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# **Amazon Virtual Private Cloud**

## **Network Administrator Guide**

**API Version 2014-06-15**



# Amazon Web Services

# Amazon Virtual Private Cloud: Network Administrator Guide

Amazon Web Services

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# Welcome

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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 your VPC as if they were running within your own infrastructure.

For more information, see the following topics:

- [Your Customer Gateway \(p. 2\)](#)
- [Example: Cisco ASA Device \(p. 12\)](#)
- [Example: Cisco IOS Device \(p. 20\)](#)
- [Example: Cisco IOS Device without Border Gateway Protocol \(p. 31\)](#)
- [Example: Juniper JunOS Device \(p. 40\)](#)
- [Example: Juniper ScreenOS Device \(p. 51\)](#)
- [Example: Yamaha Device \(p. 60\)](#)
- [Example: Generic Customer Gateway Using Border Gateway Protocol \(p. 69\)](#)
- [Example: Generic Customer Gateway without Border Gateway Protocol \(p. 77\)](#)
- [Configuring Windows Server 2008 R2 as a Customer Gateway for Your VPC \(p. 111\)](#)

# Your Customer Gateway

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## Topics

- [Your Role \(p. 2\)](#)
- [What Is a Customer Gateway? \(p. 2\)](#)
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- [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?

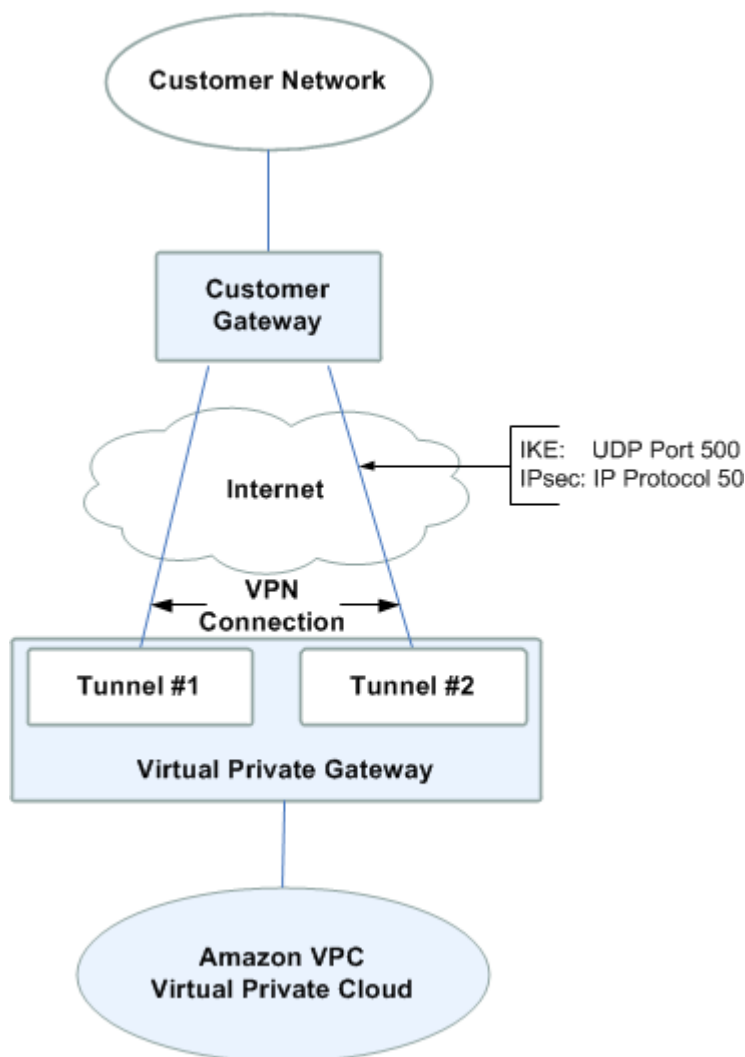
Your company has decided to use an optional Amazon VPC VPN connection that links your data center (or network) to your Amazon VPC virtual private cloud (VPC). A *customer gateway* is the anchor on your side of that connection. It can be a physical or software appliance. The anchor on the AWS side of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

## Amazon Virtual Private Cloud Network Administrator Guide

### What Is a Customer Gateway?

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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. We recommend that you don't put your customer gateway behind a device performing network address translation (NAT).

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.

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 [Amazon Virtual Private Cloud 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 <a href="#">Customer Gateway Devices We've Tested (p. 7)</a> and <a href="#">Requirements for Your Customer Gateway (p. 8)</a> ).  |
| 2 | <p>Determine the following information about the customer gateway:</p> <ul style="list-style-type: none"><li>• The vendor (for example, Cisco Systems), the platform (for example, ISR Series Routers), and the software version (for example, IOS 12.4)</li><li>• The Internet-routable IP address for the external interface.</li></ul> <p><b>Note</b><br/>We assume that the BGP ASN for the customer gateway is 65000.</p> |
| 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.  |

You can create additional VPN connections to other VPCs using the same customer gateway appliance. However, each VPN connection requires a separate public IP address on 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<br>(can be same as the CIDR block for the VPC) |   | Example: 10.0.1.0/24 |            |
| (Optional) Subnet #2 CIDR block                                     |   | Example: 10.0.2.0/24 |            |







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Four Main Parts to Customer Gateway Configuration**

| Item  | How Used   | Comments  | Your Value |
|---|--|---|------------|
| (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 <code>YOUR_UPLINK_ADDRESS</code> )                            | 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 <code>YOUR_BGP_ASN</code> )          | 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 <a href="#">Wikipedia article</a> . |            |

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 Security Association (required to exchange keys used to establish the IPsec security association)                |
|              | IPsec Security Association (handles the tunnel's encryption, authentication, and so on.)                             |
|              | Tunnel interface (receives traffic going to and from the tunnel)   |
| Optional<br> | 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. The gateways will be used in an active/active mode, but 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 AWS Management Console to create multiple customer gateways, each with the unique public IP address of the gateway and a unique autonomous system number (ASN). 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 Virtual Private Cloud 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.

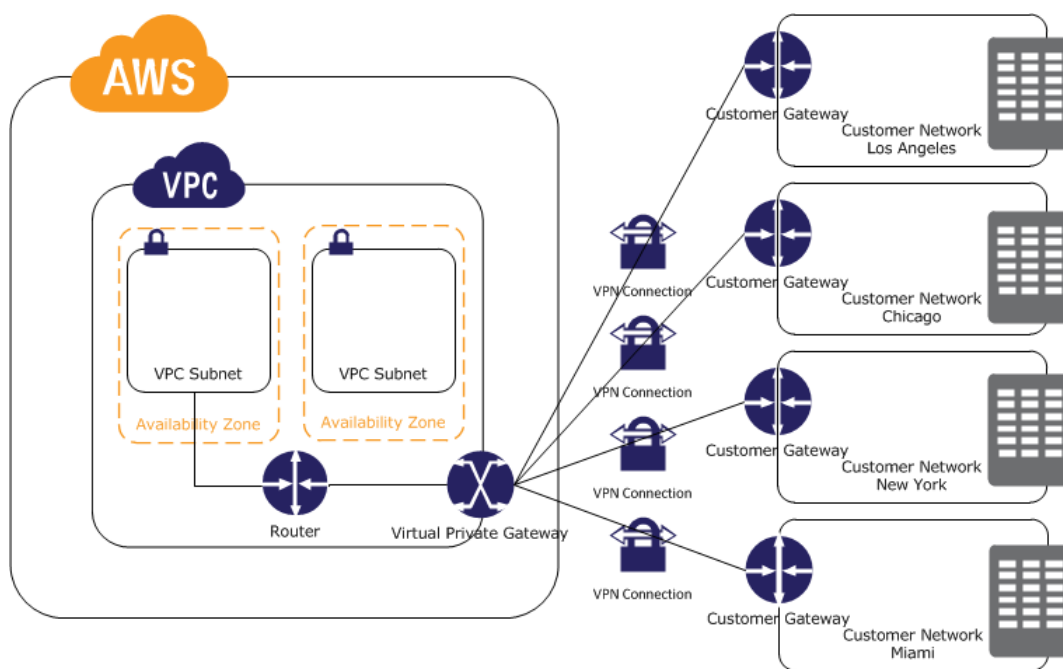
When you create multiple VPN connections, the virtual private gateway sends network traffic to the appropriate VPN connection using statically assigned routes or BGP route advertisements, depending upon how the VPN connection was configured. Statically assigned routes are preferred over BGP advertised 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)
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.
3. 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.
4. When the origins are the same, the router IDs of the advertising routes are compared. The lowest router ID is preferred.
5. When the router IDs are the same, the BGP peer IP addresses are compared. The lowest peer IP address is preferred.

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.

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:

- Cisco ASA running Cisco ASA 8.2 (or later) software
- Cisco IOS running Cisco IOS 12.4 (or later) software
- Juniper J-Series running JunOS 9.5 (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
- Yamaha RT107e, RTX1200, RTX1500, RTX3000 and SRT100 routers

- Microsoft Windows Server 2008 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. 69).

To provide context for the following requirements, think of each VPN connection as consisting of two separate tunnels. Each tunnel contains an IKE Security Association, an IPsec Security Association, and a BGP Peering. Note that you are limited to 2 Security Associations (SAs), one inbound and one outbound. 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<br><b>IKE</b> | <a href="#">RFC 2409</a> | 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. |
| Establish IPsec Security Associations in Tunnel mode<br><b>IPsec</b>   | <a href="#">RFC 4301</a> | 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 function                            | <a href="#">RFC 3602</a> | This encryption function is used to ensure privacy among both IKE and IPsec Security Associations.   |
| Utilize the SHA-1 hashing function                                     | <a href="#">RFC 2404</a> | This hashing function is used to authenticate both IKE and IPsec Security Associations.  |
| Utilize Diffie-Hellman Perfect Forward Secrecy in "Group 2" mode       | <a href="#">RFC 2409</a> | IKE uses Diffie-Hellman to establish ephemeral keys to secure all communication between customer gateways and VPN gateways.  |

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Guide  
Requirements for Your Customer Gateway**

| Requirement   | RFC                      | Comments  |
|---|--------------------------|---|
| Utilize IPsec Dead Peer Detection   | <a href="#">RFC 3706</a> | 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)<br> | 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 1436 byte Maximum Transmission Unit (MTU). An MTU up to 1500 bytes is supported.            |
| Fragment IP packets before encryption   | <a href="#">RFC 4459</a> | 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 <a href="#">the Wikipedia article on IP fragmentation</a> . |
| (Optional) Establish BGP peerings<br>                | <a href="#">RFC 4271</a> | 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.  |

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 | <a href="#">RFC 4459</a> | 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. |

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

| Technique                                  | RFC                     | Comments   |
|--|-------------------------|--|
| Reset the "Don't Fragment" flag on packets | <a href="#">RFC 791</a> | 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          |
| Protocol         | UDP                       |
| Source Port      | 500                       |
| Destination Port | 500                       |
| Input Rule I3    |                           |
| Source IP        | Virtual Private Gateway 1 |
| Dest IP          | Customer Gateway          |

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Guide  
If You Have a Firewall Between the Internet and Your  
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)               |

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.

## Example: Cisco ASA Device

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### Topics

- [A High-Level View of the Customer Gateway \(p. 12\)](#)
- [An Example Configuration \(p. 13\)](#)
- [How to Test the Customer Gateway Configuration \(p. 18\)](#)

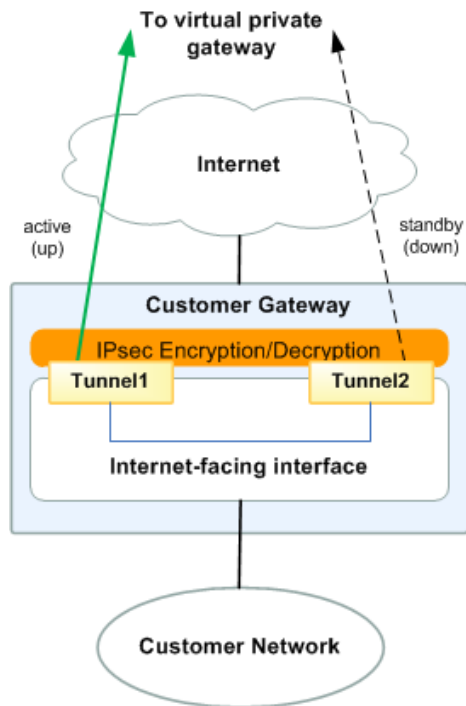
In this section we walk you through an example of the configuration information provided by your integration team if your customer gateway is a Cisco ASA device running Cisco ASA software.

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.

**Amazon Virtual Private Cloud Network Administrator  
Guide  
An Example Configuration**

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**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-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: Internet Key Exchange (IKE) Configuration
!
! A policy is established for the supported ISAKMP encryption,
! authentication, Diffie-Hellman, lifetime, and key parameters.
!
! Note that there is 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 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
```

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Guide  
An Example Configuration**

---

```
! tunnel endpoints.
!
tunnel-group AWS_ENDPOINT_1 type ipsec-l2l
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-l2l
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 applic
able
! 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. 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

! -----
```

**Amazon Virtual Private Cloud Network Administrator  
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---

```
-----
! #3: IPsec Configuration
!
! The IPsec transform set defines the encryption, authentication, and IPsec
! mode parameters.
!
crypto ipsec 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
!
! 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.
!
! Set security association lifetime until it is renegotiated.
crypto ipsec security-association lifetime seconds 3600
!
! 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 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 keep the tunnel active. A possible destin
! ation
```

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---

```
! for the ping is the VPC Gateway IP, which is the first IP address in one of
your
! subnets.
! For example: a VPC with a CIDR range of 192.168.50.0/24 will have a gateway
of
! 192.168.50.1.
! The VPC Gateway IP doesn't respond; so the ping fails, but sending
! the ping keeps the tunnel active.
!
! 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.

! This first entry provides an example to include traffic between your VPC Ad
dress space and your office.
! access-list amzn-filter extended permit ip vpc_subnet vpc_subnet_mask loc
al_subnet local_subnet_mask
! These remaining lines deny all traffic.
! 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
! exit
! 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 a yellow dot and indicate 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 must first 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.

#### Important

For the connectivity test to work, you must configure any security group or network ACL in your VPC that filters traffic to the instance to allow inbound and outbound ICMP traffic.

### 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 Virtual Private Cloud 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:
```

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```
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 do not test successfully, see [Troubleshooting Cisco ASA Customer Gateway Connectivity \(p. 84\)](#).

# Example: Cisco IOS Device

---

## Topics

- [A High-Level View of the Customer Gateway \(p. 21\)](#)
- [A Detailed View of the Customer Gateway and an Example Configuration \(p. 22\)](#)
- [How to Test the Customer Gateway Configuration \(p. 29\)](#)

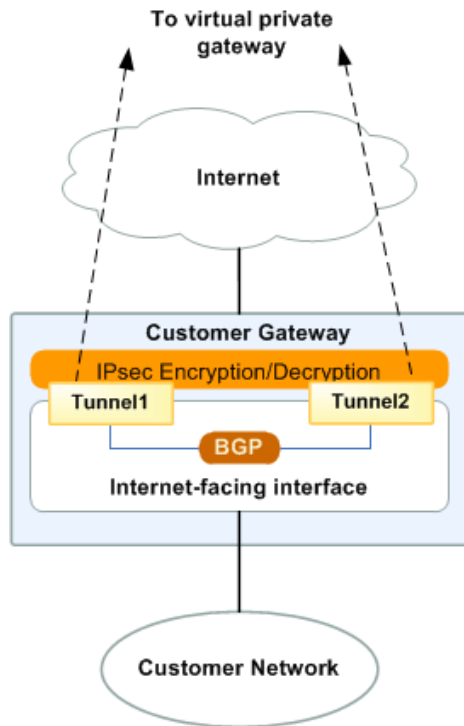
In this section we walk you through an example of the configuration information provided by your integration team if your customer gateway is a Cisco IOS device running Cisco IOS 12.4 (or later) software.

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 (which must be static, and can't be behind a device performing 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.

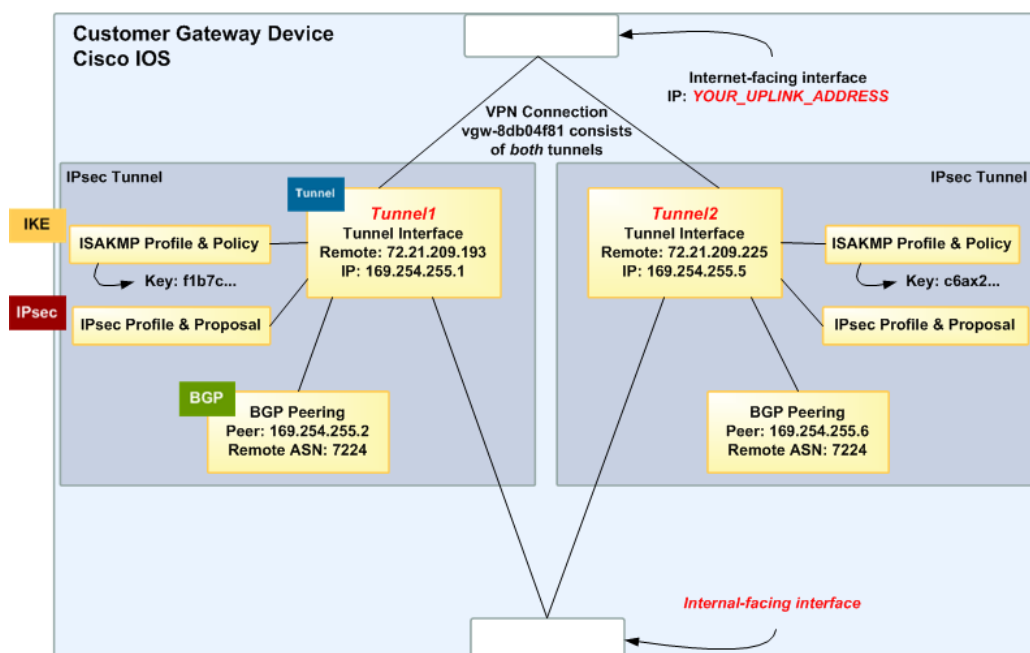
In addition, you must:

- Configure the outside interface
- Configure the tunnel interface IDs (referred to as *Tunnel1* and *Tunnel2* 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.

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## A Detailed View of the Customer Gateway and an Example 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.
!
! Note that there are a global list of ISAKMP policies, each identified by
```

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```
! 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-44a8938f-0
  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
  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.
!
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
```

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```
! 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 1396
  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 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' statement and
! 'default-originate' statements.
!
```

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Example Configuration**

```
! 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 present
! 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.
!
! 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
  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
```

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```
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.
!
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.
```

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```
!  
! 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 Tunnel12  
    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 1396  
    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 Gateway  
  
! 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.  
!  
! 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 present  
    ! 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 must first 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.

### Important

For the connectivity test to work, you must configure any security group or network ACL in your VPC that filters traffic to the instance to allow inbound and outbound ICMP traffic.

## 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 Virtual Private Cloud 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 Cisco IOS Customer Gateway Connectivity \(p. 87\)](#).

# Example: Cisco IOS Device without Border Gateway Protocol

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## Topics

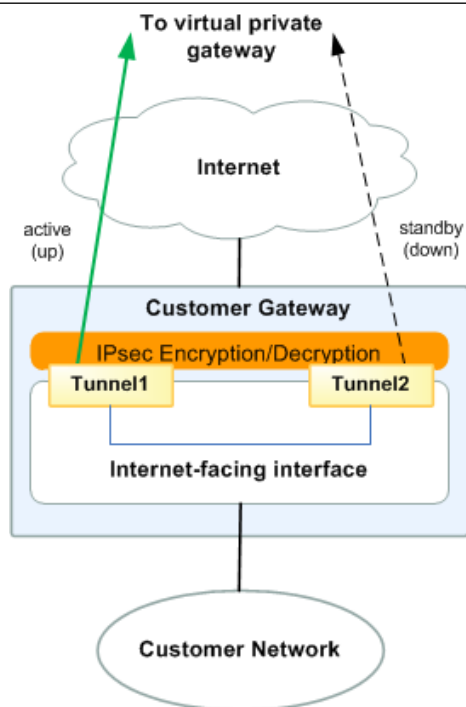
- [A High-Level View of the Customer Gateway \(p. 31\)](#)
- [A Detailed View of the Customer Gateway and an Example Configuration \(p. 32\)](#)
- [How to Test the Customer Gateway Configuration \(p. 38\)](#)

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 (which must be static, and can't be behind a device performing NAT)

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-12345678), 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:

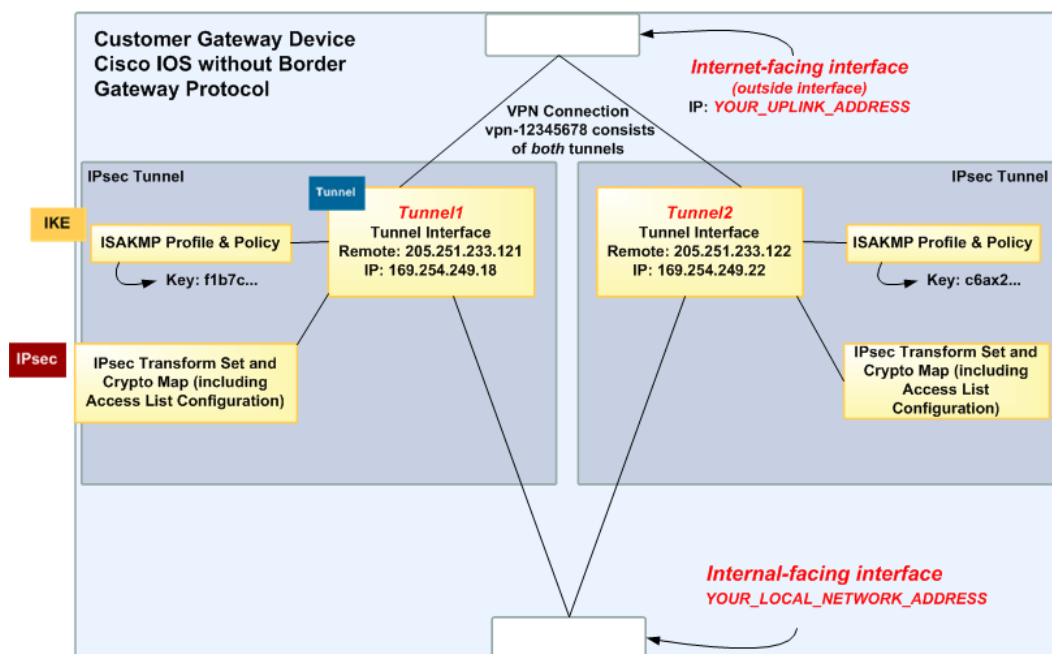
- Configure the outside interface.
- Configure the tunnel interface IDs (referred to as *Tunnel1* and *Tunnel2* in the example configuration).
- Ensure that the Crypto ISAKMP Policy Sequence number is unique.

## Amazon Virtual Private Cloud Network Administrator Guide

### A Detailed View of the Customer Gateway and an Example Configuration

- 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.
!
! 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
```

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Example Configuration**

```
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-0
local-address CUSTOMER_IP
pre-shared-key address 205.251.233.121 key PASSWORD
exit

! An ISAKMP profile is used to associate the keyring with the particular
! endpoint.
!
crypto isakmp profile isakmp-vpn-0
local-address CUSTOMER_IP
match identity address 205.251.233.121
keyring keyring-vpn-0
exit

! #2: IPSec Configuration
!
! The IPSec transform set defines the encryption, authentication, and IPSec
! mode parameters.
!
crypto ipsec transform-set ipsec-prop-vpn-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-0
set pfs group2
set security-association lifetime seconds 3600
set transform-set ipsec-prop-vpn-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.
```

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```
!
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 Tunnell
 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-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 Tunnell 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
exit
```

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```

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.
!
! 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-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-1
  local-address CUSTOMER_IP
  match identity address 205.251.233.122
  keyring keyring-vpn-1
exit

! #2: IPsec Configuration
!
! The IPsec transform set defines the encryption, authentication, and IPsec
! mode parameters.
!
crypto ipsec transform-set ipsec-prop-vpn-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-1
  set pfs group2

```



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```
set security-association lifetime seconds 3600
set transform-set ipsec-prop-vpn-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-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.
!
ip sla 200
    icmp-echo 169.254.249.21 source-interface Tunnel2
    timeout 1000
    frequency 5
exit
ip sla schedule 200 life forever start-time now
track 200 ip sla 200 reachability
! -----
----
```

## 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

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.

#### Important

For the connectivity test to work, you must configure any security group or network ACL in your VPC that filters traffic to the instance to allow inbound and outbound ICMP traffic.

### 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 Virtual Private Cloud 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 Cisco IOS Customer Gateway without Border Gateway Protocol Connectivity \(p. 92\)](#).

# Example: Juniper JunOS Device

---

## Topics

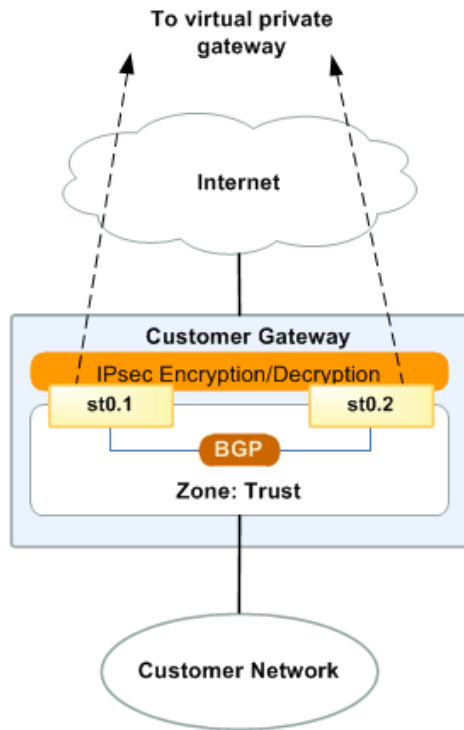
- [A High-Level View of the Customer Gateway \(p. 41\)](#)
- [A Detailed View of the Customer Gateway and an Example Configuration \(p. 42\)](#)
- [How to Test the Customer Gateway Configuration \(p. 49\)](#)

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 (which must be static, and can't be behind a device performing 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.

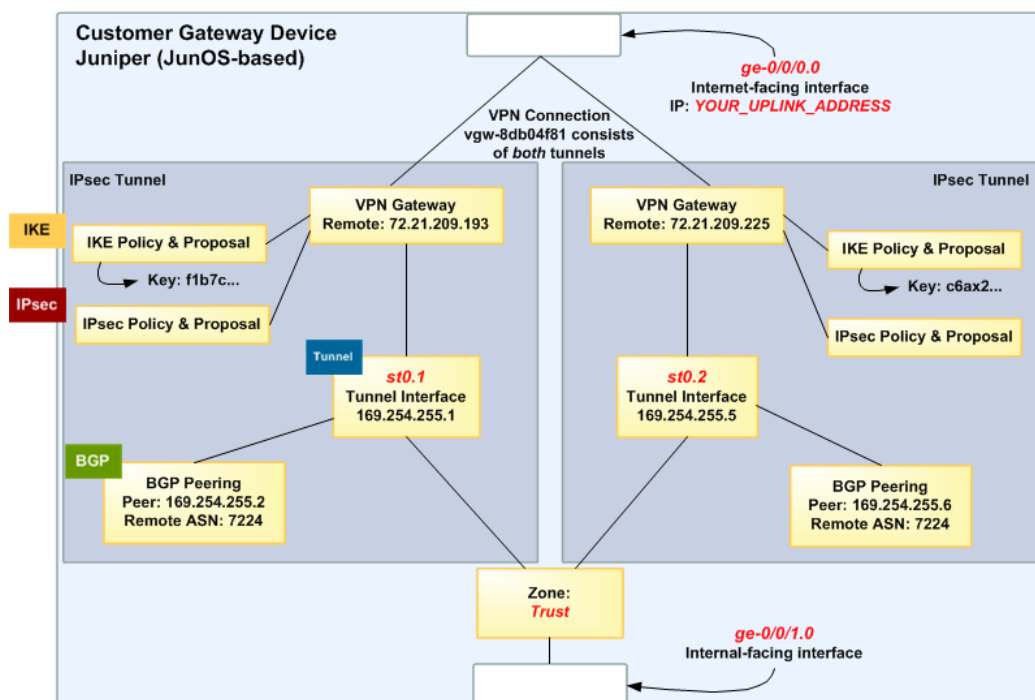
In addition, you must:

- 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.

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## A Detailed View of the Customer Gateway and an Example 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.
#
```

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```

set security ike proposal ike-prop-vpn-44a8938f-1 authentication-method pre-
shared-keys
set security ike proposal ike-prop-vpn-44a8938f-1 authentication-algorithm sha1
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-44a8938f-1 external-interface ge-0/0/0.0
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.
#
set security ipsec proposal ipsec-prop-vpn-44a8938f-1 protocol esp
set security ipsec proposal ipsec-prop-vpn-44a8938f-1 authentication-algorithm
  hmac-sha1-96
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

```



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```
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  
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 1396
```

**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. Only one prefix is
```

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```
# accepted by the Virtual Private Gateway.
#

# 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.
#
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 sha1
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.
```

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```
# 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 recre
ated.
#
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.
#
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
```

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**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 1396
```

**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. Only one prefix is
# accepted by the Virtual Private Gateway.
#

# 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 must first 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.

#### Important

For the connectivity test to work, you must configure any security group or network ACL in your VPC that filters traffic to the instance to allow inbound and outbound ICMP traffic.

### 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 Virtual Private Cloud 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),
```

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---

```
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 Juniper JunOS Customer Gateway Connectivity \(p. 96\)](#).

# Example: Juniper ScreenOS Device

---

## Topics

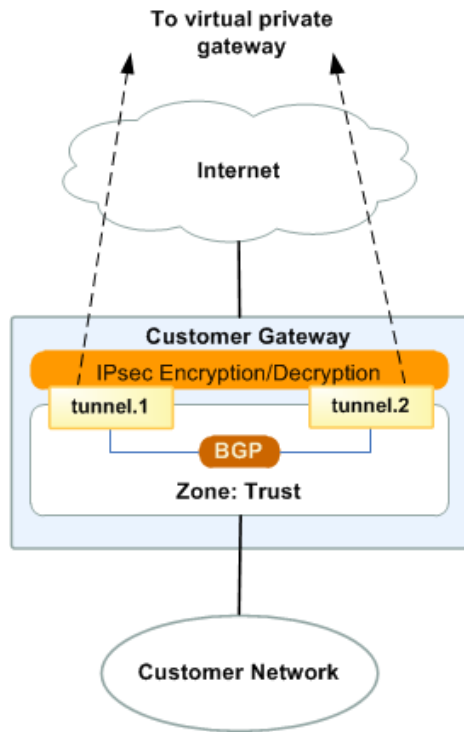
- [A High-Level View of the Customer Gateway \(p. 52\)](#)
- [A Detailed View of the Customer Gateway and an Example Configuration \(p. 53\)](#)
- [How to Test the Customer Gateway Configuration \(p. 58\)](#)

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:

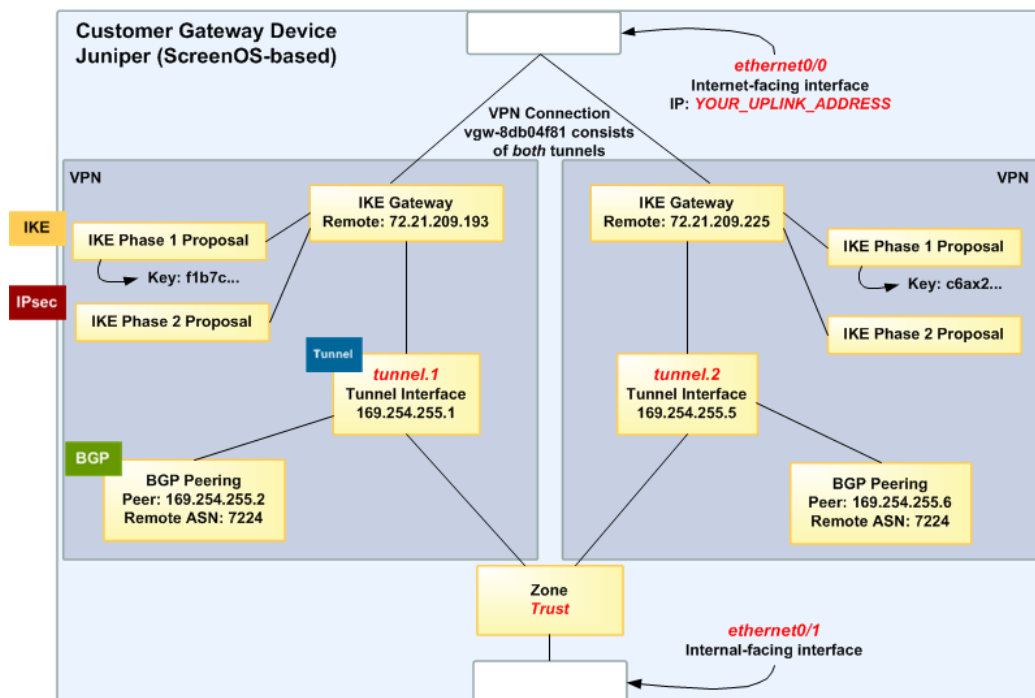
- *YOUR\_UPLINK\_ADDRESS*—The IP address for the Internet-routable external interface on the customer gateway (which must be static, and can't be behind a device performing NAT)
- *YOUR\_BGP\_ASN*—The customer gateway's BGP ASN (we use 65000 by default)

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 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.



## Amazon Virtual Private Cloud Network Administrator Guide

### A Detailed View of the Customer Gateway and an Example 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.
#

set ike pl-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.
#
```

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```
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
# debug ike all       -- Enable IKE debugging
# 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.
#

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 1396
```

#### BGP

**Amazon Virtual Private Cloud Network Administrator  
Guide  
A Detailed View of the Customer Gateway and an  
Example Configuration**

```
# #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 ipv4 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 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 ipv4 advertise-def-route
set enable
set neighbor 169.254.255.1 remote-as 7224
set neighbor 169.254.255.1 enable
set ipv4 neighbor 169.254.255.1 activate
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.
#

set ike pl-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.
```

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Example Configuration**

```
#
# 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-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 dbuf          -- Clear debug buffer
# debug ike all       -- Enable IKE debugging
# get dbuf stream     -- View debug messages
# undebuf 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.
#

set ike p2-proposal ipsec-prop-vpn-44a8938f-2 group2 esp aes128 sha-1 second
3600
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 1396
```

#### 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 ipv4 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 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 ipv4 advertise-def-route
set enable
set neighbor 169.254.255.5 remote-as 7224
set neighbor 169.254.255.5 enable
set ipv4 neighbor 169.254.255.5 activate
exit
exit
set interface tunnel.2 protocol bgp
```

## 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

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.

### **Important**

For the connectivity test to work, you must configure any security group or network ACL in your VPC that filters traffic to the instance to allow inbound and outbound ICMP traffic.

### **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 Virtual Private Cloud 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 Juniper ScreenOS Customer Gateway Connectivity \(p. 100\)](#).

# Example: Yamaha Device

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## Topics

- [A High-Level View of the Customer Gateway \(p. 61\)](#)
- [A Detailed View of the Customer Gateway and an Example Configuration \(p. 61\)](#)
- [How to Test the Customer Gateway Configuration \(p. 67\)](#)

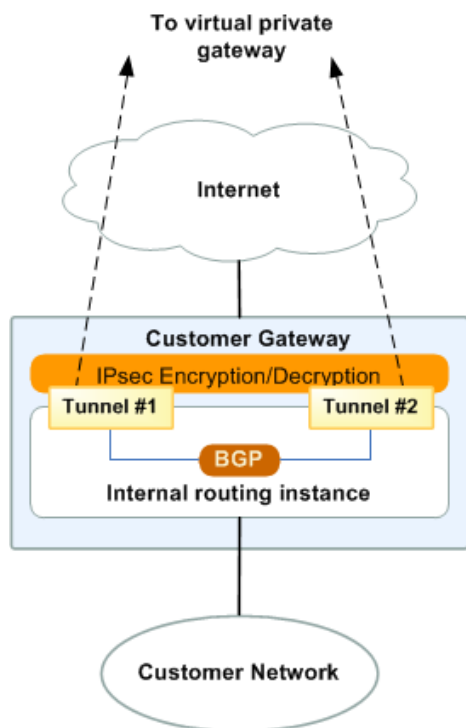
In this section we walk you through an example of the configuration information provided by your integration team if your customer gateway is a Yamaha RT107e, RTX1200, RTX1500, RTX3000, or SRT100 router.

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 (which must be static, and can't be behind a device performing NAT)
- ***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).

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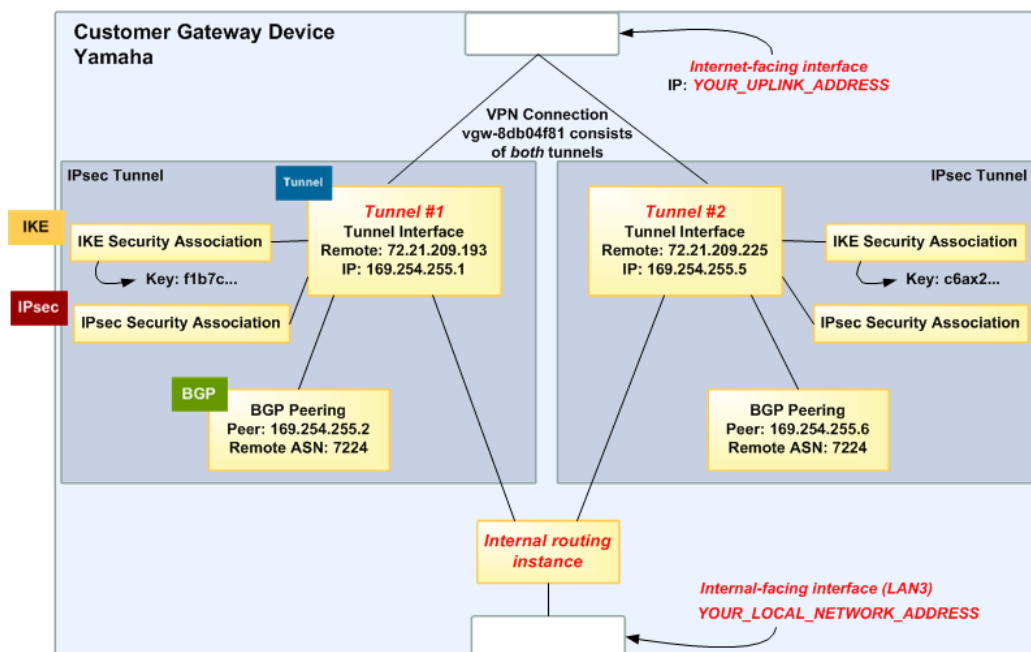
### A Detailed View of the Customer Gateway and an Example Configuration

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
#
#
```

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```
# 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.
```

```
#
```

```
tunnel select 1
```

```
ipsec ike encryption 1 aes-cbc
```

```
ipsec ike group 1 modp1024
```

```
ipsec ike hash 1 sha
```

```
# The ISAKMP keyring 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.
```

```
# Note that there is a global list of IPsec 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.
```

```
#
```

```
ipsec tunnel 200
```

```
ipsec sa policy 200 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
```

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```
# 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 1396
tunnel enable 1
no tunnel select 1
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.
#
# 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
```

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Example Configuration**

```
# To advertise additional prefixes to Amazon VPC, copy the 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.
```

```
bgp import filter 1 equal 0.0.0.0/0
bgp import 7224 static filter 1
bgp configure refresh
```

**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.
#
tunnel select 2
ipsec ike encryption 2 aes-cbc
ipsec ike group 2 modp1024
ipsec ike hash 2 sha

# The ISAKMP keyring 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.

# 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 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
```

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Example Configuration**

```
# 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
```

**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 1396
tunnel enable 2
no tunnel select 2
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.
#
```

```
# 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 169.254.255.5 hold-time=30 local-address=169.254.255.6

# To advertise additional prefixes to Amazon VPC, copy the 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.

bgp import filter 1 equal 0.0.0.0/0
bgp import 7224 static filter 1
bgp configure refresh
```

## 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

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.

#### Important

For the connectivity test to work, you must configure any security group or network ACL in your VPC that filters traffic to the instance to allow inbound and outbound ICMP traffic.

### 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 Virtual Private Cloud 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.

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---

**How to Test the Customer Gateway Configuration**

```
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 Yamaha Customer Gateway Connectivity \(p. 103\)](#).



# Example: Generic Customer Gateway Using Border Gateway Protocol

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## Topics

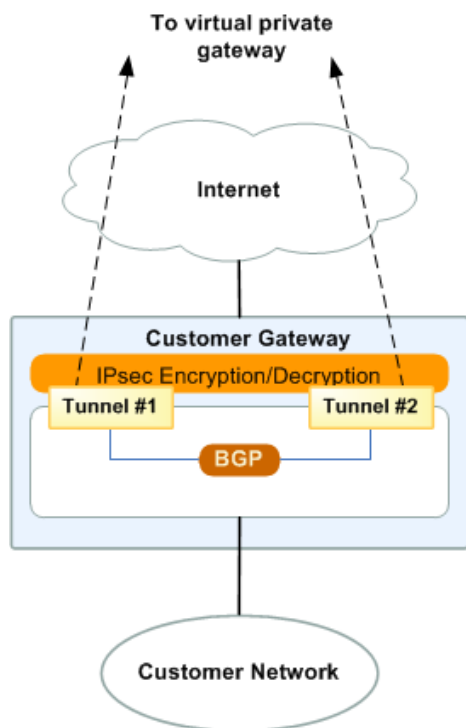
- [A High-Level View of the Customer Gateway \(p. 70\)](#)
- [A Detailed View of the Customer Gateway and an Example Configuration \(p. 70\)](#)
- [How to Test the Customer Gateway Configuration \(p. 75\)](#)

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:

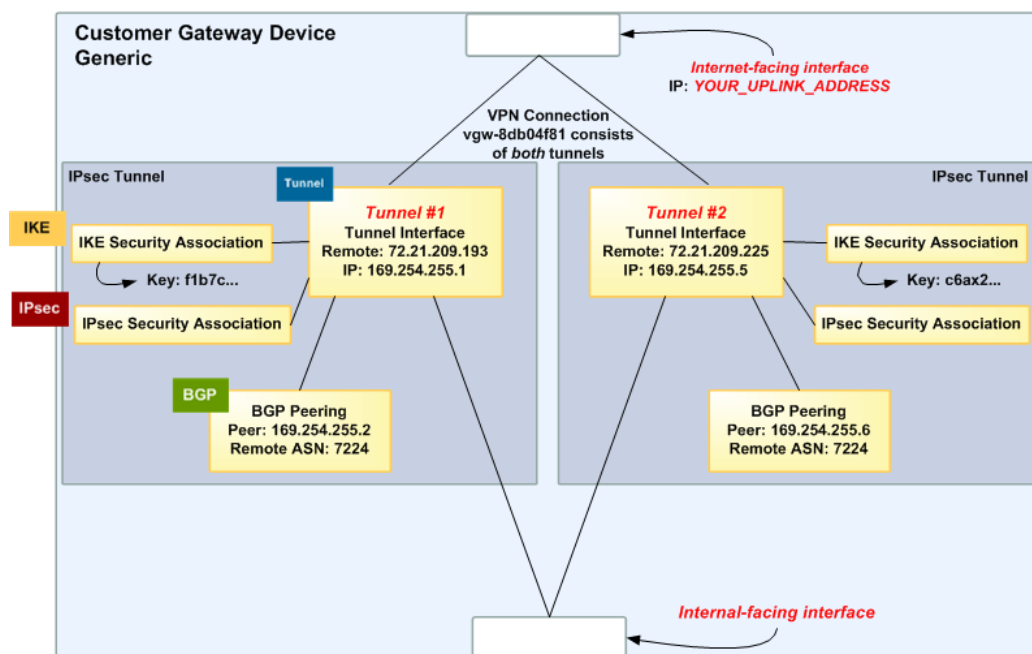
- ***YOUR\_UPLINK\_ADDRESS***—The IP address for the Internet-routable external interface on the customer gateway (which must be static, and can't be behind a device performing NAT)
- ***YOUR\_BGP\_ASN***—The customer gateway's BGP ASN (we use 65000 by default)

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.

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### A Detailed View of the Customer Gateway and an Example Configuration

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

- Authentication Method : Pre-Shared Key
- Pre-Shared Key : plain-text-password1
- Authentication Algorithm : sha1
- Encryption Algorithm : aes-128-cbc

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Example Configuration**

- 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:

- Protocol : esp
- Authentication Algorithm : hmac-sha1-96
- 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 : 1396 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.

Additionally, the Virtual Private Gateway and Customer Gateway establish the BGP peering from your tunnel interface.

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*

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Example Configuration**

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 : *169.254.255.1*
- Neighbor Hold Time : 30

Configure BGP to announce the default route (0.0.0.0/0) to the VPN Connection Gateway. The Virtual Private Gateway will announce prefixes to your Customer Gateway based upon the prefixes assigned in the creation of the VPC.

IPsec Tunnel #2

=====

**IKE**

#1: Internet Key Exchange Configuration

Configure the IKE SA as follows

- Authentication Method : Pre-Shared Key
- Pre-Shared Key : *plain-text-password2*
- Authentication Algorithm : sha1
- 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:

- Protocol : esp
- Authentication Algorithm : hmac-sha1-96
- 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

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Guide  
A Detailed View of the Customer Gateway and an  
Example Configuration**

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 : 1396 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.

Additionally, the Virtual Private Gateway and Customer Gateway establish the BGP peering from your tunnel interface.

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 : *169.254.255.6/30*
- 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 the default route (0.0.0.0/0) to the VPN Connection Gateway. The Virtual Private Gateway will announce prefixes to your Customer Gateway based upon the prefixes assigned in the creation of the VPC.

## 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

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.

### Important

For the connectivity test to work, you must configure any security group or network ACL in your VPC that filters traffic to the instance to allow inbound and outbound ICMP traffic.

### 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 Virtual Private Cloud 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),
```

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---

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 \(p. 106\)](#).



# Example: Generic Customer Gateway without Border Gateway Protocol

---

## Topics

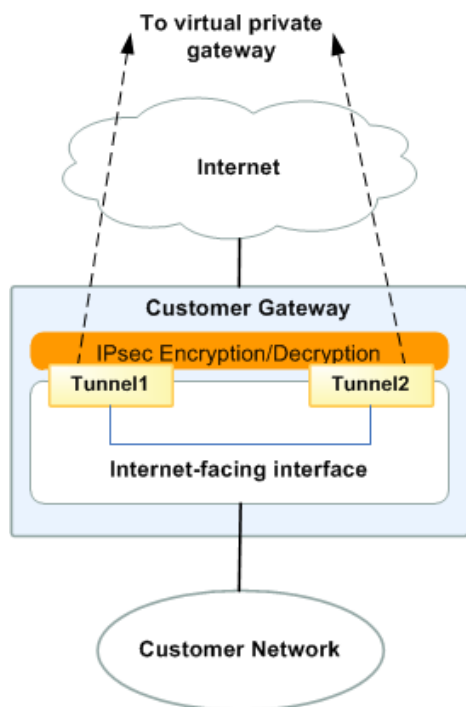
- [A High-Level View of the Customer Gateway \(p. 78\)](#)
- [A Detailed View of the Customer Gateway and an Example Configuration \(p. 78\)](#)
- [How to Test the Customer Gateway Configuration \(p. 83\)](#)

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:

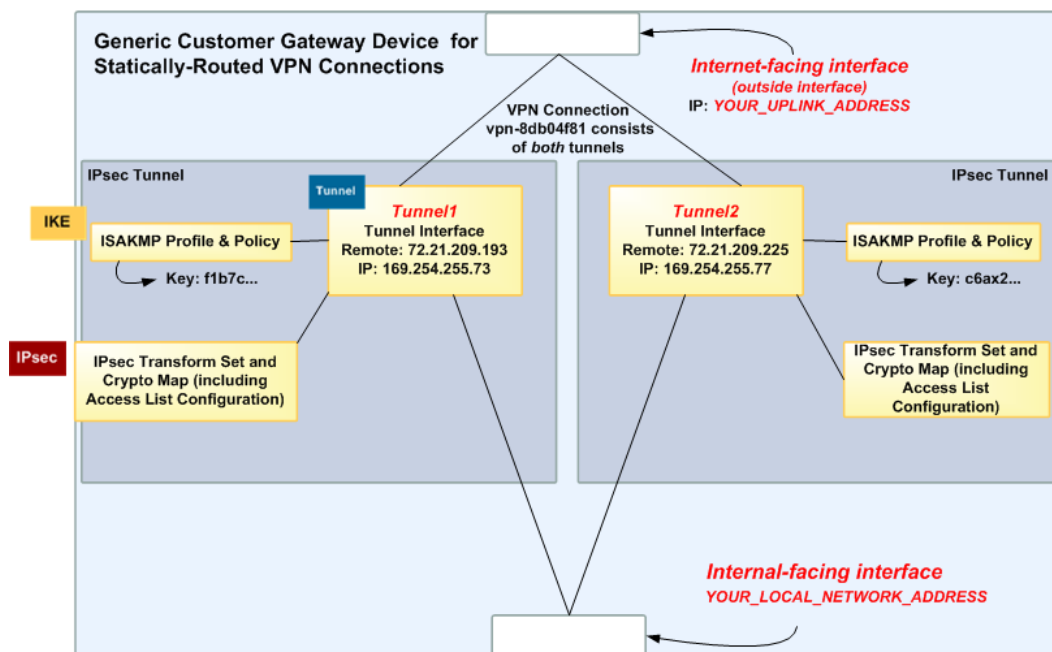
- ***YOUR\_UPLINK\_ADDRESS***—The IP address for the Internet-routable external interface on the customer gateway (which must be static, and can't be behind a device performing NAT)

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## A Detailed View of the Customer Gateway and an Example Configuration

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.

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

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

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Guide  
A Detailed View of the Customer Gateway and an  
Example Configuration**

**IKE**

#1: Internet Key Exchange Configuration

Configure the IKE SA as follows

- Authentication Method : Pre-Shared Key
- Pre-Shared Key : *PRE-SHARED-KEY-IN-PLAIN-TEXT*
- Authentication Algorithm : sha1
- 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:

- Protocol : esp
- Authentication Algorithm : hmac-sha1-96
- 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.

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.

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Example Configuration**

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 : 1427 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

- Authentication Method : Pre-Shared Key
- Pre-Shared Key : *PRE-SHARED-KEY-IN-PLAIN-TEXT*
- Authentication Algorithm : sha1
- 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:

- Protocol : esp
- Authentication Algorithm : hmac-sha1-96
- 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:

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Example Configuration**

- 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 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 : 1427 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 the tunnels.

# 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.

### Important

For the connectivity test to work, you must configure any security group or network ACL in your VPC that filters traffic to the instance to allow inbound and outbound ICMP traffic.

## 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 available in the Quick Start menu when you use the Launch Instances Wizard in the AWS Management Console. For more information, see the [Amazon Virtual Private Cloud 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 \(p. 106\)](#).

# 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 \(p. 84\)](#)
- [Troubleshooting Cisco IOS Customer Gateway Connectivity \(p. 87\)](#)
- [Troubleshooting Cisco IOS Customer Gateway without Border Gateway Protocol Connectivity \(p. 92\)](#)
- [Troubleshooting Juniper JunOS Customer Gateway Connectivity \(p. 96\)](#)
- [Troubleshooting Juniper ScreenOS Customer Gateway Connectivity \(p. 100\)](#)
- [Troubleshooting Yamaha Customer Gateway Connectivity \(p. 103\)](#)
- [Troubleshooting Generic Device Customer Gateway Connectivity Using Border Gateway Protocol \(p. 106\)](#)
- [Troubleshooting Generic Device Customer Gateway without Border Gateway Protocol Connectivity \(p. 108\)](#)

## 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.

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.

## IKE

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



```
ciscoasa# show crypto isakmp sa
  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 sub
net_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-ppel

    #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
    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 0x00000001
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 0x00000001
```

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.

Also use the following ping command to force your IPsec to start negotiation and goes up.

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

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

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:

```
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 access-list-name extended permit ip any host vpc_subnet sub
net_mask
access-list access-list-name extended permit ip any 10.0.0.0 255.0.0.0
```

3. Verify that this access list is correct. The 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, AWS\_ENDPOINT\_1/AWS\_ENDPOINT\_2).  
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.

### 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
```

|                |               |         |      |   |        |
|----------------|---------------|---------|------|---|--------|
| 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
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): (0.0.0.0/0.0.0.0/0/0)
  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: Tunnell-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 pcg 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 pcg 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 pcg 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.

```
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  
0 BGP filter-list cache entries using 0 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      | V | 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    i  
  
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: Tunnell
  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: Tunnell-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: Tunnell-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:

inbound pcg 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 pcg 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
  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
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 JunOS Device \(p. 40\)](#)). 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
Total active tunnels: 2
ID      Gateway      Port  Algorithm      SPI      Life:sec/kb  Mon  vsys
<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 c1e0eb29  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
```

## Amazon Virtual Private Cloud Network Administrator Guide BGP

```
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
Peer           AS      InPkt    OutPkt    OutQ   Flaps Last 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
  Received prefixes:        1
  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

inet.0: 10 destinations, 11 routes (10 active, 0 holddown, 0 hidden)
  Prefix            Nexthop          MED      Lclpref    AS path
* 0.0.0.0/0         Self              100      0          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      0          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/-  -1 0
00000001<   72.21.209.193  500 esp:a128/sha1 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 \(p. 51\)](#))).

## 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.

```
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 0kbps, configured egress [gbw 0kbps mbw 0kbps]
           configured ingress mbw 0kbps, current bw 0kbps
           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 vrtruster 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 de
fault(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   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.

```
# show ipsec sa gateway 1
sgw  flags local-id                               remote-id      # of sa
-----
1      U K   YOUR_LOCAL_NETWORK_ADDRESS      72.21.209.225  i:2 s:1 r:1
```

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
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.

```
# show status tunnel 1
TUNNEL[1]:
Description:
  Interface type: IPsec
  Current status is Online.
  from 2011/08/15 18:19:45.
  5 hours 7 minutes 58 seconds connection.
  Received:      (IPv4) 3933 packets [244941 octets]
                 (IPv6) 0 packet [0 octet]
  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.

```
# show status bgp neighbor 169.254.255.1 advertised-routes
Total routes: 1
*: valid route
  Network          Next Hop          Metric LocPrf Path
* default          0.0.0.0           0      IGP
```

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

```
# show ip route
Destination      Gateway          Interface      Kind  Additional Info.
default          ***.***.***.*** LAN3(DHCP)     static
10.0.0.0/16      169.254.255.1   TUNNEL[1]      BGP   path=10124
```

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.

**Amazon Virtual Private Cloud Network Administrator  
Guide  
Generic Device Customer Gateway Connectivity**

|               |  |
|---------------|--|
| <b>IKE</b>    | <p>Determine if an IKE Security Association exists.</p> <p>An IKE security association is required to exchange keys that are used to establish the IPsec Security Association.</p> <p>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.</p> <p>If an IKE security association exists, move on to IPsec.</p>  |
| <b>IPsec</b>  | <p>Determine if an IPsec Security Association exists.</p> <p>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.</p> <p>If no IPsec Security Association exists, review your IPsec configuration.</p> <p>If an IPsec Security Association exists, move on to the tunnel.</p>   |
| <b>Tunnel</b> | <p>Confirm the required firewall rules are set up (for a list of the rules, see <a href="#">If You Have a Firewall Between the Internet and Your Customer Gateway (p. 10)</a>). If they are, move forward.</p> <p>Determine if there is IP connectivity via the tunnel.</p> <p>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.</p> <p>If the ping isn't successful, review your tunnel interface configuration to ensure the proper IP address is configured.</p> <p>If the ping is successful, move on to BGP.</p> |
| <b>BGP</b>    | <p>Determine if the BGP peering is active.</p> <p>For each tunnel, do the following:</p> <ul style="list-style-type: none"><li>• On your customer gateway, determine if the BGP status is <i>Active</i> or <i>Established</i>. It may take approximately 30 seconds for a BGP peering to become active.</li><li>• Ensure that the customer gateway is advertising the default route (0.0.0.0/0) to the virtual private gateway.</li></ul> <p>If the tunnels are not in this state, review your BGP configuration.</p> <p>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.</p>   |
|               | <p>Make sure your virtual private gateway is attached to your VPC. Your integration team does this with the AWS Management Console.</p>  |

For general testing instructions applicable to all customer gateways, see [How to Test the Customer Gateway Configuration \(p. 75\)](#).

If you have questions or need further assistance, please use the [Amazon VPC forum](#).

## Troubleshooting Generic Device Customer Gateway without Border Gateway Protocol Connectivity

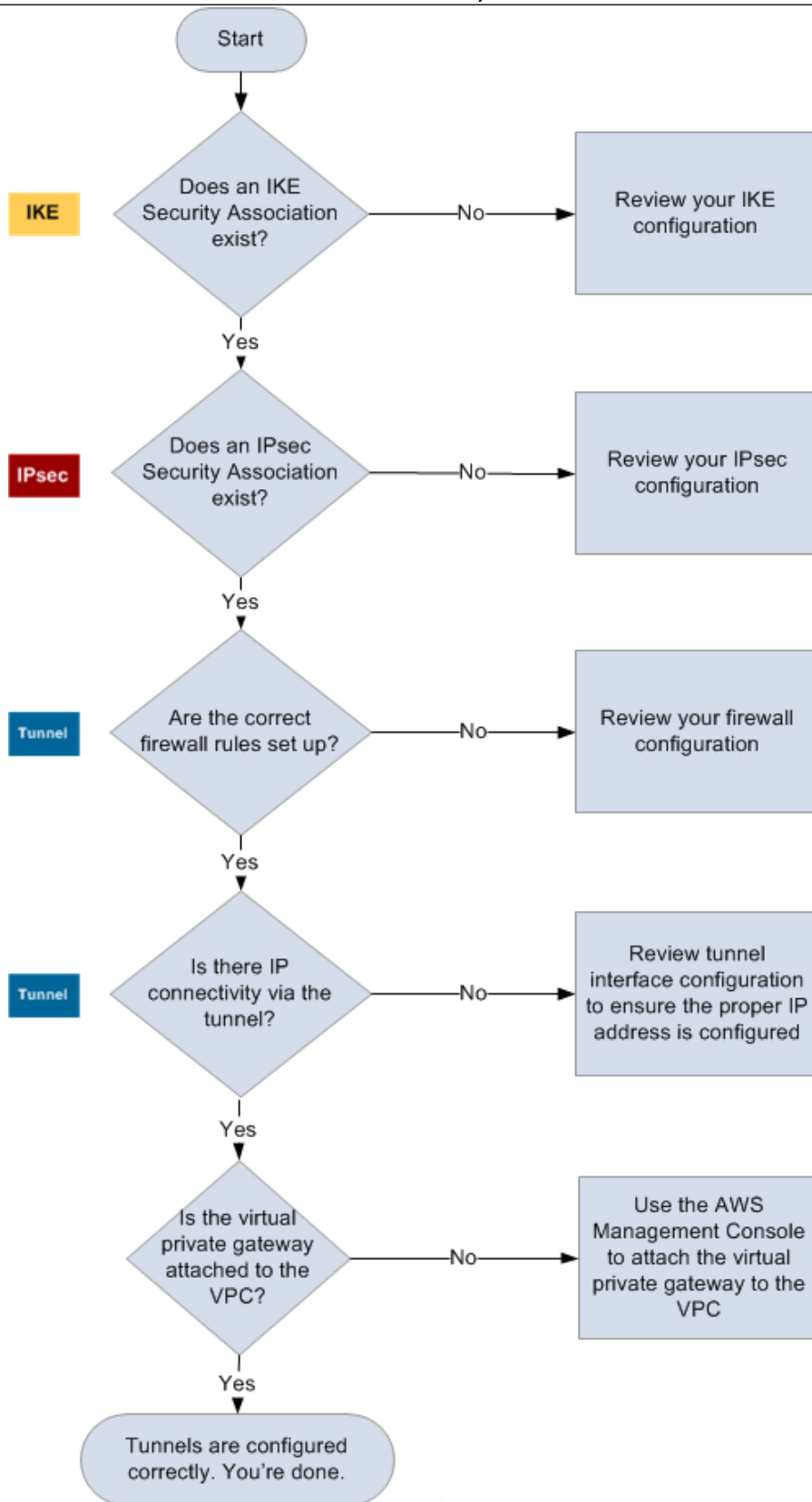
The following diagram and table provide general instructions for troubleshooting a customer gateway device that does not use Border Gateway Protocol.

**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.



Amazon Virtual Private Cloud Network Administrator  
Guide  
Generic Device Customer Gateway Connectivity (without  
BGP)



**Amazon Virtual Private Cloud Network Administrator  
Guide  
Generic Device Customer Gateway Connectivity (without  
BGP)**

|               |  |
|---------------|--|
| <b>IKE</b>    | <p>Determine if an IKE Security Association exists.</p> <p>An IKE security association is required to exchange keys that are used to establish the IPsec Security Association.</p> <p>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.</p> <p>If an IKE security association exists, move on to IPsec.</p>  |
| <b>IPsec</b>  | <p>Determine if an IPsec Security Association exists.</p> <p>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.</p> <p>If no IPsec Security Association exists, review your IPsec configuration.</p> <p>If an IPsec Security Association exists, move on to the tunnel.</p>   |
| <b>Tunnel</b> | <p>Confirm the required firewall rules are set up (for a list of the rules, see <a href="#">If You Have a Firewall Between the Internet and Your Customer Gateway (p. 10)</a>). If they are, move forward.</p> <p>Determine if there is IP connectivity via the tunnel.</p> <p>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.</p> <p>If the ping isn't successful, review your tunnel interface configuration to ensure the proper IP address is configured.</p> <p>If the ping is successful, move on to Routing.</p> |
| Static routes | <p>Routing:</p> <p>For each tunnel, do the following:</p> <ul style="list-style-type: none"> <li>• Verify that you have added a static route to your VPC CIDR with the tunnels as the next hop.</li> <li>• Verify that you have added a static route on the AWS console, to tell the VGW to route traffic back to your internal networks.</li> </ul> <p>If the tunnels are not in this state, review your device configuration.</p> <p>Ensure both tunnels are in this state, and you're done.</p>   |
|               | <p>Make sure your virtual private gateway is attached to your VPC. Your integration team does this with the AWS Management Console.</p>  |

If you have questions or need further assistance, please use the [Amazon VPC forum](#).

# Configuring Windows Server 2008 R2 as a Customer Gateway for Your VPC

---

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:

- [Step 1: Create a VPN Connection](#) (p. 112)
- [Step 2: Download the Configuration File for the VPN Connection](#) (p. 112)
- [Step 3: Configure the Server Using Data from the Configuration File](#) (p. 113)
- [Step 4: Set Up the VPN Tunnel](#) (p. 116)
- [Step 5: Enable Dead Gateway Detection](#) (p. 123)
- [Step 6: Test the VPN Connection](#) (p. 124)

## Prerequisites

Before you begin, make sure that you have the following:

- Windows Server 2008 R2 on your own network, or on an EC2 instance in a VPC
- The CIDR range for your network in which the Windows server is located, for example, 172.31.0.0/16
- The CIDR range for your VPC, for example, 10.0.0.0/16
- A customer gateway that specifies the IP address of the Windows Server 2008 R2 server

### Note

The IP address must be static and can't be behind a device performing NAT; if your customer gateway is a Windows server instance, you can use an Elastic IP address.

- A virtual private gateway attached to your VPC
- A subnet in your VPC for launching instances that will communicate with the Windows server
- Routing for your VPN connection:

- Add a route to your 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 about route tables, see [Route Tables](#) in the *Amazon Virtual Private Cloud User Guide*.
- A security group configuration that allows communication between your network and your VPC:
  - If your customer gateway is a Windows server instance in a VPC, its security group requires the following outbound custom protocol rules for IPsec traffic: IP protocol 50, IP protocol 51, and UDP 500. By default, a security group allows all outbound traffic, so this step is only required if the security group's outbound rules have been modified from their original state.
  - For instances that you launch in your VPC, add rules to their security groups that allow inbound RDP or SSH access from your network. This enables you to connect to instances in your VPC from your network. For more information, see [Security Groups for Your VPC](#) in the *Amazon Virtual Private Cloud User Guide*.
  - For instances that you launch in your VPC, add a rule to their security groups that allows inbound ICMP access. This enables you to test your VPN connection by pinging an instance in your VPC from your Windows server.

If you launched the Windows server instance from a current Amazon AMI, you might not be able to route traffic from other instances without updating your adapter settings.

#### To update your adapter settings

1. From your Windows server instance, open Control Panel, and start the Device Manager.
2. Expand the **Network adapters** node.
3. Right-click the Citrix network adapter, and then click **Properties**.
4. On the **Advanced** tab, disable the **IPv4 Checksum Offload**, **TCP Checksum Offload (IPv4)**, and **UDP Checksum Offload (IPv4)** properties, and then click **OK**.

## Step 1: Create a VPN Connection

#### To create a VPN connection

1. Open the Amazon VPC console.
2. In the navigation pane, click **VPN Connections**, and then click **Create VPN Connection**.
3. Select the virtual private gateway and customer gateway from the lists. Select the **Static** routing option, enter the **Static IP Prefixes** values for your server's network in CIDR notation (for example, 172.31.0.0/16), and then click **Yes, Create**.

## Step 2: Download the Configuration File for the VPN Connection

#### To download your configuration file

1. Click **VPN Connections** in the navigation pane.
2. Select your VPN connection, and then click **Download Configuration**.
3. 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.

## Step 3: Configure the Server Using Data from the Configuration File

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:             xCjNLsLoCmKsawkcdR9yX6GsEXAMPLE
```

### 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.

### 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 AWS Management Console displays a yellow icon indicating 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.

## Amazon Virtual Private Cloud Network Administrator Guide

### Step 3: Configure the Server Using Data from the Configuration File

|                      |   |
|----------------------|---|
| MainModeSecMethods:  | DHGroup2-AES128-SHA1 , DHGroup2-3DES-SHA1                       |
| MainModeKeyLifetime: | 480min, 0sec  |
| QuickModeSecMethods: | ESP:SHA1-AES128+60min+100000kb,<br>ESP:SHA1-3DES+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

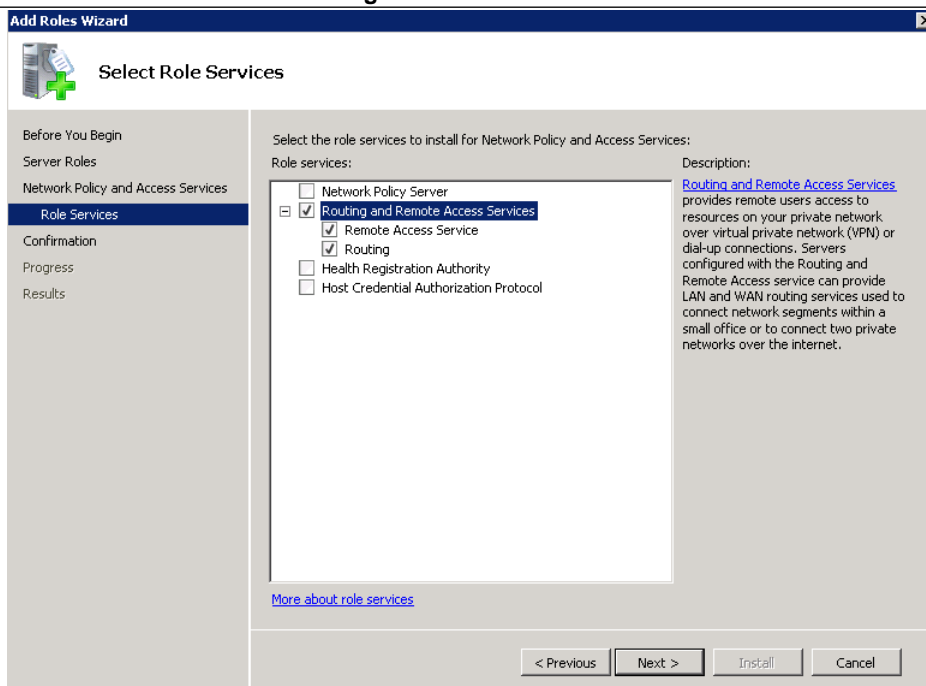
We suggest the use of master key perfect forward secrecy (PFS) for your IPsec sessions.

### To configure the Windows Server 2008 R2 server as the customer gateway

1. Log on to the Windows Server 2008 R2 server.
2. Click **Start**, point to **All Programs**, point to **Administrative Tools**, and then click **Server Manager**.
3. Install Routing and Remote Access Services:
  - a. In the Server Manager navigation pane, click **Roles**.
  - b. In the **Roles** pane, click **Add Roles**.
  - c. 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**.

## Amazon Virtual Private Cloud Network Administrator Guide

### Step 3: Configure the Server Using Data from the Configuration File



- 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

1. In the Server Manager navigation pane, expand **Roles**, and then expand **Network Policy and Access**.
2. Right-click **Routing and Remote Access Server**, and then click **Configure and Enable Routing and Remote Access**.
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-1a2b3c4d 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=xCjNLsLoCmKsakwcd0R9yX6Gsexample ^
QMSecMethods=ESP:SHA1-AES128+60min+100000kb ^
ExemptIPsecProtectedConnections=No ApplyAuthz=No QMPFS=dhgroup2
```

**Name:** You can replace the suggested name (VGW-1a2b3c4d 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.

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 \(p. 117\)](#)
- [2.3: Confirm the Tunnel Configuration \(p. 120\)](#)
- [2.4: Configure the Windows Firewall \(p. 120\)](#)

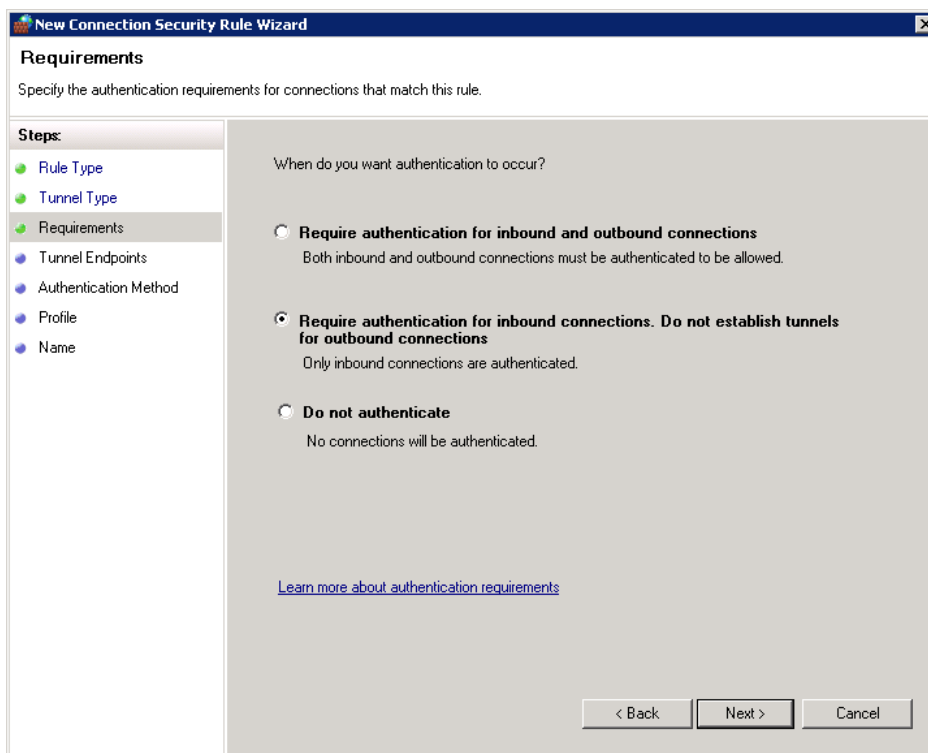


## 2.1: Configure a Security Rule for a VPN Tunnel

In this section, you will 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**.
3. 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**.

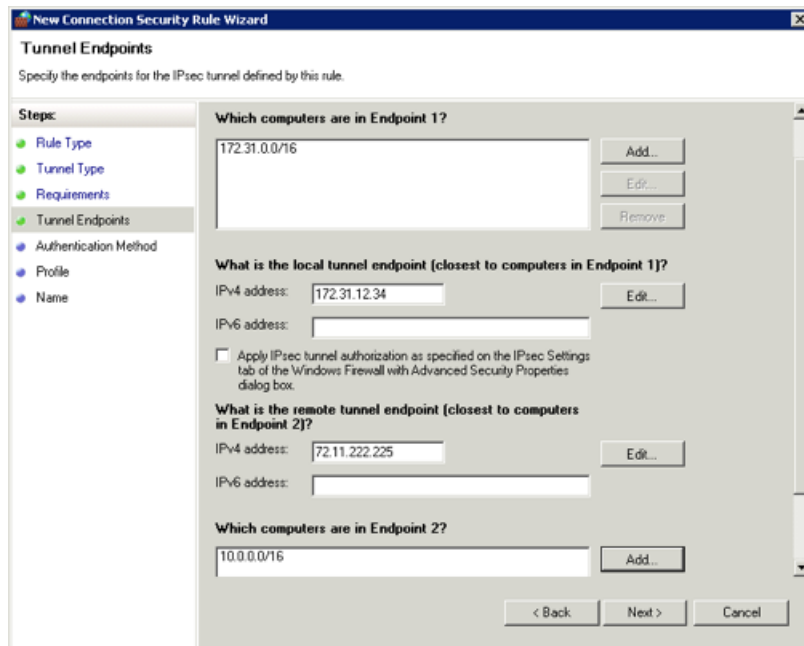
### Important

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.



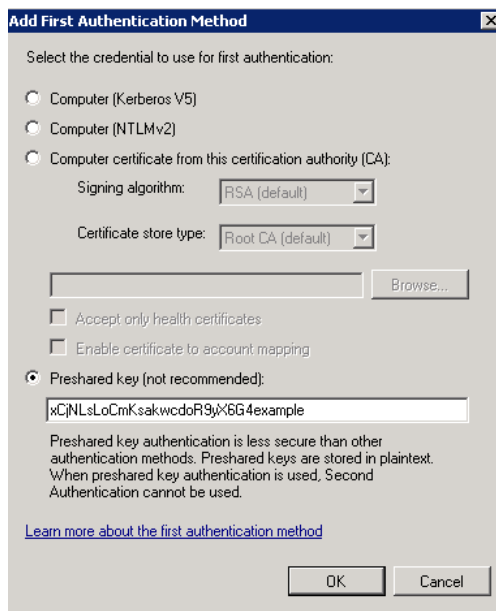
- Confirm that all the settings you've specified are correct, and then click **Next**.
- On the **Authentication Method** page, select **Advanced**, and then click **Customize**.
- Under **First authentication methods**, click **Add**.
- Select **Pre-Shared key**, enter the pre-shared key value from the configuration file, and click **OK**.

### Important

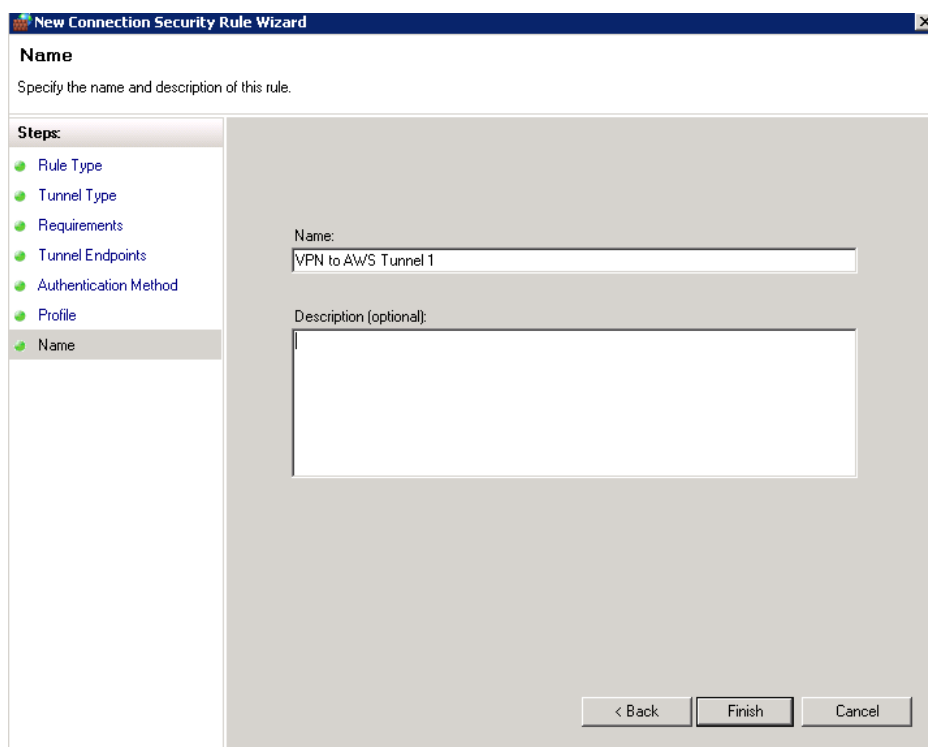
If you are repeating this procedure for Tunnel 2, be sure to select the pre-shared key for Tunnel 2.

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### Option 2: Use the Windows Server User Interface



14. Ensure that **First authentication is optional** is not selected, and click **OK**.
15. On the **Authentication Method** page, click **Next**.
16. 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.

After you've finished, you'll have two tunnels configured for your VPN connection.

## 2.3: Confirm the Tunnel Configuration

### To confirm 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.
5. 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.
  - **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

1. 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**.

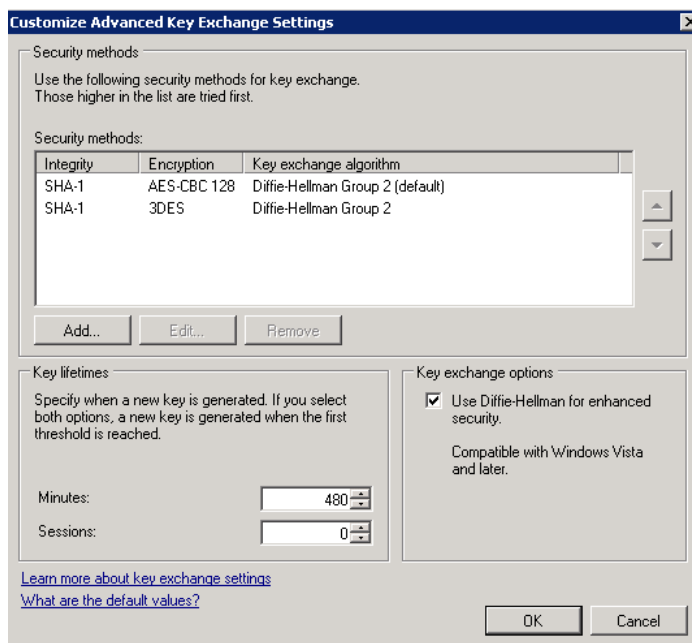
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5. In the **Customize IPsec Settings** dialog box, under **Key exchange (Main Mode)**, select **Advanced** and then click **Customize**.
6. In **Customize Advanced Key Exchange Settings**, under **Security methods**, verify that these default values are used for the first entry.
  - 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
```



7. 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: ESP
  - Integrity: SHA-1
  - Encryption: AES-CBC 128
  - Lifetime: 60 minutes

These value correspond to the following entries from the configuration file.

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```
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 website.

## Step 6: Test the VPN Connection

Get the private IP address of a running instance in your VPC, and then use the `ping` command from the Windows server to test the VPN connection; 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
Reply from 10.0.0.4: bytes=32 time=2ms TTL=62
Reply from 10.0.0.4: bytes=32 time=2ms TTL=62
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
```

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. 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 \(p. 111\)](#).
- Ensure that the operating system on the instance you are ping is configured to respond to ICMP. We recommend that you use one of the Amazon Linux AMIs.
- If the instance you are ping 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 \(p. 111\)](#).



## Document History

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The following table describes the important changes in each release of this Amazon VPC guide.

| Change   | Description  | Release Date      |
|--|--|-------------------|
| 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 are excited to announce that 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 <a href="#">Requirements for Your Customer Gateway</a> (p. 8).   | 04 May 2011       |
| 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  |