traffic between your internal network and your VPC, you will need a static route added to your router. Static Route Configuration Options: - Next hop : 169.254.255.77 You should add static routes towards your internal network on the VGW. The VGW will then send traffic towards your internal network over

How to Test the Customer Gateway Configuration

You must first test the gateway configuration for each tunnel.

the tunnels.

To test the customer gateway configuration for each tunnel

On your customer gateway, verify that you have added a static route to the VPC CIDR IP space to
use the tunnel interface.

Next you must test the connectivity for each tunnel by launching an instance into your VPC, and pinging the instance from your home network. Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- Configure your instance's security group and network ACL to enable inbound ICMP traffic.
- Ensure that you have configured routing for your VPN connection your subnet's route table must contain a route to the virtual private gateway. For more information, see Enable Route Propagation in Your Route Table in the *Amazon VPC User Guide*.

Amazon Virtual Private Cloud Network Administrator Guide How to Test the Customer Gateway Configuration

To test the end-to-end connectivity of each tunnel

- Launch an instance of one of the Amazon Linux AMIs into your VPC. The Amazon Linux AMIs
 are available in the Quick Start menu when you use the Launch Instances Wizard in the AWS
 Management Console. For more information, see the Amazon VPC Getting Started Guide.
- 2. After the instance is running, get its private IP address (for example, 10.0.0.4). The console displays the address as part of the instance's details.
- On a system in your home network, use the **ping** command with the instance's IP address. Make sure that the computer you ping from is behind the customer gateway. A successful response should be similar to the following.

```
PROMPT> ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Note

If you ping an instance from your customer gateway router, ensure that you are sourcing ping messages from an internal IP address, not a tunnel IP address. Some AMIs don't respond to ping messages from tunnel IP addresses.

If your tunnels don't test successfully, see Troubleshooting Generic Device Customer Gateway Connectivity Using Border Gateway Protocol (p. 182).

Troubleshooting

The following topics contain troubleshooting information that you can use if your tunnels aren't in the correct state when you test your customer gateway.

Topics

- Troubleshooting Cisco ASA Customer Gateway Connectivity (p. 161)
- Troubleshooting Cisco IOS Customer Gateway Connectivity (p. 164)
- Troubleshooting Cisco IOS Customer Gateway without Border Gateway Protocol Connectivity (p. 169)
- Troubleshooting Juniper JunOS Customer Gateway Connectivity (p. 173)
- Troubleshooting Juniper ScreenOS Customer Gateway Connectivity (p. 176)
- Troubleshooting Yamaha Customer Gateway Connectivity (p. 179)
- Troubleshooting Generic Device Customer Gateway Connectivity Using Border Gateway Protocol (p. 182)
- Troubleshooting Generic Device Customer Gateway without Border Gateway Protocol Connectivity (p. 185)

Troubleshooting Cisco ASA Customer Gateway Connectivity

When you troubleshoot the connectivity of a Cisco customer gateway, you need to consider three things: IKE, IPsec, and routing. You can troubleshoot these areas in any order, but we recommend that you start with IKE (at the bottom of the network stack) and move up.

Important

Some Cisco ASAs only support Active/Standby mode. When you use these Cisco ASAs, you can have only one active tunnel at a time. The other standby tunnel becomes active only if the first tunnel becomes unavailable. The standby tunnel may produce the following error in your log files, which can be ignored: Rejecting IPSec tunnel: no matching crypto map entry for remote proxy 0.0.0.0/0.0.0/0/0 local proxy 0.0.0.0/0.0.0/0.0.0.0/0/0 on interface outside

IKE

Use the following command. The response shows a customer gateway with IKE configured correctly.

ciscoasa# show crypto isakmp sa

Amazon Virtual Private Cloud Network Administrator Guide IPsec

```
Active SA: 2
Rekey SA: 0 (A tunnel will report 1 Active and 1 Rekey SA during rekey)
Total IKE SA: 2

1 IKE Peer: AWS_ENDPOINT_1
Type : L2L Role : initiator
Rekey : no State : MM_ACTIVE
```

You should see one or more lines containing an *src* of the remote gateway specified in the tunnels. The *state* should be MM_ACTIVE and *status* should be ACTIVE. The absence of an entry, or any entry in another state, indicates that IKE is not configured properly.

For further troubleshooting, run the following commands to enable log messages that provide diagnostic information.

```
router# term mon
router# debug crypto isakmp
```

To disable debugging, use the following command.

```
router# no debug crypto isakmp
```

IPsec

Use the following command. The response shows a customer gateway with IPsec configured correctly.

```
ciscoasa# show crypto ipsec sa
interface: outside
   Crypto map tag: VPN_crypto_map_name, seq num: 2, local addr:
172.25.50.101
     access-list integ-ppe-loopback extended permit ip
any vpc_subnet subnet_mask
     local ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
     remote ident (addr/mask/prot/port): (vpc_subnet/subnet_mask/0/0)
     current_peer: integ-ppe1
     #pkts encaps: 0, #pkts encrypt: 0, #pkts digest: 0
     #pkts decaps: 0, #pkts decrypt: 0, #pkts verify: 0
      #pkts compressed: 0, #pkts decompressed: 0
     #pkts not compressed: 0, #pkts comp failed: 0, #pkts decomp failed: 0
     #pre-frag successes: 0, #pre-frag failures: 0, #fragments created: 0
     #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly:
0
     #send errors: 0, #recv errors: 0
     local crypto endpt.: 172.25.50.101, remote crypto
endpt.: AWS_ENDPOINT_1
     path mtu 1500, ipsec overhead 74, media mtu 1500
     current outbound spi: 6D9F8D3B
     current inbound spi : 48B456A6
   inbound esp sas:
     spi: 0x48B456A6 (1219778214)
        transform: esp-aes esp-sha-hmac no compression
```

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```
in use settings = {L2L, Tunnel, PFS Group 2, }
     slot: 0, conn_id: 4710400, crypto-map: VPN_cry_map_1
     sa timing: remaining key lifetime (kB/sec): (4374000/3593)
     IV size: 16 bytes
     replay detection support: Y
     Anti replay bitmap:
     0x00000000 0x0000001
outbound esp sas:
 spi: 0x6D9F8D3B (1839172923)
    transform: esp-aes esp-sha-hmac no compression
     in use settings ={L2L, Tunnel, PFS Group 2, }
     slot: 0, conn_id: 4710400, crypto-map: VPN_cry_map_1
     sa timing: remaining key lifetime (kB/sec): (4374000/3593)
    IV size: 16 bytes
    replay detection support: Y
    Anti replay bitmap:
     0x00000000 0x0000001
```

For each tunnel interface, you should see both an inbound esp sas and outbound esp sas. This assumes that an SA is listed (for example, spi: 0x48B456A6), and IPsec is configured correctly.

In Cisco ASA, the IPsec will only come up after "interesting traffic" is sent. To always keep the IPsec active, we recommend configuring SLA monitor. SLA monitor will continue to send interesting traffic, keeping the IPsec active.

You can also use the following ping command to force your IPsec to start negotiation and go up.

```
ping ec2_instance_ip_address
Pinging ec2_instance_ip_address with 32 bytes of data:

Reply from ec2_instance_ip_address: bytes=32 time<1ms TTL=128
Reply from ec2_instance_ip_address: bytes=32 time<1ms TTL=128
Reply from ec2_instance_ip_address: bytes=32 time<1ms TTL=128
Ping statistics for 10.0.0.4:
Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),

Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms</pre>
```

For further troubleshooting, use the following command to enable debugging.

```
router# debug crypto ipsec
```

To disable debugging, use the following command.

```
router# no debug crypto ipsec
```

Routing

Ping the other end of the tunnel. If this is working, then your IPsec should be up and running fine. If this is not working, check your access lists, and refer the previous IPsec section.

If you are not able to reach your instances, check the following:

1. Verify that the access-list is configured to allow traffic that is associated with the crypto map. You can do this using the following command:

Amazon Virtual Private Cloud Network Administrator Guide Cisco IOS Customer Gateway Connectivity

```
ciscoasa# show run crypto
crypto ipsec transform-set transform-amzn esp-aes esp-sha-hmac
crypto map VPN_crypto_map_name 1 match address access-list-name
crypto map VPN_crypto_map_name 1 set pfs
crypto map VPN_crypto_map_name 1 set peer AWS_ENDPOINT_1 AWS_ENDPOINT_2
crypto map VPN_crypto_map_name 1 set transform-set transform-amzn
crypto map VPN_crypto_map_name 1 set security-association lifetime seconds
3600
```

2. Next, check the access list as follows.

```
ciscoasa# show run access-list access-list-name access-list acce
```

For example:

```
access-list access-list-name extended permit ip any 10.0.0.0 255.255.0.0
```

- 3. Verify that this access list is correct. The example access list in the previous step allows all internal traffic to the VPC subnet 10.0.0.0/16.
- 4. Run a traceroute from the Cisco ASA device, to see if it reaches the Amazon routers (for example, <u>AWS_ENDPOINT_1/AWS_ENDPOINT_2</u>).

If this reaches the Amazon router, then check the static routes you added in the Amazon console, and also the security groups for the particular instances.

5. For further troubleshooting, review the configuration.

Troubleshooting Cisco IOS Customer Gateway Connectivity

When you troubleshoot the connectivity of a Cisco customer gateway you need to consider four things: IKE, IPsec, tunnel, and BGP. You can troubleshoot these areas any order, but we recommend that you start with IKE (at the bottom of the network stack) and move up.

IKF

Use the following command. The response shows a customer gateway with IKE configured correctly.

```
router# show crypto isakmp sa
IPv4 Crypto ISAKMP SA
dst src state conn-id slot status
192.168.37.160 72.21.209.193 QM_IDLE 2001 0 ACTIVE
192.168.37.160 72.21.209.225 QM_IDLE 2002 0 ACTIVE
```

You should see one or more lines containing a src of the Remote Gateway specified in the tunnels. The state should be QM_IDLE and status should be ACTIVE. The absence of an entry, or any entry in another indicate that IKE is not configured properly.

For further troubleshooting, run the following commands to enable log messages that provide diagnostic information.

```
router# term mon
```

Amazon Virtual Private Cloud Network Administrator Guide IPsec

```
router# debug crypto isakmp
```

To disable debugging, use the following command.

```
router# no debug crypto isakmp
```

IPsec

Use the following command. The response shows a customer gateway with IPsec configured correctly.

```
router# show crypto ipsec sa
interface: Tunnell
   Crypto map tag: Tunnell-head-0, local addr 192.168.37.160
   protected vrf: (none)
   local ident (addr/mask/prot/port): (0.0.0.0/0.0.0/0/0)
   remote ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
   current_peer 72.21.209.225 port 500
    PERMIT, flags={origin_is_acl,}
    #pkts encaps: 149, #pkts encrypt: 149, #pkts digest: 149
     #pkts decaps: 146, #pkts decrypt: 146, #pkts verify: 146
     #pkts compressed: 0, #pkts decompressed: 0
     #pkts not compressed: 0, #pkts compr. failed: 0
     #pkts not decompressed: 0, #pkts decompress failed: 0
     #send errors 0, #recv errors 0
    local crypto endpt.: 174.78.144.73, remote crypto endpt.: 72.21.209.225
    path mtu 1500, ip mtu 1500, ip mtu idb FastEthernet0
    current outbound spi: 0xB8357C22(3090512930)
    inbound esp sas:
     spi: 0x6ADB173(112046451)
      transform: esp-aes esp-sha-hmac ,
      in use settings ={Tunnel, }
      conn id: 1, flow_id: Motorola SEC 2.0:1, crypto map: Tunnel1-head-0
      sa timing: remaining key lifetime (k/sec): (4467148/3189)
      IV size: 16 bytes
      replay detection support: Y replay window size: 128
      Status: ACTIVE
    inbound ah sas:
    inbound pcp sas:
    outbound esp sas:
     spi: 0xB8357C22(3090512930)
      transform: esp-aes esp-sha-hmac ,
      in use settings ={Tunnel, }
      conn id: 2, flow_id: Motorola SEC 2.0:2, crypto map: Tunnel1-head-0
      sa timing: remaining key lifetime (k/sec): (4467148/3189)
      IV size: 16 bytes
      replay detection support: Y replay window size: 128
      Status: ACTIVE
    outbound ah sas:
```

Amazon Virtual Private Cloud Network Administrator Guide IPsec

```
outbound pcp sas:
interface: Tunnel2
    Crypto map tag: Tunnel2-head-0, local addr 174.78.144.73
    protected vrf: (none)
    local ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
    remote ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
     current_peer 72.21.209.193 port 500
     PERMIT, flags={origin_is_acl,}
     #pkts encaps: 26, #pkts encrypt: 26, #pkts digest: 26
     #pkts decaps: 24, #pkts decrypt: 24, #pkts verify: 24
     #pkts compressed: 0, #pkts decompressed: 0
     #pkts not compressed: 0, #pkts compr. failed: 0
     #pkts not decompressed: 0, #pkts decompress failed: 0
     #send errors 0, #recv errors 0
    local crypto endpt.: 174.78.144.73, remote crypto endpt.: 72.21.209.193
    path mtu 1500, ip mtu 1500, ip mtu idb FastEthernet0
    current outbound spi: 0xF59A3FF6(4120526838)
     inbound esp sas:
     spi: 0xB6720137(3060924727)
      transform: esp-aes esp-sha-hmac ,
      in use settings ={Tunnel, }
      conn id: 3, flow_id: Motorola SEC 2.0:3, crypto map: Tunnel2-head-0
      sa timing: remaining key lifetime (k/sec): (4387273/3492)
      IV size: 16 bytes
      replay detection support: Y replay window size: 128
      Status: ACTIVE
     inbound ah sas:
     inbound pcp sas:
    outbound esp sas:
     spi: 0xF59A3FF6(4120526838)
      transform: esp-aes esp-sha-hmac ,
      in use settings ={Tunnel, }
      conn id: 4, flow_id: Motorola SEC 2.0:4, crypto map: Tunnel2-head-0
      sa timing: remaining key lifetime (k/sec): (4387273/3492)
      IV size: 16 bytes
      replay detection support: Y replay window size: 128
      Status: ACTIVE
     outbound ah sas:
    outbound pcp sas:
```

For each tunnel interface, you should see both an *inbound esp sas* and *outbound esp sas*. Assuming an SA is listed ("spi: 0xF95D2F3C", for example) and the *Status* is ACTIVE, IPsec is configured correctly.

For further troubleshooting, use the following command to enable debugging.

```
router# debug crypto ipsec
```

Use the following command to disable debugging.

Amazon Virtual Private Cloud Network Administrator Guide Tunnel

```
router# no debug crypto ipsec
```

Tunnel

First, check that you have the necessary firewall rules in place. For a list of the rules, see If You Have a Firewall Between the Internet and Your Customer Gateway (p. 10).

If your firewall rules are set up correctly, then continue troubleshooting with the following command.

```
router# show interfaces tun1
Tunnell is up, line protocol is up
 Hardware is Tunnel
  Internet address is 169.254.255.2/30
 MTU 17867 bytes, BW 100 Kbit/sec, DLY 50000 usec,
   reliability 255/255, txload 2/255, rxload 1/255
  Encapsulation TUNNEL, loopback not set
  Keepalive not set
  Tunnel source 174.78.144.73, destination 72.21.209.225
  Tunnel protocol/transport IPSEC/IP
  Tunnel TTL 255
  Tunnel transport MTU 1427 bytes
  Tunnel transmit bandwidth 8000 (kbps)
  Tunnel receive bandwidth 8000 (kbps)
  Tunnel protection via IPSec (profile "ipsec-vpn-92df3bfb-0")
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/0 (size/max)
  5 minute input rate 0 bits/sec, 1 packets/sec
  5 minute output rate 1000 bits/sec, 1 packets/sec
    407 packets input, 30010 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
```

Ensure the *line protocol* is up. Check that the tunnel source IP address, source interface and destination respectively match the tunnel configuration for the customer gateway outside IP address, interface, and virtual private gateway outside IP address. Ensure that *Tunnel protection via IPSec* is present. Make sure to run the command on both tunnel interfaces. To resolve any problems here, review the configuration.

Also use the following command, replacing 169.254.255.1 with the inside IP address of your virtual private gateway.

```
router# ping 169.254.255.1 df-bit size 1410

Type escape sequence to abort.

Sending 5, 1410-byte ICMP Echos to 169.254.255.1, timeout is 2 seconds:

Packet sent with the DF bit set
!!!!!
```

You should see 5 exclamation points.

For further troubleshooting, review the configuration.

BGP

Use the following command.

```
router# show ip bgp summary
BGP router identifier 192.168.37.160, local AS number 65000
BGP table version is 8, main routing table version 8
2 network entries using 312 bytes of memory
2 path entries using 136 bytes of memory
3/1 BGP path/bestpath attribute entries using 444 bytes of memory
1 BGP AS-PATH entries using 24 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
O BGP filter-list cache entries using O bytes of memory
Bitfield cache entries: current 1 (at peak 2) using 32 bytes of memory
BGP using 948 total bytes of memory
BGP activity 4/1 prefixes, 4/1 paths, scan interval 15 secs
Neighbor
                     AS MsgRcvd MsgSent
                                          TblVer InQ OutQ Up/Down State/
PfxRcd
169.254.255.1
                4 7224
                            363
                                    323
                                                8
                                                     0
                                                          0 00:54:21
                                                                            1
169.254.255.5
                4 7224
                            364
                                    323
                                                8
                                                     0
                                                          0 00:00:24
                                                                            1
```

Here, both neighbors should be listed. For each, you should see a State/PfxRcd value of 1.

If the BGP peering is up, verify that your customer gateway router is advertising the default route (0.0.0.0/0) to the VPC.

```
router# show bgp all neighbors 169.254.255.1 advertised-routes
For address family: IPv4 Unicast
BGP table version is 3, local router ID is 174.78.144.73
Status codes: s suppressed, d damped, h history, * valid, > best, i -
 internal,
    r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
Originating default network 0.0.0.0
Network
                   Next Hop
                                      Metric LocPrf Weight Path
*> 10.120.0.0/16
                   169.254.255.1
                                       100
                                                   0 7224
Total number of prefixes 1
```

Additionally, ensure that you're receiving the prefix corresponding to your VPC from the virtual private gateway.

```
router# show ip route bgp

10.0.0.0/16 is subnetted, 1 subnets

B 10.255.0.0 [20/0] via 169.254.255.1, 00:00:20
```

For further troubleshooting, review the configuration.

Virtual Private Gateway Attachment

Make sure your virtual private gateway is attached to your VPC. Your integration team does this with the AWS Management Console.

If you have questions or need further assistance, please use the Amazon VPC forum.

Troubleshooting Cisco IOS Customer Gateway without Border Gateway Protocol Connectivity

When you troubleshoot the connectivity of a Cisco customer gateway, you need to consider three things: IKE, IPsec and tunnel. You can troubleshoot these areas in any order, but we recommend that you start with IKE (at the bottom of the network stack) and move up.

IKE

Use the following command. The response shows a customer gateway with IKE configured correctly.

```
router# show crypto isakmp sa
IPv4 Crypto ISAKMP SA
dst src state conn-id slot status
174.78.144.73 205.251.233.121 QM_IDLE 2001 0 ACTIVE
174.78.144.73 205.251.233.122 QM_IDLE 2002 0 ACTIVE
```

You should see one or more lines containing an *src* of the remote gateway specified in the tunnels. The *state* should be QM_IDLE and *status* should be ACTIVE. The absence of an entry, or any entry in another state, indicates that IKE is not configured properly.

For further troubleshooting, run the following commands to enable log messages that provide diagnostic information.

```
router# term mon
router# debug crypto isakmp
```

To disable debugging, use the following command.

```
router# no debug crypto isakmp
```

IPsec

Use the following command. The response shows a customer gateway with IPsec configured correctly.

```
router# show crypto ipsec sa
interface: Tunnel1
   Crypto map tag: Tunnell-head-0, local addr 174.78.144.73
   protected vrf: (none)
   local ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
   remote ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
   current_peer 72.21.209.225 port 500
    PERMIT, flags={origin_is_acl,}
    #pkts encaps: 149, #pkts encrypt: 149, #pkts digest: 149
     #pkts decaps: 146, #pkts decrypt: 146, #pkts verify: 146
     #pkts compressed: 0, #pkts decompressed: 0
     #pkts not compressed: 0, #pkts compr. failed: 0
     #pkts not decompressed: 0, #pkts decompress failed: 0
     #send errors 0, #recv errors 0
    local crypto endpt.: 174.78.144.73, remote crypto endpt.:205.251.233.121
    path mtu 1500, ip mtu 1500, ip mtu idb FastEthernet0
     current outbound spi: 0xB8357C22(3090512930)
```

```
inbound esp sas:
     spi: 0x6ADB173(112046451)
      transform: esp-aes esp-sha-hmac ,
      in use settings ={Tunnel, }
      conn id: 1, flow_id: Motorola SEC 2.0:1, crypto map: Tunnel1-head-0
      sa timing: remaining key lifetime (k/sec): (4467148/3189)
      IV size: 16 bytes
      replay detection support: Y replay window size: 128
      Status: ACTIVE
     inbound ah sas:
    inbound pcp sas:
    outbound esp sas:
     spi: 0xB8357C22(3090512930)
      transform: esp-aes esp-sha-hmac ,
      in use settings ={Tunnel, }
      conn id: 2, flow_id: Motorola SEC 2.0:2, crypto map: Tunnel1-head-0
      sa timing: remaining key lifetime (k/sec): (4467148/3189)
      IV size: 16 bytes
      replay detection support: Y replay window size: 128
      Status: ACTIVE
    outbound ah sas:
    outbound pcp sas:
interface: Tunnel2
    Crypto map tag: Tunnel2-head-0, local addr 205.251.233.122
    protected vrf: (none)
    local ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
    remote ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
    current_peer 72.21.209.193 port 500
     PERMIT, flags={origin_is_acl,}
     #pkts encaps: 26, #pkts encrypt: 26, #pkts digest: 26
     #pkts decaps: 24, #pkts decrypt: 24, #pkts verify: 24
     #pkts compressed: 0, #pkts decompressed: 0
     #pkts not compressed: 0, #pkts compr. failed: 0
     #pkts not decompressed: 0, #pkts decompress failed: 0
     #send errors 0, #recv errors 0
    local crypto endpt.: 174.78.144.73, remote crypto endpt.: 205.251.233.122
    path mtu 1500, ip mtu 1500, ip mtu idb FastEthernet0
    current outbound spi: 0xF59A3FF6(4120526838)
    inbound esp sas:
     spi: 0xB6720137(3060924727)
      transform: esp-aes esp-sha-hmac ,
      in use settings ={Tunnel, }
      conn id: 3, flow_id: Motorola SEC 2.0:3, crypto map: Tunnel2-head-0
      sa timing: remaining key lifetime (k/sec): (4387273/3492)
      IV size: 16 bytes
      replay detection support: Y replay window size: 128
      Status: ACTIVE
     inbound ah sas:
```

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```
inbound pcp sas:

outbound esp sas:
    spi: 0xF59A3FF6(4120526838)
    transform: esp-aes esp-sha-hmac ,
    in use settings ={Tunnel, }
    conn id: 4, flow_id: Motorola SEC 2.0:4, crypto map: Tunnel2-head-0
    sa timing: remaining key lifetime (k/sec): (4387273/3492)
    IV size: 16 bytes
    replay detection support: Y replay window size: 128
    Status: ACTIVE

outbound ah sas:
outbound pcp sas:
```

For each tunnel interface, you should see both an inbound esp sas and outbound esp sas. This assumes that an SA is listed (for example, spi: 0x48B456A6), the status is ACTIVE, and IPsec is configured correctly.

For further troubleshooting, use the following command to enable debugging.

```
router# debug crypto ipsec
```

To disable debugging, use the following command.

```
router# no debug crypto ipsec
```

Tunnel

First, check that you have the necessary firewall rules in place. For a list of the rules, see If You Have a Firewall Between the Internet and Your Customer Gateway (p. 10).

If your firewall rules are set up correctly, then continue troubleshooting with the following command.

```
router# show interfaces tun1
Tunnell is up, line protocol is up
 Hardware is Tunnel
  Internet address is 169.254.249.18/30
  MTU 17867 bytes, BW 100 Kbit/sec, DLY 50000 usec,
   reliability 255/255, txload 2/255, rxload 1/255
  Encapsulation TUNNEL, loopback not set
  Keepalive not set
  Tunnel source 174.78.144.73, destination 205.251.233.121
  Tunnel protocol/transport IPSEC/IP
  Tunnel TTL 255
  Tunnel transport MTU 1427 bytes
  Tunnel transmit bandwidth 8000 (kbps)
  Tunnel receive bandwidth 8000 (kbps)
  Tunnel protection via IPSec (profile "ipsec-vpn-92df3bfb-0")
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/0 (size/max)
  5 minute input rate 0 bits/sec, 1 packets/sec
```

Amazon Virtual Private Cloud Network Administrator Guide Tunnel

```
5 minute output rate 1000 bits/sec, 1 packets/sec
407 packets input, 30010 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
```

Ensure the line protocol is up. Check that the tunnel source IP address, source interface, and destination respectively match the tunnel configuration for the customer gateway outside IP address, interface, and virtual private gateway outside IP address. Ensure that Tunnel protection through IPSec is present. Make sure to run the command on both tunnel interfaces. To resolve any problems, review the configuration.

You can also use the following command, replacing 169.254.249.18 with the inside IP address of your virtual private gateway.

```
router# ping 169.254.249.18 df-bit size 1410

Type escape sequence to abort.

Sending 5, 1410-byte ICMP Echos to 169.254.249.18, timeout is 2 seconds:

Packet sent with the DF bit set
!!!!!
```

You should see five exclamation points.

Routing

To see your static route table, use the following command.

```
router# sh ip route static

1.0.0.0/8 is variably subnetted

S 10.0.0.0/16 is directly connected, Tunnell
is directly connected, Tunnel2
```

You should see that the static route for the VPC CIDR through both tunnels exists. If it does not exist, add the static routes as shown here.

```
router# ip route 10.0.0.0 255.255.0.0 Tunnel1 track 100 router# ip route 10.0.0.0 255.255.0.0 Tunnel2 track 200
```

Checking the SLA Monitor

```
router# show ip sla statistics 100
IPSLAs Latest Operation Statistics

IPSLA operation id: 100
Latest RTT: 128 milliseconds

Latest operation start time: *18:08:02.155 UTC Wed Jul 15 2012

Latest operation return code: OK

Number of successes: 3

Number of failures: 0

Operation time to live: Forever
```

```
router# show ip sla statistics 200
IPSLAs Latest Operation Statistics
IPSLA operation id: 200
Latest RTT: 128 milliseconds
```

Amazon Virtual Private Cloud Network Administrator Guide Virtual Private Gateway Attachment

```
Latest operation start time: *18:08:02.155 UTC Wed Jul 15 2012
Latest operation return code: OK
Number of successes: 3
Number of failures: 0
Operation time to live: Forever
```

The value of "Number of successes" indicates whether the SLA monitor has been set up successfully.

For further troubleshooting, review the configuration.

Virtual Private Gateway Attachment

Verify that your virtual private gateway is attached to your VPC. Your integration team does this with the AWS Management Console.

If you have questions or need further assistance, please use the Amazon VPC forum.

Troubleshooting Juniper JunOS Customer Gateway Connectivity

When you troubleshoot the connectivity of a Juniper customer gateway you need to consider four things: IKE, IPsec, tunnel, and BGP. You can troubleshoot these areas in any order, but we recommend that you start with IKE (at the bottom of the network stack) and move up.

IKE

Use the following command. The response shows a customer gateway with IKE configured correctly.

```
user@router> show security ike security-associations
Index Remote Address State Initiator cookie Responder cookie Mode
4 72.21.209.225 UP c4cd953602568b74 0d6d194993328b02 Main
3 72.21.209.193 UP b8c8fb7dc68d9173 ca7cb0abaedeb4bb Main
```

You should see one or more lines containing a Remote Address of the Remote Gateway specified in the tunnels. The *State* should be UP. The absence of an entry, or any entry in another state (such as DOWN) is an indication that IKE is not configured properly.

For further troubleshooting, enable the IKE trace options (as recommended in the example configuration information (see Example: Juniper J-Series JunOS Device (p. 91)). Then run the following command to print a variety of debugging messages to the screen.

```
user@router> monitor start kmd
```

From an external host, you can retrieve the entire log file with the following command.

```
scp username@router.hostname:/var/log/kmd
```

IPsec

Use the following command. The response shows a customer gateway with IPsec configured correctly.

```
user@router> show security ipsec security-associations
```

Amazon Virtual Private Cloud Network Administrator Guide Tunnel

```
Total active tunnels: 2
                     Port Algorithm
                                            SPI
                                                     Life:sec/kb Mon vsys
     Gateway
<131073 72.21.209.225 500
                           ESP:aes-128/sha1 df27aae4 326/ unlim
                                                                     0
>131073 72.21.209.225 500
                           ESP:aes-128/sha1 5de29aa1 326/ unlim
                                                                     0
<131074 72.21.209.193 500
                           ESP:aes-128/sha1 dd16c453 300/ unlim
                                                                     0
>131074 72.21.209.193 500
                           ESP:aes-128/sha1 cle0eb29 300/ unlim
                                                                     0
```

Specifically, you should see at least two lines per Gateway address (corresponding to the Remote Gateway). Note the carets at the beginning of each line (< >) which indicate the direction of traffic for the particular entry. The output has separate lines for inbound traffic ("<", traffic from the virtual private gateway to this customer gateway) and outbound traffic (">").

For further troubleshooting, enable the IKE traceoptions (for more information, see the preceding section about IKE).

Tunnel

First, double-check that you have the necessary firewall rules in place. For a list of the rules, see If You Have a Firewall Between the Internet and Your Customer Gateway (p. 10).

If your firewall rules are set up correctly, then continue troubleshooting with the following command.

```
user@router> show interfaces st0.1
Logical interface st0.1 (Index 70) (SNMP ifIndex 126)
Flags: Point-To-Point SNMP-Traps Encapsulation: Secure-Tunnel
Input packets: 8719
Output packets: 41841
Security: Zone: Trust
Allowed host-inbound traffic: bgp ping ssh traceroute
Protocol inet, MTU: 9192
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 169.254.255.0/30, Local: 169.254.255.2
```

Make sure that the *Security: Zone* is correct, and that the *Local* address matches the customer gateway tunnel inside address.

Next, use the following command, replacing 169.254.255.1 with the inside IP address of your virtual private gateway. Your results should look like the response shown here.

```
user@router> ping 169.254.255.1 size 1382 do-not-fragment
PING 169.254.255.1 (169.254.255.1): 1410 data bytes
64 bytes from 169.254.255.1: icmp_seq=0 ttl=64 time=71.080 ms
64 bytes from 169.254.255.1: icmp_seq=1 ttl=64 time=70.585 ms
```

For further troubleshooting, review the configuration.

BGP

Use the following command.

```
user@router> show bgp summary
Groups: 1 Peers: 2 Down peers: 0
Table Tot Paths Act Paths Suppressed History Damp State
Pending
inet.0 2 1 0 0 0
0
```

Amazon Virtual Private Cloud Network Administrator Guide BGP

Peer	AS	InPkt	OutPkt	OutQ	Flaps Las	st Up/Dwn
State #Active/Received/Accepted/Damped						
169.254.255.1	7224	9	10	0	0	1:00
1/1/1/0	0/0/0/0					
169.254.255.5	7224	8	9	0	0	56
0/1/1/0	0/0/0/0					

For further troubleshooting, use the following command, replacing 169.254.255.1 with the inside IP address of your virtual private gateway.

```
user@router> show bgp neighbor 169.254.255.1
Peer: 169.254.255.1+179 AS 7224 Local: 169.254.255.2+57175 AS 65000
 Type: External State: Established Flags: <ImportEval Sync>
 Last State: OpenConfirm Last Event: RecvKeepAlive
 Last Error: None
 Export: [ EXPORT-DEFAULT ]
 Options: <Preference HoldTime PeerAS LocalAS Refresh>
 Holdtime: 30 Preference: 170 Local AS: 65000 Local System AS: 0
 Number of flaps: 0
 Peer ID: 169.254.255.1 Local ID: 10.50.0.10
                                                    Active Holdtime: 30
 Keepalive Interval: 10
                           Peer index: 0
 BFD: disabled, down
 Local Interface: st0.1
 NLRI for restart configured on peer: inet-unicast
 NLRI advertised by peer: inet-unicast
 NLRI for this session: inet-unicast
 Peer supports Refresh capability (2)
 Restart time configured on the peer: 120
 Stale routes from peer are kept for: 300
 Restart time requested by this peer: 120
 NLRI that peer supports restart for: inet-unicast
 NLRI that restart is negotiated for: inet-unicast
 NLRI of received end-of-rib markers: inet-unicast
 NLRI of all end-of-rib markers sent: inet-unicast
 Peer supports 4 byte AS extension (peer-as 7224)
 Table inet.0 Bit: 10000
   RIB State: BGP restart is complete
   Send state: in sync
   Active prefixes:
                                1
                                1
   Received prefixes:
   Accepted prefixes:
                                1
   Suppressed due to damping: 0
   Advertised prefixes:
                               1
Last traffic (seconds): Received 4
                                    Sent 8 Checked 4
Input messages: Total 24 Updates 2 Refreshes 0
                                                           Octets 505
Output messages: Total 26
                           Updates 1
                                          Refreshes 0
                                                           Octets 582
Output Queue[0]: 0
```

Here you should see *Received prefixes* and *Advertised prefixes* listed at 1 each. This should be within the *Table inet.0* section.

If the State is not Established, check the Last State and Last Error for details of what is required to correct the problem.

If the BGP peering is up, verify that your customer gateway router is advertising the default route (0.0.0.0/0) to the VPC.

```
user@router> show route advertising-protocol bgp 169.254.255.1
```

Amazon Virtual Private Cloud Network Administrator Guide Virtual Private Gateway Attachment

```
inet.0: 10 destinations, 11 routes (10 active, 0 holddown, 0 hidden)
Prefix Nexthop MED Lclpref AS path
* 0.0.0.0/0 Self I
```

Additionally, ensure that you're receiving the prefix corresponding to your VPC from the virtual private gateway.

```
user@router> show route receive-protocol bgp 169.254.255.1

inet.0: 10 destinations, 11 routes (10 active, 0 holddown, 0 hidden)

Prefix Nexthop MED Lclpref AS path
* 10.110.0.0/16 169.254.255.1 100 7224 I
```

Virtual Private Gateway Attachment

Make sure your virtual private gateway is attached to your VPC. Your integration team does this with the AWS Management Console.

If you have questions or need further assistance, please use the Amazon VPC forum.

Troubleshooting Juniper ScreenOS Customer Gateway Connectivity

When you troubleshoot the connectivity of a Juniper ScreenOS-based customer gateway you need to consider four things: IKE, IPsec, tunnel, and BGP. You can troubleshoot these areas in any order, but we recommend that you start with IKE (at the bottom of the network stack) and move up.

IKE and **IPsec**

Use the following command. The response shows a customer gateway with IKE configured correctly.

```
ssg5-serial-> get sa
total configured sa: 2
HEX ID Gateway
                       Port Algorithm
                                          SPI
                                                   Life:sec kb Sta
                                                                    PID
vsys
00000002< 72.21.209.225 500 esp:a128/sha1 80041ca4 3385 unlim A/-
                                                                      -1 0
00000002>
           72.21.209.225 500 esp:a128/sha1 8cdd274a 3385 unlim A/-
00000001<
           72.21.209.193 500 esp:a128/shal ecf0bec7 3580 unlim A/-
                                                                      -1 0
00000001>
           72.21.209.193 500 esp:a128/sha1 14bf7894 3580 unlim A/-
                                                                      -1 0
```

You should see one or more lines containing a Remote Address of the Remote Gateway specified in the tunnels. The Sta should be A/- and the SPI should be a hexadecimal number other than 00000000. Entries in other states indicate that IKE is not configured properly.

For further troubleshooting, enable the IKE trace options (as recommended in the example configuration information (see Example: Juniper ScreenOS Device (p. 115)).

Tunnel

First, double-check that you have the necessary firewall rules in place. For a list of the rules, see If You Have a Firewall Between the Internet and Your Customer Gateway (p. 10).

If your firewall rules are set up correctly, then continue troubleshooting with the following command.

Amazon Virtual Private Cloud Network Administrator Guide BGP

```
ssg5-serial-> get interface tunnel.1
 Interface tunnel.1:
 description tunnel.1
 number 20, if_info 1768, if_index 1, mode route
 link ready
 vsys Root, zone Trust, vr trust-vr
 admin mtu 1500, operating mtu 1500, default mtu 1500
 *ip 169.254.255.2/30
 *manage ip 169.254.255.2
 route-deny disable
 bound vpn:
   IPSEC-1
 Next-Hop Tunnel Binding table
 Flag Status Next-Hop(IP)
                            tunnel-id VPN
 pmtu-v4 disabled
 ping disabled, telnet disabled, SSH disabled, SNMP disabled
 web disabled, ident-reset disabled, SSL disabled
 OSPF disabled BGP enabled RIP disabled RIPng disabled mtrace disabled
 PIM: not configured IGMP not configured
 NHRP disabled
 bandwidth: physical Okbps, configured egress [gbw Okbps mbw Okbps]
            configured ingress mbw Okbps, current bw Okbps
            total allocated gbw 0kbps
```

Make sure that you see *link:ready*, and that the *IP* address matches the customer gateway tunnel inside address.

Next, use the following command, replacing 169.254.255.1 with the inside IP address of your virtual private gateway. Your results should look like the response shown here.

```
ssg5-serial-> ping 169.254.255.1
Type escape sequence to abort

Sending 5, 100-byte ICMP Echos to 169.254.255.1, timeout is 1 seconds
!!!!!
Success Rate is 100 percent (5/5), round-trip time min/avg/max=32/32/33 ms
```

For further troubleshooting, review the configuration.

BGP

Use the following command.

```
ssg5-serial-> get vrouter trust-vr protocol bgp neighbor

Peer AS Remote IP Local IP Wt Status State ConnID Up/

Down

7224 169.254.255.1 169.254.255.2 100 Enabled ESTABLISH 10

00:01:01

7224 169.254.255.5 169.254.255.6 100 Enabled ESTABLISH 11

00:00:59
```

Both BGP peers should be listed as State: ESTABLISH, which means the BGP connection to the virtual private gateway is active.

For further troubleshooting, use the following command, replacing 169.254.255.1 with the inside IP address of your virtual private gateway.

```
ssg5-serial-> get vr trust-vr prot bgp neigh 169.254.255.1
peer: 169.254.255.1, remote AS: 7224, admin status: enable
type: EBGP, multihop: 0(disable), MED: node default(0)
connection state: ESTABLISH, connection id: 18 retry interval: node
default(120s), cur retry time 15s
configured hold time: node default(90s), configured keepalive: node
default(30s)
configured adv-interval: default(30s)
designated local IP: n/a
local IP address/port: 169.254.255.2/13946, remote IP address/port:
169.254.255.1/179
router ID of peer: 169.254.255.1, remote AS: 7224
negotiated hold time: 30s, negotiated keepalive interval: 10s
route map in name: , route map out name:
weight: 100 (default)
self as next hop: disable
send default route to peer: disable
ignore default route from peer: disable
send community path attribute: no
reflector client: no
Neighbor Capabilities:
 Route refresh: advertised and received
 Address family IPv4 Unicast: advertised and received
force reconnect is disable
total messages to peer: 106, from peer: 106
update messages to peer: 6, from peer: 4
Tx queue length 0, Tx queue HWM: 1
route-refresh messages to peer: 0, from peer: 0
last reset 00:05:33 ago, due to BGP send Notification(Hold Timer Expired)
(code 4 : subcode 0)
number of total successful connections: 4
connected: 2 minutes 6 seconds
Elapsed time since last update: 2 minutes 6 seconds
```

If the BGP peering is up, verify that your customer gateway router is advertising the default route (0.0.0.0/0) to the VPC. Note that this command applies to ScreenOS version 6.2.0 and higher.

```
ssg5-serial-> get vr trust-vr protocol bgp rib neighbor 169.254.255.1

advertised

i: IBGP route, e: EBGP route, >: best route, *: valid route

Prefix Nexthop Wt Pref Med Orig AS-Path

>i 0.0.0.0/0 0.0.0.0 32768 100 0 IGP

Total IPv4 routes advertised: 1
```

Additionally, ensure that you're receiving the prefix corresponding to your VPC from the virtual private gateway. Note that this command applies to ScreenOS version 6.2.0 and higher.

```
ssg5-serial-> get vr trust-vr protocol bgp rib neighbor 169.254.255.1
received
i: IBGP route, e: EBGP route, >: best route, *: valid route
Prefix Nexthop Wt Pref Med Orig AS-Path
>e* 10.0.0.0/16 169.254.255.1 100 100 IGP 7224
```

Total IPv4 routes received: 1

Virtual Private Gateway Attachment

Make sure your virtual private gateway is attached to your VPC. Your integration team does this with the AWS Management Console.

If you have questions or need further assistance, please use the Amazon VPC forum.

Troubleshooting Yamaha Customer Gateway Connectivity

When you troubleshoot the connectivity of a Yamaha customer gateway you need to consider four things: IKE, IPsec, tunnel, and BGP. You can troubleshoot these areas in any order, but we recommend that you start with IKE (at the bottom of the network stack) and move up.

IKE

Use the following command. The response shows a customer gateway with IKE configured correctly.

You should see a line containing a *remote-id* of the Remote Gateway specified in the tunnels. You can list all the security associations (SAs) by omitting the tunnel number.

For further troubleshooting, run the following commands to enable DEBUG level log messages that provide diagnostic information.

```
# syslog debug on
# ipsec ike log message-info payload-info key-info
```

To cancel the logged items, use the following command.

```
# no ipsec ike log
# no syslog debug on
```

IPsec

Use the following command. The response shows a customer gateway with IPsec configured correctly.

```
# show ipsec sa gateway 1 detail
SA[1] Duration: 10675s
Local ID: YOUR_LOCAL_NETWORK_ADDRESS
Remote ID: 72.21.209.225
Protocol: IKE
Algorithm: AES-CBC, SHA-1, MODP 1024bit
SPI: 6b ce fd 8a d5 30 9b 02 0c f3 87 52 4a 87 6e 77
```

Amazon Virtual Private Cloud Network Administrator Guide Tunnel

```
Key: ** ** ** ** ** (confidential)
                                ** ** ** ** **
_____
SA[2] Duration: 1719s
Local ID: YOUR_LOCAL_NETWORK_ADDRESS
Remote ID: 72.21.209.225
Direction: send
Protocol: ESP (Mode: tunnel)
Algorithm: AES-CBC (for Auth.: HMAC-SHA)
SPI: a6 67 47 47
Key: ** ** ** ** ** (confidential) ** ** ** **
_____
SA[3] Duration: 1719s
Local ID: YOUR_LOCAL_NETWORK_ADDRESS
Remote ID: 72.21.209.225
Direction: receive
Protocol: ESP (Mode: tunnel)
Algorithm: AES-CBC (for Auth.: HMAC-SHA)
SPI: 6b 98 69 2b
Key: ** ** ** ** ** (confidential) ** ** ** **
SA[4] Duration: 10681s
Local ID: YOUR_LOCAL_NETWORK_ADDRESS
Remote ID: 72.21.209.225
Protocol: IKE
Algorithm: AES-CBC, SHA-1, MODP 1024bit
SPI: e8 45 55 38 90 45 3f 67 a8 74 ca 71 ba bb 75 ee
Key: ** ** ** ** ** (confidential) ** ** ** **
```

For each tunnel interface, you should see both receive sas and send sas.

For further troubleshooting, use the following command to enable debugging.

```
# syslog debug on
# ipsec ike log message-info payload-info key-info
```

Use the following command to disable debugging.

```
# no ipsec ike log
# no syslog debug on
```

Tunnel

First, check that you have the necessary firewall rules in place. For a list of the rules, see If You Have a Firewall Between the Internet and Your Customer Gateway (p. 10).

If your firewall rules are set up correctly, then continue troubleshooting with the following command.

Amazon Virtual Private Cloud Network Administrator Guide BGP

```
Transmitted: (IPv4) 3933 packets [241407 octets] (IPv6) 0 packet [0 octet]
```

Ensure the *current status* is online. Also, ensure that *Interface type* is IPsec. Make sure to run the command on both tunnel interfaces. To resolve any problems here, review the configuration.

BGP

Use the following command.

```
# show status bgp neighbor
BGP neighbor is 169.254.255.1, remote AS 7224, local AS 65000, external link
  BGP version 0, remote router ID 0.0.0.0
  BGP state = Active
 Last read 00:00:00, hold time is 0, keepalive interval is 0 seconds
  Received 0 messages, 0 notifications, 0 in queue
  Sent 0 messages, 0 notifications, 0 in queue
  Connection established 0; dropped 0
 Last reset never
Local host: unspecified
Foreign host: 169.254.255.1, Foreign port: 0
BGP neighbor is 169.254.255.5, remote AS 7224, local AS 65000, external link
 BGP version 0, remote router ID 0.0.0.0
  BGP state = Active
  Last read 00:00:00, hold time is 0, keepalive interval is 0 seconds
  Received 0 messages, 0 notifications, 0 in queue
  Sent 0 messages, 0 notifications, 0 in queue
  Connection established 0; dropped 0
 Last reset never
Local host: unspecified
Foreign host: 169.254.255.5, Foreign port:
```

Here, both neighbors should be listed. For each, you should see a BGP state value of Active.

If the BGP peering is up, verify that your customer gateway router is advertising the default route (0.0.0.0/0) to the VPC.

Additionally, ensure that you're receiving the prefix corresponding to your VPC from the virtual private gateway.

For further troubleshooting, review the configuration.

Virtual Private Gateway Attachment

Make sure your virtual private gateway is attached to your VPC. Your integration team does this with the AWS Management Console.

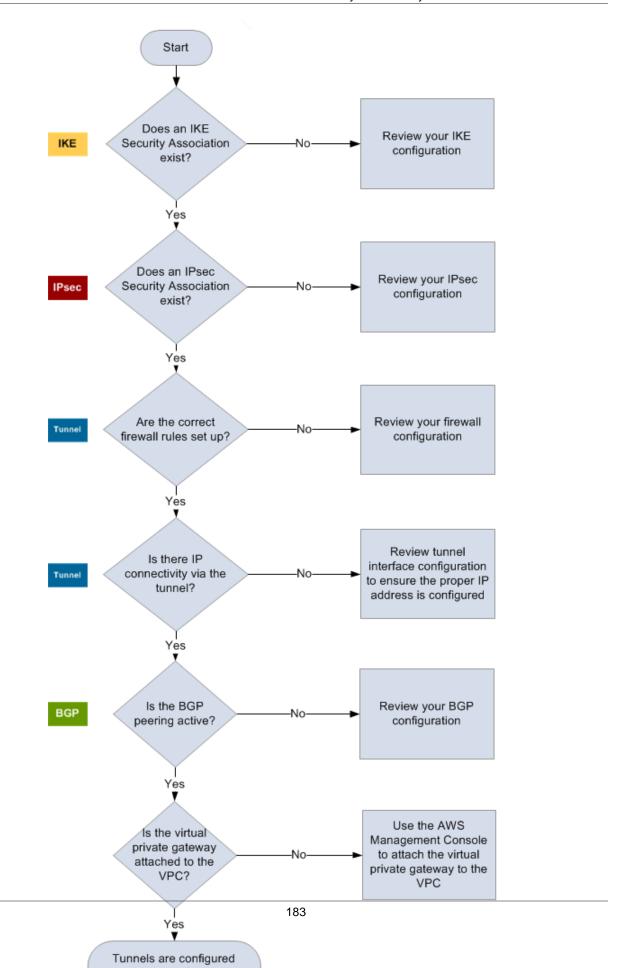
If you have questions or need further assistance, please use the Amazon VPC forum.

Troubleshooting Generic Device Customer Gateway Connectivity Using Border Gateway Protocol

The following diagram and table provide general instructions for troubleshooting a customer gateway that uses Border Gateway Protocol for devices other than those listed in this guide.

Tip

When troubleshooting problems, you might find it useful to enable the debug features of your gateway device. Consult your gateway device vendor for details.





Determine if an IKE Security Association exists.

An IKE security association is required to exchange keys that are used to establish the IPsec Security Association.

If no IKE security association exists, review your IKE configuration settings. You must configure the encryption, authentication, perfect-forward-secrecy, and mode parameters as listed in the customer gateway configuration.

If an IKE security association exists, move on to IPsec.



Determine if an IPsec Security Association exists.

An IPsec security association is the tunnel itself. Query your customer gateway to determine if an IPsec Security Association is active. Proper configuration of the IPsec SA is critical. You must configure the encryption, authentication, perfect-forward-secrecy, and mode parameters as listed in the customer gateway configuration.

If no IPsec Security Association exists, review your IPsec configuration.

If an IPsec Security Association exists, move on to the tunnel.



Confirm the required firewall rules are set up (for a list of the rules, see If You Have a Firewall Between the Internet and Your Customer Gateway (p. 10)). If they are, move forward.

Determine if there is IP connectivity via the tunnel.

Each side of the tunnel has an IP address as specified in the customer gateway configuration. The virtual private gateway address is the address used as the BGP neighbor address. From your customer gateway, ping this address to determine if IP traffic is being properly encrypted and decrypted.

If the ping isn't successful, review your tunnel interface configuration to ensure the proper IP address is configured.

If the ping is successful, move on to BGP.



Determine if the BGP peering is active.

For each tunnel, do the following:

- On your customer gateway, determine if the BGP status is *Active* or *Established*. It may take approximately 30 seconds for a BGP peering to become active.
- Ensure that the customer gateway is advertising the default route (0.0.0.0/0) to the virtual private gateway.

If the tunnels are not in this state, review your BGP configuration.

If the BGP peering is established, you are receiving a prefix, and you are advertising a prefix, your tunnel is configured correctly. Ensure both tunnels are in this state, and you're done.

Make sure your virtual private gateway is attached to your VPC. Your integration team does this with the AWS Management Console.

For general testing instructions applicable to all customer gateways, see How to Test the Customer Gateway Configuration (p. 151).

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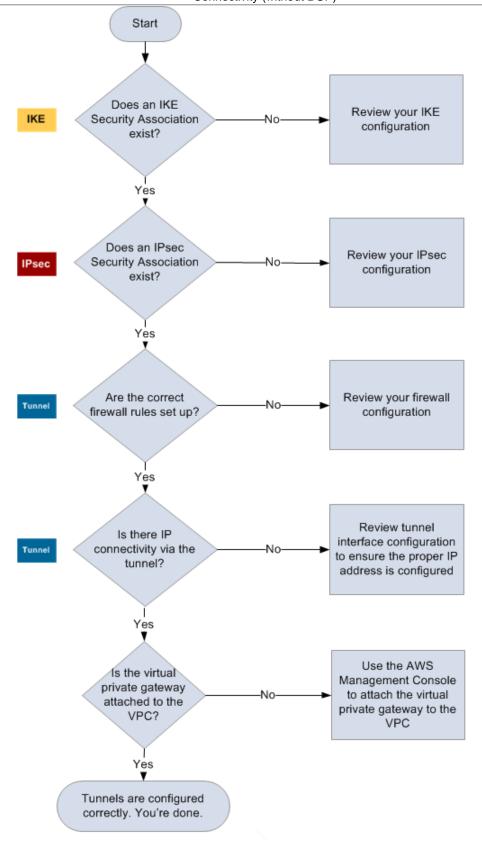
Connectivity (without BGP)

If you have questions or need further assistance, please use the Amazon VPC forum.

Troubleshooting Generic Device Customer Gateway without Border Gateway Protocol Connectivity

The following diagram and table provide general instructions for troubleshooting a customer gateway device that does not use Border Gateway Protocol.

When troubleshooting problems, you might find it useful to enable the debug features of your gateway device. Consult your gateway device vendor for details.



Amazon Virtual Private Cloud Network Administrator Guide Generic Device Customer Gateway Connectivity (without BGP)

IKE

Determine if an IKE Security Association exists.

An IKE security association is required to exchange keys that are used to establish the IPsec Security Association.

If no IKE security association exists, review your IKE configuration settings. You must configure the encryption, authentication, perfect-forward-secrecy, and mode parameters as listed in the customer gateway configuration.

If an IKE security association exists, move on to IPsec.

IPsec

Determine if an IPsec Security Association exists.

An IPsec security association is the tunnel itself. Query your customer gateway to determine if an IPsec Security Association is active. Proper configuration of the IPsec SA is critical. You must configure the encryption, authentication, perfect-forward-secrecy, and mode parameters as listed in the customer gateway configuration.

If no IPsec Security Association exists, review your IPsec configuration.

If an IPsec Security Association exists, move on to the tunnel.

Tunnel

Confirm the required firewall rules are set up (for a list of the rules, see If You Have a Firewall Between the Internet and Your Customer Gateway (p. 10)). If they are, move forward.

Determine if there is IP connectivity via the tunnel.

Each side of the tunnel has an IP address as specified in the customer gateway configuration. The virtual private gateway address is the address used as the BGP neighbor address. From your customer gateway, ping this address to determine if IP traffic is being properly encrypted and decrypted.

If the ping isn't successful, review your tunnel interface configuration to ensure the proper IP address is configured.

If the ping is successful, move on to Routing.

Static routes

Routing:

For each tunnel, do the following:

- Verify that you have added a static route to your VPC CIDR with the tunnels as the next hop.
- Verify that you have added a static route on the AWS console, to tell the VGW to route traffic back to your internal networks.

If the tunnels are not in this state, review your device configuration.

Ensure both tunnels are in this state, and you're done.

Make sure your virtual private gateway is attached to your VPC. Your integration team does this with the AWS Management Console.

If you have questions or need further assistance, please use the Amazon VPC forum.

Configuring Windows Server 2008 R2 as a Customer Gateway

You can configure Windows Server 2008 R2 as a customer gateway for your VPC. Use the following process whether you are running Windows Server 2008 R2 on an EC2 instance in a VPC, or on your own server.

Topics

- Prerequisites (p. 188)
- Step 1: Create a VPN Connection (p. 190)
- Step 2: Download the Configuration File for the VPN Connection (p. 190)
- Step 3: Configure the Windows Server (p. 192)
- Step 4: Set Up the VPN Tunnel (p. 194)
- Step 5: Enable Dead Gateway Detection (p. 200)
- Step 6: Test the VPN Connection (p. 201)

Prerequisites

Before you begin, ensure that you have configured your customer gateway and your VPN components.

Topics

- Configuring Your Windows Server (p. 188)
- Configuring VPN Components for Your VPC (p. 189)

Configuring Your Windows Server

To configure Windows Server as a customer gateway, ensure that you have the following:

- Windows Server 2008 R2 on your own network, or on an EC2 instance in a VPC. If you use an EC2 instance that you launched from a Windows AMI, do the following:
 - Disable source/destination checking for the instance. For more information, see Changing the Source/Destination Checking of a Network Interface.
 - Update your adapter settings. For more information, see Updating Your Windows Adapter Settings (p. 189).

Amazon Virtual Private Cloud Network Administrator Guide Configuring VPN Components for Your VPC

- Associate an Elastic IP address with the instance. For more information, see Working with Elastic IP Addresses.
- Ensure the instance's security group rules allow outbound IPsec traffic. By default, a security group allows all outbound traffic; however, if the security group's outbound rules have been modified from their original state, you must create the following outbound custom protocol rules for IPsec traffic: IP protocol 50, IP protocol 51, and UDP 500.
- The CIDR range for your network in which the Windows server is located, for example, 172.31.0.0/16.

Updating Your Windows Adapter Settings

If you launched a Windows server instance from a current Windows AMI, you might not be able to route traffic from other instances without updating your adapter settings.

To update your adapter settings

- Connect to your Windows instance. For more information, see Connecting to Your Windows Instance.
- 2. Open Control Panel, and start the Device Manager.
- 3. Expand the **Network adapters** node.
- 4. Right-click the Citrix network adapter, and then click Properties.
- 5. On the Advanced tab, disable the IPv4 Checksum Offload, TCP Checksum Offload (IPv4), and UDP Checksum Offload (IPv4) properties, and then click OK.

Configuring VPN Components for Your VPC

To create a VPN connection from your VPC, ensure that you have the following:

- The CIDR block of your VPC; for example, 10.0.0.0/16.
- A customer gateway that specifies the IP address of the Windows Server 2008 R2 server. Specify static routing for the routing type. For more information about creating a customer gateway, see Create a Customer Gateway.

Note

The address must be static, and may be behind a device performing network address translation (NAT). To ensure that NAT traversal (NAT-T) can function, you must adjust your firewall rules to unblock UDP port 4500. If your customer gateway is a Windows server instance, use the Elastic IP address.

- A virtual private gateway attached to your VPC. For more information, see Create a Virtual Private Gateway.
- A private subnet for launching instances that will communicate with the Windows server.

Note

A private subnet is a subnet that does not have a route to an Internet gateway.

- Routing for your VPN connection:
 - Add a route to your private subnet's route table with the virtual private gateway as the target, and the Windows server's network (CIDR range) as the destination.
 - Enable route propagation for the virtual private gateway. For more information, see Route Tables in the *Amazon VPC User Guide*.
- A security group configuration for your instances that allows communication between your network and your VPC:
 - Add rules that allow inbound RDP or SSH access from your network. This enables you to connect
 to instances in your VPC from your network. For example, to allow instances in your network to

access Linux instances in your VPC, create an inbound rule with a type of SSH, and the source set to the CIDR range of your network; for example, 172.31.0.0/16. For more information, see Security Groups for Your VPC in the *Amazon VPC User Guide*.

Add a rule that allows inbound ICMP access from your network. This enables you to test your VPN
connection by pinging an instance in your VPC from your Windows server.

Step 1: Create a VPN Connection

To create a VPN connection, you must first configure the required components for the VPN as specified in the prerequisites section, Configuring VPN Components for Your VPC (p. 189). You must also have the CIDR range for your network in which the Windows server is located, for example, 172.31.0.0/16.

To create a VPN connection

- 1. Open the Amazon VPC console at https://console.aws.amazon.com/vpc/.
- 2. In the navigation pane, click VPN Connections, and then click Create VPN Connection.
- Select the virtual private gateway and customer gateway from the lists. Select the Static routing option, enter the Static IP Prefixes values for your network in CIDR notation, and then click Yes, Create.

Step 2: Download the Configuration File for the VPN Connection

You can use the Amazon VPC console to download a Windows server configuration file for your VPN connection.

To download the configuration file

- 1. Open the Amazon VPC console at https://console.aws.amazon.com/vpc/.
- In the navigation pane, click VPN Connections.
- 3. Select your VPN connection, and then click **Download Configuration**.
- Select Microsoft as the vendor, Windows Server as the platform, and 2008 R2 as the software. Click Yes, Download. You can open the file or save it.

The configuration file contains a section of information similar to the following example. You'll see this information presented twice, one time for each tunnel. You'll use this information when configuring the Windows Server 2008 R2 server.

```
vgw-1a2b3c4d Tunnel1

Local Tunnel Endpoint: 203.0.113.1

Remote Tunnel Endpoint: 203.83.222.237

Endpoint 1: [Your_Static_Route_IP_Prefix]

Endpoint 2: [Your_VPC_CIDR_Block]

Preshared key: xCjNLsLoCmKsakwcdoR9yX6GsEXAMPLE
```

Local Tunnel Endpoint

The IP address for the customer gateway—in this case, your Windows server—that terminates the VPN connection on your network's side. If your customer gateway is a Windows server instance, this is the instance's private IP address.

Amazon Virtual Private Cloud Network Administrator Guide Step 2: Download the Configuration File for the VPN Connection

Remote Tunnel Endpoint

One of two IP addresses for the virtual private gateway that terminates the VPN connection on the AWS side.

Endpoint 1

The IP prefix that you specified as a static route when you created the VPN connection. These are the IP addresses on your network that are allowed to use the VPN connection to access your VPC.

Endpoint 2

The IP address range (CIDR block) of the VPC attached to the virtual private gateway (for example 10.0.0.0/16).

Preshared key

The pre-shared key that is used to establish the IPsec VPN connection between Local Tunnel Endpoint and Remote Tunnel Endpoint.

We suggest that you configure both tunnels as part of the VPN connection. Each tunnel connects to a separate VPN concentrator on the Amazon side of the VPN connection. Although only one tunnel at a time is up, the second tunnel automatically establishes itself if the first tunnel goes down. Having redundant tunnels ensure continuous availability in the case of a device failure. Because only one tunnel is available at a time, the Amazon VPC console indicates that one tunnel is down. This is expected behavior, so there's no action required from you.

With two tunnels configured, if a device failure occurs within AWS, your VPN connection automatically fails over to the second tunnel of the AWS virtual private gateway within a matter of minutes. When you configure your customer gateway, it's important that you configure both tunnels.

Note

From time to time, AWS performs routine maintenance on the virtual private gateway. This maintenance may disable one of the two tunnels of your VPN connection for a brief period of time. Your VPN connection automatically fails over to the second tunnel while we perform this maintenance.

Additional information regarding the Internet Key Exchange (IKE) and IPsec Security Associations (SA) is presented in the downloaded configuration file. Because the AWS VPC VPN suggested settings are the same as the Windows Server 2008 R2 default IPsec configuration settings, minimal work is needed on your part.

MainModeSecMethods: DHGroup2-AES128-SHA1,DHGroup2-3DES-SHA1

MainModeKeyLifetime: 480min,0sec

QuickModeSecMethods: ESP:SHA1-AES128+60min+100000kb,

ESP:SHA1-3D ES+60min+100000kb

QuickModePFS: DHGroup2

MainModeSecMethods

The encryption and authentication algorithms for the IKE SA. These are the suggested settings for the VPN connection, and are the default settings for Windows Server 2008 R2 IPsec VPN connections.

MainModeKeyLifetime

The IKE SA key lifetime. This is the suggested setting for the VPN connection, and is the default setting for Windows Server 2008 R2 IPsec VPN connections.

QuickModeSecMethods

The encryption and authentication algorithms for the IPsec SA. These are the suggested settings for the VPN connection, and are the default settings for Windows Server 2008 R2 IPsec VPN connections.

QuickModePFS

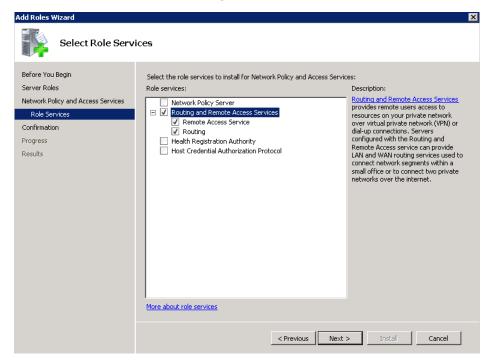
We suggest the use of master key perfect forward secrecy (PFS) for your IPsec sessions.

Step 3: Configure the Windows Server

Before you set up the VPN tunnel, you must install and configure Routing and Remote Access Services on your Windows server to allow remote users to access resources on your network.

To install Routing and Remote Access Services on Windows Server 2008 R2

- Log on to the Windows Server 2008 R2 server.
- Click Start, point to All Programs, point to Administrative Tools, and then click Server Manager.
- Install Routing and Remote Access Services:
 - a. In the Server Manager navigation pane, click Roles.
 - b. In the Roles pane, click Add Roles.
 - On the Before You Begin page, verify that your server meets the prerequisites and then click Next.
 - d. On the Select Server Roles page, click Network Policy and Access Services, and then click Next.
 - e. On the Network Policy and Access Services page, click Next.
 - f. On the Select Role Services page, click Routing and Remote Access Services, leave Remote Access Service and Routing selected, and then click Next.



- g. On the Confirm Installation Selections page, click Install.
- h. When the wizard completes, click Close.

To configure and enable Routing and Remote Access Server

- In the Server Manager navigation pane, expand Roles, and then expand Network Policy and Access.
- Right-click Routing and Remote Access Server, and then click Configure and Enable Routing and Remote Access.

Amazon Virtual Private Cloud Network Administrator Guide Step 3: Configure the Windows Server

- 3. In the Routing and Remote Access Setup Wizard, on the Welcome page, click Next.
- 4. On the **Configuration** page, click **Custom Configuration**, and then click **Next**.
- 5. Click **LAN routing**, and then click **Next**.
- 6. Click Finish.
- 7. When prompted by the **Routing and Remote Access** dialog box, click **Start service**.

Step 4: Set Up the VPN Tunnel

You can configure the VPN tunnel by running the netsh scripts included in the downloaded configuration file, or by using the New Connection Security Rule Wizard on the Windows server.

Important

We suggest that you use master key perfect forward secrecy (PFS) for your IPsec sessions. However, you can't enable PFS using the Windows Server 2008 R2 user interface; you can only enable this setting by running the netsh script with qmpfs=dhgroup2. Therefore, you should consider your requirements before you pick an option. For more information, go to Key exchange settings in the *Microsoft TechNet Library*.

Option 1: Run netsh Script

Copy the netsh script from the downloaded configuration file and replace the variables. The following is an example script.

```
netsh advfirewall consec add rule Name="VGW-la2b3c4d Tunnel 1" Enable=Yes ^ Profile=any Type=Static Mode=Tunnel
LocalTunnelEndpoint=Windows_Server_Private_IP_address ^ RemoteTunnelEndpoint=203.83.222.236 Endpoint1=Static_Route_IP_Prefix ^ Endpoint2=VPC_CIDR_Block Protocol=Any Action=RequireInClearOut ^ Auth1=ComputerPSK Auth1PSK=xCjNLsLoCmKsakwcdoR9yX6Gsexample ^ QMSecMethods=ESP:SHA1-AES128+60min+100000kb ^ ExemptIPsecProtectedConnections=No ApplyAuthz=No QMPFS=dhgroup2
```

Name: You can replace the suggested name (VGW-la2b3c4d Tunnel 1) with a name of your choice.

LocalTunnelEndpoint: Enter the private IP address of the Windows server on your network.

Endpoint1: The CIDR block of your network on which the Windows server resides, for example, 172.31.0.0/16.

Endpoint2: The CIDR block of your VPC or a subnet in your VPC, for example, 10.0.0.0/16.

Run the updated script in a command prompt window. (The ^ enables you to cut and paste wrapped text at the command line.) To set up the second VPN tunnel for this VPN connection, repeat the process using the second netsh script in the configuration file.

When you are done, go to 2.4: Configure the Windows Firewall (p. 198).

For more information about the netsh parameters, go to Netsh AdvFirewall Consec Commands in the *Microsoft TechNet Library*.

Option 2: Use the Windows Server User Interface

You can also use the Windows server user interface to set up the VPN tunnel. This section guides you through the steps.

Important

You can't enable master key perfect forward secrecy (PFS) using the Windows Server 2008 R2 user interface. Therefore, if you decide to use PFS, you must use the netsh scripts described in option 1 instead of the user interface described in this option.

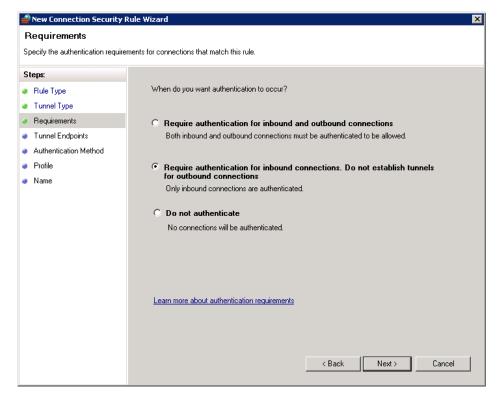
- 2.1: Configure a Security Rule for a VPN Tunnel (p. 195)
- 2.3: Confirm the Tunnel Configuration (p. 198)
- 2.4: Configure the Windows Firewall (p. 198)

2.1: Configure a Security Rule for a VPN Tunnel

In this section, you configure a security rule on your Windows server to create a VPN tunnel.

To configure a security rule for a VPN tunnel

- 1. In the Server Manager navigation pane, expand **Configuration**, and then expand **Windows Firewall with Advanced Security**.
- 2. Right-click Connection Security Rules, and then click New Rule.
- In the New Connection Security Rule wizard, on the Rule Type page, click Tunnel, and then click Next.
- 4. On the Tunnel Type page, under What type of tunnel would you like to create, click Custom Configuration. Under Would you like to exempt IPsec-protected connections from this tunnel, leave the default value checked (No. Send all network traffic that matches this connection security rule through the tunnel), and then click Next.
- 5. On the Requirements page, click Require authentication for inbound connections. Do not establish tunnels for outbound connections, and then click Next.



- 6. On **Tunnel Endpoints** page, under **Which computers are in Endpoint 1**, click **Add**. Enter the CIDR range of your network (behind your Windows server customer gateway), and then click **OK**. (Note that the range can include the IP address of your customer gateway.)
- 7. Under What is the local tunnel endpoint (closest to computer in Endpoint 1), click Edit. Enter the private IP address of your Windows server, and then click OK.
- 8. Under What is the remote tunnel endpoint (closest to computers in Endpoint 2), click Edit. Enter the IP address of the virtual private gateway for Tunnel 1 from the configuration file (see Remote Tunnel Endpoint), and then click OK.

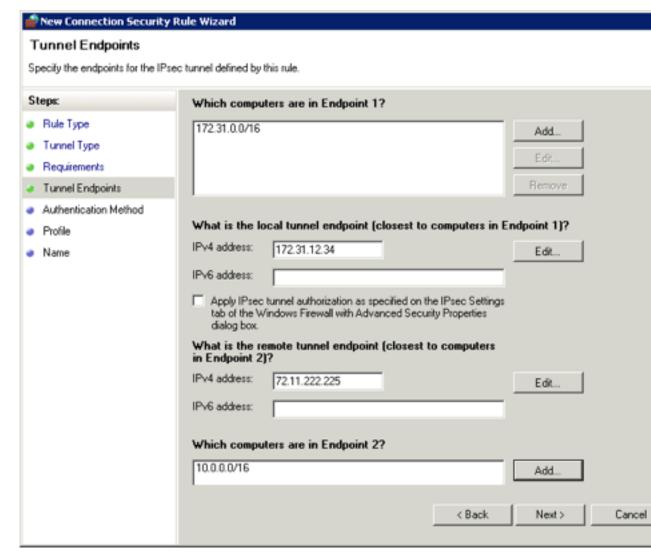
Important

If you are repeating this procedure for Tunnel 2, be sure to select the endpoint for Tunnel 2.

Under Which computers are in Endpoint 2, click Add. Enter the CIDR block of your VPC, and then click OK.

Important

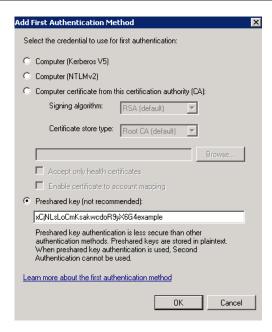
You must scroll in the dialog box until you locate **Which computers are in Endpoint 2**. Do not click **Next** until you have completed this step, or you won't be able to connect to your server.



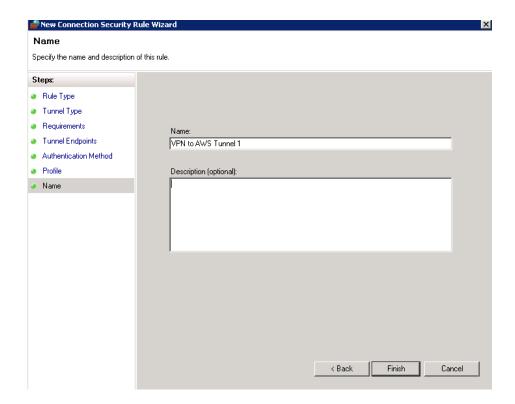
- 10. Confirm that all the settings you've specified are correct, and then click **Next**.
- 11. On the Authentication Method page, select Advanced, and then click Customize.
- 12. Under First authentication methods, click Add.
- 13. Select Pre-Shared key, enter the pre-shared key value from the configuration file, and click OK.

Important

If you are repeating this procedure for Tunnel 2, be sure to select the pre-shared key for Tunnel 2.



- 14. Ensure that First authentication is optional is not selected, and click OK.
- 15. On the Authentication Method page, click Next.
- On the Profile page, select all three check boxes: Domain, Private, and Public, and then click Next.
- 17. On the **Name** page, enter a name for your connection rule, and then click **Finish**.



Repeat the above procedure, specifying the data for Tunnel 2 from your configuration file.

Amazon Virtual Private Cloud Network Administrator Guide Option 2: Use the Windows Server User Interface

After you've finished, you'll have two tunnels configured for your VPN connection.

2.3: Confirm the Tunnel Configuration

To confirm the tunnel configuration

- 1. In the Server Manager navigation pane, expand the **Configuration** node, expand **Windows Firewall with Advanced Security**, and then click **Connection Security Rules**.
- 2. Verify the following for both tunnels:
 - Enabled is Yes
 - Authentication mode is Require inbound and clear outbound
 - Authentication method is Custom
 - Endpoint 1 port is Any
 - Endpoint 2 port is Any
 - Protocol is Any
- 3. Double-click the security rule for your first tunnel.
- 4. On the **Computers** tab, verify the following:
 - Under Endpoint 1, the CIDR block range shown matches the CIDR block range of your network.
 - Under Endpoint 2, the CIDR block range shown matches the CIDR block range of your VPC.
- On the Authentication tab, under Method, click Customize, and verify that First authentication methods contains the correct pre-shared key from your configuration file for the tunnel, and then click OK
- 6. On the Advanced tab, verify that Domain, Private, and Public are all selected.
- 7. Under IPsec tunneling, click Customize. Verify the following IPsec tunneling settings.
 - Use IPsec tunneling is selected.
 - Local tunnel endpoint (closest to Endpoint 1) contains the IP address of your server. If your customer gateway is a Windows server instance, this is the instance's private IP address.
 - Remote tunnel endpoint (closest to Endpoint 2) contains the IP address of the virtual private gateway for this tunnel.
- 8. Double-click the security rule for your second tunnel. Repeat steps 4 to 7 for this tunnel.

2.4: Configure the Windows Firewall

After setting up your security rules on your server, configure some basic IPsec settings to work with the virtual private gateway.

To configure the Windows firewall

- In the Server Manager navigation pane, right-click Windows Firewall with Advanced Security, and then click Properties.
- 2. Click the IPsec Settings tab.
- 3. Under IPsec exemptions, verify that Exempt ICMP from IPsec is No (default). Verify that IPsec tunnel authorization is None.
- 4. Under IPsec defaults, click Customize.
- In the Customize IPsec Settings dialog box, under Key exchange (Main Mode), select Advanced and then click Customize.
- 6. In Customize Advanced Key Exchange Settings, under Security methods, verify that these default values are used for the first entry.

Amazon Virtual Private Cloud Network Administrator Guide Option 2: Use the Windows Server User Interface

• Integrity: SHA-1

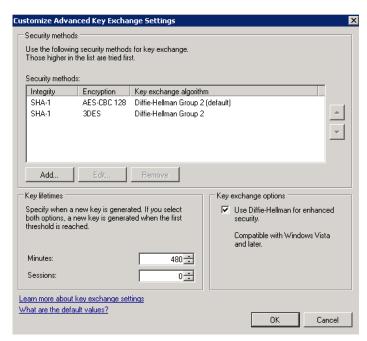
• Encryption: AES-CBC 128

• Key exchange algorithm: Diffie-Hellman Group 2

• Under **Key lifetimes**, verify that **Minutes** is 480 and **Sessions** is 0.

These settings correspond to these entries in the configuration file:

MainModeSecMethods: DHGroup2-AES128-SHA1,DHGroup2-3DES-SHA1
MainModeKeyLifetime: 480min,0sec



- Under Key exchange options, select Use Diffie-Hellman for enhanced security, and then click OK.
- 8. Under Data protection (Quick Mode), click Advanced, and then click Customize.
- 9. Click Require encryption for all connection security rules that use these settings.
- 10. Under Data integrity and encryption algorithms, leave the default values:

Protocol: ESPIntegrity: SHA-1

Encryption: AES-CBC 128Lifetime: 60 minutes

These value correspond to the following entries from the configuration file.

```
QuickModeSecMethods:
ESP:SHA1-AES128+60min+100000kb,ESP:SHA1-3D ES+60min+100000kb
```

11. Click **OK** to return to the **Customize IPsec Settings** dialog box and click **OK** again to save the configuration .

Step 5: Enable Dead Gateway Detection

Next, you need to configure TCP to detect when a gateway becomes unavailable. You can do this by modifying this registry key: HKLM\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters. Do not perform this step until you've completed the preceding sections. After you change the registry key, you must reboot the server.

To enable dead gateway detection

- 1. On the server, click **Start**, and then type **regedit** to start Registry Editor.
- 2. Expand **HKEY_LOCAL_MACHINE**, expand **SYSTEM**, expand **CurrentControlSet**, expand **Services**, expand **Tcpip**, and then expand **Parameters**.
- 3. In the other pane, right-click, point to New, and select DWORD (32-bit) Value.
- 4. Enter the name EnableDeadGWDetect.
- 5. Right-click EnableDeadGWDetect, and click Modify.
- 6. In Value data, enter 1, and then click OK.
- 7. Close Registry Editor and reboot the server.

For more information, go to EnableDeadGWDetect in the Microsoft TechNet Library.

Step 6: Test the VPN Connection

To test that the VPN connection is working correctly, launch an instance into your VPC, and ensure that it does not have an Internet connection. After you've launched the instance, ping its private IP address from your Windows server. The VPN tunnel comes up when traffic is generated from the customer gateway, therefore the ping command also initiates the VPN connection.

To launch an instance in your VPC and get its private IP address

- 1. Open the Amazon EC2 console, and click Launch Instance.
- 2. Select an Amazon Linux AMI, and select an instance type.
- 3. On the **Step3: Configure Instance Details** page, select your VPC from the **Network** list, and select a subnet from the **Subnet** list. Ensure that you select the private subnet that you configured in Configuring VPN Components for Your VPC (p. 189).
- 4. In the Auto-assign Public IP list, ensure that the setting is set to Disable.
- 5. Click Next until you get to the Step 6: Configure Security Group page. You can either select an existing security group that you configured in the Prerequisites section (Configuring VPN Components for Your VPC (p. 189)), or you can create a new security group and ensure that it has a rule that allows all ICMP traffic from the IP address of your Windows server.
- 6. Complete the rest of the steps in the wizard, and launch your instance.
- On the Instances page, select your instance. Get the private IP address in the Private IPs field on the details pane.

Connect to or log on to your Windows server, open the command prompt, and then use the ping command to ping your instance using its private IP address; for example:

```
PROMPT> ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=2ms TTL=62

Ping statistics for 10.0.0.4:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 2ms, Maximum = 2ms, Average = 2ms
```

If the ping command fails, check the following information:

- Ensure that you have configured your security group rules to allow ICMP to the instance in your VPC. If your Windows server is an EC2 instance, ensure that its security group's outbound rules allow IPsec traffic. For more information, see Prerequisites (p. 188).
- Ensure that the operating system on the instance you are pinging is configured to respond to ICMP. We recommend that you use one of the Amazon Linux AMIs.
- If the instance you are pinging is a Windows instance, log in to the instance and enable inbound ICMPv4 on the Windows firewall.
- Ensure that you have configured the route tables for your VPC or your subnet correctly. For more information, see Prerequisites (p. 188).
- If your customer gateway is a Windows server instance, ensure that you've disabled source/ destination checking for the instance. For more information, see Prerequisites (p. 188).

Amazon Virtual Private Cloud Network Administrator Guide Step 6: Test the VPN Connection

In the Amazon VPC console, on the **VPN Connections** page, select your VPN connection. The first tunnel is in the UP state. The second tunnel should be configured, but it won't be used unless the first tunnel goes down. It may take a few moments to establish the encrypted tunnels.

Configuring Windows Server 2012 R2 as a Customer Gateway

You can configure Windows Server 2012 R2 as a customer gateway for your VPC. Use the following process whether you are running Windows Server 2012 R2 on an EC2 instance in a VPC, or on your own server.

Topics

- Prerequisites (p. 203)
- Step 1: Create a VPN Connection (p. 205)
- Step 2: Download the Configuration File for the VPN Connection (p. 205)
- Step 3: Configure the Windows Server (p. 207)
- Step 4: Set Up the VPN Tunnel (p. 208)
- Step 5: Enable Dead Gateway Detection (p. 213)
- Step 6: Test the VPN Connection (p. 214)

Prerequisites

Before you begin, ensure that you have configured your customer gateway and your VPN components.

Topics

- Configuring Your Windows Server (p. 203)
- Configuring VPN Components for Your VPC (p. 204)

Configuring Your Windows Server

To configure Windows Server as a customer gateway, ensure that you have the following:

- Windows Server 2012 R2 on your own network, or on an EC2 instance in a VPC. If you use an EC2 instance that you launched from a Windows AMI, do the following:
 - Disable source/destination checking for the instance. For more information, see Changing the Source/Destination Checking of a Network Interface.

Amazon Virtual Private Cloud Network Administrator Guide Configuring VPN Components for Your VPC

- Update your adapter settings. For more information, see Updating Your Windows Adapter Settings (p. 204).
- Associate an Elastic IP address with the instance. For more information, see Working with Elastic
 IP Addresses. Take note of this address you will need it when you create the customer gateway
 in your VPC.
- Ensure the instance's security group rules allow outbound IPsec traffic. By default, a security
 group allows all outbound traffic; however, if the security group's outbound rules have been
 modified from their original state, you must create the following outbound custom protocol rules for
 IPsec traffic: IP protocol 50, IP protocol 51, and UDP 500.
- The CIDR range for your network in which the Windows server is located, for example, 172.31.0.0/16.

Updating Your Windows Adapter Settings

If you launched a Windows server instance from a current Windows AMI, you might not be able to route traffic from other instances without updating your adapter settings.

To update your adapter settings

- Connect to your Windows instance. For more information, see Connecting to Your Windows Instance.
- 2. Open Control Panel, and start the Device Manager.
- 3. Expand the Network adapters node.
- 4. Select the AWS PV network device, choose Action, and then choose Properties.
- On the Advanced tab, disable the IPv4 Checksum Offload, TCP Checksum Offload (IPv4), and UDP Checksum Offload (IPv4) properties, and then choose OK.

Configuring VPN Components for Your VPC

To create a VPN connection from your VPC, ensure that you have a VPC, and take note of its CIDR block; for example, 10.0.0.0/16. Then, do the following:

• Create a customer gateway that specifies the IP address of the Windows server. Specify static routing for the routing type. For more information, see Create a Customer Gateway.

Note

The IP address must be static and may be behind a device performing network address translation (NAT). To ensure that NAT traversal (NAT-T) can function, you must adjust your firewall rules to unblock UDP port 4500. If your customer gateway is an EC2 Windows server instance, use its Elastic IP address.

- Create a virtual private gateway, and attach it to your VPC. For more information, see Create a Virtual Private Gateway.
- Create a private subnet in your VPC (if you don't have one already) for launching instances that will communicate with the Windows server. For more information, see Adding a Subnet to Your VPC.

Note

A private subnet is a subnet that does not have a route to an Internet gateway. The routing for this subnet is described in the next item.

- Update your route tables for the VPN connection:
 - Add a route to your private subnet's route table with the virtual private gateway as the target, and the Windows server's network (CIDR range) as the destination.
 - Enable route propagation for the virtual private gateway. For more information, see Route Tables
 in the Amazon VPC User Guide.

- Create a security group configuration for your instances that allows communication between your VPC and network:
 - Add rules that allow inbound RDP or SSH access from your network. This enables you to connect
 to instances in your VPC from your network. For example, to allow computers in your network to
 access Linux instances in your VPC, create an inbound rule with a type of SSH, and the source
 set to the CIDR range of your network; for example, 172.31.0.0/16. For more information, see
 Security Groups for Your VPC in the Amazon VPC User Guide.
 - Add a rule that allows inbound ICMP access from your network. This enables you to test your VPN
 connection by pinging an instance in your VPC from your Windows server.

Step 1: Create a VPN Connection

To create a VPN connection, you must first configure the required components for the VPN as specified in the prerequisites section, Configuring VPN Components for Your VPC (p. 204). You must also have the CIDR range for your network in which the Windows server is located, for example, 172.31.0.0/16.

To create a VPN connection

- 1. Open the Amazon VPC console at https://console.aws.amazon.com/vpc/.
- 2. In the navigation pane, choose VPN Connections, and then Create VPN Connection.
- Select the virtual private gateway and customer gateway from the lists. Select the Static routing option, enter the Static IP Prefixes values for your network in CIDR notation, and then choose Yes, Create.

Step 2: Download the Configuration File for the VPN Connection

You can use the Amazon VPC console to download a Windows server configuration file for your VPN connection.

To download the configuration file

- 1. Open the Amazon VPC console at https://console.aws.amazon.com/vpc/.
- In the navigation pane, choose VPN Connections.
- 3. Select your VPN connection, and then choose **Download Configuration**.
- Select Microsoft as the vendor, Windows Server as the platform, and 2012 R2 as the software. Choose Yes, Download. You can open the file or save it.

The configuration file contains a section of information similar to the following example. You'll see this information presented twice, one time for each tunnel. You'll use this information when configuring the Windows Server 2012 R2 server.

Amazon Virtual Private Cloud Network Administrator Guide Step 2: Download the Configuration File for the VPN Connection

Local Tunnel Endpoint

The IP address for the customer gateway—in this case, your Windows server—that terminates the VPN connection on your network's side. If your customer gateway is a Windows server instance, this is the instance's private IP address.

Remote Tunnel Endpoint

One of two IP addresses for the virtual private gateway that terminates the VPN connection on the AWS side of the connection.

Endpoint 1

The IP prefix that you specified as a static route when you created the VPN connection. These are the IP addresses in your network that are allowed to use the VPN connection to access your VPC.

Endpoint 2

The IP address range (CIDR block) of the VPC attached to the virtual private gateway (for example 10.0.0.0/16).

Preshared key

The pre-shared key that is used to establish the IPsec VPN connection between Local Tunnel Endpoint and Remote Tunnel Endpoint.

We suggest that you configure both tunnels as part of the VPN connection. Each tunnel connects to a separate VPN concentrator on the Amazon side of the VPN connection. Although only one tunnel at a time is up, the second tunnel automatically establishes itself if the first tunnel goes down. Having redundant tunnels ensure continuous availability in the case of a device failure. Because only one tunnel is available at a time, the Amazon VPC console indicates that one tunnel is down. This is expected behavior, so there's no action required from you.

With two tunnels configured, if a device failure occurs within AWS, your VPN connection automatically fails over to the second tunnel of the AWS virtual private gateway within a matter of minutes. When you configure your customer gateway, it's important that you configure both tunnels.

Note

From time to time, AWS performs routine maintenance on the virtual private gateway. This maintenance may disable one of the two tunnels of your VPN connection for a brief period of time. Your VPN connection automatically fails over to the second tunnel while we perform this maintenance.

Additional information regarding the Internet Key Exchange (IKE) and IPsec Security Associations (SA) is presented in the downloaded configuration file. Because the VPC VPN suggested settings are the same as the Windows Server 2012 R2 default IPsec configuration settings, minimal work is needed on your part.

MainModeSecMethods: DHGroup2-AES128-SHA1

MainModeKeyLifetime: 480min,0sess

QuickModeSecMethods: ESP:SHA1-AES128+60min+100000kb

QuickModePFS: DHGroup2

MainModeSecMethods

The encryption and authentication algorithms for the IKE SA. These are the suggested settings for the VPN connection, and are the default settings for Windows Server 2012 R2 IPsec VPN connections.

MainModeKeyLifetime

The IKE SA key lifetime. This is the suggested setting for the VPN connection, and is the default setting for Windows Server 2012 R2 IPsec VPN connections.

QuickModeSecMethods

The encryption and authentication algorithms for the IPsec SA. These are the suggested settings for the VPN connection, and are the default settings for Windows Server 2012 R2 IPsec VPN connections.

Amazon Virtual Private Cloud Network Administrator Guide Step 3: Configure the Windows Server

QuickModePFS

We suggest that you use master key perfect forward secrecy (PFS) for your IPsec sessions.

Step 3: Configure the Windows Server

Before you set up the VPN tunnel, you must install and configure Routing and Remote Access Services on your Windows server to allow remote users to access resources on your network.

To install Routing and Remote Access Services on Windows Server 2012 R2

- 1. Log on to the Windows Server 2012 R2 server.
- Go to the Start menu, and choose Server Manager.
- 3. Install Routing and Remote Access Services:
 - a. From the Manage menu, choose Add Roles and Features.
 - On the Before You Begin page, verify that your server meets the prerequisites, and then
 choose Next.
 - c. Choose Role-based or feature-based installation, and then choose Next.
 - d. Choose Select a server from the server pool, select your Windows 2012 R2 server, and then choose Next.
 - e. Select Network Policy and Access Services in the list. In the dialog box that displays, choose Add Features to confirm the features that are required for this role.
 - f. In the same list, choose **Remote Access**, and then choose **Next**.
 - g. On the Select features page, choose Next.
 - h. On the **Network Policy and Access Services** page, choose **Next**. Leave **Network Policy Server** selected, and choose **Next**.
 - On the Remote Access page, choose Next. On the next page, select DirectAccess and VPN (RAS). In the dialog box that displays, choose Add Features to confirm the features that are required for this role service. In the same list, select Routing, and then choose Next.
 - j. On the Web Server Role (IIS) page, choose Next. Leave the default selection, and choose Next
 - k. Choose **Install**. When the installation completes, choose **Close**.

To configure and enable Routing and Remote Access Server

- 1. On the dashboard, choose **Notifications** (the flag icon). There should be a task to complete the post-deployment configuration. Choose the **Open the Getting Started Wizard** link.
- 2. Choose Deploy VPN only.
- 3. In the Routing and Remote Access dialog box, choose the server name, choose Action, and select Configure and Enable Routing and Remote Access.
- 4. In the Routing and Remote Access Server Setup Wizard, on the first page, choose Next.
- 5. On the Configuration page, choose Custom Configuration and Next.
- 6. Choose LAN routing, Next, and Finish.
- 7. When prompted by the Routing and Remote Access dialog box, choose Start service.

Step 4: Set Up the VPN Tunnel

You can configure the VPN tunnel by running the netsh scripts included in the downloaded configuration file, or by using the New Connection Security Rule wizard on the Windows server.

Important

We suggest that you use master key perfect forward secrecy (PFS) for your IPsec sessions. For more information, go to Key exchange settings in the *Microsoft TechNet Library*. If you choose to run the netsh script, it includes a parameter to enable PFS (qmpfs=dhgroup2). You cannot enable PFS using the Windows Server 2012 R2 user interface — you must enable it using the command line.

Option 1: Run netsh Script

Copy the netsh script from the downloaded configuration file and replace the variables. The following is an example script.

```
netsh advfirewall consec add rule Name="vgw-la2b3c4d Tunnel 1" ^
Enable=Yes Profile=any Type=Static Mode=Tunnel ^
LocalTunnelEndpoint=Windows_Server_Private_IP_address ^
RemoteTunnelEndpoint=203.83.222.236 Endpoint1=Your_Static_Route_IP_Prefix ^
Endpoint2=Your_VPC_CIDR_Block Protocol=Any Action=RequireInClearOut ^
Auth1=ComputerPSK Auth1PSK=xCjNLsLoCmKsakwcdoR9yX6GsEXAMPLE ^
QMSecMethods=ESP:SHA1-AES128+60min+100000kb ^
ExemptIPsecProtectedConnections=No ApplyAuthz=No QMPFS=dhgroup2
```

Name: You can replace the suggested name (vgw-la2b3c4d Tunnel 1) with a name of your choice.

LocalTunnelEndpoint: Enter the private IP address of the Windows server on your network.

Endpoint1: The CIDR block of your network on which the Windows server resides, for example, 172.31.0.0/16.

Endpoint2: The CIDR block of your VPC or a subnet in your VPC, for example, 10.0.0.0/16.

Run the updated script in a command prompt window on your Windows server. (The ^ enables you to cut and paste wrapped text at the command line.) To set up the second VPN tunnel for this VPN connection, repeat the process using the second netsh script in the configuration file.

When you are done, go to 2.4: Configure the Windows Firewall (p. 212).

For more information about the netsh parameters, go to Netsh AdvFirewall Consec Commands in the *Microsoft TechNet Library*.

Option 2: Use the Windows Server User Interface

You can also use the Windows server user interface to set up the VPN tunnel. This section guides you through the steps.

Important

You can't enable master key perfect forward secrecy (PFS) using the Windows Server 2012 R2 user interface. You must enable PFS using the command line, as described in Enable Master Key Perfect Forward Secrecy (p. 211).

Topics

Amazon Virtual Private Cloud Network Administrator Guide Option 2: Use the Windows Server User Interface

- 2.1: Configure a Security Rule for a VPN Tunnel (p. 209)
- 2.3: Confirm the Tunnel Configuration (p. 211)
- Enable Master Key Perfect Forward Secrecy (p. 211)

2.1: Configure a Security Rule for a VPN Tunnel

In this section, you configure a security rule on your Windows server to create a VPN tunnel.

To configure a security rule for a VPN tunnel

- 1. Open Server Manager, choose Tools, and select Windows Firewall with Advanced Security.
- 2. Select Connection Security Rules, choose Action, and then New Rule.
- In the New Connection Security Rule wizard, on the Rule Type page, choose Tunnel, and then choose Next.
- 4. On the Tunnel Type page, under What type of tunnel would you like to create, choose Custom configuration. Under Would you like to exempt IPsec-protected connections from this tunnel, leave the default value checked (No. Send all network traffic that matches this connection security rule through the tunnel), and then choose Next.
- 5. On the **Requirements** page, choose **Require authentication for inbound connections. Do not establish tunnels for outbound connections**, and then choose **Next**.
- 6. On **Tunnel Endpoints** page, under **Which computers are in Endpoint 1**, choose **Add**. Enter the CIDR range of your network (behind your Windows server customer gateway; for example, 172.31.0.0/16), and then choose **OK**. (Note that the range can include the IP address of your customer gateway.)
- 7. Under What is the local tunnel endpoint (closest to computer in Endpoint 1), choose Edit. In the IPv4 address field, enter the private IP address of your Windows server, and then choose OK.
- 8. Under What is the remote tunnel endpoint (closest to computers in Endpoint 2), choose Edit. In the IPv4 address field, enter the IP address of the virtual private gateway for Tunnel 1 from the configuration file (see Remote Tunnel Endpoint), and then choose OK.

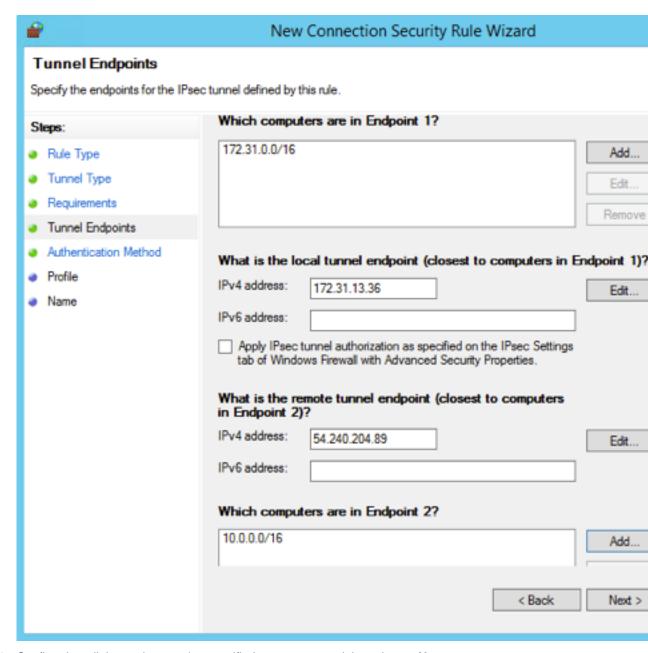
Important

If you are repeating this procedure for Tunnel 2, be sure to select the endpoint for Tunnel 2.

9. Under Which computers are in Endpoint 2, choose Add. In the This IP address or subnet field, enter the CIDR block of your VPC, and then choose OK.

Important

You must scroll in the dialog box until you locate **Which computers are in Endpoint 2**. Do not choose **Next** until you have completed this step, or you won't be able to connect to your server.



- 10. Confirm that all the settings you've specified are correct, and then choose **Next**.
- 11. On the Authentication Method page, select Advanced, and then choose Customize.
- 12. Under First authentication methods, choose Add.
- 13. Select Preshared key, enter the pre-shared key value from the configuration file, and choose OK.

Important

If you are repeating this procedure for Tunnel 2, be sure to select the pre-shared key for Tunnel 2.

- 14. Ensure that First authentication is optional is not selected, and choose OK.
- 15. Choose Next.
- On the Profile page, select all three checkboxes: Domain, Private, and Public, and then choose Next.

17. On the **Name** page, enter a name for your connection rule; for example, VPN to AWS Tunnel 1, and then choose **Finish**.

Repeat the above procedure, specifying the data for Tunnel 2 from your configuration file.

After you've finished, you'll have two tunnels configured for your VPN connection.

2.3: Confirm the Tunnel Configuration

To confirm the tunnel configuration

- Open Server Manager, choose Tools, select Windows Firewall with Advanced Security, and then select Connection Security Rules.
- 2. Verify the following for both tunnels:
 - Enabled is Yes
 - Endpoint 1 is the CIDR block for your network
 - Endpoint 2 is the CIDR block of your VPC
 - Authentication mode is Require inbound and clear outbound
 - Authentication method is Custom
 - Endpoint 1 port is Any
 - Endpoint 2 port is Any
 - Protocol is Any
- 3. Select the first rule and choose Properties.
- 4. On the **Authentication** tab, under **Method**, choose **Customize**, and verify that **First authentication methods** contains the correct pre-shared key from your configuration file for the tunnel, and then choose **OK**.
- 5. On the Advanced tab, verify that Domain, Private, and Public are all selected.
- 6. Under **IPsec tunneling**, choose **Customize**. Verify the following IPsec tunneling settings, and then choose **OK** and **OK** again to close the dialog box.
 - Use IPsec tunneling is selected.
 - Local tunnel endpoint (closest to Endpoint 1) contains the IP address of your Windows server. If your customer gateway is an EC2 instance, this is the instance's private IP address.
 - Remote tunnel endpoint (closest to Endpoint 2) contains the IP address of the virtual private gateway for this tunnel.
- 7. Open the properties for your second tunnel. Repeat steps 4 to 7 for this tunnel.

Enable Master Key Perfect Forward Secrecy

You can enable master key perfect forward secrecy by using the command line. You cannot enable this feature using the user interface.

To enable master key perfect forward secrecy

- 1. In your Windows server, open a new command prompt window.
- 2. Type the following command, replacing rule_name with the name you gave the first connection rule.

netsh advfirewall consec set rule name="rule_name" new QMPFS=dhgroup2
QMSecMethods=ESP:SHAl-AES128+60min+100000kb

Repeat step 2 for the second tunnel, this time replacing rule_name with the name that you gave the second connection rule.

2.4: Configure the Windows Firewall

After setting up your security rules on your server, configure some basic IPsec settings to work with the virtual private gateway.

To configure the Windows firewall

- Open Server Manager, choose Tools, select Windows Firewall with Advanced Security, and then choose Properties.
- On the IPsec Settings tab, under IPsec exemptions, verify that Exempt ICMP from IPsec is No (default). Verify that IPsec tunnel authorization is None.
- 3. Under IPsec defaults, choose Customize.
- 4. Under Key exchange (Main Mode), select Advanced and then choose Customize.
- 5. In **Customize Advanced Key Exchange Settings**, under **Security methods**, verify that these default values are used for the first entry.
 - Integrity: SHA-1
 - Encryption: AES-CBC 128
 - Key exchange algorithm: Diffie-Hellman Group 2
 - Under Key lifetimes, verify that Minutes is 480 and Sessions is 0.

These settings correspond to these entries in the configuration file:

```
MainModeSecMethods: DHGroup2-AES128-SHA1,DHGroup2-3DES-SHA1
MainModeKeyLifetime: 480min,0sec
```

- 6. Under **Key exchange options**, select **Use Diffie-Hellman for enhanced security**, and then choose **OK**.
- Under Data protection (Quick Mode), select Advanced, and then choose Customize.
- 8. Select Require encryption for all connection security rules that use these settings.
- 9. Under **Data integrity and encryption**, leave the default values:

Protocol: ESPIntegrity: SHA-1

Encryption: AES-CBC 128Lifetime: 60 minutes

These value correspond to the following entry from the configuration file.

```
QuickModeSecMethods:
ESP:SHA1-AES128+60min+100000kb
```

10. Choose **OK** to return to the **Customize IPsec Settings** dialog box and choose **OK** again to save the configuration .

Step 5: Enable Dead Gateway Detection

Next, you need to configure TCP to detect when a gateway becomes unavailable. You can do this by modifying this registry key: HKLM\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters. Do not perform this step until you've completed the preceding sections. After you change the registry key, you must reboot the server.

To enable dead gateway detection

- From your Windows server, launch the command prompt or a PowerShell session, and type regedit to start Registry Editor.
- Expand HKEY_LOCAL_MACHINE, expand SYSTEM, expand CurrentControlSet, expand Services, expand Tcpip, and then expand Parameters.
- 3. From the Edit menu, select New and select DWORD (32-bit) Value.
- 4. Enter the name EnableDeadGWDetect.
- 5. Select EnableDeadGWDetect, and choose Modify from the Edit menu.
- 6. In Value data, enter 1, and then choose OK.
- 7. Close the Registry Editor and reboot the server.

For more information, go to EnableDeadGWDetect in the Microsoft TechNet Library.

Step 6: Test the VPN Connection

To test that the VPN connection is working correctly, launch an instance into your VPC, and ensure that it does not have an Internet connection. After you've launched the instance, ping its private IP address from your Windows server. The VPN tunnel comes up when traffic is generated from the customer gateway, therefore the ping command also initiates the VPN connection.

To launch an instance in your VPC and get its private IP address

- 1. Open the Amazon EC2 console, and choose Launch Instance.
- 2. Select an Amazon Linux AMI, and select an instance type.
- 3. On the **Step 3: Configure Instance Details** page, select your VPC from the **Network** list, and select a subnet from the **Subnet** list. Ensure that you select the private subnet that you configured in Prerequisites (p. 203).
- 4. In the Auto-assign Public IP list, ensure that the setting is set to Disable.
- 5. Choose Next until you get to the Step 6: Configure Security Group page. You can either select an existing security group that you configured in the Prerequisites section (Prerequisites (p. 203)), or you can create a new security group and ensure that it has a rule that allows all ICMP traffic from the IP address of your Windows server.
- 6. Complete the rest of the steps in the wizard, and launch your instance.
- 7. On the **Instances** page, select your instance. Get the private IP address in the **Private IPs** field on the details pane.

Connect to or log on to your Windows server, open the command prompt, and then use the ping command to ping your instance using its private IP address; for example:

```
PROMPT> ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=2ms TTL=62

Ping statistics for 10.0.0.4:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 2ms, Maximum = 2ms, Average = 2ms
```

If the $\operatorname{\texttt{ping}}$ command fails, check the following information:

- Ensure that you have configured your security group rules to allow ICMP to the instance in your VPC. If your Windows server is an EC2 instance, ensure that its security group's outbound rules allow IPsec traffic. For more information, see Prerequisites (p. 203).
- Ensure that the operating system on the instance you are pinging is configured to respond to ICMP. We recommend that you use one of the Amazon Linux AMIs.
- If the instance you are pinging is a Windows instance, connect to the instance and enable inbound ICMPv4 on the Windows firewall.
- Ensure that you have configured the route tables correctly for your VPC or your subnet . For more information, see Prerequisites (p. 203).
- If your customer gateway is a Windows server instance, ensure that you've disabled source/ destination checking for the instance. For more information, see Prerequisites (p. 203).

Amazon Virtual Private Cloud Network Administrator Guide Step 6: Test the VPN Connection

In the Amazon VPC console, on the **VPN Connections** page, select your VPN connection. The first tunnel is in the UP state. The second tunnel should be configured, but it won't be used unless the first tunnel goes down. It may take a few moments to establish the encrypted tunnels.

Document History

The following table describes the important changes in each release of this Amazon VPC guide.

Change	Description	Release Date
VPN enhancements	A VPN connection now supports the AES 256-bit encryption function, SHA-256 hashing function, NAT traversal, and additional Diffie-Hellman groups during Phase 1 and Phase 2 of a connection. In addition, you can now use the same customer gateway IP address for each VPN connection that uses the same customer gateway device.	28 October 2015
VPN connections using static routing configuration	With this release, you can now create IPsec VPN connections to Amazon VPC using static routing configurations. Previously, VPN connections required the use of the Border Gateway Protocol (BGP). We now support both types of connections and you can now establish connectivity from devices that do not support BGP, including Cisco ASA and Microsoft Windows Server 2008 R2.	13 September 2012
Automatic route propagation	You can now configure automatic propagation of routes from your VPN and Direct Connect links to your VPC routing tables. This feature simplifies the effort to create and maintain connectivity to Amazon VPC.	13 September 2012
AWS VPN CloudHub and redundant VPN connections	With this release, the network administrator's guide has been updated with information about AWS VPN CloudHub, which you can use to securely communicate from one site to another with or without a VPC, and updated with information about using redundant VPN connections to provide a fault-tolerant connection to your VPC.	29 September 2011
VPC Everywhere	With this release, the network administrator's guide has been rewritten to reflect the new features available in the 2011-07-15 API version.	03 August 2011
Added MTU Support Information	Added information about support for Maximum Transmission Unit (MTU). For more information, see the <i>Bind tunnel to logical interface (route-based VPN)</i> requirement in Requirements for Your Customer Gateway (p. 8).	04 May 2011

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Change	Description	Release Date
Updates to Configuration Templates	Updated the configuration templates to include information about encrypting packages after fragmentation. Also removed information about VRF from the Cisco configuration and removed information about the routing instance (RI) from the Juniper JunOS configuration.	15 February 2011