User Guide

# AWS Site-to-Site VPN

# AWS Site-to-Site VPN: User Guide

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# What is AWS Site-to-Site VPN?

By default, an instance that you launch within an Amazon VPC can't communicate with a local (AWS Cloud) network and a remote device — for example, this might be a site or an on-premises device. You can enable access to your remote devices from your VPC by creating an AWS Site-to-Site VPN (Site-to-Site VPN) connection, and configuring routing to pass traffic through the connection.

Although the term *VPN connection* is a general term, in this documentation, a VPN connection refers to the connection between your VPC and your own on-premises network. Site-to-Site VPN supports Internet Protocol security (IPsec) VPN connections.

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## Concepts

The following are the key concepts for Site-to-Site VPN:

- **VPN connection**: A secure connection between your on-premises equipment and your VPCs.
- **VPN tunnel**: An encrypted link where data can pass from the customer network to or from AWS.

  Each VPN connection includes two VPN tunnels which you can simultaneously use for high availability.
- **Customer gateway**: An AWS resource which provides information to AWS about your customer gateway device.
- **Customer gateway device**: A physical device or software application on your side of the Site-to-Site VPN connection.
- **Target gateway**: A generic term for the VPN endpoint on the Amazon side of the Site-to-Site VPN connection.

- **Virtual private gateway**: A virtual private gateway is the VPN endpoint on the Amazon side of your Site-to-Site VPN connection that can be attached to a single VPC.
- **Transit gateway**: A transit hub that can be used to interconnect multiple VPCs and on-premises networks, and as a VPN endpoint for the Amazon side of the Site-to-Site VPN connection.
- **Large Bandwidth Tunnel** : A tunnel configuration that supports up to 5 Gbps bandwidth per tunnel, compared to the standard 1.25 Gbps. Available for VPN connections attached to Transit Gateway or Cloud WAN.

## Site-to-Site VPN features

The following features are supported on AWS Site-to-Site VPN connections:

- Internet Key Exchange version 2 (IKEv2)
- NAT traversal
- 4-byte ASN in the range of 1–2147483647 for Virtual Private Gateway (VGW) configuration. See Customer gateway options for your AWS Site-to-Site VPN connection for more information.
- 2-byte ASN for Customer Gateway (CGW) in the range of 1–65535. See Customer gateway options for your AWS Site-to-Site VPN connection for more information.
- CloudWatch metrics
- Reusable IP addresses for your customer gateways
- Additional encryption options; including AES 256-bit encryption, SHA-2 hashing, and additional Diffie-Hellman groups
- Configurable tunnel options
- Custom private ASN for the Amazon side of a BGP session
- Private Certificate from a subordinate CA from AWS Private Certificate Authority
- Support for IPv6 support for AWS Site-to-Site VPN
  - IPv6 for inner tunnel IP addresses (packet IP)
  - IPv6 for outer tunnel IP addresses (tunnel IP) on Transit Gateway and Cloud WAN
- Full IPv6 migration support with the following combinations:
  - IPv6 outer tunnel IP with IPv6 inner packet IP (IPv6-in-IPv6)
  - IPv6 outer tunnel IP with IPv4 inner packet IP (IPv4-in-IPv6)

# Site-to-Site VPN limitations

A Site-to-Site VPN connection has the following limitations.

- IPv6 traffic is not supported for VPN connections on a virtual private gateway. IPv6 for outer tunnel IPs is only supported on Transit Gateway and Cloud WAN.
- An Site-to-Site VPN connection does not support Path MTU Discovery.
- A single Site-to-Site VPN connection cannot support both IPv4 and IPv6 traffic simultaneously. You need separate VPN connections to transport IPv4 and IPv6 packets.
- Private IP VPN connections do not support IPv6 addresses for outer tunnel IPs.
- You cannot modify an existing IPv4 VPN connection to use IPv6. You must delete the existing connection and create a new one.

In addition, take the following into consideration when you use Site-to-Site VPN.

- When connecting your VPCs to a common on-premises network, we recommend that you use non-overlapping CIDR blocks for your networks.

# Site-to-Site VPN resources

You can create, access, and manage your Site-to-Site VPN resources using any of the following interfaces:

- **AWS Management Console**— Provides a web interface that you can use to access your Site-to-Site VPN resources.
- **AWS Command Line Interface (AWS CLI)** — Provides commands for a broad set of AWS services, including Amazon VPC, and is supported on Windows, macOS, and Linux. the AWS Site-to-Site VPN command lines are included in the larger EC2 command line reference
  - For general information about the command line interface, see AWS Command Line Interface.
  - For the list of available EC2 commands, including the Site-to-Site VPN commands, see EC2 Command Line Reference.

> **Note**
>
> The command line reference does not differentiate between the Site-to-Site VPN commands and the larger set of EC2 commands

- **AWS SDKs** — Provide language-specific APIs and takes care of many of the connection details, such as calculating signatures, handling request retries, and error handling. For more information, see AWS SDKs.
- **Query API**— Provides low-level API actions that you call using HTTPS requests. Using the Query API is the most direct way to access Amazon VPC, but it requires that your application handle low-level details such as generating the hash to sign the request, and error handling. For more information, see the Amazon EC2 API Reference.

## Pricing

You are charged for each VPN connection hour that your VPN connection is provisioned and available. For more information, see AWS Site-to-Site VPN and Accelerated Site-to-Site VPN Connection pricing.

You are charged for data transfer out from Amazon EC2 to the internet. For more information, see Data Transfer on the Amazon EC2 On-Demand Pricing page.

When you create an accelerated VPN connection, we create and manage two accelerators on your behalf. You are charged an hourly rate and data transfer costs for each accelerator. For more information, see AWS Global Accelerator pricing.

There are no additional charges for using IPv6 addresses with your Site-to-Site VPN VPN connections.

# How AWS Site-to-Site VPN works

A Site-to-Site VPN connection consists of the following components:

- A virtual private gateway or a transit gateway
- A customer gateway device
- A customer gateway

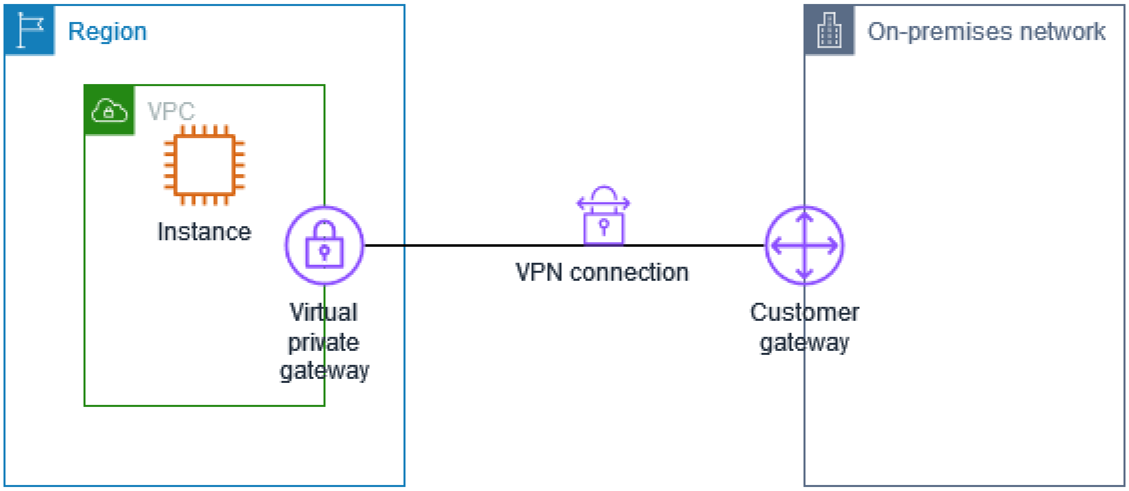
The VPN connection offers two VPN tunnels between a virtual private gateway or transit gateway on the AWS side, and a customer gateway on the on-premises side.

For more information about Site-to-Site VPN quotas, see AWS Site-to-Site VPN quotas.

## Virtual private gateway

A *virtual private gateway* is the Site-to-Site VPN Concentrator on the Amazon side of the Site-to-Site VPN connection. You create a virtual private gateway and attach it to a virtual private cloud (VPC) with resources that must access the Site-to-Site VPN connection.

The following diagram shows a VPN connection between a VPC and your on-premises network using a virtual private gateway.



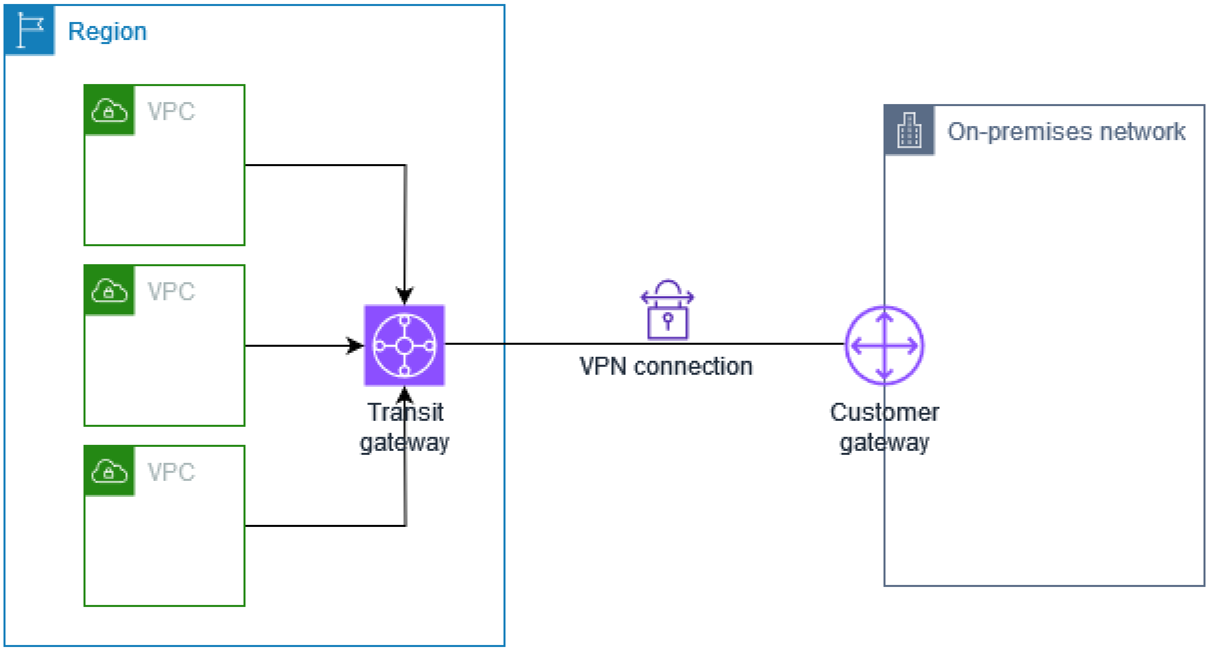
When you create a virtual private gateway, you can specify the private Autonomous System Number (ASN) for the Amazon side of the gateway. If you don't specify an ASN, the virtual private gateway is created with the default ASN (64512). You cannot change the ASN after you've created the virtual private gateway. To check the ASN for your virtual private gateway, view its details in the **Virtual private gateways** page in the Amazon VPC console, or use the describe-vpn-gateways AWS CLI command.

> **Note**
>
> Virtual private gateways do not support IPv6 for Site-to-Site VPN connections. If you need IPv6 support, use a transit gateway or Cloud WAN for your VPN connection.

## Transit gateway

A transit gateway is a transit hub that you can use to interconnect your VPCs and your on-premises networks. For more information, see Amazon VPC Transit Gateways. You can create a Site-to-Site VPN connection as an attachment on a transit gateway.

The following diagram shows a VPN connection between multiple VPCs and your on-premises network using a transit gateway. The transit gateway has three VPC attachments and a VPN attachment.



Your Site-to-Site VPN connection on a transit gateway can support IPv4 or IPv6 traffic inside the VPN tunnels (inner IP addresses). Additionally, transit gateways support IPv6 addresses for the outer tunnel IP addresses. For more information, see IPv4 and IPv6 traffic in AWS Site-to-Site VPN.

You can modify the target gateway of a Site-to-Site VPN connection from a virtual private gateway to a transit gateway. For more information, see the section called "Modify the target gateway of a VPN connection".

## Customer gateway device

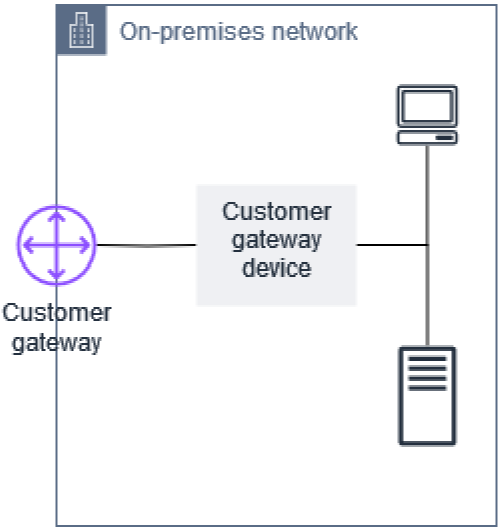
A *customer gateway device* is a physical device or software application on your side of the Site-to-Site VPN connection. You configure the device to work with the Site-to-Site VPN connection. For more information, see AWS Site-to-Site VPN customer gateway devices.

By default, your customer gateway device must bring up the tunnels for your Site-to-Site VPN connection by generating traffic and initiating the Internet Key Exchange (IKE) negotiation process. You can configure your Site-to-Site VPN connection to specify that AWS must initiate the IKE negotiation process instead. For more information, see AWS Site-to-Site VPN tunnel initiation options.

If you're using IPv6 for the outer tunnel IP addresses, your customer gateway device must support IPv6 addressing and be able to establish IPsec tunnels with IPv6 endpoints.

## Customer gateway

A *customer gateway* is a resource that you create in AWS that represents the customer gateway device in your on-premises network. When you create a customer gateway, you provide information about your device to AWS. For more information, see the section called "Customer gateway options".



To use Amazon VPC with a Site-to-Site VPN connection, you or your network administrator must also configure the customer gateway device or application in your remote network. When you create the Site-to-Site VPN connection, we provide you with the required configuration information and your network administrator typically performs this configuration. For information about the customer gateway requirements and configuration, see AWS Site-to-Site VPN customer gateway devices.

## IPv6 customer gateway

When creating a customer gateway for use with IPv6 outer tunnel IPs, you specify an IPv6 address instead of an IPv4 address. You can create an IPv6 customer gateway using the AWS Management Console or the AWS CLI.

To create an IPv6 customer gateway using the AWS CLI, use the following command:

```
aws ec2 create-customer-gateway --Ipv6-address 2001:0db8:85a3:0000:0000:8a2e:0370:7334
 --bgp-asn 65051 --type ipsec.1 --region us-west-1
```

The IPv6 address must be a valid, internet-routable IPv6 address for your customer gateway device.

# IPv6 VPN connections

Site-to-Site VPN VPN connections support the following IPv6 configurations:

- *IPv4 outer tunnel with IPv4 inner packets* - The basic IPv4 VPN capability supported on Virtual Private Gateway (VGW), Transit Gateway (TGW), and Cloud WAN.
- *IPv4 outer tunnel with IPv6 inner packets* - Allows IPv6 applications/transport within the VPN tunnel. Supported on TGW and Cloud WAN (not supported on VGW).
- *IPv6 outer tunnel with IPv6 inner packets* - Allows full IPv6 migration with IPv6 addresses for both outer tunnel IPs and inner packet IPs. Supported on TGW and Cloud WAN.
- *IPv6 outer tunnel with IPv4 inner packets* - Allows IPv6 outer tunnel addressing while supporting legacy IPv4 applications within the tunnel. Supported on TGW and Cloud WAN.

To create a VPN connection with IPv6 outer tunnel IPs, you specify `OutsideIPAddressType=Ipv6` when creating the VPN connection. AWS automatically configures the outside tunnel IPv6 addresses for the AWS side of the VPN tunnels.

Example CLI command to create a VPN connection with IPv6 outer tunnel IPs and IPv6 inner tunnel IPs:

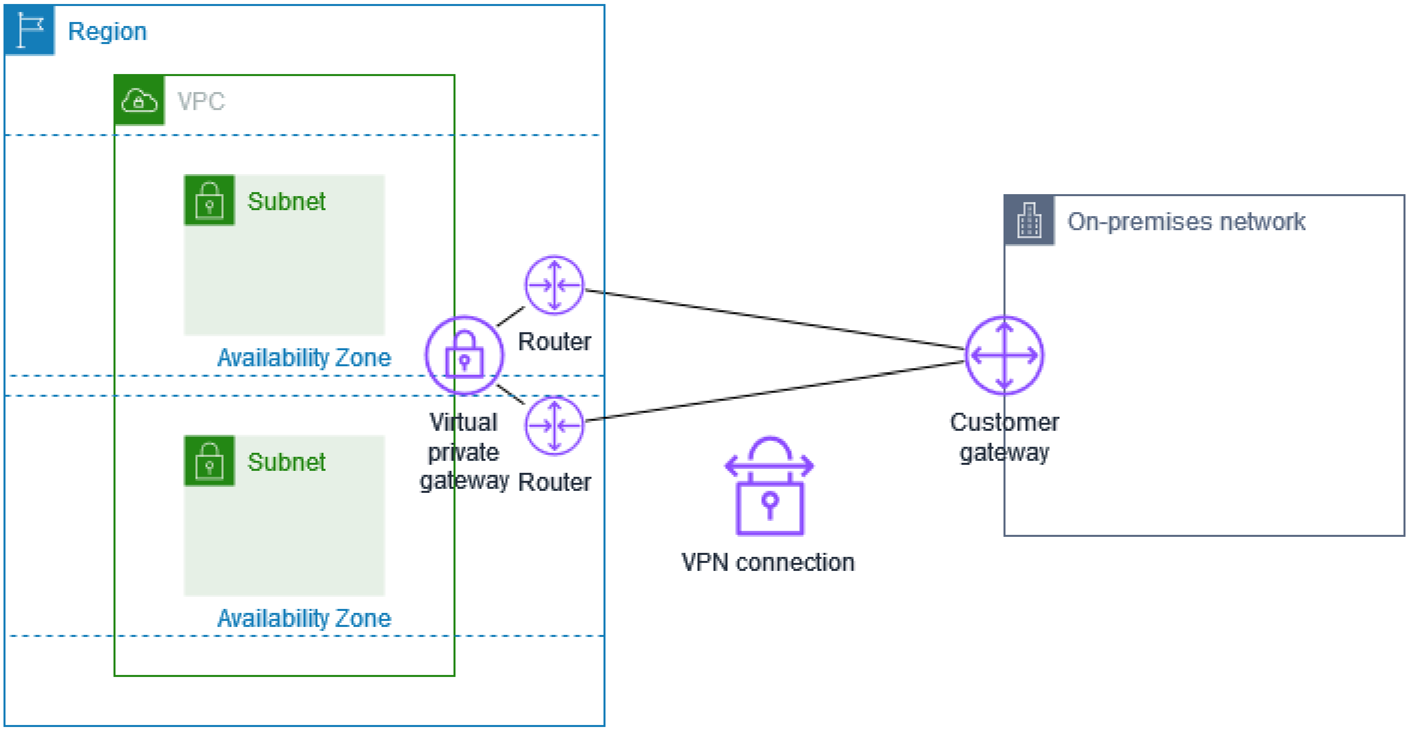
```
aws ec2 create-vpn-connection --type ipsec.1 --transit-gateway-id
 tgw-12312312312312312 --customer-gateway-id cgw-001122334455aabbc --options
 OutsideIPAddressType=Ipv6,TunnelInsideIpVersion=ipv6,TunnelOptions=[{StartupAction=start},
{StartupAction=start}]
```

You can view the IPv6 addresses assigned to your VPN connection using the `describe-vpn-connection` CLI command.

# Tunnel options for your AWS Site-to-Site VPN connection

You use a Site-to-Site VPN connection to connect your remote network to a VPC. Each Site-to-Site VPN connection has two tunnels, with each tunnel using a unique public IP address. It is important to configure both tunnels for redundancy. When one tunnel becomes unavailable (for example, down for maintenance), network traffic is automatically routed to the available tunnel for that specific Site-to-Site VPN connection.

The following diagram shows the two tunnels of a VPN connection. Each tunnel terminates in a different Availability Zone to provide increased availability. Traffic from the on-premises network to AWS uses both tunnels. Traffic from AWS to the on-premises network prefers one of the tunnels, but can automatically fail over to the other tunnel if there is a failure on the AWS side.



When you create a Site-to-Site VPN connection, you download a configuration file specific to your customer gateway device that contains information for configuring the device, including information for configuring each tunnel. You can optionally specify some of the tunnel options yourself when you create the Site-to-Site VPN connection. Otherwise, AWS provides default values.

## Tunnel bandwidth options

You can configure the bandwidth capacity for your VPN tunnels:

- **Standard bandwidth**: Up to 1.25 Gbps per tunnel (default)
- **Large Bandwidth Tunnel (LBT)**: Up to 5 Gbps per tunnel

Large Bandwidth Tunnels are available only for VPN connections attached to Transit Gateway or Cloud WAN. For more information, see Large Bandwidth Tunnels.

> **Note**
>
> Site-to-Site VPN tunnel endpoints evaluate proposals from your customer gateway starting with the lowest configured value from the list below, regardless of the proposal order from the customer gateway. You can use the `modify-vpn-connection-options` command

to restrict the list of options AWS endpoints will accept. For more information, see modify-vpn-connection-options in *Amazon EC2 Command Line Reference*.

## Large Bandwidth Tunnels

Large Bandwidth Tunnels allow you to configure Site-to-Site VPN tunnels that support up to 5 Gbps bandwidth per tunnel, compared to the standard 1.25 Gbps. Large Bandwidth Tunnels are available for VPN connections attached to Transit Gateway or Cloud WAN. This eliminates or reduces the need to deploy complex protocols such as ECMP (Equal Cost Multi Path) to achieve higher bandwidth and ensures a consistent tunnel bandwidth of 5 Gbps per tunnel. Large Bandwidth Tunnels is designed to be used in the following use cases:

- **Data center connectivity**: Support bandwidth-intensive hybrid applications, big data migrations, or disaster recovery architectures that require high-capacity connectivity between AWS workloads and on-premises data centers.
- **Direct Connect backup**: Provide backup or overlay connectivity for high-capacity Direct Connect circuits (10 Gbps+) to on-premises data centers or colocation facilities.

### Region availability

Large Bandwidth Tunnels are available in all Regions except the following:

**Unavailable AWS Regions**

| AWS Region | Description |
|---|---|
| ap-southeast-4 | Asia Pacific (Melbourne) |
| ca-west-1 | Canada West (Calgary) |
| eu-central-2 | Europe (Zurich) |
| il-central-1 | Israel (Tel Aviv) |
| me-central-1 | Middle East (UAE) |

## Requirements and limitations

- Available only for VPN connections attached to a transit gateway or to Cloud WAN. Not supported for Virtual Private Gateway attachments.
- Both tunnels of a VPN connection must use the same bandwidth configuration (both 1.25 Gbps or both 5 Gbps).
- Accelerated VPN is not supported.
- All other core VPN features such as private IP VPN, routing, and tunnel maintenance work the same with Large Bandwidth Tunnel.
- MTU limit remains 1500 bytes. Learn More on how to adjust MTU and MSS sizes according to the algorithms in use.
- You can't modify an existing tunnel to use Large Bandwidth Tunnels. You'll need to first delete the tunnel, and then create a new tunnel and setting the tunnel bandwidth to **Large**.
- Customer Gateways (CGWs) only with a fixed IP can be used with Large Bandwidth Tunnels.
- Customer Gateways (CGWs) without an IP address cannot be used with Large Bandwidth Tunnels.
- Large Bandwidth Tunnels do not support changes to the NAT-T port while the tunnel is established.
- Packets requiring fragmentation may experience lower performance. Learn More .

## Pricing for Large Bandwidth Tunnels

Information about pricing for Large Bandwidth VPN connections can be found on the AWS VPN pricing page.

## Scaling beyond 5 Gbps

For bandwidth requirements exceeding 5 Gbps per tunnel, you can use ECMP across multiple VPN connections. For example, you can achieve 20 Gbps bandwidth by deploying two VPN connections with Large Bandwidth Tunnels and using ECMP across all four tunnels.

# Configure tunnel options for AWS Site-to-Site VPN

This section provides comprehensive guidance on configuring tunnel options for AWS Site-to-Site VPN connections, covering essential parameters such as dead peer detection, IKE versions, and encryption settings. You can customize these tunnel options to optimize your VPN connection's security, performance, and compatibility with your on-premises network infrastructure.

The following are the tunnel options that you can configure.

> **Note**
>
> Some tunnel options have multiple default values. For example, **IKE versions** has two default tunnel option values: `ikev1` and `ikev2`. All default values will be associated with that tunnel option if you don't choose specific values. Click to remove any default value that you don't want associated with the tunnel option. For example, if you only want to use `ikev1` for the IKE version, click `ikev2` to remove it.

**Dead peer detection (DPD) timeout**

The number of seconds after which a DPD timeout occurs. A DPD timeout of 30 seconds means that the VPN endpoint will consider the peer dead 30 seconds after the first failed keep-alive. You can specify 30 or higher.

Default: 40

**DPD timeout action**

The action to take after dead peer detection (DPD) timeout occurs. You can specify the following:

- `Clear`: End the IKE session when DPD timeout occurs (stop the tunnel and clear the routes)
- None: Take no action when DPD timeout occurs
- `Restart`: Restart the IKE session when DPD timeout occurs

For more information, see AWS Site-to-Site VPN tunnel initiation options.

Default: `Clear`

**VPN logging options**

With Site-to-Site VPN logs, you can gain access to details on IP Security (IPsec) tunnel establishment, Internet Key Exchange (IKE) negotiations, and dead peer detection (DPD) protocol messages.

For more information, see AWS Site-to-Site VPN logs.

Available log formats: `json`, `text`

### IKE versions

The IKE versions that are permitted for the VPN tunnel. You can specify one or more of the default values.

Defaults: `ikev1`, `ikev2`

### Inside tunnel IPv4 CIDR

The range of inside (internal) IPv4 addresses for the VPN tunnel. You can specify a size /30 CIDR block from the `169.254.0.0/16` range. The CIDR block must be unique across all Site-to-Site VPN connections that use the same virtual private gateway.

> **Note**
>
> The CIDR block does not need to be unique across all connections on a transit gateway. However, if they are not unique, it can create a conflict on your customer gateway. Proceed carefully when re-using the same CIDR block on multiple Site-to-Site VPN connections on a transit gateway.

The following CIDR blocks are reserved and cannot be used:

- `169.254.0.0/30`
- `169.254.1.0/30`
- `169.254.2.0/30`
- `169.254.3.0/30`
- `169.254.4.0/30`
- `169.254.5.0/30`
- `169.254.169.252/30`

Default: A size /30 IPv4 CIDR block from the `169.254.0.0/16` range.

### Pre-shared key storage

The type of storage for the pre-shared key:

- **Standard** — The pre-shared key is stored directly in the Site-to-Site VPN service.
- **Secrets Manager** — The pre-shared key is stored using AWS Secrets Manager. For more information about Secrets Manager, see Enhanced security features using Secrets Manager.

### Tunnel bandwidth

The bandwidth supported for the tunnel.

- **Standard** — The tunnel bandwidth is set to a maximum of up to 1.25 Gbps per tunnel (default).
- **Large** — The tunnel bandwidth to a maximum of up to 5 Gbps per tunnel.

> **Note**
>
> **Large** is only available only for VPN connections attached to a transit gateway or to Cloud WAN. It is not supported for Virtual Private Gateway connections.

### Inside tunnel IPv6 CIDR

(IPv6 VPN connections only) The range of inside (internal) IPv6 addresses for the VPN tunnel. You can specify a size /126 CIDR block from the local `fd00::/8` range. The CIDR block must be unique across all Site-to-Site VPN connections that use the same transit gateway. If you don't specify an IPv6 subnet, Amazon automatically selects a /128 subnet from this range. Regardless of whether you specify the subnet or Amazon selects it, Amazon uses the first usable IPv6 address in the subnet for its side of the connection, and your side uses the second usable IPv6 address.

Default: A size /126 IPv6 CIDR block from the local `fd00::/8` range.

### Outside tunnel IP address type

The IP address type for the outside (external) tunnel IP addresses. You can specify one of the following:

- `PrivateIpv4`: Use private IPv4 address to deploy Site-to-Site VPN connections over Direct Connect.
- `PublicIpv4`: (Default) Use IPv4 addresses for the outer tunnel IPs.
- `Ipv6`: Use IPv6 addresses for the outer tunnel IPs. This option is only available for VPN connections on a transit gateway or Cloud WAN.

When you select `Ipv6`, AWS automatically configures the outside tunnel IPv6 addresses for the AWS side of the VPN tunnels. Your customer gateway device must support IPv6 addressing and be able to establish IPsec tunnels with IPv6 endpoints.

Default: `PublicIpv4`

### Local IPv4 Network CIDR

(IPv4 VPN connection only) The CIDR range used during IKE phase 2 negotiation for the customer (on-premises) side of the VPN tunnel. This range is used to propose routes but does not enforce traffic restrictions since AWS uses route-based VPNs exclusively. Policy-based VPNs are not supported as they would limit AWS' ability to support dynamic routing protocols and multi-region architectures. This should include the IP ranges from your on-premises network that need to communicate over the VPN tunnel. Proper route table configurations, NACLs, and security groups should be used to control actual traffic flow.

Default: 0.0.0.0/0

### Remote IPv4 Network CIDR

(IPv4 VPN connection only) The CIDR range used during IKE phase 2 negotiation for the AWS side of the VPN tunnel. This range is used to propose routes but does not enforce traffic restrictions since AWS uses route-based VPNs exclusively. AWS does not support policy-based VPNs because they lack the flexibility required for complex routing scenarios and are incompatible with features like transit gateways and VPN Equal Cost Multi-Path (ECMP). For VPCs, this is typically the CIDR range of your VPC. For transit gateways, this could include multiple CIDR ranges from attached VPCs or other network.

Default: 0.0.0.0/0

### Local IPv6 Network CIDR

(IPv6 VPN connection only) The IPv6 CIDR range on the customer gateway (on-premises) side that is allowed to communicate over the VPN tunnels.

Default: ::/0

### Remote IPv6 Network CIDR

(IPv6 VPN connection only) The IPv6 CIDR range on the AWS side that is allowed to communicate over the VPN tunnels.

Default: ::/0

### Phase 1 Diffie-Hellman (DH) group numbers

The DH group numbers that are permitted for the VPN tunnel for phase 1 of the IKE negotiations. You can specify one or more of the default values.

Defaults: 2, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24

**Phase 2 Diffie-Hellman (DH) group numbers**

The DH group numbers that are permitted for the VPN tunnel for phase 2 of the IKE negotiations. You can specify one or more of the default values.

Defaults: 2, 5, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24

**Phase 1 encryption algorithms**

The encryption algorithms that are permitted for the VPN tunnel for phase 1 of the IKE negotiations. You can specify one or more of the default values.

Defaults: AES128, AES256, AES128-GCM-16, AES256-GCM-16

**Phase 2 encryption algorithms**

The encryption algorithms that are permitted for the VPN tunnel for phase 2 IKE negotiations. You can specify one or more of the default values.

Defaults: AES128, AES256, AES128-GCM-16, AES256-GCM-16

**Phase 1 integrity algorithms**

The integrity algorithms that are permitted for the VPN tunnel for phase 1 of the IKE negotiations. You can specify one or more of the default values.

Defaults: SHA1, SHA2-256, SHA2-384, SHA2-512

**Phase 2 integrity algorithms**

The integrity algorithms that are permitted for the VPN tunnel for phase 2 of the IKE negotiations. You can specify one or more of the default values.

Defaults: SHA1, SHA2-256, SHA2-384, SHA2-512

**Phase 1 lifetime**

> **Note**
>
> AWS initiate re-keys with the timing values set in the Phase 1 lifetime and Phase 2 lifetime fields. If such lifetimes are different than the negotiated handshake values, this may interrupt tunnel connectivity.

The lifetime in seconds for phase 1 of the IKE negotiations. You can specify a number between 900 and 28,800.

Default: 28,800 (8 hours)

**Phase 2 lifetime**

> **Note**
>
> AWS initiate re-keys with the timing values set in the Phase 1 lifetime and Phase 2 lifetime fields. If such lifetimes are different than the negotiated handshake values, this may interrupt tunnel connectivity.

The lifetime in seconds for phase 2 of the IKE negotiations. You can specify a number between 900 and 3,600. The number that you specify must be less than the number of seconds for the phase 1 lifetime.

Default: 3,600 (1 hour)

**Pre-shared key (PSK)**

The pre-shared key (PSK) to establish the initial internet key exchange (IKE) security association between the target gateway and customer gateway.

The PSK must be between 8 and 64 characters in length and cannot start with zero (0). Allowed characters are alphanumeric characters, periods (.), and underscores (_).

Default: A 32-character alphanumeric string.

**Rekey fuzz**

The percentage of the rekey window (determined by the rekey margin time) within which the rekey time is randomly selected.

You can specify a percentage value between 0 and 100.

Default: 100

**Rekey margin time**

The margin time in seconds before the phase 1 and phase 2 lifetime expires, during which the AWS side of the VPN connection performs an IKE rekey.

You can specify a number between 60 and half of the value of the phase 2 lifetime.

The exact time of the rekey is randomly selected based on the value for rekey fuzz.

Default: 270 (4.5 minutes)

**Replay window size packets**

The number of packets in an IKE replay window.

You can specify a value between 64 and 2048.

Default: 1024

**Startup action**

The action to take when establishing the tunnel for a VPN connection. You can specify the following:

- `Start`: AWS initiates the IKE negotiation to bring the tunnel up. Only supported if your customer gateway is configured with an IP address.
- Add: Your customer gateway device must initiate the IKE negotiation to bring the tunnel up.

For more information, see AWS Site-to-Site VPN tunnel initiation options.

Default: Add

**Tunnel endpoint lifecycle control**

Tunnel endpoint lifecycle control provides control over the schedule of endpoint replacements.

For more information, see AWS Site-to-Site VPN tunnel endpoint lifecycle control.

Default: `Off`

You can specify the tunnel options when you create a Site-to-Site VPN connection, or you can modify the tunnel options for an existing VPN connection. For more information, see the following topics:

- Step 5: Create a VPN connection
- Modify AWS Site-to-Site VPN tunnel options

## AWS Site-to-Site VPN tunnel authentication options

You can use pre-shared keys, or certificates to authenticate your Site-to-Site VPN tunnel endpoints.

## Pre-shared keys

A pre-shared key (PSK) is the default authentication option for Site-to-Site VPN tunnels. When creating a tunnel, you can either specify your own PSK or allow AWS to auto-generate one for you. The PSK is stored using one of the following methods:

- Directly in the Site-to-Site VPN service. For more information, see *Site-to-Site VPN customer gateway devices*.
- In AWS Secrets Manager for enhanced security. For more information about using Secrets Manager to store a PSK, see Enhanced security features using Secrets Manager.

The PSK string is then used when configuring your customer gateway device.

## Private certificate from AWS Private Certificate Authority

If you do not want to use pre-shared keys, you can use a private certificate from AWS Private Certificate Authority to authenticate your VPN.

You must create a private certificate from a subordinate CA using AWS Private Certificate Authority (AWS Private CA). To sign the ACM subordinate CA, you can use an ACM Root CA or an external CA. For more information about creating a private certificate, see Creating and Managing a Private CA in the *AWS Private Certificate Authority User Guide*.

You must create a service-linked role to generate and use the certificate for the AWS side of the Site-to-Site VPN tunnel endpoint. For more information, see the section called "Service-linked roles".

**Note**

To facilitate seamless certification rotations, any certificate with the same certificate authority chain as the one originally specified in the `CreateCustomerGateway` API call is sufficient to establish a VPN Connection.

If you do not specify the IP address of your customer gateway device, we do not check the IP address. This operation allows you to move the customer gateway device to a different IP address without having to re-configure the VPN connection.

Site-to-Site VPN performs certificate chain verification on the customer gateway certificate when you create a certificate VPN. In addition to the basic CA and validity checks, Site-to-Site VPN checks whether the X.509 extensions are present, including Authority Key Identifier, Subject Key Identifier, and Basic Constraints.

# AWS Site-to-Site VPN tunnel initiation options

By default, your customer gateway device must bring up the tunnels for your Site-to-Site VPN connection by generating traffic and initiating the Internet Key Exchange (IKE) negotiation process. You can configure your VPN tunnels to specify that AWS must initiate or restart the IKE negotiation process instead.

## VPN tunnel IKE initiation options

The following IKE initiation options are available. You can implement either or both options, for one or both of the tunnels in your Site-to-Site VPN connection. See VPN tunnel options for more details on these and other tunnel option settings.

- **Startup action**: The action to take when establishing the VPN tunnel for a new or modified VPN connection. By default, your customer gateway device initiates the IKE negotiation process to bring the tunnel up. You can specify that AWS must initiate the IKE negotiation process instead.
- **DPD timeout action**: The action to take after dead peer detection (DPD) timeout occurs. By default, the IKE session is stopped, the tunnel goes down, and the routes are removed. You can specify that AWS must restart the IKE session when DPD timeout occurs, or you can specify that AWS must take no action when DPD timeout occurs.

## Rules and limitations

The following rules and limitations apply:

- To initiate IKE negotiation, AWS requires the public IP address of your customer gateway device. If you configured certificate-based authentication for your VPN connection and you did not specify an IP address when you created the customer gateway resource in AWS, you must create a new customer gateway and specify the IP address. Then, modify the VPN connection and specify the new customer gateway. For more information, see Change the customer gateway for an AWS Site-to-Site VPN connection.

- IKE initiation (startup action) from the AWS side of the VPN connection is supported for IKEv2 only.
- If using IKE initiation from the AWS side of the VPN connection, it does not include a timeout setting. It will continuously try to establish a connection until one is made. Additionally, the AWS side of VPN connection will re-initiate IKE negotiation when it receives a delete SA message from your customer gateway.
- If your customer gateway device is behind a firewall or other device using Network Address Translation (NAT), it must have an identity (IDr) configured. For more information about IDr, see RFC 7296.

If you do not configure IKE initiation from the AWS side for your VPN tunnel and the VPN connection experiences a period of idle time (usually 10 seconds, depending on your configuration), the tunnel might go down. To prevent this, you can use a network monitoring tool to generate keepalive pings.

## Working with VPN tunnel initiation options

For more information about working with VPN tunnel initiation options, see the following topics:

- To create a new VPN connection and specify the VPN tunnel initiation options: Step 5: Create a VPN connection
- To modify the VPN tunnel initiation options for an existing VPN connection: Modify AWS Site-to-Site VPN tunnel options

# AWS Site-to-Site VPN tunnel endpoint replacements

Your Site-to-Site VPN connection consists of two VPN tunnels for redundancy. Sometimes, one or both of the VPN tunnel endpoints is replaced when AWS performs tunnel updates, or when you modify your VPN connection. During a tunnel endpoint replacement, connectivity over the tunnel might be interrupted while the new tunnel endpoint is provisioned.

### Topics

- Customer initiated endpoint replacements
- AWS managed endpoint replacements
- AWS Site-to-Site VPN tunnel endpoint lifecycle control

## Customer initiated endpoint replacements

When you modify the following components of your VPN connection, one or both of your tunnel endpoints is replaced.

| Modification | API action | Tunnel impact |
|---|---|---|
| Modify the target gateway for the VPN connection | ModifyVpnConnection | Both tunnels are unavailable while new tunnel endpoints are provisioned. |
| Change the customer gateway for the VPN connection | ModifyVpnConnection | Both tunnels are unavailable while new tunnel endpoints are provisioned. |
| Modify the VPN connection options | ModifyVpnConnectionOptions | Both tunnels are unavailable while new tunnel endpoints are provisioned. |
| Modify the VPN tunnel options | ModifyVpnTunnelOptions | The modified tunnel is unavailable during the update. |

## AWS managed endpoint replacements

AWS Site-to-Site VPN is a managed service, and periodically applies updates to your VPN tunnel endpoints. These updates happen for a variety of reasons, including the following:

- To apply general upgrades, such as patches, resiliency improvements, and other enhancements
- To retire underlying hardware
- When automated monitoring determines that a VPN tunnel endpoint is unhealthy

AWS applies tunnel endpoint updates to one tunnel of your VPN connection at a time. During a tunnel endpoint update, your VPN connection might experience a brief loss of redundancy. It's therefore important to configure both tunnels in your VPN connection for high availability.

# AWS Site-to-Site VPN tunnel endpoint lifecycle control

Tunnel endpoint lifecycle control provides control over the schedule of endpoint replacements, and can help minimize connectivity disruptions during AWS managed tunnel endpoint replacements. With this feature, you can choose to accept AWS managed updates to tunnel endpoints at a time that works best for your business. Use this feature if you have short-term business needs or can only support a single tunnel per VPN connection.

> **Note**
>
> In rare circumstances, AWS might apply critical updates to tunnel endpoints immediately, even if the tunnel endpoint lifecycle control feature is enabled.

**Topics**

- How tunnel endpoint lifecycle control works
- Enable AWS Site-to-Site VPN tunnel endpoint lifecycle control
- Verify if AWS Site-to-Site VPN tunnel endpoint lifecycle control is enabled
- Check for available AWS Site-to-Site VPN tunnel updates
- Accept an AWS Site-to-Site VPN tunnel maintenance update
- Turn AWS Site-to-Site VPN tunnel endpoint lifecycle control off

## How tunnel endpoint lifecycle control works

Turn on the tunnel endpoint lifecycle control feature for individual tunnels within a VPN connection. It can be enabled at the time of VPN creation or by modifying tunnel options for an existing VPN connection.

After tunnel endpoint lifecycle control is enabled, you will gain additional visibility into upcoming tunnel maintenance events in two ways:

- You will receive AWS Health notifications for upcoming tunnel endpoint replacements.
- The status of pending maintenance, along with the **Maintenance auto applied after** and **Last maintenance applied** timestamps, can be seen in the AWS Management Console or by using the get-vpn-tunnel-replacement-status AWS CLI command.

When a tunnel endpoint maintenance is available, you will have the opportunity to accept the update at a time that is convenient for you, before the given **Maintenance auto applied after** timestamp.

If you do not apply updates before the **Maintenance auto applied after** date, AWS will automatically perform the tunnel endpoint replacement soon after, as part of the regular maintenance update cycle.

## Enable AWS Site-to-Site VPN tunnel endpoint lifecycle control

Endpoint lifecycle control can be enabled on an existing or new VPN connection. This can be done using either the AWS Management Console or AWS CLI.

> **Note**
>
> By default when you turn on the feature for an existing VPN connection, a tunnel endpoint replacement will be initiated at the same time. If you want to turn the feature on, but not initiate an tunnel endpoint replacement immediately, you can use the **skip tunnel replacement** option.

Existing VPN connection

The following steps demonstrate how to enable tunnel endpoint lifecycle control on an existing VPN connection.

**To enable tunnel endpoint lifecycle control using the AWS Management Console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the left-side navigation pane, choose **Site-to-Site VPN Connections**.
3. Select the appropriate connection under **VPN connections**.
4. Choose **Actions**, then **Modify VPN tunnel options**.
5. Select the specific tunnel that you want to modify by choosing the appropriate **VPN tunnel outside IP address**.
6. Under **Tunnel Endpoint Lifecycle Control**, select the **Enable** check box.
7. (Optional) Select **Skip tunnel replacement**.
8. Choose **Save changes**.

**To enable tunnel endpoint lifecycle control using the AWS CLI**

Use the modify-vpn-tunnel-options command to turn on tunnel endpoint lifecycle control.

New VPN connection

The following steps demonstrate how to enable tunnel endpoint lifecycle control during creation of a new VPN connection.

**To enable tunnel endpoint lifecycle control during creation of a new VPN connection using the AWS Management Console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN Connections**.
3. Choose **Create VPN connection**.
4. In the sections for **Tunnel 1 options** and **Tunnel 2 options**, under **Tunnel Endpoint Lifecycle Control**, select **Enable**.
5. Choose **Create VPN Connection**.

**To enable tunnel endpoint lifecycle control during creation of a new VPN connection using the AWS CLI**

Use the create-vpn-connection command to turn on tunnel endpoint lifecycle control.

## Verify if AWS Site-to-Site VPN tunnel endpoint lifecycle control is enabled

You can verify whether tunnel endpoint lifecycle control is enabled on an existing VPN tunnel by using the AWS Management Console or CLI.

- If tunnel endpoint lifecycle control is disabled, and you want to enable it see Enable tunnel endpoint lifecycle control.
- If tunnel endpoint lifecycle control is enabled, and you want to disable it, see Turn tunnel endpoint lifecycle control off.

**To verify if tunnel endpoint lifecycle control is enabled using the AWS Management Console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.

2. In the left-side navigation pane, choose **Site-to-Site VPN Connections**.
3. Select the appropriate connection under **VPN connections**.
4. Select the **Tunnel details** tab.
5. In the tunnel details, look for **Tunnel Endpoint Lifecycle Control**, which will report whether the feature is **Enabled** or **Disabled**.

#### To verify if tunnel endpoint lifecycle control is enabled using the AWS CLI

Use the describe-vpn-connections command to verify if tunnel endpoint lifecycle control is enabled.

## Check for available AWS Site-to-Site VPN tunnel updates

After you enable the tunnel endpoint lifecycle control feature, you can view whether a maintenance update is available for your VPN connection by using the AWS Management Console or CLI. Checking for an available Site-to-Site VPN tunnel update does not automatically download and deploy the update. You can choose when you want to deploy it. For the steps to download and deploy an update, see Accept a maintenance update.

#### To check for available updates using the AWS Management Console

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the left-side navigation pane, choose **Site-to-Site VPN Connections**.
3. Select the appropriate connection under **VPN connections**.
4. Select the **Tunnel details** tab.
5. Check the **Pending maintenance** column. The status will be either **Available** or **None**.

#### To check for available updates using the AWS CLI

Use the get-vpn-tunnel-replacement-status command to check for available updates.

## Accept an AWS Site-to-Site VPN tunnel maintenance update

When a maintenance update is available, you can accept it using the AWS Management Console or CLI. You can choose to accept the Site-to-Site VPN tunnel maintenance update at a time that's convenient for you. Once you accept the maintenance update it will be deployed.

**Note**

If you don't accept the maintenance update, AWS will automatically deploy it during a regular maintenance update cycle.

**To accept an available maintenance update using the AWS Management Console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the left-side navigation pane, choose **Site-to-Site VPN Connections**.
3. Select the appropriate connection under **VPN connections**.
4. Choose **Actions**, then **Replace VPN Tunnel**.
5. Select the specific tunnel that you want to replace by choosing the appropriate **VPN tunnel outside IP address**.
6. Choose **Replace**.

**To accept an available maintenance update using the AWS CLI**

Use the replace-vpn-tunnel command to accept an available maintenance update.

## Turn AWS Site-to-Site VPN tunnel endpoint lifecycle control off

If you no longer want to use the tunnel endpoint lifecycle control feature, you can turn it off using the AWS Management Console or the AWS CLI. When you turn off this feature, AWS will automatically deploy maintenance updates periodically, and these updates might happen during your business hours. To avoid any business impact, we highly recommend that you configure both tunnels in your VPN connection for high availability.

**Note**

While there is an available pending maintenance, you cannot specify the **skip tunnel replacement** option while turning the feature off. You can always turn the feature off without using the **skip tunnel replacement** option, but AWS will automatically deploy the available pending maintenance updates by initiating a tunnel endpoint replacement immediately.

**To turn off tunnel endpoint lifecycle control using the AWS Management Console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the left-side navigation pane, choose **Site-to-Site VPN Connections**.
3. Select the appropriate connection under **VPN connections**.
4. Choose **Actions**, then **Modify VPN tunnel options**.
5. Select the specific tunnel that you want to modify by choosing the appropriate **VPN tunnel outside IP address**.
6. To turn off tunnel endpoint lifecycle control, under **Tunnel Endpoint Lifecycle Control**, clear the **Enable** check box.
7. (Optional) Select **Skip tunnel replacement**.
8. Choose **Save changes**.

**To turn off tunnel endpoint lifecycle control using the AWS CLI**

Use the modify-vpn-tunnel-options command to turn off tunnel endpoint lifecycle control.

# Customer gateway options for your AWS Site-to-Site VPN connection

The following table describes the information you'll need to create a customer gateway resource in AWS.

| Item | Description |
|---|---|
| (Optional) Name tag. | Creates a tag with a key of 'Name' and a value that you specify. |
| (Dynamic routing only) Border Gateway Protocol (BGP) Autonomous System Number (ASN) of the customer gateway. | ASN in the range of 1–4,294,967,295 is supported. You can use an existing public ASN assigned to your network, with the exception of the following:<br>• 7224 — Reserved in all Regions<br>• 9059 — Reserved in the `eu-west-1` Region |

| Item | Description |
|---|---|
| | - 10124 — Reserved in the `ap-northeast-1` Region<br>- 17943 — Reserved in the `ap-southeast-1` Region<br><br>If you don't have a public ASN, you can use a private ASN in the range of 64,512–65,534 or 4,200,000,000–4,294,967,294. The default ASN is 64512. For more information about routing, see AWS Site-to-Site VPN routing options. |
| The IP address of the customer gateway device's external interface. | The IP address must be static and can be either IPv4 or IPv6.<br><br>For IPv4 addresses: If your customer gateway device is behind a network address translation (NAT) device, use the IP address of your NAT device. Also, ensure that UDP packets on port 500 (and port 4500, if NAT traversal is being used) are allowed to pass between your network and the AWS Site-to-Site VPN endpoints. See Firewall rules for more info.<br><br>For IPv6 addresses: The address must be a valid, internet-routable IPv6 address. IPv6 addresses are only supported for VPN connections on a transit gateway or Cloud WAN.<br><br>An IP address is not required when you are using a private certificate from AWS Private Certificate Authority and a public VPN. |

| Item | Description |
|---|---|
| (Optional) Private certificate from a subordinate CA using AWS Certificate Manager (ACM). | If you want to use certificate based authentication, provide the ARN of an ACM private certificate that will be used on your customer gateway device.<br>When you create a customer gateway, you can configure the customer gateway to use AWS Private Certificate Authority private certificates to authenticate the Site-to-Site VPN.<br>When you choose to use this option, you create an entirely AWS-hosted private certificate authority (CA) for internal use by your organization. Both the root CA certificate and subordinate CA certificates are stored and managed by AWS Private CA.<br>Before you create the customer gateway, you create a private certificate from a subordinate CA using AWS Private Certificate Authority , and then specify the certificate when you configure the customer gateway. For information about creating a private certificate, see Creating and managing a private CA in the *AWS Private Certificate Authority User Guide*. |
| (Optional) Device. | A name for the customer gateway device associated with this customer gateway. |

## IPv6 customer gateway options

When creating a customer gateway with an IPv6 address, consider the following:

- IPv6 customer gateways are only supported for VPN connections on a transit gateway or Cloud WAN.

- The IPv6 address must be a valid, internet-routable IPv6 address.
- Your customer gateway device must support IPv6 addressing and be able to establish IPsec tunnels with IPv6 endpoints.
- To create an IPv6 customer gateway using the AWS CLI, use an IPv6 address for the `--ip-address` parameter:

```
aws ec2 create-customer-gateway --ip-address 2001:0db8:85a3:0000:0000:8a2e:0370:7334
 --bgp-asn 65051 --type ipsec.1 --region us-west-1
```

# Accelerated AWS Site-to-Site VPN connections

You can optionally enable acceleration for your Site-to-Site VPN connection. An accelerated Site-to-Site VPN connection (accelerated VPN connection) uses AWS Global Accelerator to route traffic from your on-premises network to an AWS edge location that is closest to your customer gateway device. AWS Global Accelerator optimizes the network path, using the congestion-free AWS global network to route traffic to the endpoint that provides the best application performance (for more information, see AWS Global Accelerator). You can use an accelerated VPN connection to avoid network disruptions that might occur when traffic is routed over the public internet.

When you create an accelerated VPN connection, we create and manage two accelerators on your behalf, one for each VPN tunnel. You cannot view or manage these accelerators yourself by using the AWS Global Accelerator console or APIs.

For information about the AWS Regions that support Accelerated VPN connections, see the AWS Accelerated Site-to-Site VPN FAQs.

## Enabling acceleration

By default, when you create a Site-to-Site VPN connection, acceleration is disabled. You can optionally enable acceleration when you create a new Site-to-Site VPN attachment on a transit gateway. For more information and steps, see Create an AWS Site-to-Site VPN connection.

Accelerated VPN connections use a separate pool of IP addresses for the tunnel endpoint IP addresses. The IP addresses for the two VPN tunnels are selected from two separate network zones.

## Rules and restrictions

To use an accelerated VPN connection, the following rules apply:

- Acceleration is only supported for Site-to-Site VPN connections that are attached to a transit gateway. Virtual private gateways do not support accelerated VPN connections.
- An Accelerated Site-to-Site VPN connection cannot be used with an AWS Direct Connect public virtual interface.
- You cannot turn on or turn off acceleration for an existing Site-to-Site VPN connection. Instead, you can create a new Site-to-Site VPN connection with acceleration on or off as needed. Then, configure your customer gateway device to use the new Site-to-Site VPN connection and delete the old Site-to-Site VPN connection.
- NAT-traversal (NAT-T) is required for an accelerated VPN connection and is enabled by default. If you downloaded a configuration file from the Amazon VPC console, check the NAT-T setting and adjust it if necessary.
- IKE negotiation for accelerated VPN tunnels must be initiated from the customer gateway device. The two tunnel options that effect this behavior are `Startup Action` and `DPD Timeout Action`. See VPN tunnel options and VPN tunnel initiation options for more information.
- Site-to-Site VPN connections that use certificate-based authentication might not be compatible with AWS Global Accelerator, due to limited support for packet fragmentation in Global Accelerator. For more information, see How AWS Global Accelerator works. If you require an accelerated VPN connection that uses certificate-based authentication, then your customer gateway device must support IKE fragmentation. Otherwise, do not enable your VPN for acceleration.

# AWS Site-to-Site VPN routing options

AWS recommends advertising specific BGP routes to influence routing decisions in the virtual private gateway. Check your vendor documentation for the commands that are specific to your device.

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. Which route depends on 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. If you select the option to use BGP advertisement, then you cannot specify static routes.

For more information about route priority, see Route tables and route priority.

When you create a Site-to-Site VPN connection, you must do the following:

- Specify the type of routing that you plan to use (static or dynamic)
- Update the route table for your subnet

There are quotas on the number of routes that you can add to a route table. For more information, see the Route Tables section in Amazon VPC quotas in the *Amazon VPC User Guide*.

**Topics**

## Static and dynamic routing in AWS Site-to-Site VPN

The type of routing that you select can depend on the make and model of your customer gateway device. If your customer gateway device supports Border Gateway Protocol (BGP), specify dynamic routing when you configure your Site-to-Site VPN connection. If your customer gateway device does not support BGP, specify static routing.

**Note**

Site-to-Site VPN Concentrators only support BGP routing. Static routing is not supported for VPN connections that use a Site-to-Site VPN Concentrator.

If you use a device that supports BGP advertising, you don't specify static routes to the Site-to-Site VPN connection because the device uses BGP to advertise its routes to the virtual private gateway. If you use a device that doesn't support BGP advertising, you must select static routing and enter the routes (IP prefixes) for your network that should be communicated to the virtual private gateway.

We recommend that you use BGP-capable devices, when available, because the BGP protocol offers robust liveness detection checks that can assist failover to the second VPN tunnel if the first tunnel goes down. Devices that don't support BGP may also perform health checks to assist failover to the second tunnel when needed.

You must configure your customer gateway device to route traffic from your on-premises network to the Site-to-Site VPN connection. The configuration depends on the make and model of your device. For more information, see AWS Site-to-Site VPN customer gateway devices.

## Route tables and AWS Site-to-Site VPN route priority

Route tables determine where network traffic from your VPC is directed. In your VPC route table, you must add a route for your remote network and specify the virtual private gateway as the target. This enables traffic from your VPC that's destined for your remote network to route via the virtual private gateway and over one of the VPN tunnels. You can enable route propagation for your route table to automatically propagate your network routes to the table for you.

We use the most specific route in your route table that matches the traffic to determine how to route the traffic (longest prefix match). If your route table has overlapping or matching routes, the following rules apply:

- If propagated routes from a Site-to-Site VPN connection or Direct Connect connection overlap with the local route for your VPC, the local route is most preferred even if the propagated routes are more specific.
- If propagated routes from a Site-to-Site VPN connection or Direct Connect connection have the same destination CIDR block as other existing static routes (longest prefix match cannot be applied), we prioritize the static routes whose targets are an internet gateway, a virtual private gateway, a network interface, an instance ID, a VPC peering connection, a NAT gateway, a transit gateway, or a gateway VPC endpoint.

For example, the following route table has a static route to an internet gateway, and a propagated route to a virtual private gateway. Both routes have a destination of `172.31.0.0/24`. In this case, all traffic destined for `172.31.0.0/24` is routed to the internet gateway — it is a static route and therefore takes priority over the propagated route.

| Destination | Target |
|---|---|
| 10.0.0.0/16 | Local |
| 172.31.0.0/24 | vgw-11223344556677889 (propagated) |

| Destination | Target |
|---|---|
| 172.31.0.0/24 | igw-12345678901234567 (static) |

Only IP prefixes that are known to the virtual private gateway, whether through BGP advertisements or a static route entry, can receive traffic from your VPC. The virtual private gateway does not route any other traffic destined outside of received BGP advertisements, static route entries, or its attached VPC CIDR. Virtual private gateways do not support IPv6 traffic.

When a virtual private gateway receives routing information, it uses path selection to determine how to route traffic. Longest prefix match applies, if all endpoints are healthy. The health of a tunnel endpoint takes precedence over other routing attributes. This precedence applies to VPNs on virtual private gateways and Transit Gateways. If the prefixes are the same, then the virtual private gateway prioritizes routes as follows, from most preferred to least preferred:

- BGP propagated routes from an Direct Connect connection

  Blackhole routes are not propagated to a Site-to-Site VPN customer gateway via BGP.
- Manually added static routes for a Site-to-Site VPN connection
- BGP propagated routes from a Site-to-Site VPN connection
- For matching prefixes where each Site-to-Site VPN connection uses BGP, the AS PATH is compared and the prefix with the shortest AS PATH is preferred.

> **Note**
>
> AWS strongly recommends using customer gateway devices that support asymmetric routing.
> For customer gateway devices that support asymmetric routing, we *do not* recommend using AS PATH prepending, to ensure that both tunnels have equal AS PATH. This helps to ensure that the multi-exit discriminator (MED) value that we set on a tunnel during VPN tunnel endpoint updates is used to determine tunnel priority.
> For customer gateway devices that do not support asymmetric routing, you can use AS PATH prepending and Local Preference to prefer one tunnel over the other. However, when the egress path changes, this may cause traffic to drop.

- When the AS PATHs are the same length and if the first AS in the AS_SEQUENCE is the same across multiple paths, multi-exit discriminators (MEDs) are compared. The path with the lowest MED value is preferred.

Route priority is affected during VPN tunnel endpoint updates.

On a Site-to-Site VPN connection, AWS selects one of the two redundant tunnels as the primary egress path. This selection may change at times, and we strongly recommend that you configure both tunnels for high availability, and allow asymmetric routing. The health of a tunnel endpoint takes precedence over other routing attributes. This precedence applies to VPNs on virtual private gateways and Transit Gateways.

For a virtual private gateway, one tunnel across all Site-to-Site VPN connections on the gateway will be selected. To use more than one tunnel, we recommend exploring Equal Cost Multipath (ECMP), which is supported for Site-to-Site VPN connections on a transit gateway. For more information, see Transit gateways in *Amazon VPC Transit Gateways*. ECMP is not supported for Site-to-Site VPN connections on a virtual private gateway.

For Site-to-Site VPN connections that use BGP, the primary tunnel can be identified by the multi-exit discriminator (MED) value. We recommend advertising more specific BGP routes to influence routing decisions.

For Site-to-Site VPN connections that use static routing, the primary tunnel can be identified by traffic statistics or metrics.

## Routing during VPN tunnel endpoint updates

A Site-to-Site VPN connection consists of two VPN tunnels between a customer gateway device and a virtual private gateway or a transit gateway. We recommend that you configure both tunnels for redundancy. From time to time, AWS also performs routine maintenance on your VPN connection, which might briefly disable one of the two tunnels of your VPN connection. For more information, see Tunnel endpoint replacement notifications.

When we perform updates on one VPN tunnel, we set a lower outbound multi-exit discriminator (MED) value on the other tunnel. If you have configured your customer gateway device to use both tunnels, your VPN connection uses the other (up) tunnel during the tunnel endpoint update process.

**Note**

- To ensure that the up tunnel with the lower MED is preferred, ensure that your customer gateway device uses the same Weight and Local Preference values for both tunnels (Weight and Local Preference have higher priority than MED).

# IPv4 and IPv6 traffic in AWS Site-to-Site VPN

Your Site-to-Site VPN connection on a transit gateway can support either IPv4 traffic or IPv6 traffic inside the VPN tunnels. By default, a Site-to-Site VPN connection supports IPv4 traffic inside the VPN tunnels. You can configure a new Site-to-Site VPN connection to support IPv6 traffic inside the VPN tunnels. Then, if your VPC and your on-premises network are configured for IPv6 addressing, you can send IPv6 traffic over the VPN connection.

If you enable IPv6 for the VPN tunnels for your Site-to-Site VPN connection, each tunnel has two CIDR blocks. One is a size /30 IPv4 CIDR block, and the other is a size /126 IPv6 CIDR block.

## IPv4 and IPv6 support

Site-to-Site VPN VPN connections support the following IP configurations:

- **IPv4 outer tunnel with IPv4 inner packets** - The basic IPv4 VPN capability supported on virtual private gateways, transit gateways, and Cloud WAN.
- **IPv4 outer tunnel with IPv6 inner packets** - Allows IPv6 applications/transport within the VPN tunnel. Supported on transit gateways and Cloud WAN. This is not supported for virtual private gateways.
- **IPv6 outer tunnel with IPv6 inner packets** - Allows full IPv6 migration with IPv6 addresses for both outer tunnel IPs and inner packet IPs. Supported for both transit gateways and Cloud WAN.
- **IPv6 outer tunnel with IPv4 inner packets** - Allows IPv6 outer tunnel addressing while supporting legacy IPv4 applications within the tunnel. Supported for both transit gateways and Cloud WAN.

The following rules apply:

- IPv6 addresses for outer tunnel IPs are supported only on Site-to-Site VPN connections that are terminated on a transit gateway or Cloud WAN. Site-to-Site VPN connections on a virtual private gateways do not support IPv6 for outer tunnel IPs.
- When using IPv6 for outer tunnel IPs, you must assign IPv6 addresses on both the AWS side of the VPN connection and your customer gateway for both VPN tunnels.
- You cannot enable IPv6 support for an existing Site-to-Site VPN connection. You must delete the existing connection and create a new one.
- A Site-to-Site VPN connection cannot support both IPv4 and IPv6 traffic simultaneously. The inner encapsulated packets can be either IPv6 or IPv4, but not both. You need separate Site-to-Site VPN connections to transport IPv4 and IPv6 packets.
- Private IP VPNs do not support IPv6 addresses for outer tunnel IPs. They use either RFC 1918 or CGNAT addresses. For more information about RFC 1918, see RFC 1918 - Address Allocation for Private Internets.
- IPv6 VPNs support the same throughput (Gbps and PPS), MTU, and route limits as IPv4 VPNs.
- The IPSec encryption and key exchange work the same way for both IPv4 and IPv6 VPNs.

For more information about creating a VPN connection with IPv6 support, see Create a VPN connection in Get Started with Site-to-Site VPN.

# AWS Site-to-Site VPN Concentrators

AWS Site-to-Site VPN Concentrator is a new feature that simplifies multi-site connectivity for distributed enterprises. VPN Concentrator is suitable for customers who need to connect 25+ remote sites to AWS, with each site needing low bandwidth (under 100 Mbps).

## Supported gateway services and features

VPN Concentrators are only supported with Transit Gateway. This feature is not supported with Cloud WAN or Virtual Private Gateway.

The following table describes Site-to-Site VPN Concentrator supported features:

| Feature | Supported? |
|---|---|
| IPv6 | Yes |

| Feature | Supported? |
|---|---|
| Private Direct Connect VPN connections | No |
| Accelerated VPN | Yes |
| Multiple customer gateway devices from the same site | Yes. However, each customer gateway device must have a unique IP address. |
| Geographical restrictions | No. You can attach a site located in any region to a Concentrator in any AWS Region. |
| Site-to-Site VPN logs | Yes. You can generate VPN logs for all sites connected to the Concentrator or individua lly. |
| Transit Gateway Encryption Support | No |

## Bandwidth

Currently, Site-to-Site VPN Concentrators support 5 Gbps aggregate bandwidth. Each site can support a maximum of 100 Mbps bandwidth. However, if you need higher bandwidth, reach out to AWS Support.

## Routing

Site-to-Site VPN Concentrators support BGP (Border Gateway Protocol) routing only. Static routing is not supported.

All customer gateways connected to the Site-to-Site VPNConcentrator use the same Site-to-Site VPN Concentrator attachment to the transit gateway for routing. Each site connecting to the Site-to-Site VPN Concentrator can send a maximum of 5,000 routes from the transit gateway to a customer gateway and 1,000 routes from the customer gateway to the transit gateway.

## IP address allocation

Each VPN connection through the Site-to-Site VPN Concentrator will still have a unique AWS IP address (one per tunnel).

## Monitoring

VPN connections via Site-to-Site VPN Concentrators support the same metrics as regular VPN connections.

When you enable Transit gateway flow logs on the VPN Concentrator attachment, you will see flow logs for all the traffic coming in and going out of all the remote sites connected to the concentrator.

## Tunnel maintenance

The tunnel maintenance works the same way as existing standard Site-to-Site VPN tunnels for both endpoints when using a Site-to-Site VPN Concentrator. See Endpoint replacements for more information.

## Pricing

Information about pricing for Site-to-Site VPN Concentrator can be found on the  AWS VPN pricing page.

# Get started with AWS Site-to-Site VPN

Use the following procedure to set up an AWS Site-to-Site VPN connection. During creation, you will specify a virtual private gateway, a transit gateway, a Site-to-Site VPN Concentrator, or "Not associated" as the target gateway type. If you specify "Not associated", you can choose the target gateway type at a later time, or you can use it as a VPN attachment for AWS Cloud WAN. This tutorial helps you create a VPN connection using a virtual private gateway. It assumes that you have an existing VPC with one or more subnets.

To set up a VPN connection using a virtual private gateway, complete the following steps:

**Tasks**

**Related tasks**

- To create a VPN connection for AWS Cloud WAN, see Create a VPN Cloud WAN connection using the CLI or API.
- To create a VPN connection on a transit gateway, see Create a VPN connection.

## Prerequisites

You need the following information to set up and configure the components of a VPN connection.

| Item | Information |
|---|---|
| Customer gateway device | The physical or software device on your side of the VPN connection. You need the vendor |

| Item | Information |
|---|---|
| | (for example, Cisco), platform (for example, ISR Series Routers), and software version (for example, IOS 12.4). |
| Customer gateway | To create the customer gateway resource in AWS, you need the following information:<br>• The internet-routable IP address for the device's external interface<br>• The type of routing: static or dynamic<br>• For dynamic routing, the Border Gateway Protocol (BGP) Autonomous System Number (ASN)<br>• (Optional) Private certificate from AWS Private Certificate Authority to authenticate your VPN<br>For more information, see Customer gateway options. |
| (Optional) The ASN for the AWS side of the BGP session | You specify this when you create a virtual private gateway or transit gateway. If you do not specify a value, the default ASN applies. For more information, see Virtual private gateway. |
| VPN connection | To create the VPN connection, you need the following information:<br>• For static routing, the IP prefixes for your private network.<br>• (Optional) Tunnel options for each VPN tunnel. For more information, see Tunnel options for your AWS Site-to-Site VPN connection. |

# Step 1: Create a customer gateway

A customer gateway provides information to AWS about your customer gateway device or software application. For more information, see Customer gateway.

If you plan to use a private certificate to authenticate your VPN, create a private certificate from a subordinate CA using AWS Private Certificate Authority. For information about creating a private certificate, see Creating and managing a private CA in the *AWS Private Certificate Authority User Guide*.

> **Note**
>
> You must specify either an IP address, or the Amazon Resource Name of the private certificate.

**To create a customer gateway using the console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Customer gateways**.
3. Choose **Create customer gateway**.
4. (Optional) For **Name tag**, enter a name for your customer gateway. Doing so creates a tag with a key of `Name` and the value that you specify.
5. For **BGP ASN**, enter a Border Gateway Protocol (BGP) Autonomous System Number (ASN) for your customer gateway.
6. For **IP address type**, select one of the following options:
   - **IPv4** - (Default) Specify an IPv4 address for your customer gateway device.
   - **IPv6** - Specify an IPv6 address for your customer gateway device. This option is required when creating a VPN connection with IPv6 outer tunnel IPs.
7. For **IP address**, enter the static, internet-routable IP address for your customer gateway device. If your customer gateway device is behind a NAT device that's enabled for NAT-T, use the public IP address of the NAT device.
8. (Optional) If you want to use a private certificate, for **Certificate ARN**, choose the Amazon Resource Name of the private certificate.

9. (Optional) For **Device**, enter a name for the customer gateway device associated with this customer gateway.
10. Choose **Create customer gateway**.

**To create a customer gateway using the command line or API**

- CreateCustomerGateway (Amazon EC2 Query API)
- create-customer-gateway (AWS CLI)

  Example for creating an IPv6 customer gateway:

  ```
  aws ec2 create-customer-gateway --ipv6-address
   2001:0db8:85a3:0000:0000:8a2e:0370:7334 --bgp-asn 65051 --type ipsec.1 --region us-
  west-1
  ```
- New-EC2CustomerGateway (AWS Tools for Windows PowerShell)

# Step 2: Create a target gateway

To establish a VPN connection between your VPC and your on-premises network, you must create a target gateway on the AWS side of the connection. The target gateway can be a virtual private gateway or a transit gateway.

## Create a virtual private gateway

When you create a virtual private gateway, you can specify a custom private Autonomous System Number (ASN) for the Amazon side of the gateway, or use the Amazon default ASN. This ASN must be different from the ASN that you specified for the customer gateway.

After you create a virtual private gateway, you must attach it to your VPC.

**To create a virtual private gateway and attach it to your VPC**

1. In the navigation pane, choose **Virtual private gateways**.
2. Choose **Create virtual private gateway**.
3. (Optional) For **Name tag**, enter a name for your virtual private gateway. Doing so creates a tag with a key of `Name` and the value that you specify.

4. For **Autonomous System Number (ASN)**, keep the default selection, **Amazon default ASN**, to use the default Amazon ASN. Otherwise, choose **Custom ASN** and enter a value. For a 16-bit ASN, the value must be in the 64512 to 65534 range. For a 32-bit ASN, the value must be in the 4200000000 to 4294967294 range.
5. Choose **Create virtual private gateway**.
6. Select the virtual private gateway you created, then choose **Actions**, **Attach to VPC**.
7. For **Available VPCs**, choose your VPC and then choose **Attach to VPC**.

**To create a virtual private gateway using the command line or API**

- CreateVpnGateway (Amazon EC2 Query API)
- create-vpn-gateway (AWS CLI)
- New-EC2VpnGateway (AWS Tools for Windows PowerShell)

**To attach a virtual private gateway to a VPC using the command line or API**

- AttachVpnGateway (Amazon EC2 Query API)
- attach-vpn-gateway (AWS CLI)
- Add-EC2VpnGateway (AWS Tools for Windows PowerShell)

## Create a transit gateway

For more information about creating a transit gateway, see Transit gateways in *Amazon VPC Transit Gateways*.

# Step 3: Configure routing

To enable instances in your VPC to reach your customer gateway, you must configure your route table to include the routes used by your VPN connection and point them to your virtual private gateway or transit gateway.

## (Virtual private gateway) Enable route propagation in your route table

You can enable route propagation for your route table to automatically propagate Site-to-Site VPN routes.

For static routing, the static IP prefixes that you specify for your VPN configuration are propagated to the route table when the status of the VPN connection is UP. Similarly, for dynamic routing, the BGP-advertised routes from your customer gateway are propagated to the route table when the status of the VPN connection is UP.

> **Note**
>
> If your connection is interrupted but the VPN connection remains UP, any propagated routes that are in your route table are not automatically removed. Keep this in mind if, for example, you want traffic to fail over to a static route. In that case, you might have to disable route propagation to remove the propagated routes.

**To enable route propagation using the console**

1. In the navigation pane, choose **Route tables**.
2. Select the route table that's associated with the subnet.
3. On the **Route propagation** tab, choose **Edit route propagation**. Select the virtual private gateway that you created in the previous procedure, and then choose **Save**.

> **Note**
>
> If you do not enable route propagation, you must manually enter the static routes used by your VPN connection. To do this, select your route table, choose **Routes**, **Edit**. For **Destination**, add the static route used by your Site-to-Site VPN connection. For **Target**, select the virtual private gateway ID, and choose **Save**.

**To disable route propagation using the console**

1. In the navigation pane, choose **Route tables**.
2. Select the route table that's associated with the subnet.
3. On the **Route propagation** tab, choose **Edit route propagation**. Clear the **Propagate** check box for the virtual private gateway.
4. Choose **Save**.

**To enable route propagation using the command line or API**

- EnableVgwRoutePropagation (Amazon EC2 Query API)
- enable-vgw-route-propagation (AWS CLI)
- Enable-EC2VgwRoutePropagation (AWS Tools for Windows PowerShell)

**To disable route propagation using the command line or API**

- DisableVgwRoutePropagation (Amazon EC2 Query API)
- disable-vgw-route-propagation (AWS CLI)
- Disable-EC2VgwRoutePropagation (AWS Tools for Windows PowerShell)

## (Transit gateway) Add a route to your route table

If you enabled route table propagation for your transit gateway, the routes for the VPN attachment are propagated to the transit gateway route table. For more information, see Routing in *Amazon VPC Transit Gateways*.

If you attach a VPC to your transit gateway and you want to enable resources in the VPC to reach your customer gateway, you must add a route to your subnet route table to point to the transit gateway.

**To add a route to a VPC route table**

1. On the navigation pane, choose **Route tables**.
2. Choose the route table that is associated with your VPC.
3. On the **Routes** tab, choose **Edit routes**.
4. Choose **Add route**.
5. For **Destination**, enter the destination IP address range. For **Target**, choose the transit gateway.
6. Choose **Save changes**.

# Step 4: Update your security group

To allow access to instances in your VPC from your network, you must update your security group rules to enable inbound SSH, RDP, and ICMP access.

**To add rules to your security group to enable access**

1. In the navigation pane, choose **Security groups**.
2. Select the security group for the instances in your VPC that you want to allow access to.
3. On the **Inbound rules** tab, choose **Edit inbound rules**.
4. Add rules that allow inbound SSH, RDP, and ICMP access from your network, and then choose **Save rules**. For more information, see Work with security group rules in the *Amazon VPC User Guide*.

## Step 5: Create a VPN connection

Create the VPN connection using the customer gateway in combination with the virtual private gateway or transit gateway that you created earlier.

**To create a VPN connection**

1. In the navigation pane, choose **Site-to-Site VPN connections**.
2. Choose **Create VPN connection**.
3. (Optional) For **Name tag**, enter a name for your VPN connection. Doing so creates a tag with a key of `Name` and the value that you specify.
4. For **Target gateway type**, choose either **Virtual private gateway** or **Transit gateway**. Then, choose the virtual private gateway or transit gateway that you created earlier.
5. For **Customer gateway**, select **Existing**, then choose the customer gateway that you created earlier from **Customer gateway ID**.
6. Select one of the **Routing options** based on whether your customer gateway device supports Border Gateway Protocol (BGP):
   - If your customer gateway device supports BGP, choose **Dynamic (requires BGP)**.
   - If your customer gateway device does not support BGP, choose **Static**. For **Static IP Prefixes**, specify each IP prefix for the private network of your VPN connection.
7. Choose the Pre-shared key storage type:
   - **Standard** — The pre-shared key is stored directly in the Site-to-Site VPN service.
   - **Secrets Manager** — The pre-shared key is stored using AWS Secrets Manager. For more information about Secrets Manager, see Enhanced security features using Secrets Manager.

8. If your target gateway type is transit gateway, for **Tunnel inside IP version**, specify whether the VPN tunnels support IPv4 or IPv6 traffic. IPv6 traffic is only supported for VPN connections on a transit gateway.

9. If you specified **IPv4** for **Tunnel inside IP version**, you can optionally specify the IPv4 CIDR ranges for the customer gateway and AWS sides that are allowed to communicate over the VPN tunnels. The default is `0.0.0.0/0`.

   If you specified **IPv6** for **Tunnel inside IP version**, you can optionally specify the IPv6 CIDR ranges for the customer gateway and AWS sides that are allowed to communicate over the VPN tunnels. The default for both ranges is `::/0`.

10. For **Outside IP address type**, select one of the following options:

    - **PublicIpv4** - (Default) Use IPv4 addresses for the outer tunnel IPs.
    - **IPv6** - Use IPv6 addresses for the outer tunnel IPs. This option is only available for VPN connections on a transit gateway or Cloud WAN.

11. (Optional) For **Tunnel options**, you can specify the following information for each tunnel:

    - A size /30 IPv4 CIDR block from the `169.254.0.0/16` range for the inside tunnel IPv4 addresses.
    - If you specified **IPv6** for **Tunnel inside IP version**, a /126 IPv6 CIDR block from the `fd00::/8` range for the inside tunnel IPv6 addresses.
    - The IKE pre-shared key (PSK). The following versions are supported: IKEv1 or IKEv2.
    - To edit the advanced options for your tunnel, choose **Edit tunnel options**. For more information, see VPN tunnel options.

12. Choose **Create VPN connection**. It might take a few minutes to create the VPN connection.

### To create a VPN connection using the command line or API

- CreateVpnConnection (Amazon EC2 Query API)
- create-vpn-connection (AWS CLI)

  Example for creating a VPN connection with IPv6 outer tunnel IPs and IPv6 inner tunnel IPs:

  ```
  aws ec2 create-vpn-connection --type ipsec.1 --transit-gateway-id
   tgw-12312312312312312 --customer-gateway-id cgw-001122334455aabbc --options
  ```

```
 OutsideIPAddressType=IPv6,TunnelInsideIpVersion=ipv6,TunnelOptions=[{StartupAction=start},
{StartupAction=start}]
```

Example for creating a VPN connection with IPv6 outer tunnel IPs and IPv4 inner tunnel IPs:

```
aws ec2 create-vpn-connection --type ipsec.1 --transit-gateway-id
 tgw-12312312312312312 --customer-gateway-id cgw-001122334455aabbc --options
 OutsideIPAddressType=IPv6,TunnelInsideIpVersion=ipv4,TunnelOptions=[{StartupAction=start},
{StartupAction=start}]
```

- New-EC2VpnConnection (AWS Tools for Windows PowerShell)

## Step 6: Download the configuration file

After you create the VPN connection, you can download a sample configuration file to use for configuring the customer gateway device.

**Important**

The configuration file is an example only and might not match your intended VPN connection settings entirely. It specifies the minimum requirements for a VPN connection of AES128, SHA1, and Diffie-Hellman group 2 in most AWS Regions, and AES128, SHA2, and Diffie-Hellman group 14 in the AWS GovCloud Regions. It also specifies pre-shared keys for authentication. You must modify the example configuration file to take advantage of additional security algorithms, Diffie-Hellman groups, private certificates, and IPv6 traffic. We have introduced IKEv2 support in the configuration files for many popular customer gateway devices and will continue to add additional files over time. For a list of configuration files with IKEv2 support, see AWS Site-to-Site VPN customer gateway devices.

### Permissions

To properly load the download configuration screen from the AWS Management Console, you must ensure that your IAM role or user has permission for the following Amazon EC2 APIs: `GetVpnConnectionDeviceTypes` and `GetVpnConnectionDeviceSampleConfiguration`.

**To download the configuration file using the console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Select your VPN connection and choose **Download configuration**.
4. Select the **Vendor**, **Platform**, **Software**, and **IKE version** that correspond to your customer gateway device. If your device is not listed, choose **Generic**.
5. Choose **Download**.

**To download a sample configuration file using the command line or API**

- GetVpnConnectionDeviceTypes (Amazon EC2 API)
- GetVpnConnectionDeviceSampleConfiguration (Amazon EC2 Query API)
- get-vpn-connection-device-types (AWS CLI)
- get-vpn-connection-device-sample-configuration (AWS CLI)

## Step 7: Configure the customer gateway device

Use the sample configuration file to configure your customer gateway device. The customer gateway device is the physical or software appliance on your side of the VPN connection. For more information, see AWS Site-to-Site VPN customer gateway devices.

# AWS Site-to-Site VPN architectural scenarios

The following are scenarios in which you might create multiple VPN connections with one or more customer gateway devices.

**Multiple VPN connections using the same customer gateway device**

You can create additional VPN connections from your on-premises location to other VPCs using the same customer gateway device. You can reuse the same customer gateway IP address for each of those VPN connections.

**Multiple customer gateway devices to a single virtual private gateway (Site-to-Site VPN CloudHub)**

You can establish multiple VPN connections to a single virtual private gateway from multiple customer gateway devices. This enables you to have multiple locations connected to the AWS VPN CloudHub. For more information, see Secure communication between AWS Site-to-Site VPN connections using VPN CloudHub. When you have customer gateway devices at multiple geographic locations, each device should advertise a unique set of IP ranges specific to the location.

**Redundant VPN connection using a second customer gateway device**

To protect against a loss of connectivity if your customer gateway device becomes unavailable, you can set up a second VPN connection using a second customer gateway device. For more information, see Redundant AWS Site-to-Site VPN connections for failover. When you establish redundant customer gateway devices at a single location, both devices should advertise the same IP ranges.

The following are common Site-to-Site VPN architectures:

- Single and multiple VPN connections
- the section called “Redundant VPN connections”
- Secure communications between VPN connections using VPN CloudHub

# AWS Site-to-Site VPN single and multiple VPN connection examples

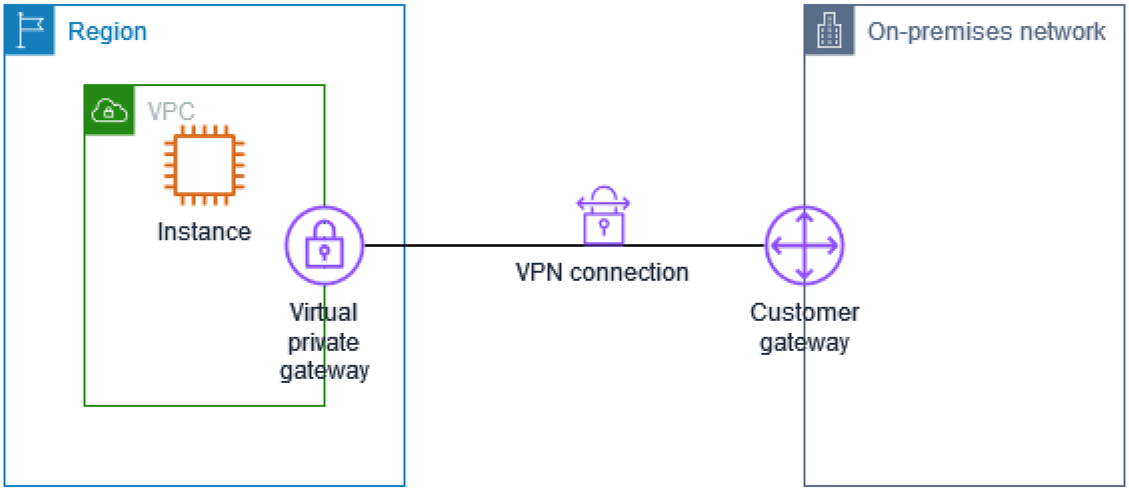
The following diagrams illustrate single and multiple Site-to-Site VPN connections.

**Examples**

- Single Site-to-Site VPN connection
- Single Site-to-Site VPN connection with a transit gateway
- Multiple Site-to-Site VPN connections
- Multiple Site-to-Site VPN connections with a transit gateway
- Site-to-Site VPN connection with Direct Connect
- Private IP Site-to-Site VPN connection with Direct Connect

## Single Site-to-Site VPN connection

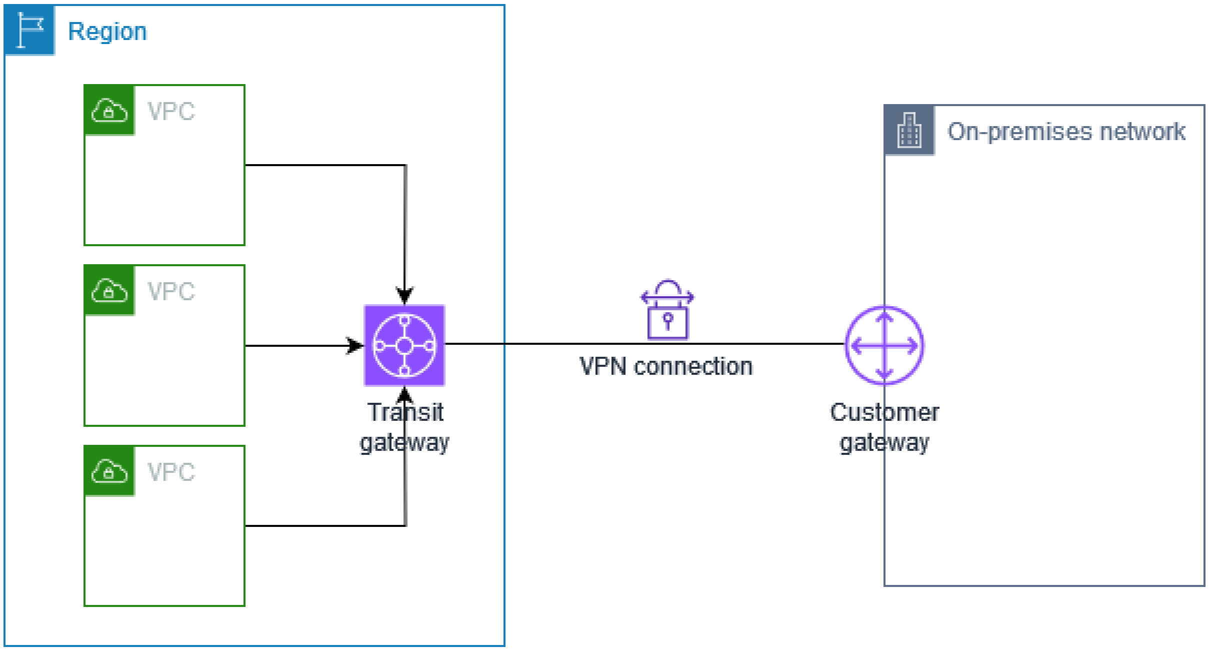
The VPC has an attached virtual private gateway, and your on-premises (remote) network includes a customer gateway device, which you must configure to enable the VPN connection. You must update the VPC route tables so that any traffic from the VPC bound for your network goes to the virtual private gateway.



For steps to set up this scenario, see Get started with AWS Site-to-Site VPN.

## Single Site-to-Site VPN connection with a transit gateway

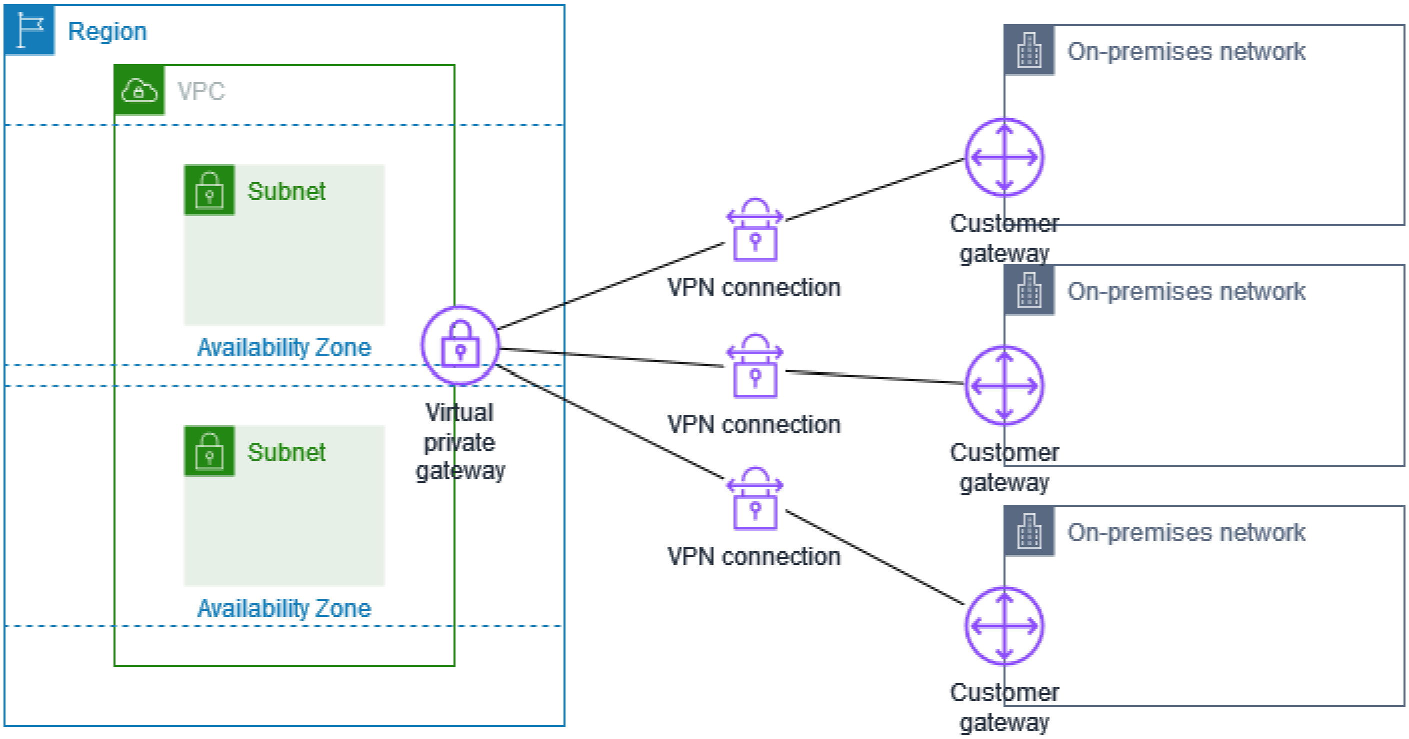
The VPC has an attached transit gateway, and your on-premises (remote) network includes a customer gateway device, which you must configure to enable the VPN connection. You must update the VPC route tables so that any traffic from the VPC bound for your network goes to the transit gateway.



For steps to set up this scenario, see Get started with AWS Site-to-Site VPN.

## Multiple Site-to-Site VPN connections

The VPC has an attached virtual private gateway, and you have multiple Site-to-Site VPN connections to multiple on-premises locations. You set up the routing so that any traffic from the VPC bound for your networks is routed to the virtual private gateway.

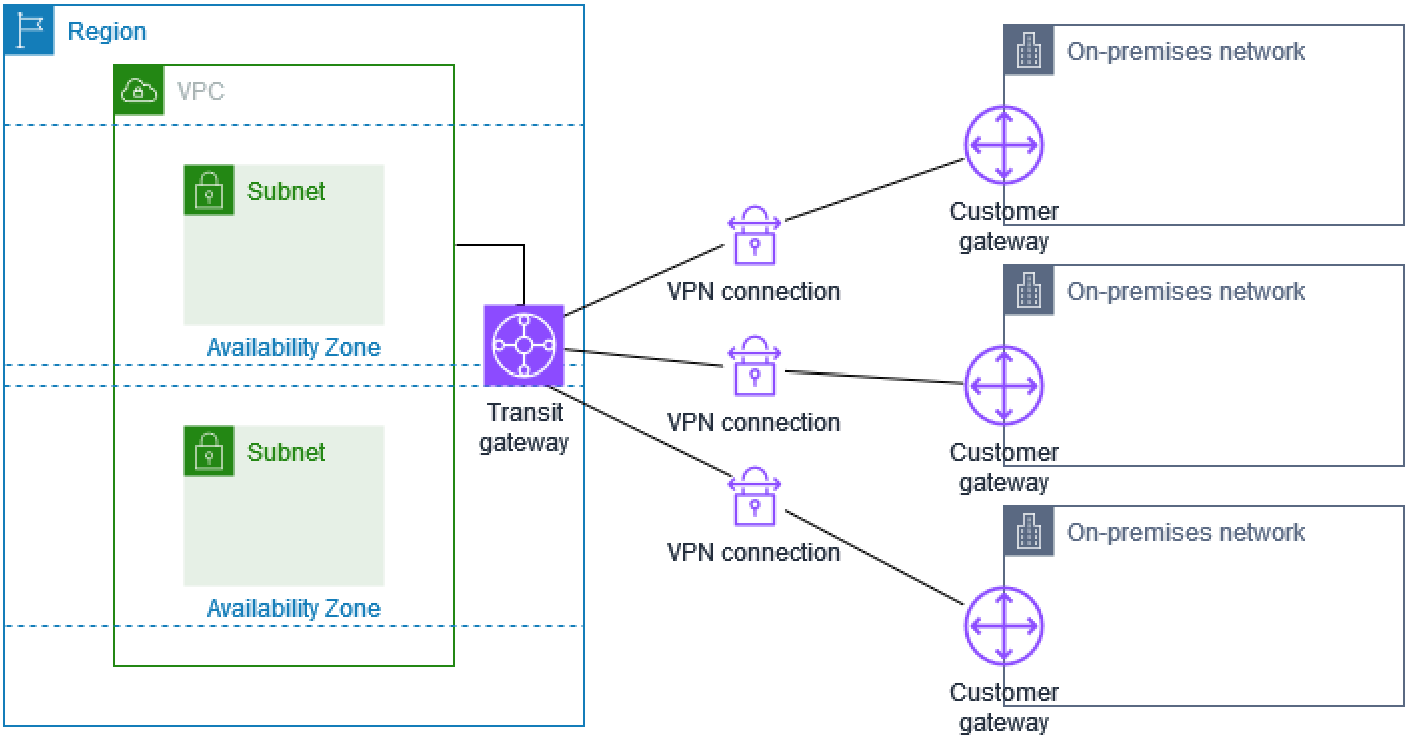


When you create multiple Site-to-Site VPN connections to a single VPC, you can configure a second customer gateway to create a redundant connection to the same external location. For more information, see Redundant AWS Site-to-Site VPN connections for failover.

You can also use this scenario to create Site-to-Site VPN connections to multiple geographic locations and provide secure communication between sites. For more information, see Secure communication between AWS Site-to-Site VPN connections using VPN CloudHub.

## Multiple Site-to-Site VPN connections with a transit gateway

The VPC has an attached transit gateway, and you have multiple Site-to-Site VPN connections to multiple on-premises locations. You set up the routing so that any traffic from the VPC bound for your networks is routed to the transit gateway.

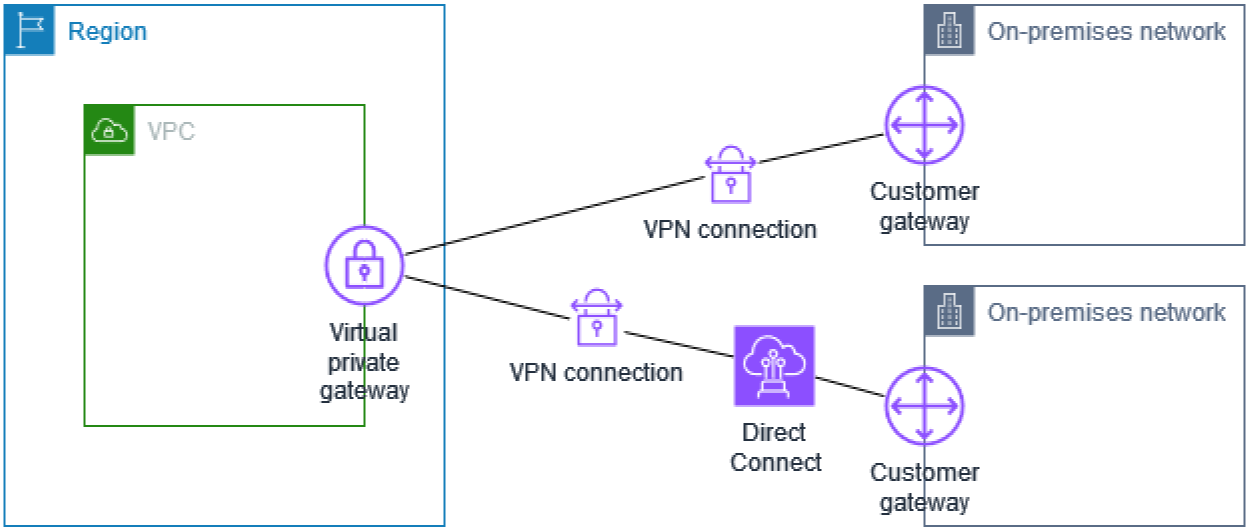


When you create multiple Site-to-Site VPN connections to a single transit gateway, you can configure a second customer gateway to create a redundant connection to the same external location.

You can also use this scenario to create Site-to-Site VPN connections to multiple geographic locations and provide secure communication between sites.

## Site-to-Site VPN connection with Direct Connect

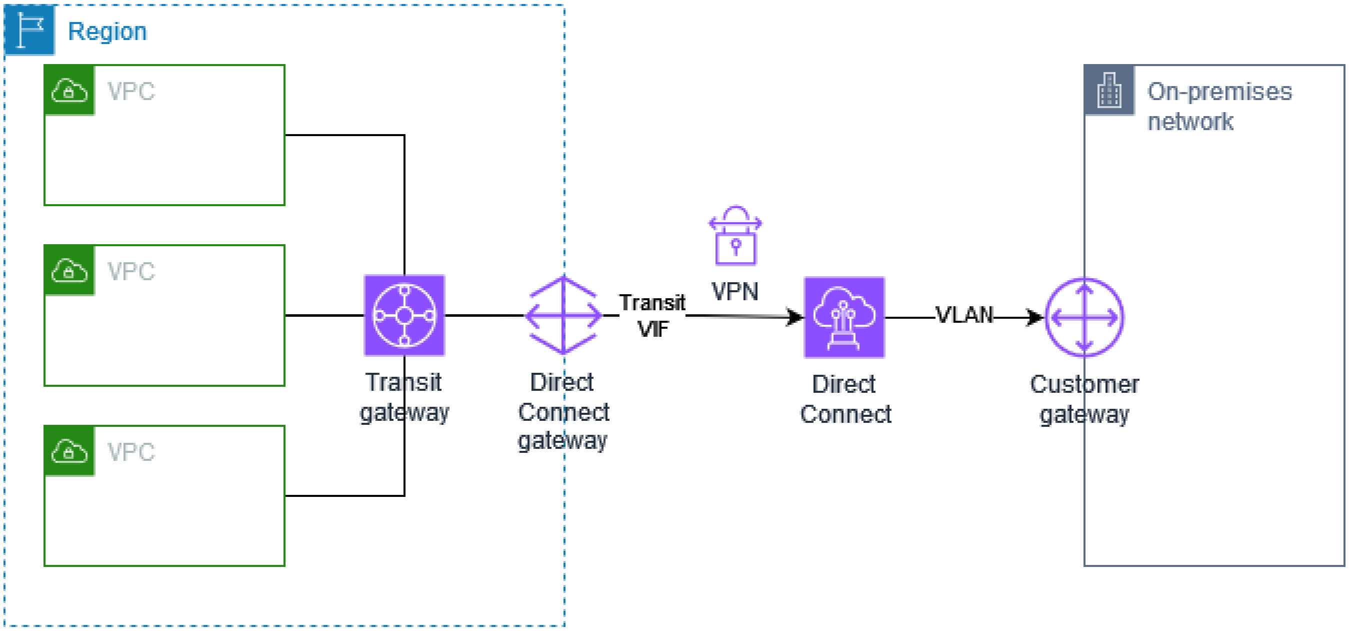
The VPC has an attached virtual private gateway, and connects to your on-premises (remote) network through AWS Direct Connect. You can configure an Direct Connect public virtual interface to establish a dedicated network connection between your network to public AWS resources through a virtual private gateway. You set up the routing so that any traffic from the VPC bound for your network routes to the virtual private gateway and the Direct Connect connection.



When both Direct Connect and the VPN connection are set up on the same virtual private gateway, adding or removing objects might cause the virtual private gateway to enter the ‘attaching’ state. This indicates a change is being made to internal routing that will switch between Direct Connect and the VPN connection to minimize interruptions and packet loss. When this is complete, the virtual private gateway returns to the ‘attached’ state.

## Private IP Site-to-Site VPN connection with Direct Connect

With a private IP Site-to-Site VPN you can encrypt Direct Connect traffic between your on-premises network and AWS without the use of public IP addresses. Private IP VPN over Direct Connect ensures that traffic between AWS and on-premises networks is both secure and private, allowing customers to comply with regulatory and security mandates.



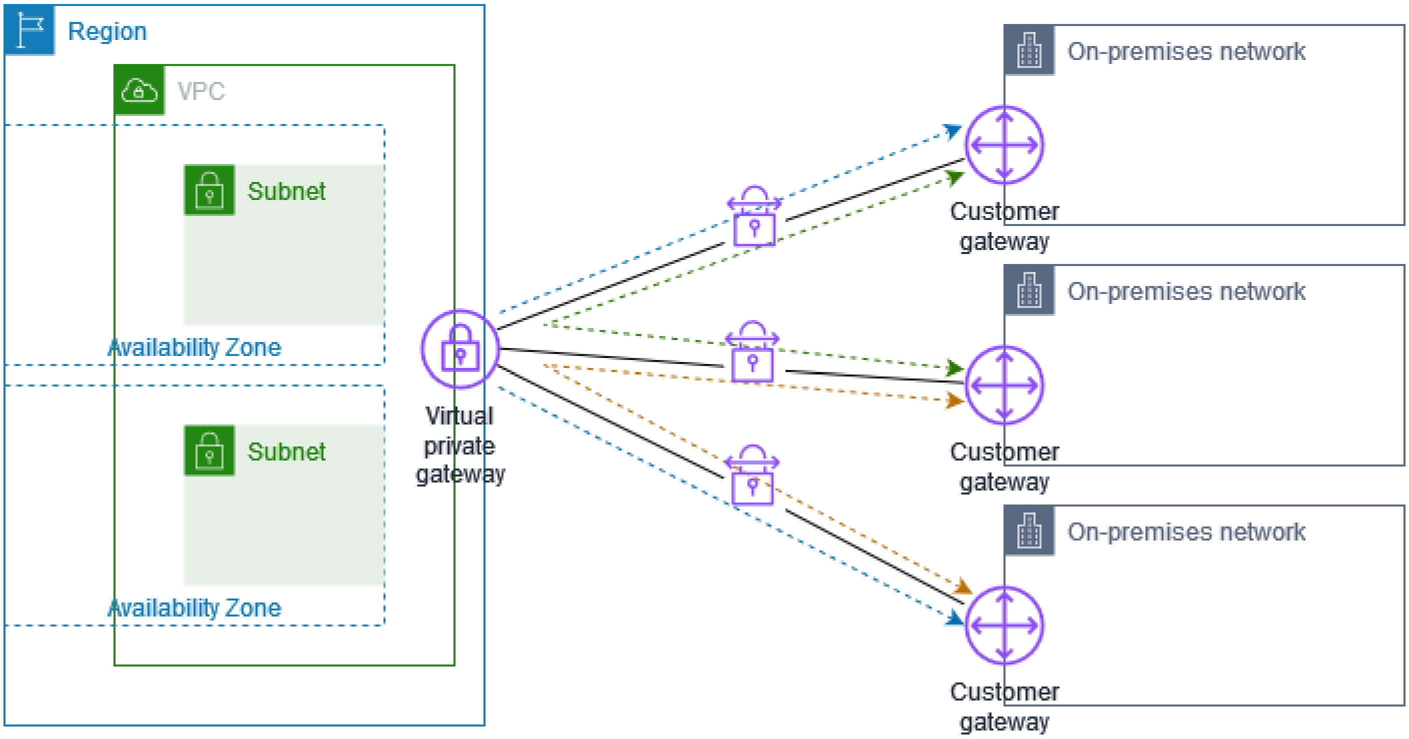
For more information, see the following blog post: Introducing AWS Site-to-Site VPN Private IP VPNs.

# Secure communication between AWS Site-to-Site VPN connections using VPN CloudHub

If you have multiple AWS Site-to-Site VPN connections, you can provide secure communication between sites using the AWS VPN CloudHub. This enables your sites to communicate with each other, and not just with the resources in your VPC. The VPN CloudHub operates on a simple hub-and-spoke model that you can use with or without a VPC. This design is suitable if you have multiple branch offices and existing internet connections and would like to implement a convenient, potentially low-cost hub-and-spoke model for primary or backup connectivity between these sites.

## Overview

The following diagram shows the VPN CloudHub architecture. The dashed lines show network traffic between remote sites being routed over the VPN connections. The sites must not have overlapping IP ranges.



For this scenario, do the following:

1. Create a single virtual private gateway.
2. Create multiple customer gateways, each with the public IP address of the gateway. You must use a unique Border Gateway Protocol (BGP) Autonomous System Number (ASN) for each customer gateway.
3. Create a dynamically routed Site-to-Site VPN connection from each customer gateway to the common virtual private gateway.
4. Configure the customer gateway devices to advertise a site-specific prefix (such as 10.0.0.0/24, 10.0.1.0/24) to the virtual private gateway. These routing advertisements are received and re-advertised to each BGP peer, enabling each site to send data to and receive data from the other sites. This is done using the network statements in the VPN configuration files for the Site-to-Site VPN connection. The network statements differ slightly depending on the type of router you use.
5. Configure the routes in your subnet route tables to enable instances in your VPC to communicate with your sites. For more information, see (Virtual private gateway) Enable route propagation in your route table. You can configure an aggregate route in your route table (for example, 10.0.0.0/16). Use more specific prefixes between customer gateways devices and the virtual private gateway.

Sites that use Direct Connect connections to the virtual private gateway can also be part of the AWS VPN CloudHub. For example, your corporate headquarters in New York can have an Direct Connect connection to the VPC and your branch offices can use Site-to-Site VPN connections to the VPC. The branch offices in Los Angeles and Miami can send and receive data with each other and with your corporate headquarters, all using the AWS VPN CloudHub.

## Pricing

To use AWS VPN CloudHub, you pay typical Amazon VPC Site-to-Site VPN connection rates. You are billed the connection rate for each hour that each VPN is connected to the virtual private gateway. When you send data from one site to another using the AWS VPN CloudHub, there is no cost to send data from your site to the virtual private gateway. You only pay standard AWS data transfer rates for data that is relayed from the virtual private gateway to your endpoint.

For example, if you have a site in Los Angeles and a second site in New York and both sites have a Site-to-Site VPN connection to the virtual private gateway, you pay the per hour rate for each Site-to-Site VPN connection (so if the rate was $.05 per hour, it would be a total of $.10 per hour). You also pay the standard AWS data transfer rates for all data that you send from Los Angeles to New

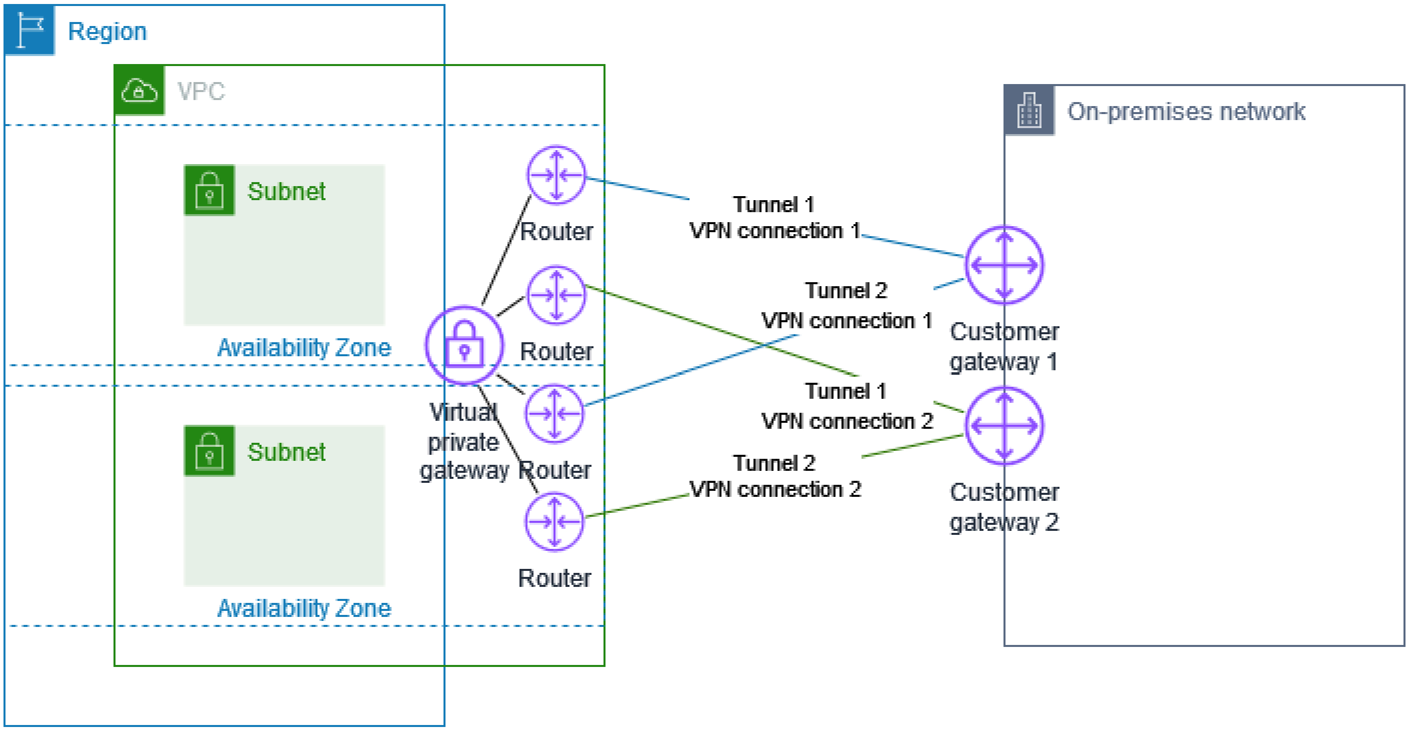
York (and vice versa) that traverses each Site-to-Site VPN connection. Network traffic sent over the Site-to-Site VPN connection to the virtual private gateway is free but network traffic sent over the Site-to-Site VPN connection from the virtual private gateway to the endpoint is billed at the standard AWS data transfer rate.

For more information, see Site-to-Site VPN Connection Pricing.

## Redundant AWS Site-to-Site VPN connections for failover

To protect against a loss of connectivity in case your customer gateway device becomes unavailable, you can set up a second Site-to-Site VPN connection to your VPC and virtual private gateway by adding a second customer gateway device. By using redundant VPN connections and customer gateway devices, you can perform maintenance on one of your devices while traffic continues to flow over the second VPN connection.

The following diagram shows two VPN connections. Each VPN connection has its own tunnels and its own customer gateway.



For this scenario, do the following:

- Set up a second Site-to-Site VPN connection by using the same virtual private gateway and creating a new customer gateway. The customer gateway IP address for the second Site-to-Site VPN connection must be publicly accessible.
- Configure a second customer gateway device. Both devices should advertise the same IP ranges to the virtual private gateway. We use BGP routing to determine the path for traffic. If one customer gateway device fails, the virtual private gateway directs all traffic to the working customer gateway device.

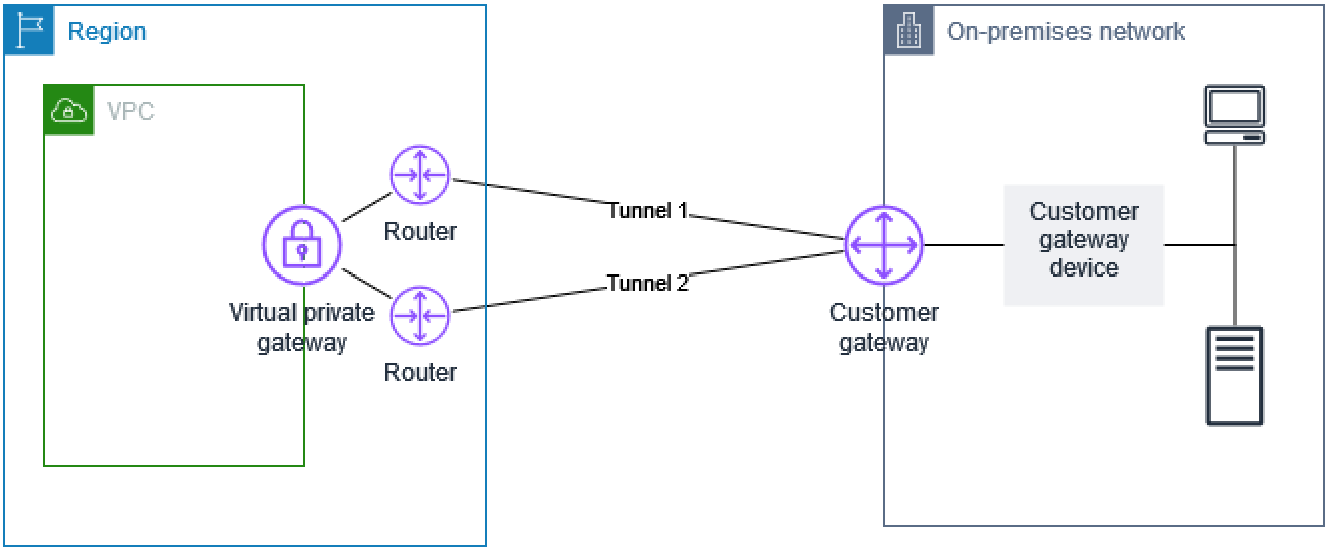
Dynamically routed Site-to-Site VPN connections use the Border Gateway Protocol (BGP) to exchange routing information between your customer gateways and the virtual private gateways. Statically routed Site-to-Site VPN connections require you to enter static routes for the remote network on your side of the customer gateway. BGP-advertised and statically entered route information allow gateways on both sides to determine which tunnels are available and reroute traffic if a failure occurs. We recommend that you configure your network to use the routing information provided by BGP (if available) to select an available path. The exact configuration depends on the architecture of your network.

For more information about creating and configuring a customer gateway and a Site-to-Site VPN connection, see Get started with AWS Site-to-Site VPN.

# AWS Site-to-Site VPN customer gateway devices

A *customer gateway device* is a physical or software appliance that you own or manage in your on-premises network (on your side of a Site-to-Site VPN connection). You or your network administrator must configure the device to work with the Site-to-Site VPN connection.

The following diagram shows your network, the customer gateway device, and the VPN connection that goes to the virtual private gateway that is attached to your VPC. The two lines between the customer gateway and virtual private gateway represent the tunnels for the VPN connection. 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. From time to time, AWS also performs routine maintenance on the VPN connection, which might briefly disable one of the two tunnels of your VPN connection. For more information, see AWS Site-to-Site VPN tunnel endpoint replacements. When you configure your customer gateway device, it's therefore important that you configure it to use both tunnels.



For the steps to set up a VPN connection, see Get started with AWS Site-to-Site VPN. During this process, you create a customer gateway resource in AWS, which provides information to AWS about your device, for example, its public-facing IP address. For more information, see Customer gateway options for your AWS Site-to-Site VPN connection. The customer gateway resource in AWS does not configure or create the customer gateway device. You must configure the device yourself.

You can also find software VPN appliances on the AWS Marketplace.

# Requirements for an AWS Site-to-Site VPN customer gateway device

AWS supports a number of Site-to-Site VPN customer gateway devices, which we provide downloadable configuration files for. For a list of supported devices, and the steps to download the configuration files, see Static and dynamic routing configuration files.

If you have a device that isn't in the list of supported devices, the following section describes the requirements that the device must meet in order to establish a Site-to-Site VPN connection.

There are four main parts to the configuration of your customer gateway device. The following symbols represent each part of the configuration.

| | |
|---|---|
| IKE | Internet key exchange (IKE) security association. This is required to exchange keys used to establish the IPsec security association. |
| IPsec | IPsec security association. This handles the tunnel's encryption, authentication, and so on. |
| Tunnel | Tunnel interface. This receives traffic going to and from the tunnel. |
| BGP | (Optional) Border Gateway Protocol (BGP) peering. For devices that use BGP, this exchanges routes between the customer gateway device and the virtual private gateway. |

The following table lists the requirements for the customer gateway device, the related RFC (for reference), and comments about the requirements.

Each VPN connection consists of two separate tunnels. Each tunnel contains an IKE security association, an IPsec security association, and a BGP peering. You are limited to one unique security association (SA) pair per tunnel (one inbound and one outbound), and therefore two unique SA pairs in total for two tunnels (four SAs). Some devices use a policy-based VPN and create as many SAs as ACL entries. Therefore, you might need to consolidate your rules and then filter so that you don't permit unwanted traffic.

By default, the VPN tunnel comes up when traffic is generated and the IKE negotiation is initiated from your side of the VPN connection. You can configure the VPN connection to initiate the IKE negotiation from the AWS side of the connection instead. For more information, see AWS Site-to-Site VPN tunnel initiation options.

VPN endpoints support rekey and can start renegotiations when phase 1 is about to expire if the customer gateway device hasn't sent any renegotiation traffic.

| Requirement | RFC | Comments |
|---|---|---|
| Establish IKE security association<br>IKE | RFC 2409<br>RFC 7296 | The IKE security association is established first between the virtual private gateway and the customer gateway device using a pre-shared key or a private certificate that uses AWS Private Certificate Authority as the authenticator. When established, IKE negotiates an ephemeral key to secure future IKE messages. There must be complete agreement among the parameters, including encryption and authentication parameters.<br>When you create a VPN connection in AWS, you can specify your own pre-shared key for each tunnel, or you can let AWS generate one for you. Alternatively, you can specify the private certificate using AWS Private Certificate Authority to use for your customer gateway device. For more information, about configuring VPN tunnels see Tunnel options for your AWS Site-to-Site VPN connection.<br>The following versions are supported: IKEv1 and IKEv2.<br>We support Main mode only with IKEv1.<br>The Site-to-Site VPN service is a route-based solution. If you are using a policy-based configuration, you must limit your configuration to a single security association (SA). |

| Requirement | RFC | Comments |
|---|---|---|
| Establish IPsec security associations in Tunnel mode<br>IPsec | RFC 4301 | Using the IKE ephemeral key, keys are established between the virtual private gateway and the customer gateway device 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. |
| Use the AES 128-bit encryption or AES 256-bit encryption function | RFC 3602 | The encryption function is used to ensure privacy for both IKE and IPsec security associations. |
| Use the SHA-1 or SHA-2 (256) hashing function | RFC 2404 | This hashing function is used to authenticate both IKE and IPsec security associations. |
| Use Diffie-Hellman Perfect Forward Secrecy. | RFC 2409 | IKE uses Diffie-Hellman to establish ephemeral keys to secure all communication between customer gateway devices and virtual private gateways.<br>The following groups are supported:<br>• Phase 1 groups: 2, 14-24<br>• Phase 2 groups: 2, 5, 14-24 |
| (Dynamically-routed VPN connections) Use IPsec Dead Peer Detection | RFC 3706 | 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 used if possible. |

| Requirement | RFC | Comments |
|---|---|---|
| (Dynamically-routed VPN connections) Bind tunnel to logical interface (route-based VPN)<br>Tunnel | None | Your device must be able to bind the IPsec tunnel to a logical interface. The logical interface contains an IP address that is used to establish BGP peering to the virtual private gateway. This logical interface should perform no additional encapsulation (for example, GRE or IP in IP). Your interface should be set to a 1399 byte Maximum Transmission Unit (MTU). |
| (Dynamically-routed VPN connections) Establish BGP peerings<br>BGP | RFC 4271 | BGP is used to exchange routes between the customer gateway device and the 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 that are reachable through the IPsec SA. |

An AWS VPN connection does not support Path MTU Discovery (RFC 1191).

If you have a firewall between your customer gateway device and the internet, see Firewall rules for an AWS Site-to-Site VPN customer gateway device.

## Best practices for an AWS Site-to-Site VPN customer gateway device

### Use IKEv2

We strongly recommend using IKEv2 for your Site-to-Site VPN connection. IKEv2 is a simpler, more robust, and more secure protocol than IKEv1. You should only use IKEv1 if your customer gateway device does not support IKEv2. For more details on the differences between IKEv1 and IKEv2, see Appendix A of RFC7296.

### Reset the "Don't Fragment (DF)" flag on packets

Some packets carry a flag, known as the Don't Fragment (DF) flag, which 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 for reducing the amount of data transmitted in each packet. Some VPN devices can override the DF flag and fragment packets unconditionally as required. If your customer gateway device has this ability, we recommend that you use it as appropriate. See RFC 791 for more details.

### Fragment IP packets before encryption

If packets being sent to over your Site-to-Site VPN connection exceed the MTU size, they must be fragmented. To avoid decreased performance, we recommend that you configure your customer gateway device to fragment the packets *before* they are encrypted. Site-to-Site VPN will then reassemble any fragmented packets before forwarding them to the next destination, in order to achieve higher packet-per-second flows through the AWS network. See RFC 4459 for more details.

### Ensure packet size does not exceed MTU for destination networks

Since Site-to-Site VPN will reassemble any fragmented packets received from your customer gateway device before forwarding to the next destination, keep in mind, there may be packet size/ MTU considerations for destination networks where these packets get forwarded next, such as over Direct Connect, or with certain protocols, such as Radius.

### Adjust MTU and MSS sizes according to the algorithms in use

TCP packets are often the most common type of packet across IPsec tunnels. Site-to-Site VPN supports a maximum transmission unit (MTU) of 1446 bytes and a corresponding maximum segment size (MSS) of 1406 bytes. However, encryption algorithms have varying header sizes and can prevent the ability to achieve these maximum values. To obtain optimal performance by avoiding fragmentation, we recommend that you set the MTU and MSS based specifically on the algorithms being used.

Use the following table to set your MTU/MSS to avoid fragmentation and achieve optimal performance:

| Encryption Algorithm | Hashing Algorithm | NAT-Traversal | MTU | MSS (IPv4) | MSS (IPv6-in-IPv4) |
|---|---|---|---|---|---|
| AES-GCM-16 | N/A | disabled | 1446 | 1406 | 1386 |
| AES-GCM-16 | N/A | enabled | 1438 | 1398 | 1378 |

| Encryption Algorithm | Hashing Algorithm | NAT-Traversal | MTU | MSS (IPv4) | MSS (IPv6-in-IPv4) |
|---|---|---|---|---|---|
| AES-CBC | SHA1/SHA2-256 | disabled | 1438 | 1398 | 1378 |
| AES-CBC | SHA1/SHA2-256 | enabled | 1422 | 1382 | 1362 |
| AES-CBC | SHA2-384 | disabled | 1422 | 1382 | 1362 |
| AES-CBC | SHA2-384 | enabled | 1422 | 1382 | 1362 |
| AES-CBC | SHA2-512 | disabled | 1422 | 1382 | 1362 |
| AES-CBC | SHA2-512 | enabled | 1406 | 1366 | 1346 |

**Note**

The AES-GCM algorithms cover both encryption and authentication, so there is no distinct authentication algorithm choice which would affect MTU.

### Disable IKE unique IDs

Some customer gateway devices support a setting which ensures that at most, one Phase 1 security association exists per tunnel configuration. This setting can result in inconsistent Phase 2 states between VPN peers. If your customer gateway device supports this setting, we recommend disabling it.

## Firewall rules for an AWS Site-to-Site VPN customer gateway device

You must have a static IP address to use as the endpoint for the IPsec tunnels that connect your customer gateway device to AWS Site-to-Site VPN endpoints. If a firewall is in place between AWS and your customer gateway device, the rules in the following tables must be in place to establish the IPsec tunnels. The IP addresses for the AWS-side will be in the configuration file.

### Inbound (from the internet)

| Input rule I1 | |
|---|---|
| Source IP | Tunnel1 Outside IP |
| Dest IP | Customer Gateway |
| Protocol | UDP |
| Source port | 500 |
| Destination | 500 |
| **Input rule I2** | |
| Source IP | Tunnel2 Outside IP |
| Dest IP | Customer Gateway |
| Protocol | UDP |
| Source port | 500 |
| Destination port | 500 |
| **Input rule I3** | |
| Source IP | Tunnel1 Outside IP |
| Dest IP | Customer Gateway |
| Protocol | IP 50 (ESP) |
| **Input rule I4** | |
| Source IP | Tunnel2 Outside IP |
| Dest IP | Customer Gateway |
| Protocol | IP 50 (ESP) |

### Outbound (to the internet)

| Output rule O1 | |
|---|---|
| Source IP | Customer Gateway |
| Dest IP | Tunnel1 Outside IP |
| Protocol | UDP |
| Source port | 500 |
| Destination port | 500 |
| Output rule O2 | |
| Source IP | Customer Gateway |
| Dest IP | Tunnel2 Outside IP |
| Protocol | UDP |
| Source port | 500 |
| Destination port | 500 |
| Output rule O3 | |
| Source IP | Customer Gateway |
| Dest IP | Tunnel1 Outside IP |
| Protocol | IP 50 (ESP) |
| Output rule O4 | |
| Source IP | Customer Gateway |
| Dest IP | Tunnel2 Outside IP |
| 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 that contain the encrypted network traffic.

> **Note**
>
> If you are using NAT traversal (NAT-T) on your device, ensure that UDP traffic on port 4500 is also allowed to pass between your network and the AWS Site-to-Site VPN endpoints. Check if your device is advertising NAT-T.

# Static and dynamic configuration files for an AWS Site-to-Site VPN customer gateway device

After you create the VPN connection, you additionally have the option to download an AWS-provided sample configuration file from the Amazon VPC console, or by using the EC2 API. See Step 6: Download the configuration file for more information. You can also download .zip files of sample configurations specifically for static vs. dynamic routing from those respective pages.

The AWS-provided sample configuration file contains information specific to your VPN connection which you can use to configure your customer gateway device. These device-specific configuration files are only available for devices that AWS has tested. If your specific customer gateway device is not listed, you can download a generic configuration file to begin with.

> **Important**
>
> The configuration file is an example only and might not match your intended Site-to-Site VPN connection settings entirely. It specifies the minimum requirements for a Site-to-Site VPN connection of AES128, SHA1, and Diffie-Hellman group 2 in most AWS Regions, and AES128, SHA2, and Diffie-Hellman group 14 in the AWS GovCloud Regions. It also specifies pre-shared keys for authentication. You must modify the example configuration file to take advantage of additional security algorithms, Diffie-Hellman groups, private certificates, and IPv6 traffic.

> **Note**
>
> These device-specific configuration files are provided by AWS on a best-effort basis. While they have been tested by AWS, this testing is limited. If you are experiencing an issue

with the configuration files, you might need to contact the specific vendor for additional support.

The following table contains a list of devices which have an example configuration file available for download that has been updated to support IKEv2. We have introduced IKEv2 support in the configuration files for many popular customer gateway devices and will continue to add additional files over time. This list will be updated as more example configuration files are added.

| Vendor | Platform | Software |
|---|---|---|
| Checkpoint | Gaia | R80.10+ |
| Cisco Meraki | MX Series | 15.12+ (WebUI) |
| Cisco Systems, Inc. | ASA 5500 Series | ASA 9.7+ VTI |
| Cisco Systems, Inc. | CSRv AMI | IOS 12.4+ |
| Fortinet | Fortigate 40+ Series | FortiOS 6.4.4+ (GUI) |
| Juniper Networks, Inc. | J-Series Routers | JunOS 9.5+ |
| Juniper Networks, Inc. | SRX Routers | JunOS 11.0+ |
| Mikrotik | RouterOS | 6.44.3 |
| Palo Alto Networks | PA Series | PANOS 7.0+ |
| SonicWall | NSA, TZ | OS 6.5 |
| Sophos | Sophos Firewall | v19+ |
| Strongswan | Ubuntu 16.04 | Strongswan 5.5.1+ |
| Yamaha | RTX Routers | Rev.10.01.16+ |

# Downloadable static routing configuration files for an AWS Site-to-Site VPN customer gateway device

To download a sample configuration file with values specific to your Site-to-Site VPN connection configuration, use the Amazon VPC console, the AWS command line or the Amazon EC2 API. For more information, see Step 6: Download the configuration file.

You can also download generic example configuration files for static routing that do not include values specific to your Site-to-Site VPN connection configuration: static-routing-examples.zip

The files use placeholder values for some components. For example, they use:

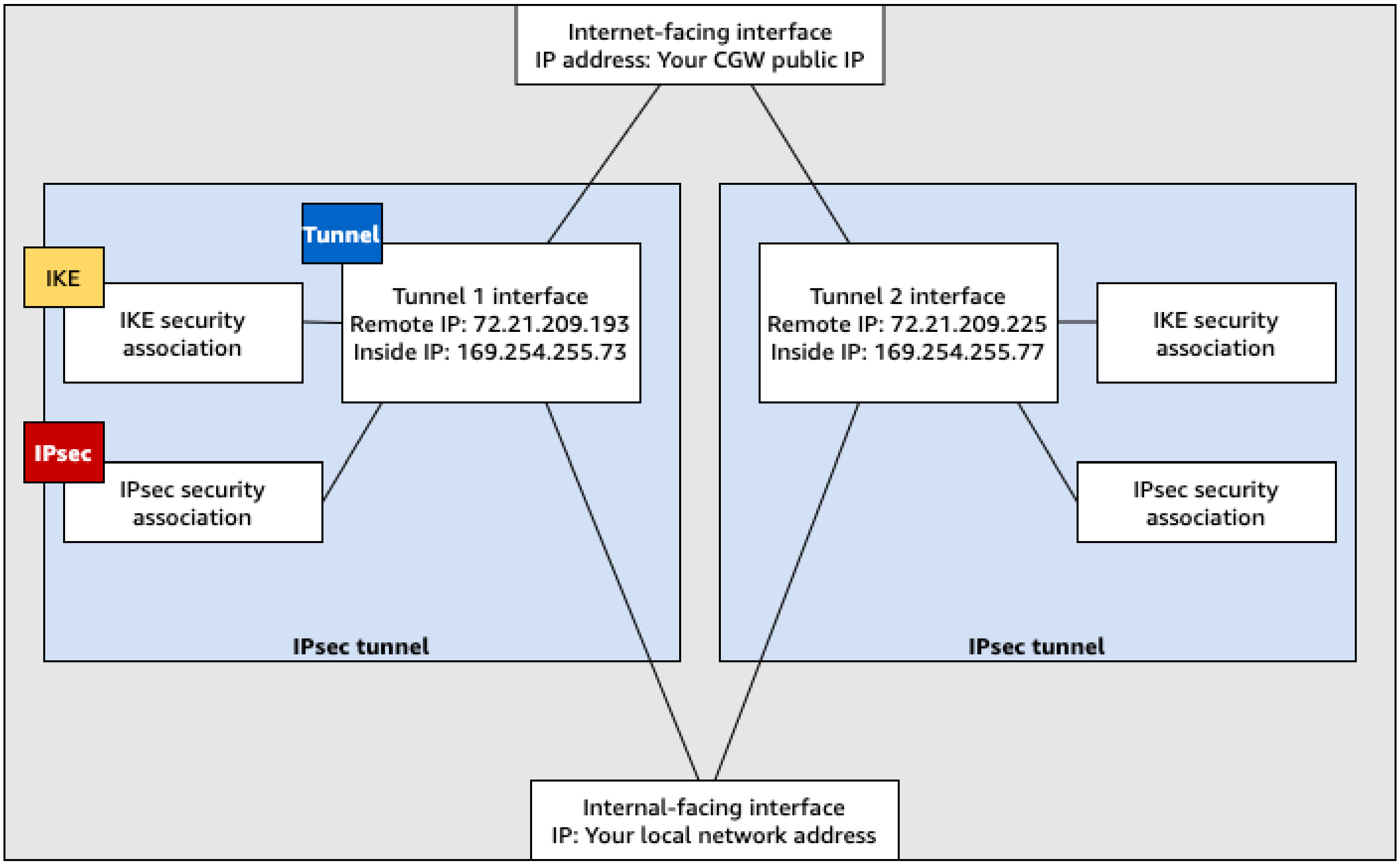
- Example values for the VPN connection ID, customer gateway ID and virtual private gateway ID
- Placeholders for the remote (outside) IP address AWS endpoints (*AWS_ENDPOINT_1* and *AWS_ENDPOINT_2*)
- A placeholder for the IP address for the internet-routable external interface on the customer gateway device (*your-cgw-ip-address*)
- A placeholder for the pre-shared key value (pre-shared-key)
- Example values for the tunnel inside IP addresses.
- Example values for MTU setting.

**Note**

MTU settings provided in the sample configuration files are examples only. Please refer to Best practices for an AWS Site-to-Site VPN customer gateway device for information on setting the optimal MTU value for your situation.

In addition to providing placeholder values, the files specify the minimum requirements for a Site-to-Site VPN connection of AES128, SHA1, and Diffie-Hellman group 2 in most AWS Regions, and AES128, SHA2, and Diffie-Hellman group 14 in the AWS GovCloud Regions. They also specify pre-shared keys for authentication. You must modify the example configuration file to take advantage of additional security algorithms, Diffie-Hellman groups, private certificates, and IPv6 traffic.

The following diagram provides an overview of the different components that are configured on the customer gateway device. It includes example values for the tunnel interface IP addresses.


Internet-facing interface
IP address: Your CGW public IP
Tunnel
IKE
IKE security association
Tunnel 1 interface
Remote IP: 72.21.209.193
Inside IP: 169.254.255.73
IPsec
IPsec security association
IPsec tunnel
Tunnel 2 interface
Remote IP: 72.21.209.225
Inside IP: 169.254.255.77
IKE security association
IPsec security association
IPsec tunnel
Internal-facing interface
IP: Your local network address

Customer gateway device

## Configure static routing for an AWS Site-to-Site VPN customer gateway device

The following are some example procedures for configuring a customer gateway device using its user interface (if available).

Check Point

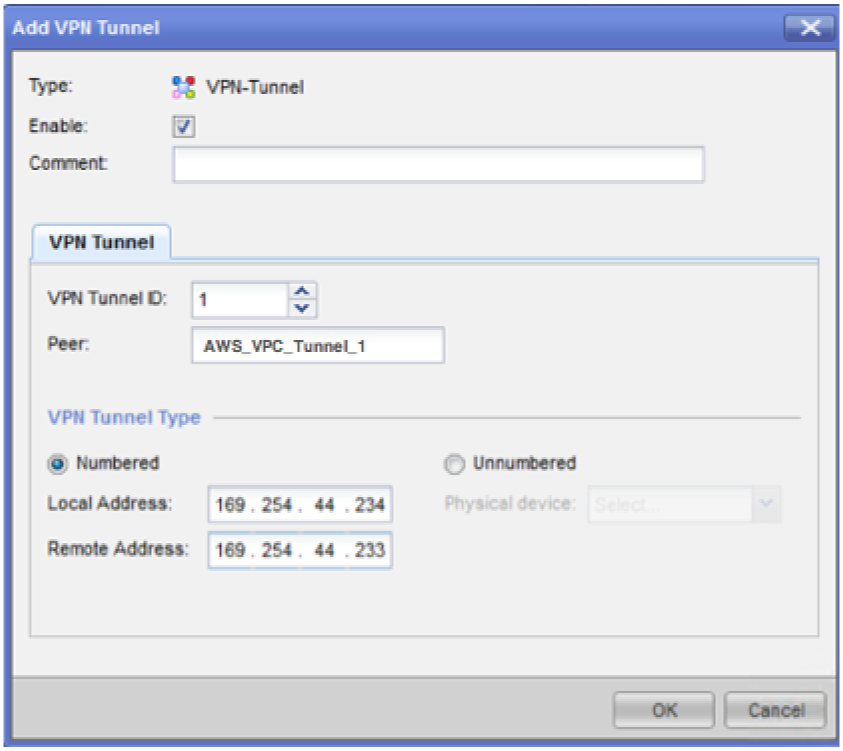
The following are steps for configuring your customer gateway device if your device is a Check Point Security Gateway device running R77.10 or above, using the Gaia operating system and Check Point SmartDashboard. You can also refer to the Check Point Security Gateway IPsec VPN to Amazon Web Services VPC article on the Check Point Support Center.

**To configure the tunnel interface**

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

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

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



Type: VPN-Tunnel

Enable: ☑

Comment:

VPN Tunnel ID: 1

Peer: AWS_VPC_Tunnel_1

VPN Tunnel Type

● Numbered ○ Unnumbered

Local Address: 169 . 254 . 44 . 234

Remote Address: 169 . 254 . 44 . 233

Physical device: Select...

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

```
set interface vpnt1 mtu 1436
```

For tunnel 2, run the following command.

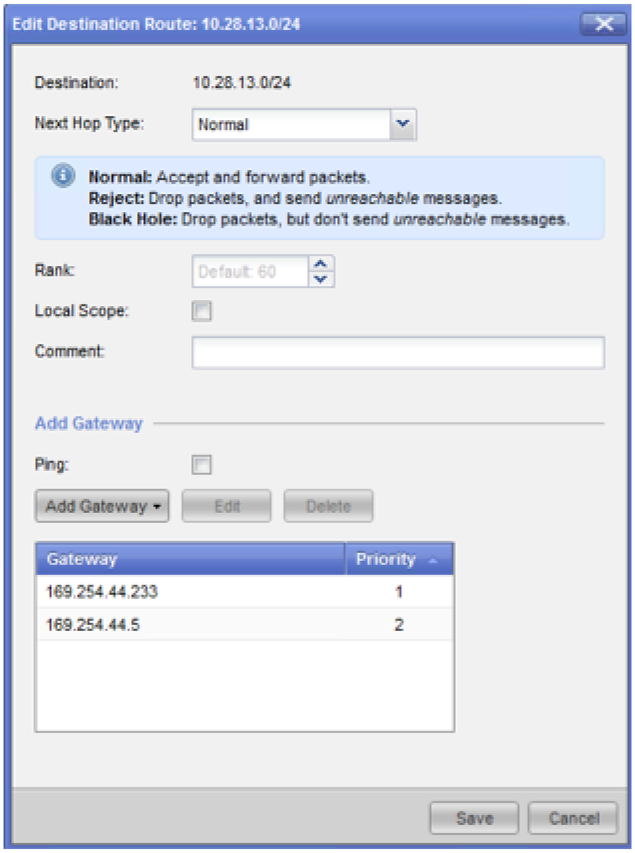
```
set interface vpnt2 mtu 1436
```

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

**To configure the static routes**

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

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



Destination: 10.28.13.0/24

Next Hop Type: Normal

**Normal:** Accept and forward packets.
**Reject:** Drop packets, and send *unreachable* messages.
**Black Hole:** Drop packets, but don't send *unreachable* messages.

Rank: Default: 60

Local Scope: □

Comment:

Add Gateway

Ping: □

| Gateway | Priority |
|---|---|
| 169.254.44.233 | 1 |
| 169.254.44.5 | 2 |

7. Choose **Save**.

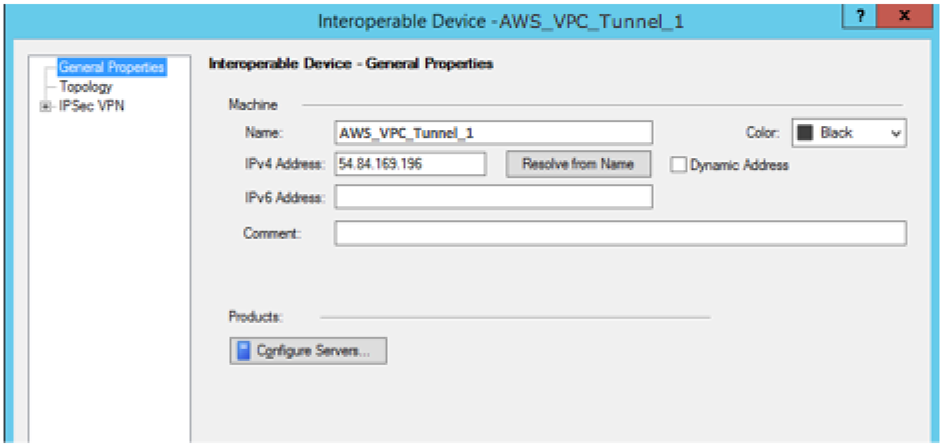
If you're using a cluster, repeat the preceding steps for the other members of the cluster.

#### To define a new network object

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

1. Open the Check Point SmartDashboard.
2. For **Groups**, open the context menu and choose **Groups**, **Simple Group**. You can use the same group for each network object.
3. For **Network Objects**, open the context (right-click) menu and choose **New**, **Interoperable Device**.
4. For **Name**, enter the name that you provided for your tunnel, for example, `AWS_VPC_Tunnel_1` or `AWS_VPC_Tunnel_2`.

5. For **IPv4 Address**, enter the outside IP address of the virtual private gateway provided in the configuration file, for example, `54.84.169.196`. Save your settings and close the dialog box.



Interoperable Device -AWS_VPC_Tunnel_1

Interoperable Device - General Properties

Machine

Name: AWS_VPC_Tunnel_1

Color: Black

IPv4 Address: 54.84.169.196

□ Dynamic Address

IPv6 Address:

Comment:

Products:

6. In the SmartDashboard, open your gateway properties and in the category pane, choose **Topology**.

7. To retrieve the interface configuration, choose **Get Topology**.

8. In the **VPN Domain** section, choose **Manually defined**, and then browse to and select the empty simple group that you created in step 2. Choose **OK**.

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

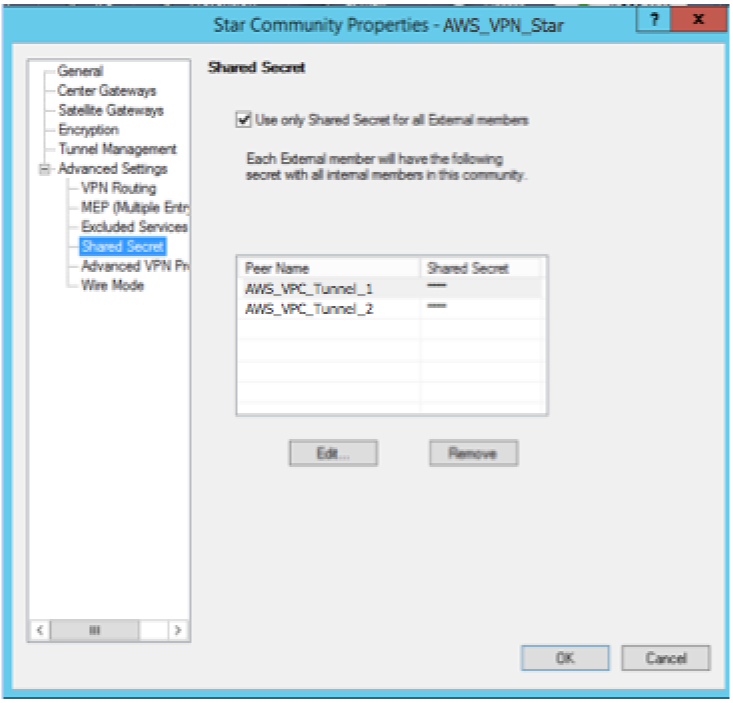
9. Repeat these steps to create a second network object, using the information under the `IPSec Tunnel #2` section of the configuration file.

> **Note**
>
> If you're using clusters, edit the topology and define the interfaces as cluster interfaces. Use the IP addresses that are specified in the configuration file.

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

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

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



Shared Secret

☑ Use only Shared Secret for all External members

Each External member will have the following secret with all internal members in this community.

| Peer Name | Shared Secret |
|---|---|
| AWS_VPC_Tunnel_1 | **** |
| AWS_VPC_Tunnel_2 | **** |

12. Still in the **Advanced Settings** category, choose **Advanced VPN Properties**, configure the properties as follows, and then choose **OK** when you're done:

    - IKE (Phase 1):
        - **Use Diffie-Hellman group**: `Group 2`
        - **Renegotiate IKE security associations every** `480` **minutes**
    - IPsec (Phase 2):
        - Choose **Use Perfect Forward Secrecy**
        - **Use Diffie-Hellman group**: `Group 2`
        - **Renegotiate IPsec security associations every** `3600` **seconds**

### To create firewall rules

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

1. In the SmartDashboard, choose **Global Properties** for your gateway. In the category pane, expand **VPN**, and choose **Advanced**.
2. Choose **Enable VPN Directional Match in VPN Column**, and save your changes.

3. In the SmartDashboard, choose **Firewall**, and create a policy with the following rules:

   - Allow the VPC subnet to communicate with the local network over the required protocols.
   - Allow the local network to communicate with the VPC subnet over the required protocols.

4. Open the context menu for the cell in the VPN column, and choose **Edit Cell**.
5. In the **VPN Match Conditions** dialog box, choose **Match traffic in this direction only**. Create the following directional match rules by choosing **Add** for each, and choose **OK** when you're done:

   - `internal_clear` > VPN community (The VPN star community that you created earlier, for example, `AWS_VPN_Star`)
   - VPN community > VPN community
   - VPN community > `internal_clear`

6. In the SmartDashboard, choose **Policy**, **Install**.
7. In the dialog box, choose your gateway and choose **OK** to install the policy.

**To modify the tunnel_keepalive_method property**

Your Check Point gateway can use Dead Peer Detection (DPD) to identify when an IKE association is down. To configure DPD for a permanent tunnel, the permanent tunnel must be configured in the AWS VPN community (refer to Step 8).

By default, the `tunnel_keepalive_method` property for a VPN gateway is set to `tunnel_test`. You must change the value to dpd. Each VPN gateway in the VPN community that requires DPD monitoring must be configured with the `tunnel_keepalive_method` property, including any 3rd party VPN gateway. You cannot configure different monitoring mechanisms for the same gateway.

You can update the `tunnel_keepalive_method` property using the GuiDBedit tool.

1. Open the Check Point SmartDashboard, and choose **Security Management Server**, **Domain Management Server**.
2. Choose **File**, **Database Revision Control...** and create a revision snapshot.
3. Close all SmartConsole windows, such as the SmartDashboard, SmartView Tracker, and SmartView Monitor.

4. Start the GuiBDedit tool. For more information, see the Check Point Database Tool article on the Check Point Support Center.
5. Choose **Security Management Server**, **Domain Management Server**.
6. In the upper left pane, choose **Table**, **Network Objects**, **network_objects**.
7. In the upper right pane, select the relevant **Security Gateway**, **Cluster** object.
8. Press CTRL+F, or use the **Search** menu to search for the following: `tunnel_keepalive_method`.
9. In the lower pane, open the context menu for `tunnel_keepalive_method`, and choose **Edit...**. Choose **dpd** and then choose **OK**.
10. Repeat steps 7 through 9 for each gateway that's part of the AWS VPN Community.
11. Choose **File**, **Save All**.
12. Close the GuiDBedit tool.
13. Open the Check Point SmartDashboard, and choose **Security Management Server**, **Domain Management Server**.
14. Install the policy on the relevant **Security Gateway**, **Cluster** object.

For more information, see the New VPN features in R77.10 article on the Check Point Support Center.

**To enable TCP MSS clamping**

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

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

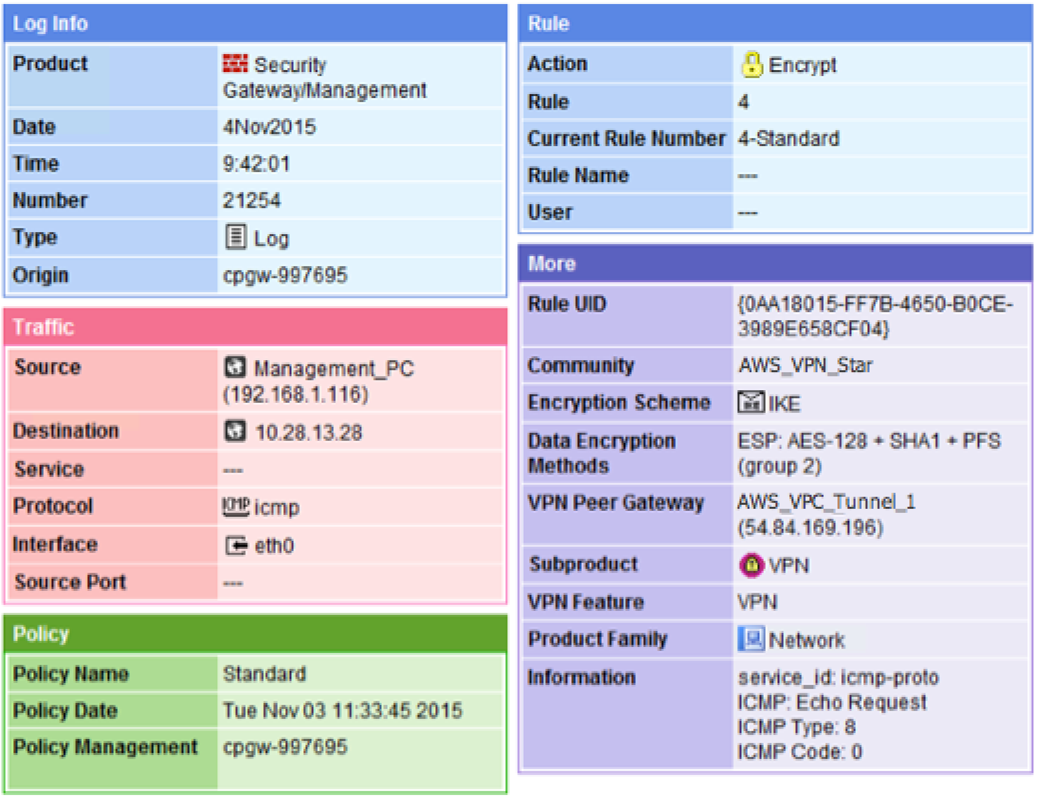
**To verify the tunnel status**

You can verify the tunnel status by running the following command from the command line tool in expert mode.

```
vpn tunnelutil
```

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

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



| Log Info | |
|---|---|
| Product | Security Gateway/Management |
| Date | 4Nov2015 |
| Time | 9:42:01 |
| Number | 21254 |
| Type | Log |
| Origin | cpgw-997695 |

| Traffic | |
|---|---|
| Source | Management_PC (192.168.1.116) |
| Destination | 10.28.13.28 |
| Service | --- |
| Protocol | icmp |
| Interface | eth0 |
| Source Port | --- |

| Policy | |
|---|---|
| Policy Name | Standard |
| Policy Date | Tue Nov 03 11:33:45 2015 |
| Policy Management | cpgw-997695 |

| Rule | |
|---|---|
| Action | Encrypt |
| Rule | 4 |
| Current Rule Number | 4-Standard |
| Rule Name | --- |
| User | --- |

| More | |
|---|---|
| Rule UID | {0AA18015-FF7B-4650-B0CE-3989E658CF04} |
| Community | AWS_VPN_Star |
| Encryption Scheme | IKE |
| Data Encryption Methods | ESP: AES-128 + SHA1 + PFS (group 2) |
| VPN Peer Gateway | AWS_VPC_Tunnel_1 (54.84.169.196) |
| Subproduct | VPN |
| VPN Feature | VPN |
| Product Family | Network |
| Information | service_id: icmp-proto<br>ICMP: Echo Request<br>ICMP Type: 8<br>ICMP Code: 0 |

SonicWALL

The following procedure demonstrates how to configure the VPN tunnels on the SonicWALL device using the SonicOS management interface.

**To configure the tunnels**

1. Open the SonicWALL SonicOS management interface.
2. In the left pane, choose **VPN**, **Settings**. Under **VPN Policies**, choose **Add...**.
3. In the VPN policy window on the **General** tab, complete the following information:

   - **Policy Type**: Choose **Tunnel Interface**.

- **Authentication Method**: Choose **IKE using Preshared Secret**.
- **Name**: Enter a name for the VPN policy. We recommend that you use the name of the VPN ID, as provided in the configuration file.
- **IPsec Primary Gateway Name or Address**: Enter the IP address of the virtual private gateway as provided in the configuration file (for example, `72.21.209.193`).
- **IPsec Secondary Gateway Name or Address**: Leave the default value.
- **Shared Secret**: Enter the pre-shared key as provided in the configuration file, and enter it again in **Confirm Shared Secret**.
- **Local IKE ID**: Enter the IPv4 address of the customer gateway (the SonicWALL device).
- **Peer IKE ID**: Enter the IPv4 address of the virtual private gateway.

4. On the **Network** tab, complete the following information:

   - Under **Local Networks**, choose **Any address**. We recommend this option to prevent connectivity issues from your local network.
   - Under **Remote Networks**, choose **Choose a destination network from list**. Create an address object with the CIDR of your VPC in AWS.

5. On the **Proposals** tab, complete the following information:

   - Under **IKE (Phase 1) Proposal**, do the following:
     - **Exchange**: Choose **Main Mode**.
     - **DH Group**: Enter a value for the Diffie-Hellman group (for example, 2).
     - **Encryption**: Choose **AES-128** or **AES-256**.
     - **Authentication**: Choose **SHA1** or **SHA256**.
     - **Life Time**: Enter `28800`.
   - Under **IKE (Phase 2) Proposal**, do the following:
     - **Protocol**: Choose **ESP**.
     - **Encryption**: Choose **AES-128** or **AES-256**.
     - **Authentication**: Choose **SHA1** or **SHA256**.
     - Select the **Enable Perfect Forward Secrecy** check box, and choose the Diffie-Hellman group.
     - **Life Time**: Enter `3600`.

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

6. On the **Advanced** tab, complete the following information:

   - Select **Enable Keep Alive**.
   - Select **Enable Phase2 Dead Peer Detection** and enter the following:
     - For **Dead Peer Detection Interval**, enter `60` (this is the minimum that the SonicWALL device accepts).
     - For **Failure Trigger Level**, enter `3`.
   - For **VPN Policy bound to**, select **Interface X1**. This is the interface that's typically designated for public IP addresses.

7. Choose **OK**. On the **Settings** page, the **Enable** check box for the tunnel should be selected by default. A green dot indicates that the tunnel is up.

## Cisco devices: additional information

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.

Cisco ASAs from version 9.7.1 and later support Active/Active mode. When you use these Cisco ASAs, you can have both tunnels active at the same time. With this redundancy, you should always have connectivity to your VPC through one of the tunnels.

For Cisco devices, you must do the following:

- 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 that are configured on the device.

- Ensure that the SLA monitoring number is unique.
- Configure all internal routing that moves traffic between the customer gateway device and your local network.

## Downloadable dynamic routing configuration files for AWS Site-to-Site VPN customer gateway device

To download a sample configuration file with values specific to your Site-to-Site VPN connection configuration, use the Amazon VPC console, the AWS command line or the Amazon EC2 API. For more information, see Step 6: Download the configuration file.

You can also download generic example configuration files for dynamic routing that do not include values specific to your Site-to-Site VPN connection configuration: dynamic-routing-examples.zip

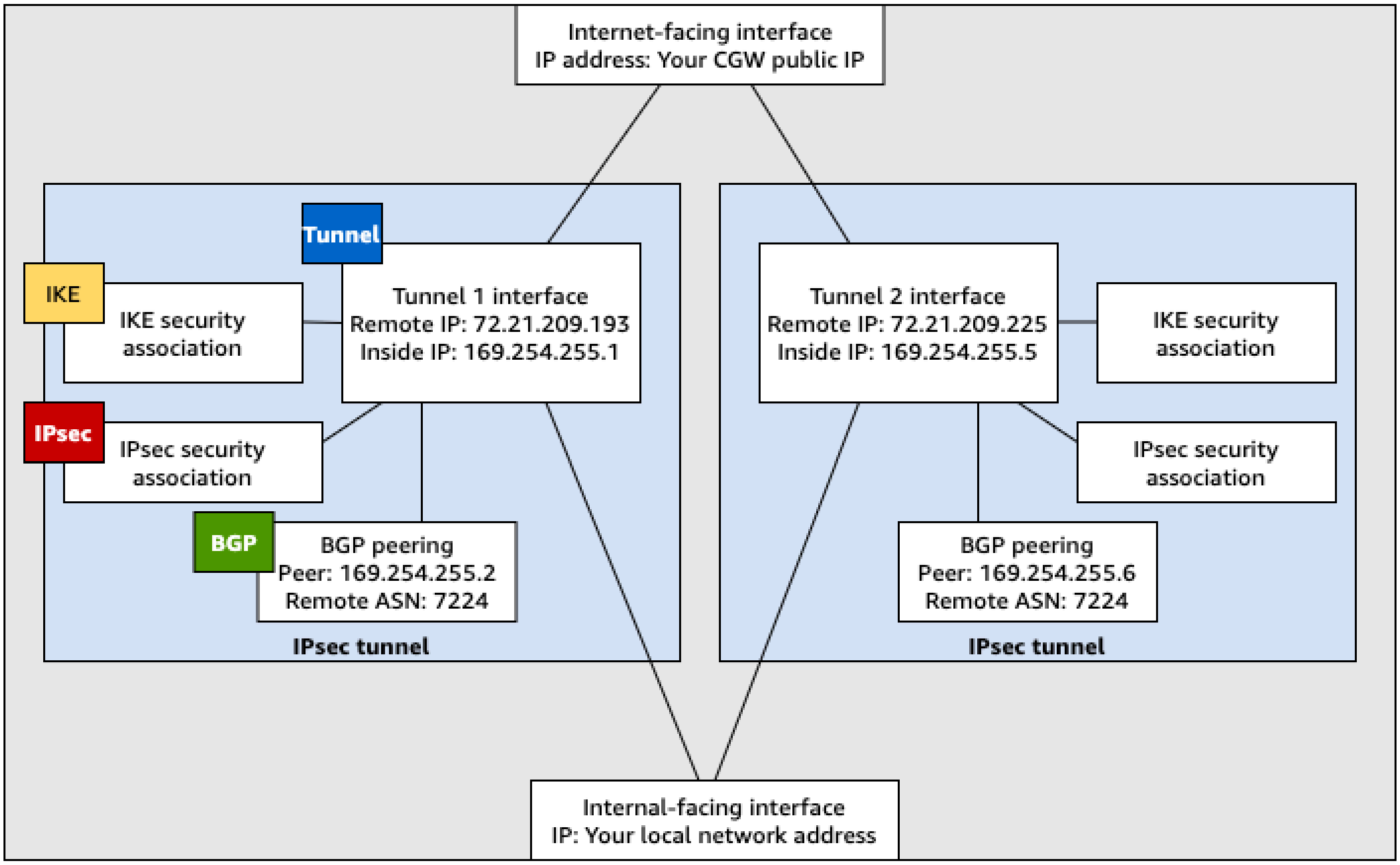
The files use placeholder values for some components. For example, they use:

- Example values for the VPN connection ID, customer gateway ID and virtual private gateway ID
- Placeholders for the remote (outside) IP address AWS endpoints (*`AWS_ENDPOINT_1`* and *`AWS_ENDPOINT_2`*)
- A placeholder for the IP address for the internet-routable external interface on the customer gateway device (*`your-cgw-ip-address`*)
- A placeholder for the pre-shared key value (pre-shared-key)
- Example values for the tunnel inside IP addresses.
- Example values for MTU setting.

> **Note**
>
> MTU settings provided in the sample configuration files are examples only. Please refer to Best practices for an AWS Site-to-Site VPN customer gateway device for information on setting the optimal MTU value for your situation.

In addition to providing placeholder values, the files specify the minimum requirements for a Site-to-Site VPN connection of AES128, SHA1, and Diffie-Hellman group 2 in most AWS Regions, and AES128, SHA2, and Diffie-Hellman group 14 in the AWS GovCloud Regions. They also specify pre-shared keys for authentication. You must modify the example configuration file to take advantage of additional security algorithms, Diffie-Hellman groups, private certificates, and IPv6 traffic.

The following diagram provides an overview of the different components that are configured on the customer gateway device. It includes example values for the tunnel interface IP addresses.



Customer gateway device

## Configure dynamic routing for an AWS Virtual Private Network customer gateway device

The following are some example procedures for configuring a customer gateway device using its user interface (if available).

Check Point

The following are steps for configuring a Check Point Security Gateway device running R77.10 or above, using the Gaia web portal and Check Point SmartDashboard. You can also refer to the Amazon Web Services (AWS) VPN BGP article on the Check Point Support Center.

### To configure the tunnel interface

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

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

   ```
   set as 65000
   ```

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

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

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

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

5. Set the virtual private gateway ASN.

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

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

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

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

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

8. Save the configuration.

   ```
   save config
   ```

### To create a BGP policy

Next, create a BGP policy that allows the import of routes that are advertised by AWS. Then, configure your customer gateway to advertise its local routes to AWS.

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

### To advertise local routes

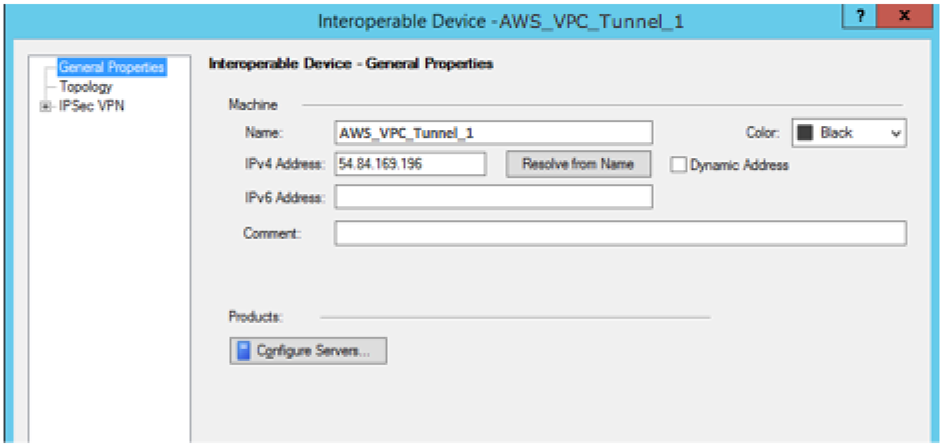
The following steps are for distributing local interface routes. You can also redistribute routes from different sources (for example, static routes, or routes obtained through dynamic routing protocols). For more information, see the Gaia Advanced Routing R77 Versions Administration Guide.

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

### To define a new network object

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

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



Interoperable Device -AWS_VPC_Tunnel_1

Interoperable Device - General Properties

Machine

Name: AWS_VPC_Tunnel_1

Color: Black

IPv4 Address: 54.84.169.196

□ Dynamic Address

IPv6 Address:

Comment:

Products:

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

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

> **Note**
>
> If you're using clusters, edit the topology and define the interfaces as cluster interfaces. Use the IP addresses that are specified in the configuration file.

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

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

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

> **Note**
>
> You must select the **IKEv1 for IPv4 and IKEv2 for IPv6** option for IKEv1 functionality.

7. In the dialog box, configure the encryption properties as follows, and then choose **OK** when you're done:

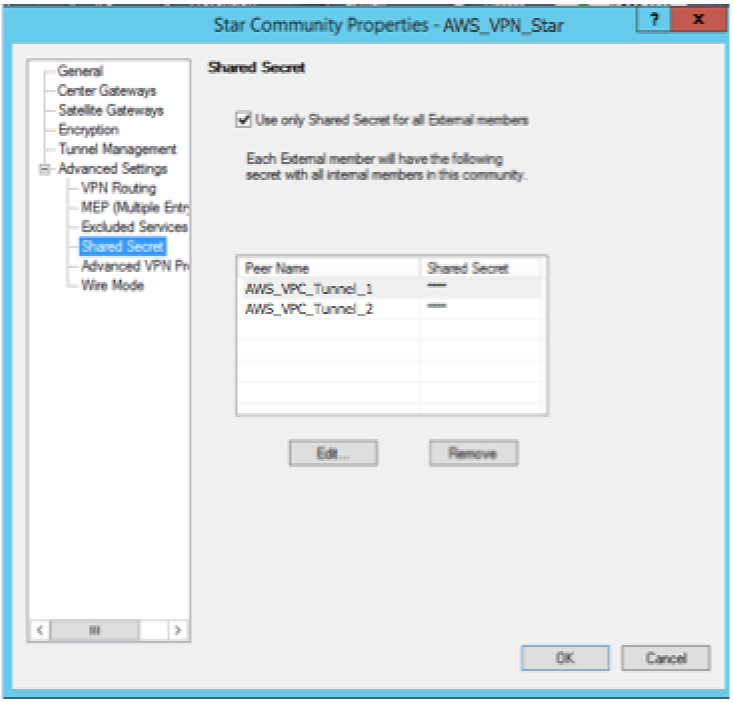
   - IKE Security Association (Phase 1) Properties:
     - **Perform key exchange encryption with**: AES-128
     - **Perform data integrity with**: SHA-1
   - IPsec Security Association (Phase 2) Properties:
     - **Perform IPsec data encryption with**: AES-128
     - **Perform data integrity with**: SHA-1

8. In the category pane, choose **Tunnel Management**. Choose **Set Permanent Tunnels**, **On all tunnels in the community**. In the **VPN Tunnel Sharing** section, choose **One VPN tunnel per Gateway pair**.

9. In the category pane, expand **Advanced Settings**, and choose **Shared Secret**.

10. Select the peer name for the first tunnel, choose **Edit**, and then enter the pre-shared key as specified in the configuration file in the `IPSec Tunnel #1` section.

11. Select the peer name for the second tunnel, choose **Edit**, and then enter the pre-shared key as specified in the configuration file in the `IPSec Tunnel #2` section.



Shared Secret

☑ Use only Shared Secret for all External members

Each External member will have the following secret with all internal members in this community.

| Peer Name | Shared Secret |
|---|---|
| AWS_VPC_Tunnel_1 | **** |
| AWS_VPC_Tunnel_2 | **** |

12. Still in the **Advanced Settings** category, choose **Advanced VPN Properties**, configure the properties as follows, and then choose **OK** when you're done:

    - IKE (Phase 1):
        - **Use Diffie-Hellman group**: `Group 2 (1024 bit)`
        - **Renegotiate IKE security associations every** `480` **minutes**
    - IPsec (Phase 2):
        - Choose **Use Perfect Forward Secrecy**
        - **Use Diffie-Hellman group**: `Group 2 (1024 bit)`
        - **Renegotiate IPsec security associations every** `3600` **seconds**

### To create firewall rules

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

1. In the SmartDashboard, choose **Global Properties** for your gateway. In the category pane, expand **VPN**, and choose **Advanced**.
2. Choose **Enable VPN Directional Match in VPN Column**, and choose **OK**.

3. In the SmartDashboard, choose **Firewall**, and create a policy with the following rules:

   - Allow the VPC subnet to communicate with the local network over the required protocols.
   - Allow the local network to communicate with the VPC subnet over the required protocols.
4. Open the context menu for the cell in the VPN column, and choose **Edit Cell**.
5. In the **VPN Match Conditions** dialog box, choose **Match traffic in this direction only**. Create the following directional match rules by choosing **Add** for each, and then choose **OK** when you're done:

   - `internal_clear` > VPN community (The VPN star community that you created earlier, for example, `AWS_VPN_Star`)
   - VPN community > VPN community
   - VPN community > `internal_clear`
6. In the SmartDashboard, choose **Policy**, **Install**.
7. In the dialog box, choose your gateway and choose **OK** to install the policy.

**To modify the tunnel_keepalive_method property**

Your Check Point gateway can use Dead Peer Detection (DPD) to identify when an IKE association is down. To configure DPD for a permanent tunnel, the permanent tunnel must be configured in the AWS VPN community.

By default, the `tunnel_keepalive_method` property for a VPN gateway is set to `tunnel_test`. You must change the value to `dpd`. Each VPN gateway in the VPN community that requires DPD monitoring must be configured with the `tunnel_keepalive_method` property, including any 3rd party VPN gateway. You cannot configure different monitoring mechanisms for the same gateway.

You can update the `tunnel_keepalive_method` property using the GuiDBedit tool.

1. Open the Check Point SmartDashboard, and choose **Security Management Server**, **Domain Management Server**.
2. Choose **File**, **Database Revision Control...** and create a revision snapshot.
3. Close all SmartConsole windows, such as the SmartDashboard, SmartView Tracker, and SmartView Monitor.

4. Start the GuiBDedit tool. For more information, see the Check Point Database Tool article on the Check Point Support Center.
5. Choose **Security Management Server**, **Domain Management Server**.
6. In the upper left pane, choose **Table**, **Network Objects**, **network_objects**.
7. In the upper right pane, select the relevant **Security Gateway**, **Cluster** object.
8. Press CTRL+F, or use the **Search** menu to search for the following: `tunnel_keepalive_method`.
9. In the lower pane, open the context menu for `tunnel_keepalive_method`, and select **Edit...**. Choose **dpd**, **OK**.
10. Repeat steps 7 through 9 for each gateway that's part of the AWS VPN Community.
11. Choose **File**, **Save All**.
12. Close the GuiDBedit tool.
13. Open the Check Point SmartDashboard, and choose **Security Management Server**, **Domain Management Server**.
14. Install the policy on the relevant **Security Gateway**, **Cluster** object.

For more information, see the New VPN features in R77.10 article on the Check Point Support Center.

**To enable TCP MSS clamping**

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

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

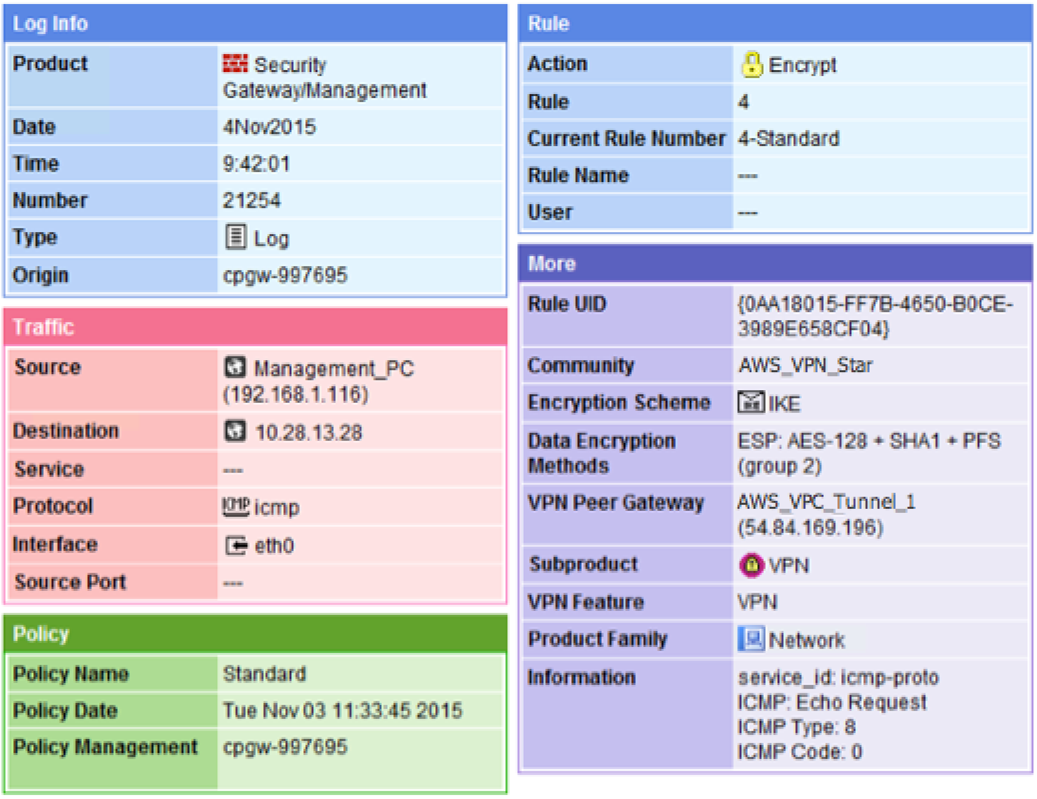
**To verify the tunnel status**

You can verify the tunnel status by running the following command from the command line tool in expert mode.

```
vpn tunnelutil
```

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

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



| Log Info | |
|---|---|
| Product | Security Gateway/Management |
| Date | 4Nov2015 |
| Time | 9:42:01 |
| Number | 21254 |
| Type | Log |
| Origin | cpgw-997695 |

| Traffic | |
|---|---|
| Source | Management_PC (192.168.1.116) |
| Destination | 10.28.13.28 |
| Service | --- |
| Protocol | icmp |
| Interface | eth0 |
| Source Port | --- |

| Policy | |
|---|---|
| Policy Name | Standard |
| Policy Date | Tue Nov 03 11:33:45 2015 |
| Policy Management | cpgw-997695 |

| Rule | |
|---|---|
| Action | Encrypt |
| Rule | 4 |
| Current Rule Number | 4-Standard |
| Rule Name | --- |
| User | --- |

| More | |
|---|---|
| Rule UID | {0AA18015-FF7B-4650-B0CE-3989E658CF04} |
| Community | AWS_VPN_Star |
| Encryption Scheme | IKE |
| Data Encryption Methods | ESP: AES-128 + SHA1 + PFS (group 2) |
| VPN Peer Gateway | AWS_VPC_Tunnel_1 (54.84.169.196) |
| Subproduct | VPN |
| VPN Feature | VPN |
| Product Family | Network |
| Information | service_id: icmp-proto<br>ICMP: Echo Request<br>ICMP Type: 8<br>ICMP Code: 0 |

SonicWALL

You can configure a SonicWALL device using the SonicOS management interface. For more information about configuring the tunnels, see Configure static routing for an AWS Site-to-Site VPN customer gateway device.

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

## Cisco devices: additional information

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.

Cisco ASAs from version 9.7.1 and later support Active/Active mode. When you use these Cisco ASAs, you can have both tunnels active at the same time. With this redundancy, you should always have connectivity to your VPC through one of the tunnels.

For Cisco devices, you must do the following:

- 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 that are configured on the device.
- Ensure that the SLA monitoring number is unique.
- Configure all internal routing that moves traffic between the customer gateway device and your local network.

## Juniper devices: additional information

The following information applies to the example configuration files for Juniper J-Series and SRX customer gateway devices.

- The outside interface is referred to as *`ge-0/0/0.0`*.
- The tunnel interface IDs are referred to as *`st0.1`* and *`st0.2`*.
- Ensure that you identify the security zone for the uplink interface (the configuration information uses the default 'untrust' zone).
- Ensure that you identify the security zone for the inside interface (the configuration information uses the default 'trust' zone).

# Configure Windows Server as an AWS Site-to-Site VPN customer gateway device

You can configure a server running Windows Server as a customer gateway device for your VPC. Use the following process whether you are running Windows Server on an EC2 instance in a VPC, or on your own server. The following procedures apply to Windows Server 2012 R2 and later.

**Contents**

## Configuring your Windows instance

If you are configuring Windows Server on an EC2 instance that you launched from a Windows AMI, do the following:

- Disable source/destination checking for the instance:
  1. Open the Amazon EC2 console at https://eusc-de-east-1.console.amazonaws-eusc.eu/ec2/.
  2. Select your Windows instance, and choose **Actions**, **Networking**, **Change source/destination check**. Choose **Stop**, and then choose **Save**.
- Update your adapter settings so that you can route traffic from other instances:
  1. Connect to your Windows instance. For more information, see Connecting to your Windows instance.
  2. Open the Control Panel, and start the Device Manager.
  3. Expand the **Network adapters** node.
  4. Select the network adapter (depending on the instance type, this might be Amazon Elastic Network Adapter or Intel 82599 Virtual Function), and choose **Action**, **Properties**.

5. On the **Advanced** tab, disable the **IPv4 Checksum Offload**, **TCP Checksum Offload (IPv4)**, and **UDP Checksum Offload (IPv4)** properties, and then choose **OK**.

- Allocate an Elastic IP address to your account and associate it with the instance. For more information, see Elastic IP addresses in the *Amazon EC2 User Guide*. Take note of this address — you need it when you create the customer gateway.
- Ensure that the instance's security group rules allow outbound IPsec traffic. By default, a security group allows all outbound traffic. However, if the security group's outbound rules have been modified from their original state, you must create the following outbound custom protocol rules for IPsec traffic: IP protocol 50, IP protocol 51, and UDP 500.

Take note of the CIDR range of the network in which your Windows instance is located, for example, `172.31.0.0/16`.

## Step 1: Create a VPN connection and configure your VPC

To create a VPN connection from your VPC, do the following:

1. Create a virtual private gateway and attach it to your VPC. For more information, see Create a virtual private gateway.
2. Create a VPN connection and new customer gateway. For the customer gateway, specify the public IP address of your Windows Server. For the VPN connection, choose static routing, and then enter the CIDR range for your network in which the Windows Server is located, for example, `172.31.0.0/16`. For more information, see Step 5: Create a VPN connection.

After you create the VPN connection, configure the VPC to enable communication over the VPN connection.

**To configure your VPC**

- Create a private subnet in your VPC (if you don't have one already) for launching instances to communicate with the Windows Server. For more information, see Creating a subnet in your VPC.

> **Note**
>
> A private subnet is a subnet that does not have a route to an internet gateway. The routing for this subnet is described in the next item.

- Update your route tables for the VPN connection:
  - Add a route to your private subnet's route table with the virtual private gateway as the target, and the Windows Server's network (CIDR range) as the destination. For more information, see Adding and removing routes from a route table in the *Amazon VPC User Guide*.
  - Enable route propagation for the virtual private gateway. For more information, see (Virtual private gateway) Enable route propagation in your route table.
- Create a security group for your instances that allows communication between your VPC and network:
  - Add rules that allow inbound RDP or SSH access from your network. This enables you to connect to instances in your VPC from your network. For example, to allow computers in your network to access Linux instances in your VPC, create an inbound rule with a type of SSH, and the source set to the CIDR range of your network (for example, `172.31.0.0/16`). For more information, see Security groups for your VPC in the *Amazon VPC User Guide*.
  - Add a rule that allows inbound ICMP access from your network. This enables you to test your VPN connection by pinging an instance in your VPC from your Windows Server.

## Step 2: Download the configuration file for the VPN connection

You can use the Amazon VPC console to download a Windows Server configuration file for your VPN connection.

**To download the configuration file**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN Connections**.
3. Select your VPN connection and choose **Download Configuration**.
4. Select **Microsoft** as the vendor, **Windows Server** as the platform, and **2012 R2** as the software. Choose **Download**. You can open the file or save it.

The configuration file contains a section of information similar to the following example. You see this information presented twice, one time for each tunnel.

```
vgw-1a2b3c4d Tunnel1
--------------------------------------------------------------------
Local Tunnel Endpoint:       203.0.113.1
Remote Tunnel Endpoint:      203.83.222.237
```

```
Endpoint 1:                   [Your_Static_Route_IP_Prefix]
Endpoint 2:                   [Your_VPC_CIDR_Block]
Preshared key:                xCjNLsLoCmKsakwcdoR9yX6GsEXAMPLE
```

`Local Tunnel Endpoint`

The IP address that you specified for the customer gateway when you created the VPN connection.

`Remote Tunnel Endpoint`

One of two IP addresses for the virtual private gateway that terminates the VPN connection on the AWS side of the connection.

`Endpoint 1`

The IP prefix that you specified as a static route when you created the VPN connection. These are the IP addresses in your network that are allowed to use the VPN connection to access your VPC.

`Endpoint 2`

The IP address range (CIDR block) of the VPC that is 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 Site-to-Site VPN Concentrator on the Amazon side of the VPN connection. Although only one tunnel at a time is up, the second tunnel automatically establishes itself if the first tunnel goes down. Having redundant tunnels ensure continuous availability in the case of a device failure. Because only one tunnel is available at a time, the Amazon VPC console indicates that one tunnel is down. This is expected behavior, so there's no action required from you.

With two tunnels configured, if a device failure occurs within AWS, your VPN connection automatically fails over to the second tunnel of the virtual private gateway within a matter of minutes. When you configure your customer gateway device, it's important that you configure both tunnels.

**Note**

From time to time, AWS performs routine maintenance on the virtual private gateway. This maintenance might 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.

```
MainModeSecMethods:         DHGroup2-AES128-SHA1
MainModeKeyLifetime:        480min,0sess
QuickModeSecMethods:        ESP:SHA1-AES128+60min+100000kb
QuickModePFS:               DHGroup2
```

`MainModeSecMethods`

The encryption and authentication algorithms for the IKE SA. These are the suggested settings for the VPN connection, and are the default settings for Windows Server 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 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 IPsec VPN connections.

`QuickModePFS`

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

## Step 3: Configure the Windows Server

Before you set up the VPN tunnel, you must install and configure Routing and Remote Access Services on Windows Server. That allows remote users to access resources on your network.

### To install Routing and Remote Access Services

1. Log on to your Windows Server.
2. Go to the **Start** menu, and choose **Server Manager**.
3. Install Routing and Remote Access Services:

    a. From the **Manage** menu, choose **Add Roles and Features**.

    b. On the **Before You Begin** page, verify that your server meets the prerequisites, and then choose **Next**.

    c. Choose **Role-based or feature-based installation**, and then choose **Next**.

    d. Choose **Select a server from the server pool**, select your Windows Server, and then choose **Next**.

    e. Select **Network Policy and Access Services** in the list. In the dialog box that displays, choose **Add Features** to confirm the features that are required for this role.

    f. In the same list, choose **Remote Access**, **Next**.

    g. On the **Select features** page, choose **Next**.

    h. On the **Network Policy and Access Services** page, choose **Next**.

    i. On the **Remote Access** page, choose **Next**. On the next page, select **DirectAccess and VPN (RAS)**. In the dialog box that displays, choose **Add Features** to confirm the features that are required for this role service. In the same list, select **Routing**, and then choose **Next**.

    j. On the **Web Server Role (IIS)** page, choose **Next**. Leave the default selection, and choose **Next**.

    k. Choose **Install**. When the installation completes, choose **Close**.

### To configure and enable Routing and Remote Access Server

1. On the dashboard, choose **Notifications** (the flag icon). There should be a task to complete the post-deployment configuration. Choose the **Open the Getting Started Wizard** link.
2. Choose **Deploy VPN only**.
3. In the **Routing and Remote Access** dialog box, choose the server name, choose **Action**, and then select **Configure and Enable Routing and Remote Access**.
4. In the **Routing and Remote Access Server Setup Wizard**, on the first page, choose **Next**.
5. On the **Configuration** page, choose **Custom Configuration**, **Next**.
6. Choose **LAN routing**, **Next**, **Finish**.

7. When prompted by the **Routing and Remote Access** dialog box, choose **Start service**.

## Step 4: Set up the VPN tunnel

You can configure the VPN tunnel by running the netsh scripts included in the downloaded configuration file, or by using the Windows Server user interface.

> **Important**
>
> We suggest that you use master key perfect forward secrecy (PFS) for your IPsec sessions. If you choose to run the netsh script, it includes a parameter to enable PFS (`qmpfs=dhgroup2`). You cannot enable PFS using the Windows user interface — you must enable it using the command line.

**Options**

- Option 1: Run the netsh script
- Option 2: Use the Windows Server user interface

### Option 1: Run the 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=Your_Static_Route_IP_Prefix ^
Endpoint2=Your_VPC_CIDR_Block Protocol=Any Action=RequireInClearOut ^
Auth1=ComputerPSK Auth1PSK=xCjNLsLoCmKsakwcdoR9yX6GsEXAMPLE ^
QMSecMethods=ESP:SHA1-AES128+60min+100000kb ^
ExemptIPsecProtectedConnections=No ApplyAuthz=No QMPFS=dhgroup2
```

**Name**: You can replace the suggested name (`vgw-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`. Surround this value with double quotes (").

**Endpoint2**: The CIDR block of your VPC or a subnet in your VPC, for example, `10.0.0.0/16`. Surround this value with double quotes (").

Run the updated script in a command prompt window on your Windows Server. (The ^ enables you to cut and paste wrapped text at the command line.) To set up the second VPN tunnel for this VPN connection, repeat the process using the second netsh script in the configuration file.

When you are done, go to Configure the Windows firewall.

For more information about the netsh parameters, see 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.

> ⚠ **Important**
>
> You can't enable master key perfect forward secrecy (PFS) using the Windows Server user interface. You must enable PFS using the command line, as described in Enable master key perfect forward secrecy.

#### Tasks

- Configure a security rule for a VPN tunnel
- Confirm the tunnel configuration
- Enable master key perfect forward secrecy
- Configure the Windows firewall

### Configure a security rule for a VPN tunnel

In this section, you configure a security rule on your Windows Server to create a VPN tunnel.

#### To configure a security rule for a VPN tunnel

1. Open Server Manager, choose **Tools**, and then select **Windows Defender Firewall with Advanced Security**.

2. Select **Connection Security Rules**, choose **Action**, and then **New Rule**.

3. In the **New Connection Security Rule** wizard, on the **Rule Type** page, choose **Tunnel**, and then choose **Next**.

4. On the **Tunnel Type** page, under **What type of tunnel would you like to create**, choose **Custom configuration**. Under **Would you like to exempt IPsec-protected connections from this tunnel**, leave the default value checked (**No. Send all network traffic that matches this connection security rule through the tunnel**), and then choose **Next**.

5. On the **Requirements** page, choose **Require authentication for inbound connections. Do not establish tunnels for outbound connections**, and then choose **Next**.

6. On the **Tunnel Endpoints** page, under **Which computers are in Endpoint 1**, choose **Add**. Enter the CIDR range of your network (behind your Windows Server customer gateway device; for example, `172.31.0.0/16`), and then choose **OK**. The range can include the IP address of your customer gateway device.

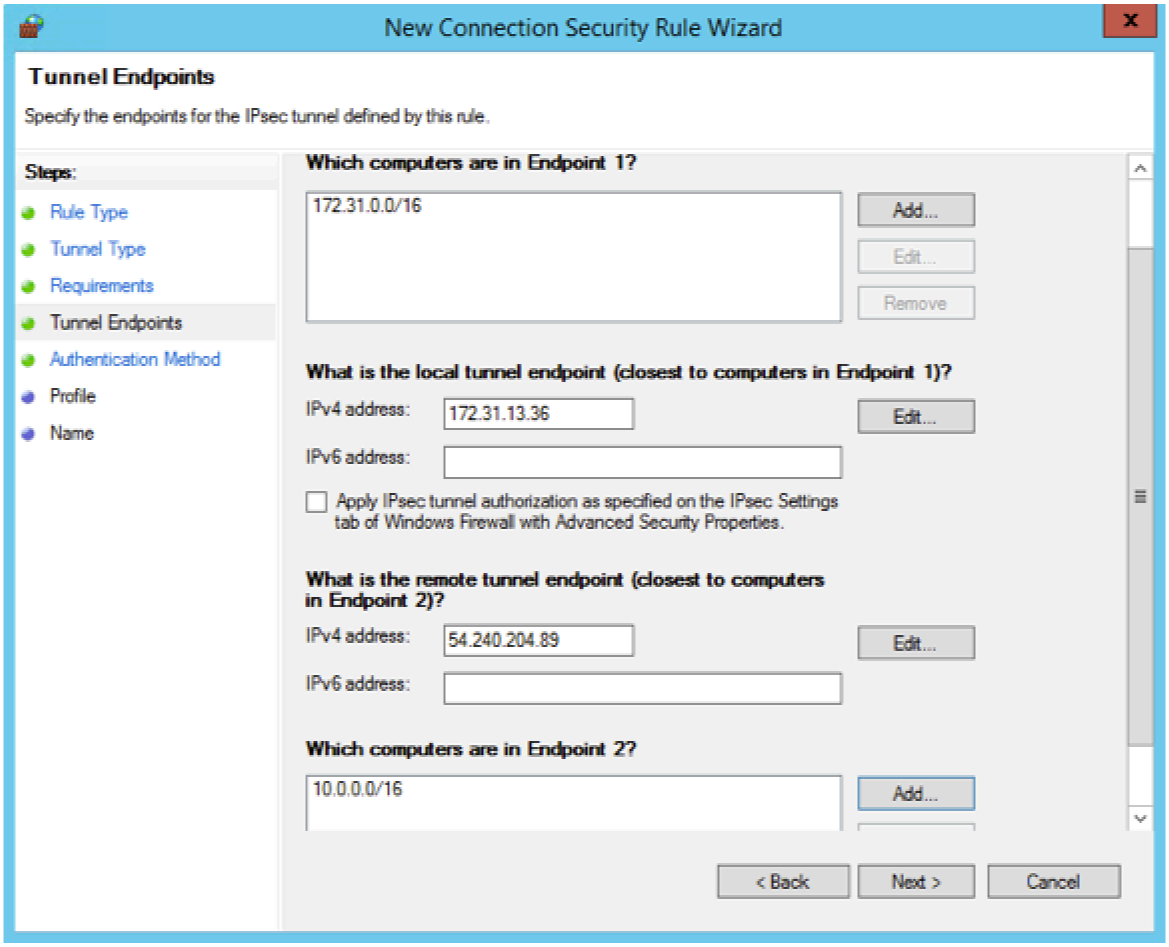
7. Under **What is the local tunnel endpoint (closest to computer in Endpoint 1)**, choose **Edit**. In the **IPv4 address** field, enter the private IP address of your Windows Server, and then choose **OK**.

8. Under **What is the remote tunnel endpoint (closest to computers in Endpoint 2)**, choose **Edit**. In the **IPv4 address** field, enter the IP address of the virtual private gateway for Tunnel 1 from the configuration file (see `Remote Tunnel Endpoint`), and then choose **OK**.

   > ⚠ **Important**
   >
   > If you are repeating this procedure for Tunnel 2, be sure to select the endpoint for Tunnel 2.

9. Under **Which computers are in Endpoint 2**, choose **Add**. In the **This IP address or subnet field**, enter the CIDR block of your VPC, and then choose **OK**.

   > ⚠ **Important**
   >
   > You must scroll in the dialog box until you locate **Which computers are in Endpoint 2**. Do not choose **Next** until you have completed this step, or you won't be able to connect to your server.



New Connection Security Rule Wizard

**Tunnel Endpoints**

Specify the endpoints for the IPsec tunnel defined by this rule.

Which computers are in Endpoint 1?

172.31.0.0/16

What is the local tunnel endpoint (closest to computers in Endpoint 1)?

IPv4 address: 172.31.13.36

IPv6 address:

□ Apply IPsec tunnel authorization as specified on the IPsec Settings tab of Windows Firewall with Advanced Security Properties.

What is the remote tunnel endpoint (closest to computers in Endpoint 2)?

IPv4 address: 54.240.204.89

IPv6 address:

Which computers are in Endpoint 2?

10.0.0.0/16

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

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

14. Ensure that **First authentication is optional** is not selected, and choose **OK**.
15. Choose **Next**.
16. On the **Profile** page, select all three check boxes: **Domain**, **Private**, and **Public**. Choose **Next**.

17. On the **Name** page, enter a name for your connection rule; for example, `VPN to Tunnel 1`, and then choose **Finish**.

Repeat the preceding 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.

### Confirm the tunnel configuration

#### To confirm the tunnel configuration

1. Open Server Manager, choose **Tools**, select **Windows Firewall with Advanced Security**, and then select **Connection Security Rules**.
2. Verify the following for both tunnels:
   - **Enabled** is `Yes`
   - **Endpoint 1** is the CIDR block for your network
   - **Endpoint 2** is the CIDR block of your VPC
   - **Authentication mode** is `Require inbound and clear outbound`
   - **Authentication method** is `Custom`
   - **Endpoint 1 port** is Any
   - **Endpoint 2 port** is Any
   - **Protocol** is Any
3. Select the first rule and choose **Properties**.
4. On the **Authentication** tab, under **Method**, choose **Customize**. Verify that **First authentication methods** contains the correct pre-shared key from your configuration file for the tunnel, and then choose **OK**.
5. On the **Advanced** tab, verify that **Domain**, **Private**, and **Public** are all selected.
6. Under **IPsec tunneling**, choose **Customize**. Verify the following IPsec tunneling settings, and then choose **OK** and **OK** again to close the dialog box.
   - **Use IPsec tunneling** is selected.
   - **Local tunnel endpoint (closest to Endpoint 1)** contains the IP address of your Windows Server. If your customer gateway device is an EC2 instance, this is the instance's private IP address.

   - **Remote tunnel endpoint (closest to Endpoint 2)** contains the IP address of the virtual private gateway for this tunnel.

7. Open the properties for your second tunnel. Repeat steps 4 to 7 for this tunnel.

### Enable master key perfect forward secrecy

You can enable master key perfect forward secrecy by using the command line. You cannot enable this feature using the user interface.

#### To enable master key perfect forward secrecy

1. In your Windows Server, open a new command prompt window.
2. Enter the following command, replacing `rule_name` with the name that you gave the first connection rule.

   ```
   netsh advfirewall consec set rule name="rule_name" new QMPFS=dhgroup2
    QMSecMethods=ESP:SHA1-AES128+60min+100000kb
   ```

3. Repeat step 2 for the second tunnel, this time replacing `rule_name` with the name that you gave the second connection rule.

### 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. Open Server Manager, choose **Tools**, select **Windows Defender Firewall with Advanced Security**, and then choose **Properties**.
2. On the **IPsec Settings** tab, under **IPsec exemptions**, verify that **Exempt ICMP from IPsec** is **No (default)**. Verify that **IPsec tunnel authorization** is **None**.
3. Under **IPsec defaults**, choose **Customize**.
4. Under **Key exchange (Main Mode)**, select **Advanced** and then choose **Customize**.
5. In **Customize Advanced Key Exchange Settings**, under **Security methods**, verify that the following default values are used for the first entry:

   - Integrity: SHA-1

- Encryption: AES-CBC 128
- Key exchange algorithm: Diffie-Hellman Group 2
- Under **Key lifetimes**, verify that **Minutes** is `480` and **Sessions** is `0`.

These settings correspond to these entries in the configuration file.

```
MainModeSecMethods: DHGroup2-AES128-SHA1,DHGroup2-3DES-SHA1
MainModeKeyLifetime: 480min,0sec
```

6. Under **Key exchange options**, select **Use Diffie-Hellman for enhanced security**, and then choose **OK**.
7. Under **Data protection (Quick Mode)**, select **Advanced**, and then choose **Customize**.
8. Select **Require encryption for all connection security rules that use these settings**.
9. Under **Data integrity and encryption**, leave the default values:

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

   These values correspond to the following entry from the configuration file.

   ```
   QuickModeSecMethods:
   ESP:SHA1-AES128+60min+100000kb
   ```

10. Choose **OK** to return to the **Customize IPsec Settings** dialog box and choose **OK** again to save the configuration.

## Step 5: Enable dead gateway detection

Next, 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. From your Windows Server, launch the command prompt or a PowerShell session, and enter **regedit** to start Registry Editor.
2. Expand **HKEY_LOCAL_MACHINE**, expand **SYSTEM**, expand **CurrentControlSet**, expand **Services**, expand **Tcpip**, and then expand **Parameters**.
3. From the **Edit** menu, select **New** and select **DWORD (32-bit) Value**.
4. Enter the name **EnableDeadGWDetect**.
5. Select **EnableDeadGWDetect** and choose **Edit**, **Modify**.
6. In **Value data**, enter **1**, and then choose **OK**.
7. Close the Registry Editor and reboot the server.

For more information, see EnableDeadGWDetect in the *Microsoft TechNet Library*.

## Step 6: Test the VPN connection

To test that the VPN connection is working correctly, launch an instance into your VPC, and ensure that it does not have an internet connection. After you've launched the instance, ping its private IP address from your Windows Server. The VPN tunnel comes up when traffic is generated from the customer gateway device. Therefore, the ping command also initiates the VPN connection.

For steps to test the VPN connection, see Test an AWS Site-to-Site VPN connection.

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 Configuring your Windows instance.
- Ensure that the operating system on the instance you are pinging is configured to respond to ICMP. We recommend that you use one of the Amazon Linux AMIs.
- If the instance you are pinging is a Windows instance, connect to the instance and enable inbound ICMPv4 on the Windows firewall.
- Ensure that you have configured the route tables correctly for your VPC or your subnet. For more information, see Step 1: Create a VPN connection and configure your VPC.

- If your customer gateway device is an EC2 instance, ensure that you've disabled source/destination checking for the instance. For more information, see Configuring your Windows instance.

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 isn't used unless the first tunnel goes down. It may take a few moments to establish the encrypted tunnels.

# Troubleshooting AWS Site-to-Site VPN customer gateway device

When troubleshooting issues with your customer gateway device, it's important to have a structured approach. The first two topics in this section provide generalized flowcharts for troubleshooting issues when using a device configured for dynamic routing (BGP enabled), and a device configured for static routing (without BGP enabled), respectively. Following those topics are device-specific troubleshooting guides for Cisco, Juniper, and Yamaha customer gateway devices.

In addition to the topics in this section, enabling AWS Site-to-Site VPN logs can be very helpful for troubleshooting and resolving VPN connectivity issues. For general testing instructions, also see Test an AWS Site-to-Site VPN connection.

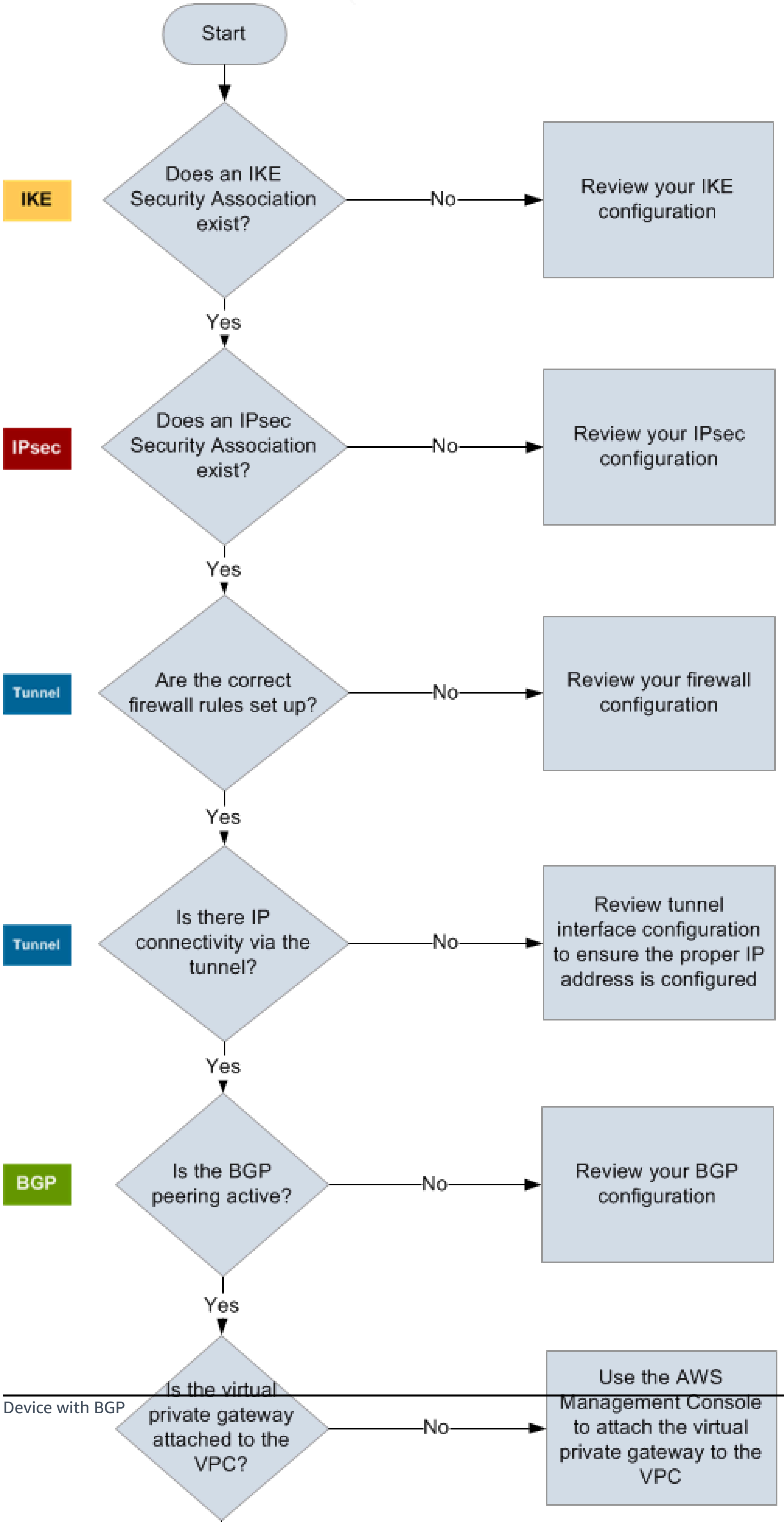
**Topics**

### Additional resources

- Amazon VPC forum

## Troubleshoot AWS Site-to-Site VPN connectivity when using Border Gateway Protocol

The following diagram and table provide general instructions for troubleshooting a customer gateway device that uses Border Gateway Protocol (BGP). We also recommend that you enable the debug features of your device. Consult your gateway device vendor for details.

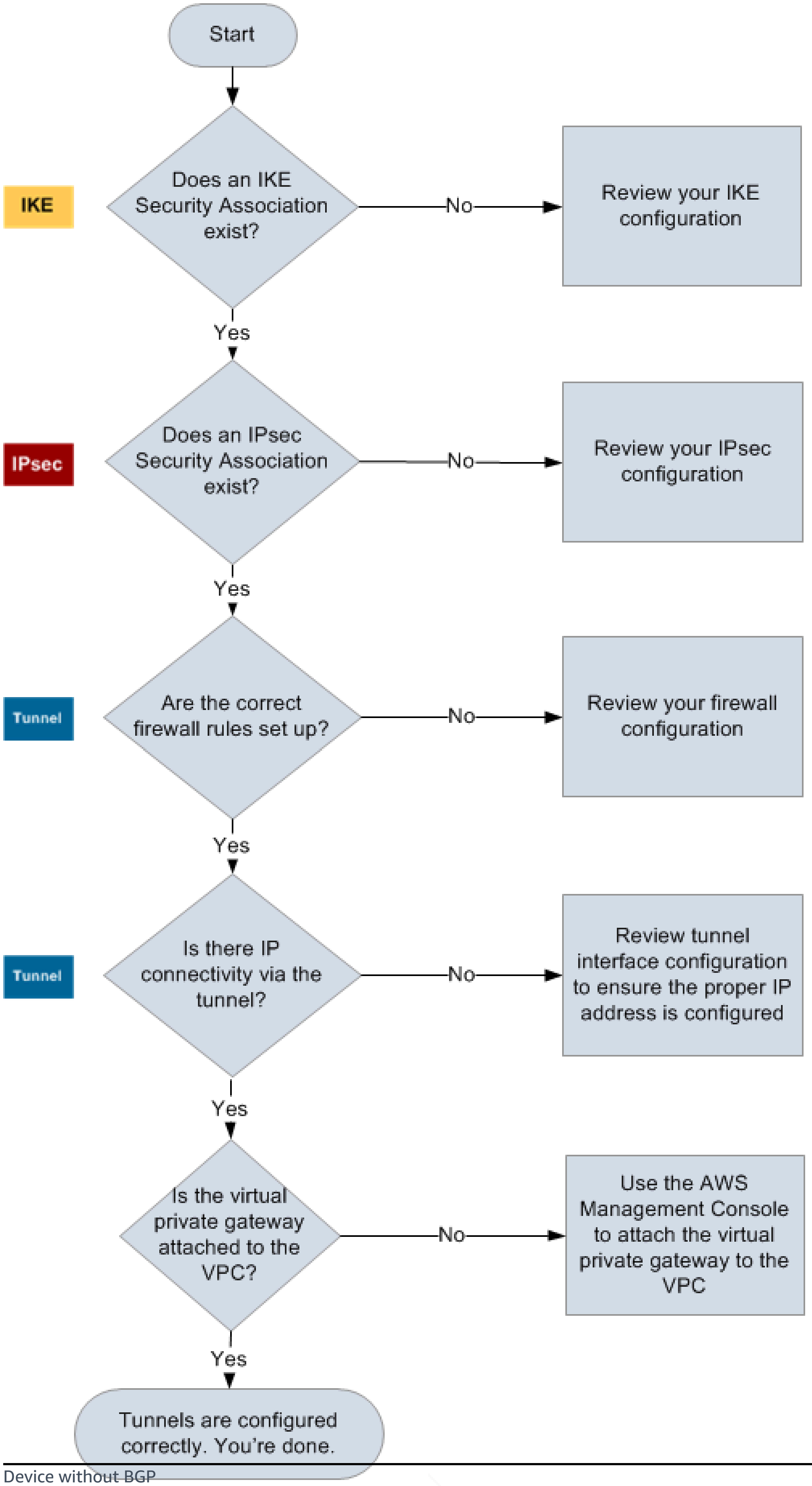

Start
IKE
Does an IKE Security Association exist?
No
Review your IKE configuration
Yes
IPsec
Does an IPsec Security Association exist?
No
Review your IPsec configuration
Yes
Tunnel
Are the correct firewall rules set up?
No
Review your firewall configuration
Yes
Tunnel
Is there IP connectivity via the tunnel?
No
Review tunnel interface configuration to ensure the proper IP address is configured
Yes
BGP
Is the BGP peering active?
No
Review your BGP configuration
Yes
Is the virtual private gateway attached to the VPC?
No
Use the AWS Management Console to attach the virtual private gateway to the VPC

| | |
|---|---|
| IKE | Determine if an IKE security association exists.<br>An IKE security association is required to exchange keys that are used to establish the IPsec security association.<br>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 configuration file.<br>If an IKE security association exists, move on to 'IPsec'. |
| IPsec | Determine if an IPsec security association (SA) exists.<br>An IPsec SA is the tunnel itself. Query your customer gateway device to determine if an IPsec SA is active. Ensure that you configure the encryption, authentication, perfect forward secrecy, and mode parameters as listed in the configuration file.<br>If no IPsec SA exists, review your IPsec configuration.<br>If an IPsec SA exists, move on to 'Tunnel'. |
| Tunnel | Confirm that the required firewall rules are set up (for a list of the rules, see Firewall rules for an AWS Site-to-Site VPN customer gateway device). If they are, move forward.<br>Determine if there is IP connectivity through the tunnel.<br>Each side of the tunnel has an IP address as specified in the configuration file. The virtual private gateway address is the address used as the BGP neighbor address. From your customer gateway device, ping this address to determine if IP traffic is being properly encrypted and decrypted.<br>If the ping isn't successful, review your tunnel interface configuration to make sure that the proper IP address is configured.<br>If the ping is successful, move on to 'BGP'. |
| BGP | Determine if the BGP peering session is active.<br>For each tunnel, do the following: |

| | |
|---|---|
| | • On your customer gateway device, determine if the BGP status is `Active` or `Established` . It may take approximately 30 seconds for a BGP peering to become active.<br>• Ensure that the customer gateway device is advertising the default route (0.0.0.0/0) to the virtual private gateway.<br>If the tunnels are not in this state, review your BGP configuration.<br>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. |

## Troubleshoot AWS Site-to-Site VPN connectivity without Border Gateway Protocol

The following diagram and table provide general instructions for troubleshooting a customer gateway device that does not use Border Gateway Protocol (BGP). We also recommend that you enable the debug features of your device. Consult your gateway device vendor for details.


Start
IKE
Does an IKE Security Association exist?
No
Review your IKE configuration
Yes
IPsec
Does an IPsec Security Association exist?
No
Review your IPsec configuration
Yes
Tunnel
Are the correct firewall rules set up?
No
Review your firewall configuration
Yes
Tunnel
Is there IP connectivity via the tunnel?
No
Review tunnel interface configuration to ensure the proper IP address is configured
Yes
Is the virtual private gateway attached to the VPC?
No
Use the AWS Management Console to attach the virtual private gateway to the VPC
Yes
Tunnels are configured correctly. You're done.

| | |
|---|---|
| IKE | Determine if an IKE security association exists.<br>An IKE security association is required to exchange keys that are used to establish the IPsec security association.<br>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 configuration file.<br>If an IKE security association exists, move on to 'IPsec'. |
| IPsec | Determine if an IPsec security association (SA) exists.<br>An IPsec SA is the tunnel itself. Query your customer gateway device to determine if an IPsec SA is active. Ensure that you configure the encryption, authentication, perfect forward secrecy, and mode parameters as listed in the configuration file.<br>If no IPsec SA exists, review your IPsec configuration.<br>If an IPsec SA exists, move on to 'Tunnel'. |
| Tunnel | Confirm that the required firewall rules are set up (for a list of the rules, see Firewall rules for an AWS Site-to-Site VPN customer gateway device). If they are, move forward.<br>Determine if there is IP connectivity through the tunnel.<br>Each side of the tunnel has an IP address as specified in the configuration file. The virtual private gateway address is the address used as the BGP neighbor address. From your customer gateway device, ping this address to determine if IP traffic is being properly encrypted and decrypted.<br>If the ping isn't successful, review your tunnel interface configuration to make sure that the proper IP address is configured.<br>If the ping is successful, move on to 'Static routes'. |
| Static routes | For each tunnel, do the following: |

| | |
|---|---|
| | • Verify that you have added a static route to your VPC CIDR with the tunnels as the next hop.<br>• Verify that you have added a static route on the Amazon VPC console, to tell the virtual private gateway to route traffic back to your internal networks.<br>If the tunnels are not in this state, review your device configuration.<br>Make sure that both tunnels are in this state, and you're done. |

## Troubleshoot AWS Site-to-Site VPN connectivity with a Cisco ASA customer gateway device

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

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

### IKE

Use the following command. The response shows a customer gateway device 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` value for the remote gateway that is specified in the tunnels. The `state` value 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 device with IPsec configured correctly.

```
ciscoasa# show crypto ipsec sa
```

```
interface: outside
    Crypto map tag: VPN_crypto_map_name, seq num: 2, local addr: 172.25.50.101

      access-list integ-ppe-loopback extended permit ip any vpc_subnet subnet_mask
      local ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
      remote ident (addr/mask/prot/port): (vpc_subnet/subnet_mask/0/0)
      current_peer: integ-ppe1

      #pkts encaps: 0, #pkts encrypt: 0, #pkts digest: 0
      #pkts decaps: 0, #pkts decrypt: 0, #pkts verify: 0
      #pkts compressed: 0, #pkts decompressed: 0
      #pkts not compressed: 0, #pkts comp failed: 0, #pkts decomp failed: 0
      #pre-frag successes: 0, #pre-frag failures: 0, #fragments created: 0
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
      #send errors: 0, #recv errors: 0

      local crypto endpt.: 172.25.50.101, remote crypto endpt.: AWS_ENDPOINT_1

      path mtu 1500, ipsec overhead 74, media mtu 1500
      current outbound spi: 6D9F8D3B
      current inbound spi : 48B456A6

    inbound esp sas:
      spi: 0x48B456A6 (1219778214)
         transform: esp-aes esp-sha-hmac no compression
         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 `inbound esp sas` and `outbound esp sas`. This assumes that an SA is listed (for example, `spi: 0x48B456A6`), and that IPsec is configured correctly.

In Cisco ASA, the IPsec only comes up after interesting traffic (traffic that should be encrypted) is sent. To always keep the IPsec active, we recommend configuring an SLA monitor. The SLA monitor continues to send interesting traffic, keeping the IPsec active.

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

```
ping ec2_instance_ip_address
```

```
Pinging ec2_instance_ip_address with 32 bytes of data:

Reply from ec2_instance_ip_address: bytes=32 time<1ms TTL=128
Reply from ec2_instance_ip_address: bytes=32 time<1ms TTL=128
Reply from ec2_instance_ip_address: bytes=32 time<1ms TTL=128

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

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

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 established. If this is not working, check your access lists, and refer to the previous IPsec section.

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

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. Check the access list using the following command.

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

   ```
   access-list access-list-name extended permit ip any vpc_subnet subnet_mask
   ```

3. Verify that the access list is correct. The following example access list allows all internal traffic to the VPC subnet 10.0.0.0/16.

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

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 that you added in the Amazon VPC console, and also the security groups for the particular instances.

5. For further troubleshooting, review the configuration.

## Bounce the tunnel interface

If the tunnel appears to be up but traffic isn't flowing properly, bouncing (disabling and re-enabling) the tunnel interface can often resolve connectivity issues. To bounce the tunnel interface on a Cisco ASA:

1. Run the following:

   ```
   ciscoasa# conf t
   ciscoasa(config)# interface tunnel X  (where X is your tunnel ID)
   ciscoasa(config-if)# shutdown
   ciscoasa(config-if)# no shutdown
   ciscoasa(config-if)# end
   ```

   Alternately you can use a single-line command:

   ```
   ciscoasa# conf t ; interface tunnel X ; shutdown ; no shutdown ; end
   ```

2. After bouncing the interface, check if the VPN connection has been re-established and if traffic is now flowing correctly..

# Troubleshoot AWS Site-to-Site VPN connectivity with a Cisco IOS customer gateway device

When you troubleshoot the connectivity of a Cisco customer gateway device, consider four things: IKE, IPsec, the 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 device 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 an `src` value for the remote gateway that is 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, 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 device with IPsec configured correctly.

```
router# show crypto ipsec sa
```

```
interface: Tunnel1
    Crypto map tag: Tunnel1-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: Tunnel1-head-0
       sa timing: remaining key lifetime (k/sec): (4467148/3189)
       IV size: 16 bytes
       replay detection support: Y  replay window size: 128
       Status: ACTIVE

     inbound ah sas:

     inbound pcp sas:

     outbound esp sas:
      spi: 0xB8357C22(3090512930)
       transform: esp-aes esp-sha-hmac ,
       in use settings ={Tunnel, }
       conn id: 2, flow_id: Motorola SEC 2.0:2, crypto map: Tunnel1-head-0
       sa timing: remaining key lifetime (k/sec): (4467148/3189)
       IV size: 16 bytes
       replay detection support: Y  replay window size: 128
       Status: ACTIVE

     outbound ah sas:

     outbound pcp sas:

interface: Tunnel2
     Crypto map tag: Tunnel2-head-0, local addr 174.78.144.73

     protected vrf: (none)
     local  ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
     remote ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
     current_peer 72.21.209.193 port 500
      PERMIT, flags={origin_is_acl,}
     #pkts encaps: 26, #pkts encrypt: 26, #pkts digest: 26
     #pkts decaps: 24, #pkts decrypt: 24, #pkts verify: 24
     #pkts compressed: 0, #pkts decompressed: 0
     #pkts not compressed: 0, #pkts compr. failed: 0
     #pkts not decompressed: 0, #pkts decompress failed: 0
     #send errors 0, #recv errors 0

     local crypto endpt.: 174.78.144.73, remote crypto endpt.: 72.21.209.193
     path mtu 1500, ip mtu 1500, ip mtu idb FastEthernet0
     current outbound spi: 0xF59A3FF6(4120526838)

     inbound esp sas:
      spi: 0xB6720137(3060924727)
       transform: esp-aes esp-sha-hmac ,
       in use settings ={Tunnel, }
       conn id: 3, flow_id: Motorola SEC 2.0:3, crypto map: Tunnel2-head-0
       sa timing: remaining key lifetime (k/sec): (4387273/3492)
       IV size: 16 bytes
       replay detection support: Y  replay window size: 128
       Status: ACTIVE

     inbound ah sas:

     inbound pcp sas:

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

     outbound ah sas:

     outbound pcp sas:
```

For each tunnel interface, you should see both `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 more information, see Firewall rules for an AWS Site-to-Site VPN customer gateway device.

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

```
router# show interfaces tun1
```

```
Tunnel1 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
```

Make sure that 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 device outside IP address, interface, and virtual private gateway outside IP address. Make sure that `Tunnel protection via IPSec` is present. Run the command on both tunnel interfaces. To resolve any problems, review the configuration and check the physical connections to your customer gateway device.

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 five 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
```

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 device 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.

## Troubleshoot AWS Site-to-Site VPN connectivity with a Cisco IOS customer gateway device without Border Gateway Protocol

When you troubleshoot the connectivity of a Cisco customer gateway device, 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 device 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` value for the remote gateway that is 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 device with IPsec configured correctly.

```
router# show crypto ipsec sa
```

```
interface: Tunnel1
    Crypto map tag: Tunnel1-head-0, local addr 174.78.144.73

    protected vrf: (none)
    local  ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
    remote ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
    current_peer 72.21.209.225 port 500
     PERMIT, flags={origin_is_acl,}
     #pkts encaps: 149, #pkts encrypt: 149, #pkts digest: 149
     #pkts decaps: 146, #pkts decrypt: 146, #pkts verify: 146
     #pkts compressed: 0, #pkts decompressed: 0
     #pkts not compressed: 0, #pkts compr. failed: 0
     #pkts not decompressed: 0, #pkts decompress failed: 0
     #send errors 0, #recv errors 0

     local crypto endpt.: 174.78.144.73, remote crypto endpt.:205.251.233.121
     path mtu 1500, ip mtu 1500, ip mtu idb FastEthernet0
     current outbound spi: 0xB8357C22(3090512930)

     inbound esp sas:
      spi: 0x6ADB173(112046451)
       transform: esp-aes esp-sha-hmac ,
       in use settings ={Tunnel, }
       conn id: 1, flow_id: Motorola SEC 2.0:1, crypto map: Tunnel1-head-0
       sa timing: remaining key lifetime (k/sec): (4467148/3189)
       IV size: 16 bytes
       replay detection support: Y  replay window size: 128
       Status: ACTIVE

     inbound ah sas:

     inbound pcp sas:

     outbound esp sas:
      spi: 0xB8357C22(3090512930)
       transform: esp-aes esp-sha-hmac ,
       in use settings ={Tunnel, }
       conn id: 2, flow_id: Motorola SEC 2.0:2, crypto map: Tunnel1-head-0
       sa timing: remaining key lifetime (k/sec): (4467148/3189)
       IV size: 16 bytes
       replay detection support: Y  replay window size: 128
       Status: ACTIVE

     outbound ah sas:

     outbound pcp sas:

interface: Tunnel2
     Crypto map tag: Tunnel2-head-0, local addr 205.251.233.122

     protected vrf: (none)
     local  ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
     remote ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
     current_peer 72.21.209.193 port 500
      PERMIT, flags={origin_is_acl,}
     #pkts encaps: 26, #pkts encrypt: 26, #pkts digest: 26
     #pkts decaps: 24, #pkts decrypt: 24, #pkts verify: 24
     #pkts compressed: 0, #pkts decompressed: 0
     #pkts not compressed: 0, #pkts compr. failed: 0
     #pkts not decompressed: 0, #pkts decompress failed: 0
     #send errors 0, #recv errors 0

     local crypto endpt.: 174.78.144.73, remote crypto endpt.:205.251.233.122
     path mtu 1500, ip mtu 1500, ip mtu idb FastEthernet0
     current outbound spi: 0xF59A3FF6(4120526838)

     inbound esp sas:
      spi: 0xB6720137(3060924727)
       transform: esp-aes esp-sha-hmac ,
       in use settings ={Tunnel, }
       conn id: 3, flow_id: Motorola SEC 2.0:3, crypto map: Tunnel2-head-0
       sa timing: remaining key lifetime (k/sec): (4387273/3492)
       IV size: 16 bytes
       replay detection support: Y  replay window size: 128
       Status: ACTIVE

     inbound ah sas:

     inbound pcp sas:
```

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

     outbound ah sas:

     outbound pcp sas:
```

For each tunnel interface, you should see both an inbound `esp sas` and outbound `esp sas`. This assumes that an SA is listed (for example, `spi: 0x48B456A6`), that the status is `ACTIVE`, and that 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 more information, see Firewall rules for an AWS Site-to-Site VPN customer gateway device.

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

```
router# show interfaces tun1
```

```
Tunnel1 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
```

Make sure that 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 device outside IP address, interface, and virtual private gateway outside IP address. Make sure that `Tunnel protection through IPSec` is present. Run the command on both tunnel interfaces. To resolve any problems, review the configuration and check the physical connections to your customer gateway device.

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, Tunnel1
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 follows.

```
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 for `Number of successes` indicates whether the SLA monitor has been set up successfully.

For further troubleshooting, review the configuration.

## Troubleshoot AWS Site-to-Site VPN connectivity with a Juniper JunOS customer gateway device

When you troubleshoot the connectivity of a Juniper customer gateway device, 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 device 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 file. 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 device 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). The carets at the beginning of each line (< >) 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 device) 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 rules, see Firewall rules for an AWS Site-to-Site VPN customer gateway device.

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

```
user@router> show interfaces st0.1
```

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

Make sure that the `Security: Zone` is correct, and that the `Local` address matches the customer gateway device 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

Run 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 device 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                                    I
```

Additionally, make sure that you're receiving the prefix that corresponds to your VPC from the virtual private gateway.

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

```
inet.0: 10 destinations, 11 routes (10 active, 0 holddown, 0 hidden)
  Prefix                  Nexthop              MED     Lclpref    AS path
* 10.110.0.0/16           169.254.255.1        100                7224 I
```

# Troubleshoot AWS Site-to-Site VPN connectivity with a Juniper ScreenOS customer gateway device

When you troubleshoot the connectivity of a Juniper ScreenOS-based customer gateway device, 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 device 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 that is specified in the tunnels. The Sta value should be A/- and 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 file).

## Tunnel

First, double-check that you have the necessary firewall rules in place. For a list of rules, see Firewall rules for an AWS Site-to-Site VPN customer gateway device.

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 device 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

Run the following command.

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

```
Peer AS Remote IP       Local IP          Wt Status   State     ConnID Up/Down
--------------------------------------------------------------------------------
   7224 169.254.255.1   169.254.255.2    100 Enabled  ESTABLISH     10 00:01:01
   7224 169.254.255.5   169.254.255.6    100 Enabled  ESTABLISH     11 00:00:59
```

The state of both BGP peers should be `ESTABLISH`, which means that the BGP connection to the virtual private gateway is active.

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

```
ssg5-serial-> get vr trust-vr prot bgp neigh 169.254.255.1
```

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

If the BGP peering is up, verify that your customer gateway device is advertising the default route (0.0.0.0/0) to the VPC. 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 that corresponds to your VPC from the virtual private gateway. 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
```

## Troubleshoot AWS Site-to-Site VPN connectivity with a Yamaha customer gateway device

When you troubleshoot the connectivity of a Yamaha customer gateway device, 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.

> **Note**
>
> The `proxy ID` setting used in phase 2 of IKE is disabled by default on the Yamaha router. This can cause problems connecting to Site-to-Site VPN. If the `proxy ID` is not configured on your router, please see the AWS-provided example configuration file for Yamaha to set properly.

### IKE

Run the following command. The response shows a customer gateway device 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` value for the remote gateway that is specified in the tunnels. You can list all of 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, run the following command.

```
# no ipsec ike log
# no syslog debug on
```

## IPsec

Run the following command. The response shows a customer gateway device 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
```

Run 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 rules, see Firewall rules for an AWS Site-to-Site VPN customer gateway device.

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]
```

Make sure that the `current status` value is online and that `Interface type` is IPsec. Make sure to run the command on both tunnel interfaces. To resolve any problems here, review the configuration.

## BGP

Run 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:
```

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 device 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 that corresponds 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
```

## AWS Site-to-Site VPN and eero Integration

AWS Site-to-Site VPN has collaborated with eero to make it simple and convenient for organizations to establish secure connectivity between their remote sites and AWS in just a few clicks.

This solution leverages eero’s WiFi access points and network gateways to provide local connectivity. Using eero’s gateway appliances and Site-to-Site VPN, customers can automatically establish VPN connectivity to access their applications hosted in AWS such as payment gateways for point of sales systems in just a few clicks. This makes it simple and faster for customers to scale their remote site connectivity across hundreds of sites and eliminates the need for an onsite technician with networking expertise to set-up the connectivity. This solution is suitable for distributed enterprises with up to 500 remote offices, with each office having up to 100 users.

To learn more about this integration, including detailed set-up guide, check the eero documentation.

**Note**

There are no changes to the functionality of AWS Site-to-Site VPN as part of this integration.

**Considerations:**

- Available only for VPN connections attached to a Transit Gateway or to Cloud WAN. Not supported for Virtual Private Gateway attachments.
- 5 Gbps tunnels are not supported.
- Site-to-Site VPN Concentrator is not supported.
- Site-to-Site VPN quotas do not change with this integration.

# Work with AWS Site-to-Site VPN

You can work with Site-to-Site VPN resources using the Amazon VPC console or the AWS CLI.

**Topics**

## Create and manage AWS Site-to-Site VPN Concentrators

Site-to-Site VPN Concentrators allow you to aggregate and manage multiple VPN connections from remote sites, providing centralized management.

After creating your Site-to-Site VPN Concentrators, you can view and manage them from the Site-to-Site VPN Concentrators main page in the Amazon VPC Console. This dashboard displays all active VPN Concentrators managing secure connections between AWS and your remote sites.

**Topics**

# Create an AWS Site-to-Site VPN Concentrator

Create a Concentrator using either the Amazon VPC Console, the APIs, or the AWS CLI. Before you create a Concentrator, you must first have created a transit gateway to associate with the Concentrator. For more information about creating transit gateways, see Create a transit gateway in the *Amazon VPC AWS Transit Gateway Guide*.

## Create a Site-to-Site VPN Concentrator using the console

To create a Site-to-Site VPN Concentrator using the AWS Management Console, follow these steps:

**To create a Site-to-Site VPN Concentrator using the console**

1. Open the Amazon VPC Console at https://console.aws.amazon.com/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN Concentrators**.
3. Choose **Create Site-to-Site VPN Concentrator**.
4. (Optional) For **Name tag**, enter a name for your Site-to-Site VPN Concentrator.
5. For **Transit gateway**, select an existing transit gateway.
6. (Optional) Add tags to help identify and organize your Site-to-Site VPN Concentrator.
   a. Choose **Add new tag**.
   b. For **Key**, enter a tag key (for example, **`Name`**).
   c. For **Value**, enter a tag value (for example, **`Production-VPN-Concentrator`**).
   d. Repeat the previous steps to add additional tags as needed.
7. Choose **Create Site-to-Site VPN Concentrator**.

After creation, the Site-to-Site VPN Concentrator will be in a `pending` state while it is being provisioned. Once ready, the state will change to `available` and you can begin creating VPN connections that use the Site-to-Site VPN Concentrator.

## Create a Site-to-Site VPN Concentrator using the CLI

Before creating a Site-to-Site VPN Concentrator using the CLI, ensure you have the following:

- An existing Transit Gateway in your AWS account
- Appropriate IAM permissions to create Site-to-Site VPN Concentrators
- The ID of the Transit Gateway you want to attach the Concentrator to

The following example creates a Site-to-Site VPN Concentrator for the specified transit gateway:

```
aws ec2 create-vpn-concentrator --transit-gateway-id tgw-123456789
```

The following shows a successful response:

```
{
    "VpnConcentrator": {
        "VpnConcentratorId": "vcn-0123456789abcdef0",
        "State": "pending",
        "TransitGatewayId": "tgw-123456789",
        "CreationTime": "2025-09-29T17:26:31.000Z",
        "Tags": []
    }
}
```

## Create a Site-to-Site VPN Concentrator using the API

You can create a Site-to-Site VPN Concentrator using the CreateVpnConcentrators API.

The API accepts the following key parameters:

`TransitGatewayId`

The ID of the Transit Gateway to attach the Site-to-Site VPN Concentrator to.

`TagSpecification`

Tags to assign to the Site-to-Site VPN Concentrator for resource organization and billing.

The following example shows how to create a Site-to-Site VPN Concentrator attached to a Transit Gateway:

```
POST / HTTP/1.1
Host: ec2.us-east-1.amazonaws.com
Content-Type: application/x-www-form-urlencoded
Authorization: AWS4-HMAC-SHA256 Credential=...

Action=CreateVpnConcentrator
&Version=2016-11-15
&TransitGatewayId=tgw-0123456789abcdef0
&TagSpecification.1.ResourceType=vpn-concentrator
&TagSpecification.1.Tag.1.Key=Name
```

```
&TagSpecification.1.Tag.1.Value=MyVpnConcentrator
```

Upon successful creation, the API returns details about the newly created Site-to-Site VPN Concentrator:

```
<?xml version="1.0" encoding="UTF-8"?>
<CreateVpnConcentratorResponse xmlns="http://ec2.amazonaws.com/doc/2016-11-15/">
    <requestId>12345678-1234-1234-1234-123456789012</requestId>
    <vpnConcentrator>
        <vpnConcentratorId>vcn-0123456789abcdef0</vpnConcentratorId>
        <state>pending</state>
        <transitGatewayId>tgw-0123456789abcdef0</transitGatewayId>
        <creationTime>2024-01-15T10:30:00.000Z</creationTime>
        <tagSet>
            <item>
                <key>Name</key>
                <value>MyVpnConcentrator</value>
            </item>
        </tagSet>
    </vpnConcentrator>
</CreateVpnConcentratorResponse>
```

## Manage AWS Site-to-Site VPN Concentrator tags

Tags are key-value pairs that help you organize and manage your Site-to-Site VPN Concentrators. You can use tags to categorize Site-to-Site VPN Concentrators by purpose, environment, cost center, or any other criteria that makes sense for your organization.

### Manage tags using the console

You can add or delete tags for a Site-to-Site VPN Concentrator using the AWS Management Console.

#### To add tags to a Site-to-Site VPN Concentrator

1. Open the Amazon VPC Console at https://console.aws.amazon.com/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN Concentrators**.
3. Select the Site-to-Site VPN Concentrator that you want to tag.
4. Choose the **Tags** tab.
5. Choose **Manage tags**.

6. Choose **Add new tag**.
7. For **Key**, enter a tag key (for example, **`Environment`**).
8. For **Value**, enter a tag value (for example, **`Production`**).
9. Choose **Save changes**.

#### To delete tags from a Site-to-Site VPN Concentrator

1. Open the Amazon VPC Console at https://console.aws.amazon.com/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN Concentrators.**
3. Select the Site-to-Site VPN Concentrator from which you want to remove tags.
4. Choose the **Tags** tab.
5. Choose **Manage tags**.
6. For each tag you want to remove, choose **Remove**.
7. Choose **Save changes**.

## Manage tags using the CLI

You can add, modify, or remove tags using the AWS CLI.

### Add tags

The following example adds tags to a Site-to-Site VPN Concentrator:

```
aws ec2 create-tags --resources vcn-0123456789abcdef0 --tags
 Key=Environment,Value=Production Key=Team,Value=NetworkOps
```

This command returns no output on success.

### View tags

The following example describes the tags for a Site-to-Site VPN Concentrator:

```
aws ec2 describe-tags --filters "Name=resource-id,Values=vcn-0123456789abcdef0"
```

The following response is returned:

```
{
    "Tags": [
        {
            "Key": "Environment",
            "ResourceId": "vcn-0123456789abcdef0",
            "ResourceType": "vpn-concentrator",
            "Value": "Production"
        },
        {
            "Key": "Team",
            "ResourceId": "vcn-0123456789abcdef0",
            "ResourceType": "vpn-concentrator",
            "Value": "NetworkOps"
        }
    ]
}
```

### Remove tags

The following example removes tags from a Site-to-Site VPN Concentrator:

```
aws ec2 delete-tags --resources vcn-0123456789abcdef0 --tags Key=Environment Key=Team
```

This command returns no output on success.

## Manage tags using the API

You can programmatically manage Site-to-Site VPN Concentrator tags using the Amazon EC2 API operations.

### CreateTags

Use the `CreateTags` operation to add or update tags:

```
POST / HTTP/1.1
Host: ec2.region.amazonaws.com
Content-Type: application/x-www-form-urlencoded

Action=CreateTags
&ResourceId.1=vcn-0123456789abcdef0
&Tag.1.Key=Environment
&Tag.1.Value=Production
&Tag.2.Key=Team
&Tag.2.Value=NetworkOps
&Version=2016-11-15
```

The following response is returned:

```
<?xml version="1.0" encoding="UTF-8"?>
<CreateTagsResponse xmlns="http://ec2.amazonaws.com/doc/2016-11-15/">
    <requestId>7a62c49f-347e-4fc4-9331-6e8eEXAMPLE</requestId>
    <return>true</return>
</CreateTagsResponse>
```

### DescribeTags

Use the `DescribeTags` operation to retrieve tags:

```
POST / HTTP/1.1
Host: ec2.region.amazonaws.com
Content-Type: application/x-www-form-urlencoded

Action=DescribeTags
&Filter.1.Name=resource-id
&Filter.1.Value.1=vcn-0123456789abcdef0
&Version=2016-11-15
```

The following response is returned:

```
<?xml version="1.0" encoding="UTF-8"?>
<DescribeTagsResponse xmlns="http://ec2.amazonaws.com/doc/2016-11-15/">
    <requestId>7a62c49f-347e-4fc4-9331-6e8eEXAMPLE</requestId>
    <tagSet>
        <item>
            <resourceId>vcn-0123456789abcdef0</resourceId>
            <resourceType>vpn-concentrator</resourceType>
            <key>Environment</key>
            <value>Production</value>
        </item>
        <item>
            <resourceId>vcn-0123456789abcdef0</resourceId>
            <resourceType>vpn-concentrator</resourceType>
            <key>Team</key>
            <value>NetworkOps</value>
        </item>
    </tagSet>
</DescribeTagsResponse>
```

### DeleteTags

Use the `DeleteTags` operation to remove tags:

```
POST / HTTP/1.1
Host: ec2.region.amazonaws.com
Content-Type: application/x-www-form-urlencoded

Action=DeleteTags
&ResourceId.1=vcn-0123456789abcdef0
&Tag.1.Key=Environment
&Tag.2.Key=Team
&Version=2016-11-15
```

The following response is returned:

```
<?xml version="1.0" encoding="UTF-8"?>
<DeleteTagsResponse xmlns="http://ec2.amazonaws.com/doc/2016-11-15/">
    <requestId>7a62c49f-347e-4fc4-9331-6e8eEXAMPLE</requestId>
    <return>true</return>
</DeleteTagsResponse>
```

# Delete an AWS Site-to-Site VPN Concentrator

When you no longer need a Site-to-Site VPN Concentrator, you can delete it to stop incurring charges. Deleting a Site-to-Site VPN Concentrator permanently removes it and all associated configurations.

## Prerequisites

Before deleting a Site-to-Site VPN Concentrator, ensure the following:

- All VPN connections associated with the Site-to-Site VPN Concentrator are deleted.
- You have the necessary permissions to delete Site-to-Site VPN Concentrators (`ec2:DeleteVpnConcentrator`).

## Delete a Site-to-Site VPN Concentrator using the console

### To delete a Site-to-Site VPN Concentrator

1. Open the Amazon VPC Console at https://console.aws.amazon.com/vpc/.

2. In the navigation pane, choose **Site-to-Site Concentrators**.
3. Select the Site-to-Site VPN Concentrator that you want to delete.
4. Choose **Actions**, and then choose **Delete Site-to-Site VPN Concentrator**.
5. In the confirmation dialog, type **`delete`** to confirm the deletion.
6. Choose **Delete**.

## Delete a Site-to-Site VPN Concentrator using the CLI

Use the `delete-vpn-concentrator` command to delete a Site-to-Site VPN Concentrator. You'll need the `vpn-concentrator-id` in order to delete it.

The following example deletes a Site-to-Site VPN Concentrator:

```
aws ec2 delete-vpn-concentrator --vpn-concentrator-id vcn-0123456789abcdef0
```

The following response is returned:

```
{
    "VpnConcentrator": {
        "VpnConcentratorId": "vcn-0123456789abcdef0",
        "State": "deleting",
        "Message": "The Site-to-Site VPN Concentrator vcn-0123456789abcdef0 is being
 deleted and will be removed from your account."
    }
}
```

## Delete a Site-to-Site VPN Concentrator using the API

Use the `DeleteVpnConcentrator` operation to delete a Site-to-Site VPN Concentrator. You'll need the `VpnConcentratorId` in order to delete it.

The following example deletes a Site-to-Site VPN Concentrator:

```
POST / HTTP/1.1
Host: ec2.region.amazonaws.com
Content-Type: application/x-www-form-urlencoded

Action=DeleteVpnConcentrator
```

```
&VpnConcentratorId=vcn-0123456789abcdef0
&Version=2016-11-15
```

The following response is returned:

```
<?xml version="1.0" encoding="UTF-8"?>
<DeleteVpnConcentratorResponse xmlns="http://ec2.amazonaws.com/doc/2016-11-15/">
    <requestId>7a62c49f-347e-4fc4-9331-6e8eEXAMPLE</requestId>
    <vpnConcentrator>
        <vpnConcentratorId>vcn-0123456789abcdef0</vpnConcentratorId>
        <state>deleting</state>
        <message>The Site-to-Site VPN Concentrator vcn-0123456789abcdef0 is being
 deleted and will be removed from your account.</message>
    </vpnConcentrator>
</DeleteVpnConcentratorResponse>
```

# Create an AWS Site-to-Site VPN connection

You can create Site-to-Site VPN connections that attach to transit gateways or Cloud WAN global networks. Both attachment types support IPv4 and IPv6 protocols and can optionally use Site-to-Site VPN Concentrators for connecting multiple remote sites cost-effectively.

## Create a VPN connection using the console

**To create a VPN connection using the console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Choose **Create VPN connection**.
4. (Optional) For **Name tag**, enter a name for the connection. Doing so creates a tag with a key of Name and the value that you specify.
5. For **Target gateway type**, choose one of the following:

    - **Virtual private gateway** - Create a new virtual private gateway VPN connection by choosing an existing **Virtual private gateway**.
    - **Transit gateway** - Create a new transit gateway VPN connection by choosing an existing **Transit gateway**. For more information about creating a transit gateway, see Transit gateways in *Amazon VPC Transit Gateways*.

- **Site-to-Site VPN Concentrator** - Create a new Site-to-Site VPN Concentrator connection by using an existing Site-to-Site VPN Concentrator or creating a new one. Choose one of the following:
  - **Existing** - Create a new Site-to-Site VPN Concentrator VPN connection using an existing Concentrator.
  - **New** - Enter an optional name for the Site-to-Site VPN Concentrator and then choose the transit gateway to associate with it.
- **Not associated** - Create an unattached VPN connection that can later be associated with Cloud WAN through the Network Manager console or API. For more information about VPN attachments and Cloud WAN, see Site-to-site VPN attachments in AWS Cloud WAN in the *AWS Cloud WAN User Guide*.

6. For **Customer gateway**, do one of the following:

   - To use an existing customer gateway, choose **Existing**, and then choose the **Customer gateway ID**.
   - To create a new customer gateway, choose **New**, and then do the following:
     - For the **IP address** , enter a static **IPv4** or **IPv6** address.
     - (Optional) For **Certificate ARN**, choose the ARN of your private certificate (if using certificate-based authentication).
     - For **BGP ASN**, enter the Border Gateway Protocol (BGP) Autonomous System Number (ASN) of your customer gateway. For more information, see Customer gateway options.

7. For **Routing options**, choose **Dynamic (requires BGP)** or **Static**.

   > **Note**
   >
   > Cloud WAN VPN connections and VPN connections using Concentrators only support BGP routing. Static routing is not supported for these connection types.

8. For **Pre-shared key storage** choose either **Standard** or **Secrets Manager**. The default selection is **Standard**. For more information about using AWS Secrets Manager, see Security.
9. For **Tunnel inside IP version**, choose **IPv4** or **IPv6**.
10. (Optional) For **Enable acceleration**, choose the check box to enable acceleration. For more information, see Accelerated VPN connections.

If you enable acceleration, we create two accelerators that are used by your VPN connection. Additional charges apply.

11. (Optional) Depending on which tunnel inside IP version you've chosen, do one of the following:

    - IPv4 — For **Local IPv4 network CIDR**, specify the IPv4 CIDR range on the customer gateway (on-premises) side that is allowed to communicate over the VPN tunnels. For **Remote IPv4 network CIDR**, choose the CIDR range on the AWS side that is allowed to communicate over VPN tunnels. The default value for both fields is `0.0.0.0/0`.
    - IPv6 — For **Local IPv6 network CIDR**, specify the IPv6 CIDR range on the customer gateway (on-premises) side that is allowed to communicate over the VPN tunnels. For **Remote IPv6 network CIDR**, choose the CIDR range on the AWS side that is allowed to communicate over VPN tunnels. The default value for both fields is `::/0`

12. For **Outside IP address type**, choose one of the following options:

    - **Public IPv4** - (Default) Use IPv4 addresses for the outer tunnel IPs.
    - **Private IPv4** - Use a private IPv4 address for use within private networks.
    - **IPv6** - Use IPv6 addresses for the outer tunnel IPs. This option requires that your customer gateway device supports IPv6 addressing.

    > **Note**
    >
    > If you select **IPv6** for the outside IP address type, you must create a customer gateway with an IPv6 address

13. (Optional) For **Tunnel 1 options**, you can specify the following information for each tunnel:

    - A size /30 IPv4 CIDR block from the `169.254.0.0/16` range for the inside tunnel IPv4 addresses.
    - If you specified **IPv6** for **Tunnel inside IP version**, a /126 IPv6 CIDR block from the `fd00::/8` range for the inside tunnel IPv6 addresses.
    - The IKE pre-shared key (PSK). The following versions are supported: IKEv1 or IKEv2.
    - To edit the advanced options for your tunnel, choose **Edit tunnel options**. For more information, see VPN tunnel options.
    - (Optional) Choose **Enable** for the **Tunnel activity log** to capture log messages for IPsec activity and DPD protocol messages.

- (Optional) Choose **Turn on** for **Tunnel endpoint lifecycle** to control the schedule for endpoint replacements. For more information about tunnel endpoint lifecycle, see Tunnel endpoint lifecycle.

14. (Optional) Choose **Tunnel 2 options** and follow the previous steps to set up a second tunnel.
15. Choose **Create VPN connection**.

# Create an AWS Site-to-Site VPN transit gateway connection using the CLI or API

## Create a VPN connection to Transit Gateway using the CLI

Use the create-vpn-connection command and specify the transit gateway ID for the `--transit-gateway-id` option.

The following example demonstrates creating a VPN connection with IPv6 outer tunnel IPs and IPv6 inner tunnel IPs:

```
aws ec2 create-vpn-connection \
--type ipsec.1 \
--transit-gateway-id tgw-12312312312312312 \
--customer-gateway-id cgw-001122334455aabbc \
--options
 OutsideIPAddressType=Ipv6,TunnelInsideIpVersion=ipv6,TunnelOptions=[{StartupAction=start},
{StartupAction=start}]
```

Example response:

```
{
    "VpnConnection": {
        "VpnConnectionId": "vpn-0abcdef1234567890",
        "State": "pending",
        "CustomerGatewayId": "cgw-001122334455aabbc",
        "Type": "ipsec.1",
        "TransitGatewayId": "tgw-12312312312312312",
        "Category": "VPN",
        "Routes": [],
        "Options": {
            "StaticRoutesOnly": false,
            "OutsideIPAddressType": "Ipv6",
            "TunnelInsideIpVersion": "ipv6"
        }
    }
}
```

## Create a VPN connection to Transit Gateway using the API

You can create a VPN connection using the Amazon EC2 API. This section provides example request and response messages for creating a transit gateway VPN connection using the API.

### Prerequisites

Before creating a VPN connection using the API, ensure you have:

- A transit gateway created and available
- A customer gateway configured with your on-premises device details

The following example shows how to create a VPN connection using the `CreateVpnConnection` API action:

```
POST / HTTP/1.1
Host: ec2.us-east-1.amazonaws.com
Content-Type: application/x-www-form-urlencoded

Action=CreateVpnConnection
&Type=ipsec.1
&TransitGatewayId=tgw-12345678901234567
&CustomerGatewayId=cgw-12345678901234567
&Options.StaticRoutesOnly=false
&Version=2016-11-15
```

This example creates a VPN connection with dynamic routing (BGP) between the specified transit gateway and customer gateway.

A successful API response returns the VPN connection details:

```
<?xml version="1.0" encoding="UTF-8"?>
<CreateVpnConnectionResponse xmlns="http://ec2.amazonaws.com/doc/2016-11-15/">
    <requestId>7a62c49f-347e-4fc4-9331-6e8eEXAMPLE</requestId>
    <vpnConnection>
        <vpnConnectionId>vpn-1a2b3c4d5e6f78901</vpnConnectionId>
        <state>pending</state>
        <customerGatewayId>cgw-12345678901234567</customerGatewayId>
        <type>ipsec.1</type>
        <transitGatewayId>tgw-12345678901234567</transitGatewayId>
        <category>VPN</category>
        <options>
            <staticRoutesOnly>false</staticRoutesOnly>
        </options>
    </vpnConnection>
</CreateVpnConnectionResponse>
```

The response includes the VPN connection ID, current state, and configuration details. The connection will initially be in a "pending" state while AWS provisions the VPN tunnels.

## Create an AWS Site-to-Site VPN Cloud WAN connection using the CLI or API

You can create an Site-to-Site VPN connections between your on-premises and AWS Cloud WAN following the procedure below. For more information, see Site-to-site VPN attachments in AWS Cloud WAN in the *AWS Cloud WAN User Guide*.

### Create a VPN connection to Cloud WAN using the CLI

Use the create-vpn-connection command to create a VPN connection that will later be attached to a Cloud WAN global network. This creates an unattached VPN connection that can subsequently be associated with Cloud WAN through the Network Manager console or API.

**Prerequisites**

Before creating a Cloud WAN VPN connection, ensure you have the following:

- `customer-gateway-id` - An existing customer gateway resource (`cgw-xxxxxxxxx`) that represents your on-premises VPN device.
- **Cloud WAN Global Network** - A Cloud WAN global network must be created and configured with appropriate network segments.
- **BGP Configuration** - Cloud WAN VPN connections require BGP routing; static routing is not supported. You must set `StaticRoutesOnly=false` in the options parameter

This command creates a VPN connection without specifying a target gateway. The connection will be in an unattached state and can later be associated with your Cloud WAN global network through the Network Manager console or API. The `StaticRoutesOnly=false` option enables BGP routing, which is mandatory for Cloud WAN VPN attachments as static routing is not supported.

The following example creates an unattached VPN connection for Cloud WAN:

```
aws ec2 create-vpn-connection \
            --type ipsec.1 \
            --customer-gateway-id cgw-0123456789abcdef0 \
            --options StaticRoutesOnly=false
```

The response returns the following:

```
{
            "VpnConnection": {
            "VpnConnectionId": "vpn-0abcdef1234567890",
            "State": "pending",
            "CustomerGatewayId": "cgw-0123456789abcdef0",
            "Type": "ipsec.1",
            "Category": "VPN",
            "Routes": [],
            "Options": {
            "StaticRoutesOnly": false
            }
            }
            }
```

After creating the VPN connection, you can attach it to your Cloud WAN global network using the Network Manager console or the `create-site-to-site-vpn-attachment` API call.

## Create a VPN Cloud WAN connection using the API

You can use the EC2 API to create a VPN connection for Cloud WAN integration. This involves making a `CreateVpnConnection` API call that creates an unattached VPN connection, which can then be associated with your Cloud WAN global network.

The API request creates a VPN connection without specifying a target gateway, leaving it in an unattached state that's ready for Cloud WAN integration. The connection uses BGP routing, which is required for Cloud WAN VPN attachments.

The following example shows the HTTP request to create a Cloud WAN VPN connection:

```
POST / HTTP/1.1
            Host: ec2.us-east-1.amazonaws.com
            Content-Type: application/x-www-form-urlencoded
            Authorization: AWS4-HMAC-SHA256 Credential=...

            Action=CreateVpnConnection
            &Type=ipsec.1
            &CustomerGatewayId=cgw-0123456789abcdef0
            &Options.StaticRoutesOnly=false
            &Version=2016-11-15
```

The API returns a successful response containing the VPN connection details. The connection will be in a `pending` state initially while AWS provisions the VPN tunnels, at which time the status changes to `available`.

```
<?xml version="1.0" encoding="UTF-8"?>
            <CreateVpnConnectionResponse xmlns="http://ec2.amazonaws.com/
doc/2016-11-15/">
            <requestId>12345678-1234-1234-1234-123456789012</requestId>
            <vpnConnection>
            <vpnConnectionId>vpn-0abcdef1234567890</vpnConnectionId>
            <state>pending</state>
            <customerGatewayId>cgw-0123456789abcdef0</customerGatewayId>
            <type>ipsec.1</type>
            <category>VPN</category>
            <options>
            <staticRoutesOnly>false</staticRoutesOnly>
            </options>
            <vgwTelemetry/>
            <routes/>
            </vpnConnection>
            </CreateVpnConnectionResponse>
```

### Response Details

The API response provides the following key information:

- **vpnConnectionId** - The unique identifier for your VPN connection (e.g., `vpn-0abcdef1234567890`) that you'll use to attach it to Cloud WAN
- **state** - Initially "pending" while AWS provisions the VPN tunnels, then transitions to "available" when ready for attachment

- **category** - Shows "VPN" indicating this is an unattached VPN connection suitable for Cloud WAN integration
- **staticRoutesOnly** - Set to "false" to enable BGP routing, which is required for Cloud WAN VPN attachments

Once the VPN connection reaches the "available" state, you can attach it to your Cloud WAN global network using the Network Manager `CreateSiteToSiteVpnAttachment` API or through the AWS console.

## Create an AWS Site-to-Site VPN Concentrator connection using the CLI or API

### Create a Site-to-Site VPN Concentrator connection using the CLI

After creating a Site-to-Site VPN Concentrator, you need to establish individual VPN connections from your remote sites to the Site-to-Site VPN Concentrator. Each remote site requires its own VPN connection that references the Site-to-Site VPN Concentrator ID. This allows multiple remote sites to share the same Site-to-Site VPN Concentrator infrastructure while maintaining separate, secure tunnels for each site.

To establish a VPN connection using a Site-to-Site VPN Concentrator, specify the Site-to-Site VPN Concentrator instead of the transit gateway when creating the VPN connection. The following example creates a VPN connection using a Site-to-Site VPN Concentrator:

```
aws ec2 create-vpn-connection \
--type ipsec.1 \
--customer-gateway-id cgw-123456789 \
--vpn-concentrator-id vcn-0123456789abcdef0
```

A successful response returns the following:

```
{
    "VpnConnection": {
        "VpnConnectionId": "vpn-0abcdef1234567890",
        "State": "pending",
        "CustomerGatewayId": "cgw-123456789",
        "Type": "ipsec.1",
        "VpnConcentratorId": "vcn-0123456789abcdef0",
        "Category": "VPN",
        "Routes": [],
        "Options": {
            "StaticRoutesOnly": false
        }
    }
}
```

## Create a Site-to-Site VPN Concentrator connection using the API

You can create a VPN connection that uses a Site-to-Site VPN Concentrator using the Amazon EC2 API. This section provides example request and response messages for creating a VPN connection with a Site-to-Site VPN Concentrator.

Before creating a VPN connection with a Site-to-Site VPN Concentrator using the API, ensure you have:

- A Site-to-Site VPN Concentrator created and available
- A customer gateway configured for your remote site
- Network configuration allowing IPsec traffic between your site and AWS

The following example shows how to create a VPN connection using a Site-to-Site VPN Concentrator with the `CreateVpnConnection` API action:

```
POST / HTTP/1.1
Host: ec2.us-east-1.amazonaws.com
Content-Type: application/x-www-form-urlencoded

Action=CreateVpnConnection
&Type=ipsec.1
&VpnConcentratorId=vcn-0123456789abcdef0
&CustomerGatewayId=cgw-12345678901234567
&Options.StaticRoutesOnly=false
&Version=2016-11-15
```

This example creates a VPN connection between the specified Site-to-Site VPN Concentrator and customer gateway. The Site-to-Site VPN Concentrator acts as the AWS side endpoint, allowing multiple remote sites to connect through a centralized hub.

A successful API response returns the VPN connection details with Site-to-Site VPN Concentrator information:

```
<?xml version="1.0" encoding="UTF-8"?>
<CreateVpnConnectionResponse xmlns="http://ec2.amazonaws.com/doc/2016-11-15/">
    <requestId>8b73d60f-458f-5gc5-a442-7f9fEXAMPLE</requestId>
    <vpnConnection>
        <vpnConnectionId>vpn-9z8y7x6w5v4u32109</vpnConnectionId>
        <state>pending</state>
        <customerGatewayId>cgw-12345678901234567</customerGatewayId>
        <type>ipsec.1</type>
        <vpnConcentratorId>vcn-0123456789abcdef0</vpnConcentratorId>
        <category>VPN</category>
        <options>
            <staticRoutesOnly>false</staticRoutesOnly>
        </options>
    </vpnConnection>
</CreateVpnConnectionResponse>
```

The response includes the VPN connection ID and references the Site-to-Site VPN Concentrator ID instead of a transit gateway ID. This connection allows your remote site to communicate with other sites connected to the same Site-to-Site VPN Concentrator, enabling hub-and-spoke network topologies.

# View AWS Site-to-Site VPN connections

## View VPN connections using the console

You can view your VPN connections and their details using the AWS Management Console. This provides a visual interface to monitor connection status, tunnel health, and configuration details.

**To view VPN connections using the console**

1. Open the Amazon VPC console at https://console.aws.amazon.com/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN Connections**.
3. Select your VPN connection to view detailed information including:
   - Connection state and status
   - Tunnel details and health status

- Route information
- Configuration parameters

The console displays real-time status information and allows you to monitor tunnel connectivity, view routing tables, and access configuration details for troubleshooting.

## View VPN connections using the CLI

Use the AWS CLI to query and retrieve detailed information about your VPN connections programmatically. This method enables automation, scripting, and integration with monitoring tools.

To query all VPN connections in your current AWS account and region, execute the `describe-vpn-connections` command without parameters. However, if you want to view the details about a particular VPN connection you'll need to know the VPN connection Id.

To retrieve detailed information for a specific VPN connection, specify the connection ID as a parameter. The following example shows a request to view details about a specific VPN connection.

```
aws ec2 describe-vpn-connections --vpn-connection-ids vpn-1234567890abcdef0
```

The response includes comprehensive information about the VPN connection, including tunnel options, routing details, and current status.

- `State` - The current state of the VPN connection
- `TunnelOptions` - Configuration and status for each tunnel
- `OutsideIpAddress` - The public IP addresses of the VPN tunnels
- `Routes` - Routing information for the connection

Example response excerpt showing key connection details:

```
{
    "VpnConnections": [
        {
            "VpnConnectionId": "vpn-1234567890abcdef0",
            "State": "available",
            "CustomerGatewayId": "cgw-1234567890abcdef0",
            "Type": "ipsec.1",
            "Options": {
                "StaticRoutesOnly": false,
                "TunnelOptions": [
                    {
                        "OutsideIpAddress": "203.0.113.12",
                        "TunnelInsideCidr": "169.254.10.0/30",
                        "PreSharedKey": "example_key_1234567890abcdef0",
                        "Phase1LifetimeSeconds": 28800,
                        "Phase2LifetimeSeconds": 3600
                    },
                    {
                        "OutsideIpAddress": "203.0.113.34",
                        "TunnelInsideCidr": "169.254.11.0/30",
                        "PreSharedKey": "example_key_0987654321fedcba0",
                        "Phase1LifetimeSeconds": 28800,
                        "Phase2LifetimeSeconds": 3600
                    }
                ]
            }
        }
    ]
}
```

## View VPN connections using the API

Make direct API calls to the Amazon EC2 service to retrieve VPN connection information. This approach provides maximum flexibility for custom applications and programmatic integrations.

The `DescribeVpnConnections` API action queries and returns detailed information about one or more VPN connections. You can apply filters by connection ID, state, or other attributes to narrow your results.

The following shows an example request to provide details about a single VPN connection.

```

POST / HTTP/1.1
Host: ec2.us-east-1.amazonaws.com
Content-Type: application/x-www-form-urlencoded
Authorization: AWS4-HMAC-SHA256 Credential=AKIAIOSFODNN7EXAMPLE/20230101/us-east-1/ec2/
aws4_request, SignedHeaders=host;x-amz-date, Signature=example_signature

Action=DescribeVpnConnections
```

```
&VpnConnectionId.1=vpn-1234567890abcdef0
&Version=2016-11-15
```

The response returns details about that VPN connection.

```
<?xml version="1.0" encoding="UTF-8"?>
<DescribeVpnConnectionsResponse xmlns="http://ec2.amazonaws.com/doc/2016-11-15/">
    <requestId>12345678-1234-1234-1234-123456789012</requestId>
    <vpnConnectionSet>
        <item>
            <vpnConnectionId>vpn-1234567890abcdef0</vpnConnectionId>
            <state>available</state>
            <customerGatewayId>cgw-1234567890abcdef0</customerGatewayId>
            <type>ipsec.1</type>
            <options>
                <staticRoutesOnly>false</staticRoutesOnly>
                <tunnelOptionSet>
                    <item>
                        <outsideIpAddress>203.0.113.12</outsideIpAddress>
                        <tunnelInsideCidr>169.254.10.0/30</tunnelInsideCidr>
                        <preSharedKey>example_key_1234567890abcdef0</preSharedKey>
                    </item>
                    <item>
                        <outsideIpAddress>203.0.113.34</outsideIpAddress>
                        <tunnelInsideCidr>169.254.11.0/30</tunnelInsideCidr>
                        <preSharedKey>example_key_0987654321fedcba0</preSharedKey>
                    </item>
                </tunnelOptionSet>
            </options>
        </item>
    </vpnConnectionSet>
</DescribeVpnConnectionsResponse>
```

# Test an AWS Site-to-Site VPN connection

After you create the AWS Site-to-Site VPN connection and configure the customer gateway, you can launch an instance and test the connection by pinging the instance.

Before you begin, make sure of the following:

- Use an AMI that responds to ping requests. We recommend that you use one of the Amazon Linux AMIs.
- Configure any security group or network ACL in your VPC that filters traffic to the instance to allow inbound and outbound ICMP traffic. This enables the instance to receive `ping` requests.
- If you are using instances running Windows Server, connect to the instance and enable inbound ICMPv4 on the Windows firewall in order to ping the instance.
- (Static routing) Ensure that the customer gateway device has a static route to your VPC, and that your VPN connection has a static route so that traffic can get back to your customer gateway device.
- (Dynamic routing) Ensure that the BGP status on your customer gateway device is established. It takes approximately 30 seconds for a BGP peering session to be established. Ensure that routes are advertised with BGP correctly and showing in the subnet route table, so that traffic can get back to your customer gateway. Make sure that both tunnels are configured with BGP routing.
- Ensure that you have configured routing in your subnet route tables for the VPN connection.

### To test connectivity

1. Open the Amazon EC2 console at https://eusc-de-east-1.console.amazonaws-eusc.eu/ec2/.
2. On the dashboard, choose **Launch instance**.
3. (Optional) For **Name**, enter a descriptive name for your instance.
4. For **Application and OS Images (Amazon Machine Image)**, choose **Quick Start**, and then choose the operating system for your instance.
5. For **Key pair name**, choose an existing key pair or create a new one.
6. For **Network settings**, choose **Select existing security group**, and then choose the security group that you configured.
7. In the **Summary** panel, choose **Launch instance**.
8. After the instance is running, get its private IP address (for example, 10.0.0.4). The Amazon EC2 console displays the address as part of the instance's details.
9. From a computer in your network that is behind the customer gateway device, use the **ping** command with the instance's private IP address.

   ```
   ping 10.0.0.4
   ```

   A successful response is similar to the following.

```
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
```

To test tunnel failover, you can temporarily disable one of the tunnels on your customer gateway device and then repeat this step. You can't disable a tunnel on the AWS side of the VPN connection.

10. To test the connection from AWS to your on-premises network, you can use SSH or RDP to connect to your instance from your network. You can then run the `ping` command with the private IP address of another computer in your network, to verify that both sides of the connection can initiate and receive requests.

    For more information about how to connect to a Linux instance, see Connect to your Linux instance in the *Amazon EC2 User Guide*. For more information about how to connect to a Windows instance, see Connect to your Windows instance in the *Amazon EC2 User Guide*.

# Delete an AWS Site-to-Site VPN connection and gateway

If you no longer need an AWS Site-to-Site VPN connection, you can delete it. When you delete a Site-to-Site VPN connection, we do not delete the customer gateway or virtual private gateway that was associated with the Site-to-Site VPN connection. If you no longer need the customer gateway and virtual private gateway, you can delete them.

> ⚠ **Warning**
>
> If you delete your Site-to-Site VPN connection and then create a new one, you must download a new configuration file and reconfigure the customer gateway device.

**Tasks**

- Delete an AWS Site-to-Site VPN connection
- Delete an AWS Site-to-Site VPN customer gateway
- Detach and delete a virtual private gateway in AWS Site-to-Site VPN

## Delete an AWS Site-to-Site VPN connection

After you delete your Site-to-Site VPN connection, it remains visible for a short while with a state of `deleted`, and then the entry is automatically removed.

**To delete a VPN connection using the console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Select the VPN connection and choose **Actions**, **Delete VPN connection**.
4. When prompted for confirmation, enter **`delete`** and then choose **Delete**.

**To delete a VPN connection using the command line or API**

- DeleteVpnConnection (Amazon EC2 Query API)
- delete-vpn-connection (AWS CLI)
- Remove-EC2VpnConnection (AWS Tools for Windows PowerShell)

## Delete an AWS Site-to-Site VPN customer gateway

If you no longer need a customer gateway, you can delete it. You can't delete a customer gateway that's being used in a Site-to-Site VPN connection.

**To delete a customer gateway using the console**

1. In the navigation pane, choose **Customer gateways**.
2. Select the customer gateway and choose **Actions**, **Delete customer gateway**.
3. When prompted for confirmation, enter **`delete`** and then choose **Delete**.

**To delete a customer gateway using the command line or API**

- DeleteCustomerGateway (Amazon EC2 Query API)

- delete-customer-gateway (AWS CLI)
- Remove-EC2CustomerGateway (AWS Tools for Windows PowerShell)

## Detach and delete a virtual private gateway in AWS Site-to-Site VPN

If you no longer require a virtual private gateway for your VPC, you can detach it from the VPC.

**To detach a virtual private gateway using the console**

1. In the navigation pane, choose **Virtual private gateways**.
2. Select the virtual private gateway and choose **Actions**, **Detach from VPC**.
3. Choose **Detach virtual private gateway**.

If you no longer require a detached virtual private gateway, you can delete it. You can't delete a virtual private gateway that's still attached to a VPC. After you delete your virtual private gateway, it remains visible for a short while with a state of `deleted`, and then the entry is automatically removed.

**To delete a virtual private gateway using the console**

1. In the navigation pane, choose **Virtual private gateways**.
2. Select the virtual private gateway and choose **Actions**, **Delete virtual private gateway**.
3. When prompted for confirmation, enter **`delete`** and then choose **Delete**.

**To detach a virtual private gateway using the command line or API**

- DetachVpnGateway (Amazon EC2 Query API)
- detach-vpn-gateway (AWS CLI)
- Dismount-EC2VpnGateway (AWS Tools for Windows PowerShell)

**To delete a virtual private gateway using the command line or API**

- DeleteVpnGateway (Amazon EC2 Query API)
- delete-vpn-gateway (AWS CLI)
- Remove-EC2VpnGateway (AWS Tools for Windows PowerShell)

# Modify the target gateway of an AWS Site-to-Site VPN connection

You can modify the target gateway of an AWS Site-to-Site VPN connection. The following migration options are available:

- An existing virtual private gateway to a transit gateway
- An existing virtual private gateway to another virtual private gateway
- An existing transit gateway to another transit gateway
- An existing transit gateway to a virtual private gateway

After you modify the target gateway, your Site-to-Site VPN connection will be temporarily unavailable for a brief period while we provision the new endpoints.

The following tasks help you complete the migration to a new gateway.

**Tasks**

## Step 1: Create the new target gateway

Before you perform the migration to the new target gateway, you must first configure the new gateway. For information about adding a virtual private gateway, see the section called “Create a virtual private gateway”. For more information about adding a transit gateway, see Create a transit gateway in *Amazon VPC Transit Gateways*.

If the new target gateway is a transit gateway, attach the VPCs to the transit gateway. For information about VPC attachments, see Transit gateway attachments to a VPC in *Amazon VPC Transit Gateways*.

When you modify the target from a virtual private gateway to a transit gateway, you can optionally set the transit gateway ASN to be the same value as the virtual private gateway ASN. If you choose to have a different ASN, then you must set the ASN on your customer gateway device to the transit gateway ASN. For more information, see the section called "Step 6: Update the customer gateway ASN (conditional)".

## Step 2: Delete your static routes (conditional)

This step is required when you migrate from a virtual private gateway with static routes to a transit gateway.

You must delete the static routes before you migrate to the new gateway.

> **Tip**
>
> Keep a copy of the static route before you delete it. You will need to add back these routes to the transit gateway after the VPN connection migration is complete.

**To delete a route from a route table**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Route tables**, and then select the route table.
3. On the **Routes** tab, choose **Edit routes**.
4. Choose **Remove** for the static route to the virtual private gateway.
5. Choose **Save changes**.

## Step 3: Migrate to a new gateway

**To change the target gateway**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Select the VPN connection and choose **Actions**, **Modify VPN connection**.
4. For **Target type**, choose the gateway type.

    a. If the new target gateway is a virtual private gateway, choose **VPN gateway**.

   b. If the new target gateway is transit gateway, choose **Transit gateway**.

5. Choose **Save changes**.

**To modify a Site-to-Site VPN connection using the command line or API**

- ModifyVpnConnection (Amazon EC2 Query API)
- modify-vpn-connection (AWS CLI)

## Step 4: Update VPC route tables

After you migrate to the new gateway, you might need to modify your VPC route table. For more information, see Route tables in the *Amazon VPC User Guide*.

The following table provides information about the VPC route table updates to make after you modify the VPN gateway target.

| Existing gateway | New gateway | VPC route table change |
|---|---|---|
| Virtual private gateway with propagated routes | Transit gateway | Add a route that contains the ID of the transit gateway. |
| Virtual private gateway with propagated routes | Virtual private gateway with propagated routes | There is no action required. |
| Virtual private gateway with propagated routes | Virtual private gateway with static route | Add a route that contains the ID of the new virtual private gateway. |
| Virtual private gateway with static routes | Transit gateway | Update the route that contains the ID of the virtual private gateway to the ID of the  transit gateway. |
| Virtual private gateway with static routes | Virtual private gateway with static routes | Update the route that contains the ID of the virtual private gateway to the ID |

| Existing gateway | New gateway | VPC route table change |
|---|---|---|
| | | of the new virtual private gateway. |
| Virtual private gateway with static routes | Virtual private gateway with propagated routes | Delete the route that contains the ID of the virtual private gateway. |
| Transit gateway | Virtual private gateway with static routes | Update the route that contains the ID of the transit gateway to the ID of the virtual private gateway. |
| Transit gateway | Virtual private gateway with propagated routes | Delete the route that contains the ID of the transit gateway. |
| Transit gateway | Transit gateway | Update the route that contains the ID of the transit gateway to the ID of the new transit gateway. |

## Step 5: Update the target gateway routing (conditional)

When the new gateway is a transit gateway, modify the transit gateway route table to allow traffic between the VPC and the Site-to-Site VPN. For more information, see Transit gateway route tables in *Amazon VPC Transit Gateways*.

If you deleted VPN static routes, you must add the static routes to the transit gateway route table.

Unlike a virtual private gateway, a transit gateway sets the same value for the multi-exit discriminator (MED) across all the tunnels on a VPN attachment. If you are migrating from a virtual private gateway to a transit gateway and relied on the MED value for tunnel selection, we recommend that you make routing changes to avoid connection issues. For example, you can advertise more specific routes on your transit gateway. For more information, see Route tables and AWS Site-to-Site VPN route priority.

## Step 6: Update the customer gateway ASN (conditional)

When the new gateway has a different ASN from the old gateway, you must update the ASN on your customer gateway device to point to the new ASN. See Customer gateway options for your AWS Site-to-Site VPN connection for more information.

# Modify AWS Site-to-Site VPN connection options

You can modify the connection options for your Site-to-Site VPN connection. You can modify the following options:

- The IPv4 CIDR ranges on the local (customer gateway) side and the remote (AWS) side of the VPN connection that can communicate over the VPN tunnels. The default is `0.0.0.0/0` for both ranges.
- The IPv6 CIDR ranges on the local (customer gateway) and the remote (AWS) side of the VPN connection that can communicate over the VPN tunnels. The default is `::/0` for both ranges.

When you modify the VPN connection options, the VPN endpoint IP addresses on the AWS side do not change, and the tunnel options do not change. Your VPN connection will be temporarily unavailable for a brief period while the VPN connection is updated.

**To modify the VPN connection options using the console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Select your VPN connection, and choose **Actions**, **Modify VPN connection options**.
4. Enter new CIDR ranges as needed.
5. Choose **Save changes**.

**To modify the VPN connection options using the command line or API**

- modify-vpn-connection-options (AWS CLI)
- ModifyVpnConnectionOptions (Amazon EC2 Query API)

# Modify AWS Site-to-Site VPN tunnel options

You can modify the tunnel options for the VPN tunnels in your Site-to-Site VPN connection. You can modify one VPN tunnel at a time.

> ⚠ **Important**
>
> When you modify a VPN tunnel, connectivity over the tunnel is interrupted for up to several minutes. Ensure that you plan for the expected downtime.

**To modify the VPN tunnel options using the console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Select the Site-to-Site VPN connection, and choose **Actions**, **Modify VPN tunnel options**.
4. For **VPN tunnel outside IP address**, choose the tunnel endpoint IP of the VPN tunnel.
5. Choose or enter new values for the tunnel options as needed. For more information about the tunnel options, see VPN tunnel options.

   > ⓘ **Note**
   >
   > Some tunnel options have multiple default values. Click to remove any default value. That default value is then removed from the tunnel option.

6. Choose **Save changes**.

**To modify the VPN tunnel options using the command line or API**

- (AWS CLI) Use describe-vpn-connections to view the current tunnel options, and modify-vpn-tunnel-options to modify the tunnel options.
- (Amazon EC2 Query API) Use DescribeVpnConnections to view the current tunnel options, and ModifyVpnTunnelOptions to modify the tunnel options.

# Edit static routes for an AWS Site-to-Site VPN connection

For a Site-to-Site VPN connection on a virtual private gateway that's configured for static routing, you can add or remove static routes from your VPN configuration.

**To add or remove a static route using the console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Select the VPN connection.
4. Choose **Edit static routes**.
5. Add or remove routes as needed.
6. Choose **Save changes**.
7. If you have not enabled route propagation for your route table, you must manually update the routes in your route table to reflect the updated static IP prefixes in your VPN connection. For more information, see (Virtual private gateway) Enable route propagation in your route table.
8. For a VPN connection on a transit gateway, you add, modify, or remove the static routes in the transit gateway route table. For more information, see Transit gateway route tables in *Amazon VPC Transit Gateways*.

**To add a static route using the command line or API**

- CreateVpnConnectionRoute (Amazon EC2 Query API)
- create-vpn-connection-route (AWS CLI)
- New-EC2VpnConnectionRoute (AWS Tools for Windows PowerShell)

**To delete a static route using the command line or API**

- DeleteVpnConnectionRoute (Amazon EC2 Query API)
- delete-vpn-connection-route (AWS CLI)
- Remove-EC2VpnConnectionRoute (AWS Tools for Windows PowerShell)

# Change the customer gateway for an AWS Site-to-Site VPN connection

You can change the customer gateway of your Site-to-Site VPN connection by using the Amazon VPC console or a command line tool.

After you change the customer gateway, your VPN connection will be temporarily unavailable for a brief period while we provision the new endpoints.

**To change the customer gateway using the console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Select the VPN connection.
4. Choose **Actions**, **Modify VPN connection**.
5. For **Target type**, choose **Customer gateway**.
6. For **Target customer gateway**, choose the new customer gateway.
7. Choose **Save changes**.

**To change the customer gateway using the command line or API**

- ModifyVpnConnection (Amazon EC2 Query API)
- modify-vpn-connection (AWS CLI)

# Replace compromised credentials for an AWS Site-to-Site VPN connection

If you believe that the tunnel credentials for your Site-to-Site VPN connection have been compromised, you can change the IKE pre-shared key or change the ACM certificate. The method you use depends on the authentication option you used for your VPN tunnels. For more information, see AWS Site-to-Site VPN tunnel authentication options.

**To change the IKE pre-shared key**

You can modify the tunnel options for the VPN connection and specify a new IKE pre-shared key for each tunnel. For more information, see Modify AWS Site-to-Site VPN tunnel options.

Alternatively, you can delete the VPN connection. For more information, see Delete a VPN connection and gateway. You don't need to delete the VPC or the virtual private gateway. Then, create a new VPN connection using the same virtual private gateway, and configure the new keys on your customer gateway device. You can specify your own pre-shared keys for the tunnels or let AWS generate new pre-shared keys for you. For more information, see Create a VPN connection. The tunnel's inside and outside addresses might change when you recreate the VPN connection.

**To change the certificate for the AWS side of the tunnel endpoint**

Rotate the certificate. For more information, see Rotate VPN tunnel endpoint certificates.

**To change the certificate on the customer gateway device**

1. Create a new certificate. For information, see Issuing and managing certificates in the *AWS Certificate Manager User Guide*.
2. Add the certificate to the customer gateway device.

## Rotate AWS Site-to-Site VPN tunnel endpoint certificates

You can rotate the certificates on the tunnel endpoints on the AWS side by using the Amazon VPC console. When a tunnel endpoint's certificate is close to expiration, AWS automatically rotates the certificate using the service-linked role. For more information, see the section called "Service-linked roles".

**To rotate the Site-to-Site VPN tunnel endpoint certificate using the console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Select the Site-to-Site VPN connection, and then choose **Actions**, **Modify VPN tunnel certificate**.
4. Select the tunnel endpoint.
5. Choose **Save**.

**To rotate the Site-to-Site VPN tunnel endpoint certificate using the AWS CLI**

Use the modify-vpn-tunnel-certificate command.

# Private IP AWS Site-to-Site VPN with Direct Connect

With private IP VPN, you can deploy IPsec VPN over Direct Connect, encrypting traffic between your on-premises network and AWS, without the use of public IP addresses or additional third-party VPN equipment.

One of the main use cases for private IP VPN over Direct Connect is helping customers in the financial, healthcare, and federal industries meet regulatory and compliance goals. Private IP VPN over Direct Connect ensures that traffic between AWS and on-premises networks is both secure and private, allowing customers to comply with their regulatory and security mandates.

## Benefits of private IP VPN

- **Simplified network management and operations:** Without private IP VPN, customers have to deploy third-party VPN and routers to implement private VPNs over Direct Connect networks. With private IP VPN capability, customers don’t have to deploy and manage their own VPN infrastructure. This leads to simplified network operations and reduced costs.
- **Improved security posture:** Previously, customers had to use a public Direct Connect virtual interface (VIF) for encrypting traffic over Direct Connect, which requires public IP addresses for VPN endpoints. Using public IPs increases the probability of external (DOS) attacks, which in turn compels customers to deploy additional security gear for network protection. Also, a public VIF opens access between all AWS public services and customer on-premises networks, increasing the severity of the risk. The private IP VPN feature allows encryption over Direct Connect transit VIFs (instead of public VIFs), coupled with the ability to configure private IPs. This provides end-to-end private connectivity in addition to encryption, improving the overall security posture.
- **Higher route scale:** Private IP VPN connections offer higher route limits (5000 outbound routes and 1000 inbound routes) as compared to Direct Connect alone, which currently has a limit of 200 outbound and 100 inbound routes.

## How private IP VPN works

Private IP Site-to-Site VPN works over an Direct Connect transit virtual interface (VIF). It uses an Direct Connect gateway and a transit gateway to interconnect your on-premises networks with AWS VPCs. A private IP VPN connection has termination points at the transit gateway on the AWS side, and at your customer gateway device on the on-premises side. You must assign private IP addresses to both the transit gateway and the customer gateway device ends of the IPsec tunnels. You can use private IP addresses from either RFC1918 or RFC6598 private IPv4 address ranges.

You attach a private IP VPN connection to a transit gateway. You then route traffic between the VPN attachment and any VPCs (or other networks) that are also attached to the transit gateway. You do that by associating a route table with the VPN attachment. In the reverse direction, you can route traffic from your VPCs to the private IP VPN attachment by using route tables that are associated with the VPCs.

The route table that's associated with the VPN attachment can be the same or different from the one associated with the underlying Direct Connect attachment. This gives you the ability to route both encrypted and unencrypted traffic simultaneously between your VPCs and your on-premises networks.

For more details on the traffic path leaving the VPN, see Private virtual interface and transit virtual interface routing policies in the *Direct Connect User Guide*.

## Prerequisites

The following table describes the perquisites before creating a private IP VPN over Direct Connect.

| Item | Steps | Information |
|---|---|---|
| Prepare the transit gateway for Site-to-Site VPN. | Create the transit gateway by using the Amazon Virtual Private Cloud (VPC) console or using the command-line or API.<br>See Transit gateways in the *Amazon VPC Transit Gateways Guide*. | A transit gateway is a network transit hub that you can use to interconnect your VPCs and on-premises networks. You can create a new transit gateway or use an existing one for the private IP VPN connection. When you create the transit gateway, or modify an existing transit gateway, you specify a private IP CIDR block for the connection.<br>**Note**<br>When specifying the transit gateway CIDR block to be associate |

| Item | Steps | Information |
|---|---|---|
| | | d with your Private IP VPN, ensure the CIDR block does not overlap with any IP addresses for any other network attachments on the transit gateway. If any IP CIDR blocks do overlap, it may cause configuration issues with your customer gateway device. |
| Create the Direct Connect gateway for Site-to-Site VPN. | Create the Direct Connect gateway by using the Direct Connect console or by using the command-line or API.<br>See Create an AWS Direct Connect gateway in the *Direct Connect User Guide*. | A Direct Connect gateway allows you to connect virtual interfaces (VIFs) across multiple AWS Regions. This gateway is used to connect to your VIF. |
| Create the transit gateway association for Site-to-Site VPN. | Create the association between the Direct Connect gateway and the transit gateway by using the Direct Connect console or using the command-line or API.<br>See Associate or disassociate Direct Connect with a transit gateway in the *Direct Connect User Guide*. | After creating the Direct Connect gateway, create a transit gateway associati on for the Direct Connect gateway. Specify the private IP CIDR for the transit gateway that was identified earlier in the allowed prefixes list. |

**Tasks**

- Create a private IP AWS Site-to-Site VPN over Direct Connect

## Create a private IP AWS Site-to-Site VPN over Direct Connect

To create a private IP VPN with Direct Connect follow these steps. Before you create the private IP VPN over Direct Connect, you need to ensure that a transit gateway and Direct Connect gateway are first created. After creating the two gateways you then need to create an assocation between the two. These prerequisites are described in the following table. Once you've created and associated the two gateways, you'll create a VPN customer cateway and connection using that association.

### Prerequisites

The following table describes the perquisites before creating a private IP VPN over Direct Connect.

| Item | Steps | Information |
|---|---|---|
| Prepare the transit gateway for Site-to-Site VPN. | Create the transit gateway by using the Amazon Virtual Private Cloud (VPC) console or using the command-line or API.<br>See Transit gateways in the *Amazon VPC Transit Gateways Guide*. | A transit gateway is a network transit hub that you can use to interconnect your VPCs and on-premises networks. You can create a new transit gateway or use an existing one for the private IP VPN connection. When you create the transit gateway, or modify an existing transit gateway, you specify a private IP CIDR block for the connection.<br>**Note**<br>When specifying the transit gateway CIDR block to be associate d with your Private |

| Item | Steps | Information |
|---|---|---|
| | | IP VPN, ensure the CIDR block does not overlap with any IP addresses for any other network attachments on the transit gateway. If any IP CIDR blocks do overlap, it may cause configuration issues with your customer gateway device. |
| Create the Direct Connect gateway for Site-to-Site VPN. | Create the Direct Connect gateway by using the Direct Connect console or by using the command-line or API.<br>See Create an AWS Direct Connect gateway in the *Direct Connect User Guide*. | A Direct Connect gateway allows you to connect virtual interfaces (VIFs) across multiple AWS Regions. This gateway is used to connect to your VIF. |
| Create the transit gateway association for Site-to-Site VPN. | Create the association between the Direct Connect gateway and the transit gateway by using the Direct Connect console or using the command-line or API.<br>See Associate or disassociate Direct Connect with a transit gateway in the *Direct Connect User Guide*. | After creating the Direct Connect gateway, create a transit gateway associati on for the Direct Connect gateway. Specify the private IP CIDR for the transit gateway that was identified earlier in the allowed prefixes list. |

## Create the customer gateway and connection for Site-to-Site VPN

A customer gateway is a resource that you create in AWS. It represents the customer gateway device in your on-premises network. When you create a customer gateway, you provide information about your device to AWS. For more details, see Customer gateway.

**To create a customer gateway using the console**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Customer gateways**.
3. Choose **Create customer gateway**.
4. (Optional) For **Name tag**, enter a name for your customer gateway. Doing so creates a tag with a key of `Name` and the value that you specify.
5. For **BGP ASN**, enter a Border Gateway Protocol (BGP) Autonomous System Number (ASN) for your customer gateway.
6. For **IP address**, enter the private IP address for your customer gateway device.

   > ⚠ **Important**
   >
   > When configuring AWS Private IP AWS Site-to-Site VPN, you must specify your own tunnel endpoint IP addresses using RFC 1918 addresses. Do not use the point-to-point IP addresses for the eBGP peering between your customer gateway router and the Direct Connect endpoint. AWS recommends using a loopback or LAN interface on your customer gateway router as the source or destination address instead of point-to-point connections.
   > For more information about RFC 1918, see Address Allocation for Private Internets.

7. (Optional) For **Device**, enter a name for the device that hosts this customer gateway.
8. Choose **Create customer gateway**.
9. In the navigation pane, choose **Site-to-Site VPN connections**.
10. Choose **Create VPN connection**.
11. (Optional) For **Name tag**, enter a name for your Site-to-Site VPN connection. Doing so creates a tag with a key of `Name` and the value that you specify.
12. For **Target gateway type**, choose **Transit gateway**. Then, choose the transit gateway that you identified earlier.

13. For **Customer gateway**, select **Existing**. Then, choose the customer gateway that you created earlier.
14. Select one of the routing options based on whether your customer gateway device supports Border Gateway Protocol (BGP):

    - If your customer gateway device supports BGP, choose **Dynamic (requires BGP)**.
    - If your customer gateway device does not support BGP, choose **Static**.
15. For **Tunnel inside IP version**, specify whether the VPN tunnels support IPv4 or IPv6 traffic.
16. (Optional) If you specified **IPv4** for **Tunnel inside IP Version**, you can optionally specify the IPv4 CIDR ranges for the customer gateway and AWS sides that are allowed to communicate over the VPN tunnels. The default is `0.0.0.0/0`.

    If you specified **IPv6** for **Tunnel inside IP version**, you can optionally specify the IPv6 CIDR ranges for the customer gateway and AWS sides that are allowed to communicate over the VPN tunnels. The default for both ranges is `::/0`.
17. For **Outside IP address type**, choose **PrivateIpv4**.
18. For **Transport attachment ID**, choose the transit gateway attachment for the appropriate Direct Connect gateway.
19. Choose **Create VPN connection**.

> **Note**
>
> The **Enable acceleration** option is not applicable for VPN connections over Direct Connect.

**To create a customer gateway using the command line or API**

- CreateCustomerGateway (Amazon EC2 Query API)
- create-customer-gateway (AWS CLI)

# Security in AWS Site-to-Site VPN

Cloud security at AWS is the highest priority. As an AWS customer, you benefit from data centers and network architectures that are built to meet the requirements of the most security-sensitive organizations.

Security is a shared responsibility between AWS and you. The describes this as security *of* the cloud and security *in* the cloud:

- **Security of the cloud** — AWS is responsible for protecting the infrastructure that runs AWS services in the AWS Cloud. AWS also provides you with services that you can use securely. Third-party auditors regularly test and verify the effectiveness of our security as part of the .
- **Security in the cloud** — Your responsibility is determined by the AWS service that you use. You are also responsible for other factors including the sensitivity of your data, your company's requirements, and applicable laws and regulations.

This documentation helps you understand how to apply the shared responsibility model when using Site-to-Site VPN. The following topics show you how to configure Site-to-Site VPN to meet your security and compliance objectives. You also learn how to use other AWS services that help you to monitor and secure your Site-to-Site VPN resources.

**Contents**

## Enhanced AWS Site-to-Site VPN security features using Secrets Manager

AWS Site-to-Site VPN's Security Rebase feature provides enhanced security capabilities that gives you greater control and visibility over your VPN connections. A key improvement is the ability to store pre-shared keys (PSKs) in AWS Secrets Manager rather than directly in the Site-to-Site

VPN service, allowing for better secret management and compliance with security best practices. The feature also includes a `GetActiveVpnTunnelStatus` API that provides real-time visibility into the security parameters being used in active VPN tunnels, including encryption algorithms, integrity algorithms, and Diffie-Hellman groups for both IKE phases. Additionally, you can now generate recommended security configurations that enforce the use of modern protocols by excluding legacy options such as IKEv1. These enhancements are particularly valuable if your organization needs to maintain strict security standards, require detailed audit trails of your VPN configurations, or want to ensure your VPN connections are using the most secure protocols available.

**Contents**

## Change the Secrets Manager pre-shared key in AWS Site-to-Site VPN

If your tunnel is inaccessible in Secrets Manager, you can change the pre-shared key for that tunnel.

> **Note**
>
> - When changing the pre-shared key, ensure you have the necessary IAM permissions for both the Secrets Manager service.
> - After changing the pre-shared key for a VPN tunnel, connectivity is interrupted for up to several minutes. Ensure that you plan for expected downtime.

**To change the Secrets Manager pre-shared key for a VPN tunnel**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Select the Site-to-Site VPN connection, and choose **Actions**, **Modify VPN tunnel options**.
4. For **VPN tunnel outside IP address**, choose the tunnel endpoint IP of the VPN tunnel.
5. In the **New pre-shared key**, choose a new pre-shared key.

> **Note**
>
> This option is only available for keys stored in Secrets Manager.

6. Choose **Save changes**.
7. Repeat these steps for any other tunnel.

## Change the pre-shared key storage mode in AWS Site-to-Site VPN

Change the pre-shared key storage mode for an existing VPN tunnel.

> **Note**
>
> - When changing storage modes, ensure you have the necessary IAM permissions for both the Site-to-Site VPN and Secrets Manager services.
> - After changing the storage mode for a VPN tunnel, connectivity is interrupted for up to several minutes. Ensure that you plan for expected downtime.

**To change the pre-shared key storage mode**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Select the Site-to-Site VPN connection, and choose **Actions**, **Modify VPN tunnel options**.
4. For **VPN tunnel outside IP address**, choose the tunnel endpoint IP of the VPN tunnel.
5. Under **Pre-shared key storage**, choose one of the following pre-shared key storage types.

   - **Standard** — The pre-shared key is stored directly in the Site-to-Site VPN service.
   - **Secrets Manager** — The pre-shared key is stored using AWS Secrets Manager. For more information about Secrets Manager, see Enhanced security features using Secrets Manager.
6. Choose **Save changes**.

When changing the storage mode from Secrets Manager to Standard:

- The pre-shared key is removed from Secrets Manager and moved to the Site-to-Site VPN service.

- The tunnel's entry is removed from the Secrets Manager secret.

When changing the storage mode from Standard to Secrets Manager:

- The pre-shared key is removed from the Site-to-Site VPN service
- A new Secrets Manager secret is created, if one doesn't already exist.
- The new pre-shared key is stored in Secrets Manager.

# Data protection in AWS Site-to-Site VPN

The AWS applies to data protection in AWS Site-to-Site VPN. As described in this model, AWS is responsible for protecting the global infrastructure that runs all of the AWS Cloud. You are responsible for maintaining control over your content that is hosted on this infrastructure. You are also responsible for the security configuration and management tasks for the AWS services that you use. For more information about data privacy, see the Data Privacy FAQ.

For data protection purposes, we recommend that you protect AWS account credentials and set up individual users with AWS IAM Identity Center or AWS Identity and Access Management (IAM). That way, each user is given only the permissions necessary to fulfill their job duties. We also recommend that you secure your data in the following ways:

- Use multi-factor authentication (MFA) with each account.
- Use SSL/TLS to communicate with AWS resources. We require TLS 1.2 and recommend TLS 1.3.
- Set up API and user activity logging with AWS CloudTrail. For information about using CloudTrail trails to capture AWS activities, see Working with CloudTrail trails in the *AWS CloudTrail User Guide*.
- Use AWS encryption solutions, along with all default security controls within AWS services.
- Use advanced managed security services such as Amazon Macie, which assists in discovering and securing sensitive data that is stored in Amazon S3.
- If you require FIPS 140-3 validated cryptographic modules when accessing AWS through a command line interface or an API, use a FIPS endpoint. For more information about the available FIPS endpoints, see Federal Information Processing Standard (FIPS) 140-3.

We strongly recommend that you never put confidential or sensitive information, such as your customers' email addresses, into tags or free-form text fields such as a **Name** field. This includes when you work with Site-to-Site VPN or other AWS services using the console, API, AWS CLI, or AWS SDKs. Any data that you enter into tags or free-form text fields used for names may be used for billing or diagnostic logs. If you provide a URL to an external server, we strongly recommend that you do not include credentials information in the URL to validate your request to that server.

## Internetwork traffic privacy

A Site-to-Site VPN connection privately connects your VPC to your on-premises network. Data that's transferred between your VPC and your network routes over an encrypted VPN connection to help maintain the confidentiality and integrity of the data in transit. Amazon supports Internet Protocol security (IPsec) VPN connections. IPsec is a protocol suite for securing IP communications by authenticating and encrypting each IP packet in a data stream.

Each Site-to-Site VPN connection consists of two encrypted IPsec VPN tunnels that link AWS and your network. Traffic in each tunnel can be encrypted with AES128 or AES256 and use Diffie-Hellman groups for key exchange, providing Perfect Forward Secrecy. AWS authenticates with SHA1 or SHA2 hashing functions.

Instances in your VPC do not require a public IP address to connect to resources on the other side of your Site-to-Site VPN connection. Instances can route their internet traffic through the Site-to-Site VPN connection to your on-premises network. They can then access the internet through your existing outbound traffic points and your network security and monitoring devices.

See the following topics for more information:

- Tunnel options for your AWS Site-to-Site VPN connection: Provides information about the IPsec and Internet Key Exchange (IKE) options that are available for each tunnel.
- AWS Site-to-Site VPN tunnel authentication options: Provides information about the authentication options for your VPN tunnel endpoints.
- Requirements for an AWS Site-to-Site VPN customer gateway device: Provides information about the requirements for the customer gateway device on your side of the VPN connection.
- Secure communication between AWS Site-to-Site VPN connections using VPN CloudHub: If you have multiple Site-to-Site VPN connections, you can provide secure communication between your on-premises sites by using the AWS VPN CloudHub.

# Identity and access management for AWS Site-to-Site VPN

AWS Identity and Access Management (IAM) is an AWS service that helps an administrator securely control access to AWS resources. IAM administrators control who can be *authenticated* (signed in) and *authorized* (have permissions) to use Site-to-Site VPN resources. IAM is an AWS service that you can use with no additional charge.

**Topics**

## Audience

How you use AWS Identity and Access Management (IAM) differs based on your role:

- **Service user** - request permissions from your administrator if you cannot access features (see Troubleshooting AWS Site-to-Site VPN identity and access)
- **Service administrator** - determine user access and submit permission requests (see How AWS Site-to-Site VPN works with IAM)
- **IAM administrator** - write policies to manage access (see Identity-based policy examples for AWS Site-to-Site VPN)

## Authenticating with identities

Authentication is how you sign in to AWS using your identity credentials. You must be authenticated as the AWS account root user, an IAM user, or by assuming an IAM role.

You can sign in as a federated identity using credentials from an identity source like AWS IAM Identity Center (IAM Identity Center), single sign-on authentication, or Google/Facebook credentials. For more information about signing in, see How to sign in to your AWS account in the *AWS Sign-In User Guide*.

For programmatic access, AWS provides an SDK and CLI to cryptographically sign requests. For more information, see AWS Signature Version 4 for API requests in the *IAM User Guide*.

## AWS account root user

When you create an AWS account, you begin with one sign-in identity called the AWS account *root user* that has complete access to all AWS services and resources. We strongly recommend that you don't use the root user for everyday tasks. For tasks that require root user credentials, see Tasks that require root user credentials in the *IAM User Guide*.

## Federated identity

As a best practice, require human users to use federation with an identity provider to access AWS services using temporary credentials.

A *federated identity* is a user from your enterprise directory, web identity provider, or Directory Service that accesses AWS services using credentials from an identity source. Federated identities assume roles that provide temporary credentials.

For centralized access management, we recommend AWS IAM Identity Center. For more information, see What is IAM Identity Center? in the *AWS IAM Identity Center User Guide*.

## IAM users and groups

An *IAM user* is an identity with specific permissions for a single person or application. We recommend using temporary credentials instead of IAM users with long-term credentials. For more information, see Require human users to use federation with an identity provider to access AWS using temporary credentials in the *IAM User Guide*.

An *IAM group* specifies a collection of IAM users and makes permissions easier to manage for large sets of users. For more information, see Use cases for IAM users in the *IAM User Guide*.

## IAM roles

An *IAM role* is an identity with specific permissions that provides temporary credentials. You can assume a role by switching from a user to an IAM role (console) or by calling an AWS CLI or AWS API operation. For more information, see Methods to assume a role in the *IAM User Guide*.

IAM roles are useful for federated user access, temporary IAM user permissions, cross-account access, cross-service access, and applications running on Amazon EC2. For more information, see Cross account resource access in IAM in the *IAM User Guide*.

# Managing access using policies

You control access in AWS by creating policies and attaching them to AWS identities or resources. A policy defines permissions when associated with an identity or resource. AWS evaluates these policies when a principal makes a request. Most policies are stored in AWS as JSON documents. For more information about JSON policy documents, see Overview of JSON policies in the *IAM User Guide*.

Using policies, administrators specify who has access to what by defining which **principal** can perform **actions** on what **resources**, and under what **conditions**.

By default, users and roles have no permissions. An IAM administrator creates IAM policies and adds them to roles, which users can then assume. IAM policies define permissions regardless of the method used to perform the operation.

## Identity-based policies

Identity-based policies are JSON permissions policy documents that you attach to an identity (user, group, or role). These policies control what actions identities can perform, on which resources, and under what conditions. To learn how to create an identity-based policy, see Define custom IAM permissions with customer managed policies in the *IAM User Guide*.

Identity-based policies can be *inline policies* (embedded directly into a single identity) or *managed policies* (standalone policies attached to multiple identities). To learn how to choose between managed and inline policies, see Choose between managed policies and inline policies in the *IAM User Guide*.

## Resource-based policies

Resource-based policies are JSON policy documents that you attach to a resource. Examples include IAM *role trust policies* and Amazon S3 *bucket policies*. In services that support resource-based policies, service administrators can use them to control access to a specific resource. You must specify a principal in a resource-based policy.

Resource-based policies are inline policies that are located in that service. You can't use AWS managed policies from IAM in a resource-based policy.

## Other policy types

AWS supports additional policy types that can set the maximum permissions granted by more common policy types:

- **Permissions boundaries** – Set the maximum permissions that an identity-based policy can grant to an IAM entity. For more information, see Permissions boundaries for IAM entities in the *IAM User Guide*.
- **Service control policies (SCPs)** – Specify the maximum permissions for an organization or organizational unit in AWS Organizations. For more information, see Service control policies in the *AWS Organizations User Guide*.
- **Resource control policies (RCPs)** – Set the maximum available permissions for resources in your accounts. For more information, see Resource control policies (RCPs) in the *AWS Organizations User Guide*.
- **Session policies** – Advanced policies passed as a parameter when creating a temporary session for a role or federated user. For more information, see Session policies in the *IAM User Guide*.

### Multiple policy types

When multiple types of policies apply to a request, the resulting permissions are more complicated to understand. To learn how AWS determines whether to allow a request when multiple policy types are involved, see Policy evaluation logic in the *IAM User Guide*.

## How AWS Site-to-Site VPN works with IAM

Before you use IAM to manage access to Site-to-Site VPN, learn what IAM features are available to use with Site-to-Site VPN.

### IAM features you can use with AWS Site-to-Site VPN

| IAM feature | Site-to-Site VPN support |
|---|---|
| Identity-based policies | Yes |
| Resource-based policies | No |
| Policy actions | Yes |
| Policy resources | Yes |
| Policy condition keys (service-specific) | Yes |
| ACLs | No |

| IAM feature | Site-to-Site VPN support |
|---|---|
| ABAC (tags in policies) | No |
| Temporary credentials | Yes |
| Principal permissions | Yes |
| Service roles | Yes |
| Service-linked roles | Yes |

To get a high-level view of how Site-to-Site VPN and other AWS services work with most IAM features, see AWS services that work with IAM in the *IAM User Guide*.

## Identity-based policies for Site-to-Site VPN

**Supports identity-based policies:** Yes

Identity-based policies are JSON permissions policy documents that you can attach to an identity, such as an IAM user, group of users, or role. These policies control what actions users and roles can perform, on which resources, and under what conditions. To learn how to create an identity-based policy, see Define custom IAM permissions with customer managed policies in the *IAM User Guide*.

With IAM identity-based policies, you can specify allowed or denied actions and resources as well as the conditions under which actions are allowed or denied. To learn about all of the elements that you can use in a JSON policy, see IAM JSON policy elements reference in the *IAM User Guide*.

### Identity-based policy examples for Site-to-Site VPN

To view examples of Site-to-Site VPN identity-based policies, see Identity-based policy examples for AWS Site-to-Site VPN.

## Resource-based policies within Site-to-Site VPN

**Supports resource-based policies:** No

Resource-based policies are JSON policy documents that you attach to a resource. Examples of resource-based policies are IAM *role trust policies* and Amazon S3 *bucket policies*. In services that support resource-based policies, service administrators can use them to control access to a specific resource. For the resource where the policy is attached, the policy defines what actions a specified principal can perform on that resource and under what conditions. You must specify a principal in a resource-based policy. Principals can include accounts, users, roles, federated users, or AWS services.

To enable cross-account access, you can specify an entire account or IAM entities in another account as the principal in a resource-based policy. For more information, see Cross account resource access in IAM in the *IAM User Guide*.

## Policy actions for Site-to-Site VPN

**Supports policy actions:** Yes

Administrators can use AWS JSON policies to specify who has access to what. That is, which **principal** can perform **actions** on what **resources**, and under what **conditions**.

The `Action` element of a JSON policy describes the actions that you can use to allow or deny access in a policy. Include actions in a policy to grant permissions to perform the associated operation.

To see a list of Site-to-Site VPN actions, see Actions defined by AWS Site-to-Site VPN in the *Service Authorization Reference*.

Policy actions in Site-to-Site VPN use the following prefix before the action:

```
ec2
```

To specify multiple actions in a single statement, separate them with commas.

```
"Action": [
      "ec2:action1",
      "ec2:action2"
         ]
```

To view examples of Site-to-Site VPN identity-based policies, see Identity-based policy examples for AWS Site-to-Site VPN.

## Policy resources for Site-to-Site VPN

**Supports policy resources:** Yes

Administrators can use AWS JSON policies to specify who has access to what. That is, which **principal** can perform **actions** on what **resources**, and under what **conditions**.

The `Resource` JSON policy element specifies the object or objects to which the action applies. As a best practice, specify a resource using its Amazon Resource Name (ARN). For actions that don't support resource-level permissions, use a wildcard (*) to indicate that the statement applies to all resources.

```
"Resource": "*"
```

To see a list of Site-to-Site VPN resource types and their ARNs, see Resources defined by AWS Site-to-Site VPN in the *Service Authorization Reference*. To learn with which actions you can specify the ARN of each resource, see Actions defined by AWS Site-to-Site VPN.

To view examples of Site-to-Site VPN identity-based policies, see Identity-based policy examples for AWS Site-to-Site VPN.

## Policy condition keys for Site-to-Site VPN

**Supports service-specific policy condition keys:** Yes

Administrators can use AWS JSON policies to specify who has access to what. That is, which **principal** can perform **actions** on what **resources**, and under what **conditions**.

The `Condition` element specifies when statements execute based on defined criteria. You can create conditional expressions that use condition operators, such as equals or less than, to match the condition in the policy with values in the request. To see all AWS global condition keys, see AWS global condition context keys in the *IAM User Guide*.

To see a list of Site-to-Site VPN condition keys, see Condition keys for AWS Site-to-Site VPN in the *Service Authorization Reference*. To learn with which actions and resources you can use a condition key, see Actions defined by AWS Site-to-Site VPN.

To view examples of Site-to-Site VPN identity-based policies, see Identity-based policy examples for AWS Site-to-Site VPN.

## ACLs in Site-to-Site VPN

**Supports ACLs:** No

Access control lists (ACLs) control which principals (account members, users, or roles) have permissions to access a resource. ACLs are similar to resource-based policies, although they do not use the JSON policy document format.

## ABAC with Site-to-Site VPN

**Supports ABAC (tags in policies):** No

Attribute-based access control (ABAC) is an authorization strategy that defines permissions based on attributes called tags. You can attach tags to IAM entities and AWS resources, then design ABAC policies to allow operations when the principal's tag matches the tag on the resource.

To control access based on tags, you provide tag information in the condition element of a policy using the `aws:ResourceTag/key-name`, `aws:RequestTag/key-name`, or `aws:TagKeys` condition keys.

If a service supports all three condition keys for every resource type, then the value is **Yes** for the service. If a service supports all three condition keys for only some resource types, then the value is **Partial**.

For more information about ABAC, see Define permissions with ABAC authorization in the *IAM User Guide*. To view a tutorial with steps for setting up ABAC, see Use attribute-based access control (ABAC) in the *IAM User Guide*.

## Using temporary credentials with Site-to-Site VPN

**Supports temporary credentials:** Yes

Temporary credentials provide short-term access to AWS resources and are automatically created when you use federation or switch roles. AWS recommends that you dynamically generate temporary credentials instead of using long-term access keys. For more information, see Temporary security credentials in IAM and AWS services that work with IAM in the *IAM User Guide*.

## Cross-service principal permissions for Site-to-Site VPN

**Supports forward access sessions (FAS):** Yes

Forward access sessions (FAS) use the permissions of the principal calling an AWS service, combined with the requesting AWS service to make requests to downstream services. For policy details when making FAS requests, see Forward access sessions.

### Service roles for Site-to-Site VPN

**Supports service roles:** Yes

A service role is an IAM role that a service assumes to perform actions on your behalf. An IAM administrator can create, modify, and delete a service role from within IAM. For more information, see Create a role to delegate permissions to an AWS service in the *IAM User Guide*.

> ⚠ **Warning**
>
> Changing the permissions for a service role might break Site-to-Site VPN functionality. Edit service roles only when Site-to-Site VPN provides guidance to do so.

### Service-linked roles for Site-to-Site VPN

**Supports service-linked roles:** Yes

A service-linked role is a type of service role that is linked to an AWS service. The service can assume the role to perform an action on your behalf. Service-linked roles appear in your AWS account and are owned by the service. An IAM administrator can view, but not edit the permissions for service-linked roles.

For details about creating or managing service-linked roles, see AWS services that work with IAM. Find a service in the table that includes a `Yes` in the **Service-linked role** column. Choose the **Yes** link to view the service-linked role documentation for that service.

## Identity-based policy examples for AWS Site-to-Site VPN

By default, users and roles don't have permission to create or modify Site-to-Site VPN resources. To grant users permission to perform actions on the resources that they need, an IAM administrator can create IAM policies.

To learn how to create an IAM identity-based policy by using these example JSON policy documents, see Create IAM policies (console) in the *IAM User Guide*.

For details about actions and resource types defined by Site-to-Site VPN, including the format of the ARNs for each of the resource types, see Actions, resources, and condition keys for AWS Site-to-Site VPN in the *Service Authorization Reference*.

**Topics**

## Policy best practices

Identity-based policies determine whether someone can create, access, or delete Site-to-Site VPN resources in your account. These actions can incur costs for your AWS account. When you create or edit identity-based policies, follow these guidelines and recommendations:

- **Get started with AWS managed policies and move toward least-privilege permissions** – To get started granting permissions to your users and workloads, use the *AWS managed policies* that grant permissions for many common use cases. They are available in your AWS account. We recommend that you reduce permissions further by defining AWS customer managed policies that are specific to your use cases. For more information, see AWS managed policies or AWS managed policies for job functions in the *IAM User Guide*.
- **Apply least-privilege permissions** – When you set permissions with IAM policies, grant only the permissions required to perform a task. You do this by defining the actions that can be taken on specific resources under specific conditions, also known as *least-privilege permissions*. For more information about using IAM to apply permissions, see Policies and permissions in IAM in the *IAM User Guide*.
- **Use conditions in IAM policies to further restrict access** – You can add a condition to your policies to limit access to actions and resources. For example, you can write a policy condition to specify that all requests must be sent using SSL. You can also use conditions to grant access to service actions if they are used through a specific AWS service, such as CloudFormation. For more information, see IAM JSON policy elements: Condition in the *IAM User Guide*.
- **Use IAM Access Analyzer to validate your IAM policies to ensure secure and functional permissions** – IAM Access Analyzer validates new and existing policies so that the policies adhere to the IAM policy language (JSON) and IAM best practices. IAM Access Analyzer provides more than 100 policy checks and actionable recommendations to help you author secure and

functional policies. For more information, see Validate policies with IAM Access Analyzer in the *IAM User Guide*.

- **Require multi-factor authentication (MFA)** – If you have a scenario that requires IAM users or a root user in your AWS account, turn on MFA for additional security. To require MFA when API operations are called, add MFA conditions to your policies. For more information, see Secure API access with MFA in the *IAM User Guide*.

For more information about best practices in IAM, see Security best practices in IAM in the *IAM User Guide*.

## Using the Site-to-Site VPN console

To access the AWS Site-to-Site VPN console, you must have a minimum set of permissions. These permissions must allow you to list and view details about the Site-to-Site VPN resources in your AWS account. If you create an identity-based policy that is more restrictive than the minimum required permissions, the console won't function as intended for entities (users or roles) with that policy.

You don't need to allow minimum console permissions for users that are making calls only to the AWS CLI or the AWS API. Instead, allow access to only the actions that match the API operation that they're trying to perform.

To ensure that users and roles can still use the Site-to-Site VPN console, also attach the Site-to-Site VPN `AmazonVPCFullAccess` or `AmazonVPCReadOnlyAccess` AWS managed policy to the entities. For more information, see Adding permissions to a user in the *IAM User Guide*.

## Describe specific Site-to-Site VPN connections

JSON

```
{
   "Version":"2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": [
            "ec2:DescribeVpnConnections"
         ],
         "Resource": ["*"]
      }
   ]
}
```

## Create and describe resources needed for an AWS Site-to-Site VPN connection

JSON

```
{
   "Version":"2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": [
         "ec2:DescribeVpnConnections",
         "ec2:DescribeVpnGateways",
         "ec2:DescribeCustomerGateways",
         "ec2:CreateCustomerGateway",
         "ec2:CreateVpnGateway",
         "ec2:CreateVpnConnection"
         ],
         "Resource": [
            "*"
         ]
      },
   {
         "Effect": "Allow",
         "Action": "iam:CreateServiceLinkedRole",
         "Resource": "arn:aws:iam::*:role/aws-service-role/s2svpn.amazonaws.com/
AWSServiceRoleForVPCS2SVPNInternal",
         "Condition": {
            "StringLike": {
               "iam:AWSServiceName":"s2svpn.amazonaws.com"
            }
         }
      }
   ]
}
```

## Troubleshooting AWS Site-to-Site VPN identity and access

Use the following information to help you diagnose and fix common issues that you might encounter when working with Site-to-Site VPN and IAM.

**Topics**

### I am not authorized to perform an action in Site-to-Site VPN

If you receive an error that you're not authorized to perform an action, your policies must be updated to allow you to perform the action.

The following example error occurs when the `mateojackson` IAM user tries to use the console to view details about a fictional *`my-example-widget`* resource but doesn't have the fictional `ec2:`*`GetWidget`* permissions.

```
User: arn:aws:iam::123456789012:user/mateojackson is not authorized to perform:
 ec2:GetWidget on resource: my-example-widget
```

In this case, the policy for the `mateojackson` user must be updated to allow access to the *`my-example-widget`* resource by using the `ec2:`*`GetWidget`* action.

If you need help, contact your AWS administrator. Your administrator is the person who provided you with your sign-in credentials.

### I am not authorized to perform iam:PassRole

If you receive an error that you're not authorized to perform the `iam:PassRole` action, your policies must be updated to allow you to pass a role to Site-to-Site VPN.

Some AWS services allow you to pass an existing role to that service instead of creating a new service role or service-linked role. To do this, you must have permissions to pass the role to the service.

The following example error occurs when an IAM user named `marymajor` tries to use the console to perform an action in Site-to-Site VPN. However, the action requires the service to have permissions that are granted by a service role. Mary does not have permissions to pass the role to the service.

```
User: arn:aws:iam::123456789012:user/marymajor is not authorized to perform:
 iam:PassRole
```

In this case, Mary's policies must be updated to allow her to perform the `iam:PassRole` action.

If you need help, contact your AWS administrator. Your administrator is the person who provided you with your sign-in credentials.

### I want to allow people outside of my AWS account to access my Site-to-Site VPN resources

You can create a role that users in other accounts or people outside of your organization can use to access your resources. You can specify who is trusted to assume the role. For services that support resource-based policies or access control lists (ACLs), you can use those policies to grant people access to your resources.

To learn more, consult the following:

- To learn whether Site-to-Site VPN supports these features, see How AWS Site-to-Site VPN works with IAM.
- To learn how to provide access to your resources across AWS accounts that you own, see Providing access to an IAM user in another AWS account that you own in the *IAM User Guide*.
- To learn how to provide access to your resources to third-party AWS accounts, see Providing access to AWS accounts owned by third parties in the *IAM User Guide*.
- To learn how to provide access through identity federation, see Providing access to externally authenticated users (identity federation) in the *IAM User Guide*.
- To learn the difference between using roles and resource-based policies for cross-account access, see Cross account resource access in IAM in the *IAM User Guide*.

## AWS managed policies for Site-to-Site VPN

To add permissions to users, groups, and roles, it is easier to use AWS managed policies than to write policies yourself. It takes time and expertise to create IAM customer managed policies that provide your team with only the permissions they need. To get started quickly, you can use our

AWS managed policies. These policies cover common use cases and are available in your AWS account. For more information about AWS managed policies, see AWS managed policies in the *IAM User Guide*.

AWS services maintain and update AWS managed policies. You can't change the permissions in AWS managed policies. Services occasionally add additional permissions to an AWS managed policy to support new features. This type of update affects all identities (users, groups, and roles) where the policy is attached. Services are most likely to update an AWS managed policy when a new feature is launched or when new operations become available. Services do not remove permissions from an AWS managed policy, so policy updates won't break your existing permissions.

Additionally, AWS supports managed policies for job functions that span multiple services. For example, the `ReadOnlyAccess` AWS managed policy provides read-only access to all AWS services and resources. When a service launches a new feature, AWS adds read-only permissions for new operations and resources. For a list and descriptions of job function policies, see AWS managed policies for job functions in the *IAM User Guide*.

## AWS managed policy: AWSVPCS2SVpnServiceRolePolicy

You can attach the `AWSVPCS2SVpnServiceRolePolicy` policy to your IAM identities. This policy allows Site-to-Site VPN to manage an AWS Secrets Manager secret within Site-to-Site VPN. For more information, see the section called "Using service-linked roles".

To view the permissions for this policy, see AWSVPCS2SVpnServiceRolePolicy in the *AWS Managed Policy Reference*.

## Site-to-Site VPN updates to AWS managed policies

View details about updates to AWS managed policies for Site-to-Site VPN since this service began tracking these changes in May 2025.

| Change | Description | Date |
|---|---|---|
| AWSVPCS2SVpnServiceRolePolicy - Updated policy. | New permissions added to the policy allowing Site-to-Site VPN to manage the VPN connection's AWS Secrets Manager `s2svpn-managed` secret. | May 14, 2025 |

# Using service-linked roles for Site-to-Site VPN

AWS Site-to-Site VPN uses AWS Identity and Access Management (IAM) service-linked roles. A service-linked role is a unique type of IAM role that is linked directly to Site-to-Site VPN. Service-linked roles are predefined by Site-to-Site VPN and include all the permissions that the service requires to call other AWS services on your behalf.

A service-linked role makes setting up Site-to-Site VPN easier because you don’t have to manually add the necessary permissions. Site-to-Site VPN defines the permissions of its service-linked roles, and unless defined otherwise, only Site-to-Site VPN can assume its roles. The defined permissions include the trust policy and the permissions policy, and that permissions policy cannot be attached to any other IAM entity.

You can delete a service-linked role only after first deleting their related resources. This protects your Site-to-Site VPN resources because you can't inadvertently remove permission to access the resources.

## Service-linked role permissions for Site-to-Site VPN

Site-to-Site VPN uses the service-linked role named **AWSServiceRoleForVPCS2SVPN** – Allow Site-to-Site VPN to create and manage resources related to your VPN connections.

The AWSServiceRoleForVPCS2SVPN service-linked role trusts the following service to assume the role:

- `s2svpn.amazonaws.com`

This service-linked role uses the managed policy AWSVPCS2SVpnServiceRolePolicy to complete the following actions on the specified resources:

- When using certificate authentication for your VPN connection, AWS Site-to-Site VPN exports the VPN tunnel AWS Certificate Manager certificates for use on the VPN tunnel endpoints.
- When using certificate authentication for your VPN connection, AWS Site-to-Site VPN manages the renewal of the VPN tunnel AWS Certificate Manager certificates.
- When using SecretsManager pre-shared key storage for your VPN connection, AWS Site-to-Site VPN manages the VPN connection’s AWS Secrets Manager s2svpn managed secret.

To view the permissions for this policy, see AWSVPCS2SVpnServiceRolePolicy in the *AWS Managed Policy Reference*.

## Create a service-linked role for Site-to-Site VPN

You don't need to manually create a service-linked role. When you create a customer gateway with an associated ACM private certificate in the AWS Management Console, the AWS CLI, or the AWS API, Site-to-Site VPN creates the service-linked role for you.

If you delete this service-linked role, and then need to create it again, you can use the same process to recreate the role in your account. When you create a customer gateway with an associated ACM private certificate, Site-to-Site VPN creates the service-linked role for you again.

## Edit a service-linked role for Site-to-Site VPN

Site-to-Site VPN does not allow you to edit the AWSServiceRoleForVPCS2SVPN service-linked role. After you create a service-linked role, you cannot change the name of the role because various entities might reference the role. However, you can edit the description of the role using IAM. For more information, see Edit a service-linked role description in the *IAM User Guide*.

## Delete a service-linked role for Site-to-Site VPN

If you no longer need to use a feature or service that requires a service-linked role, we recommend that you delete that role. That way you don’t have an unused entity that is not actively monitored or maintained. However, you must clean up the resources for your service-linked role before you can manually delete it.

> **Note**
>
> If the Site-to-Site VPN service is using the role when you try to delete the resources, then the deletion might fail. If that happens, wait for a few minutes and try the operation again.

### To delete Site-to-Site VPN resources used by the AWSServiceRoleForVPCS2SVPN

You can delete this service-linked role only after you delete all customer gateways that have an associated ACM private certificate. This ensures that you cannot inadvertently remove permission to access your ACM certificates in use by Site-to-Site VPN connections.

### To manually delete the service-linked role using IAM

Use the IAM console, the AWS CLI, or the AWS API to delete the AWSServiceRoleForVPCS2SVPN service-linked role. For more information, see Delete a service-linked role in the *IAM User Guide*.

# Resilience in AWS Site-to-Site VPN

The AWS global infrastructure is built around AWS Regions and Availability Zones. AWS Regions provide multiple physically separated and isolated Availability Zones, which are connected with low-latency, high-throughput, and highly redundant networking. With Availability Zones, you can design and operate applications and databases that automatically fail over between zones without interruption. Availability Zones are more highly available, fault tolerant, and scalable than traditional single or multiple data center infrastructures.

For more information about AWS Regions and Availability Zones, see AWS Global Infrastructure.

In addition to the AWS global infrastructure, Site-to-Site VPN offers features to help support your data resiliency and backup needs.

## Two tunnels per VPN connection

A Site-to-Site VPN connection consists of two tunnels, each terminating in a different Availability Zone, to provide increased availability to your VPC. 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. From time to time, AWS also performs routine maintenance on your VPN connection, which may briefly disable one of the two tunnels of your VPN connection. For more information, see AWS Site-to-Site VPN tunnel endpoint replacements. When you configure your customer gateway, it's therefore important that you configure both tunnels.

## Redundancy

To protect against a loss of connectivity in case your customer gateway becomes unavailable, you can set up a second Site-to-Site VPN connection. For more information, see the following documentation:

- Redundant AWS Site-to-Site VPN connections for failover
- Amazon Virtual Private Cloud Connectivity Options
- Building a Scalable and Secure Multi-VPC AWS Network Infrastructure

# Infrastructure security in AWS Site-to-Site VPN

As a managed service, AWS Site-to-Site VPN is protected by AWS global network security. For information about AWS security services and how AWS protects infrastructure, see AWS Cloud Security. To design your AWS environment using the best practices for infrastructure security, see Infrastructure Protection in *Security Pillar AWS Well‐Architected Framework*.

You use AWS published API calls to access Site-to-Site VPN through the network. Clients must support the following:

- Transport Layer Security (TLS). We require TLS 1.2 and recommend TLS 1.3.
- Cipher suites with perfect forward secrecy (PFS) such as DHE (Ephemeral Diffie-Hellman) or ECDHE (Elliptic Curve Ephemeral Diffie-Hellman). Most modern systems such as Java 7 and later support these modes.

# Monitor an AWS Site-to-Site VPN connection

Monitoring is an important part of maintaining the reliability, availability, and performance of your AWS Site-to-Site VPN connection. You should collect monitoring data from all of the parts of your solution so that you can more easily debug a multi-point failure if one occurs. Before you start monitoring your Site-to-Site VPN connection; however, you should create a monitoring plan that includes answers to the following questions:

- What are your monitoring goals?
- What resources will you monitor?
- How often will you monitor these resources?
- What monitoring tools will you use?
- Who will perform the monitoring tasks?
- Who should be notified when something goes wrong?

The next step is to establish a baseline for normal VPN performance in your environment, by measuring performance at various times and under different load conditions. As you monitor your VPN, store historical monitoring data so that you can compare it with current performance data, identify normal performance patterns and performance anomalies, and devise methods to address issues.

To establish a baseline, you should monitor the following items:

- The state of your VPN tunnels
- Data into the tunnel
- Data out of the tunnel

**Topics**

# Monitoring tools

AWS provides various tools that you can use to monitor a Site-to-Site VPN connection. You can configure some of these tools to do the monitoring for you, while some of the tools require manual intervention. We recommend that you automate monitoring tasks as much as possible.

## Automated monitoring tools

You can use the following automated monitoring tools to watch a Site-to-Site VPN connection and report when something is wrong:

- **Amazon CloudWatch Alarms** — Watch a single metric over a time period that you specify, and perform one or more actions based on the value of the metric relative to a given threshold over a number of time periods. The action is a notification sent to an Amazon SNS topic. CloudWatch alarms do not invoke actions simply because they are in a particular state; the state must have changed and been maintained for a specified number of periods. For more information, see Monitor AWS Site-to-Site VPN tunnels using Amazon CloudWatch.
- **AWS CloudTrail Log Monitoring** — Share log files between accounts, monitor CloudTrail log files in real time by sending them to CloudWatch Logs, write log processing applications in Java, and validate that your log files have not changed after delivery by CloudTrail. For more information, see Log API calls using AWS CloudTrail in the *Amazon EC2 API Reference* and Working with CloudTrail log files in the *AWS CloudTrail User Guide*.
- **AWS Health events** — Receive alerts and notifications related to changes in the health of your Site-to-Site VPN tunnels, best practice configuration recommendations, or when approaching scaling limits. Use events on the Personal Health Dashboard to trigger automated failovers, reduce troubleshooting time, or optimize connections for high availability. For more information, see AWS Health and AWS Site-to-Site VPN events.

## Manual monitoring tools

Another important part of monitoring a Site-to-Site VPN connection involves manually monitoring those items that the CloudWatch alarms don't cover. The Amazon VPC and CloudWatch console dashboards provide an at-a-glance view of the state of your AWS environment.

**Note**

In the Amazon VPC console, Site-to-Site VPN tunnel state parameters such as "Status" and "Last status change", may not reflect transient state changes or momentary tunnel flaps. It is recommended to use CloudWatch metrics and logs for granular tunnel state change updates.

- The Amazon VPC dashboard shows:
  - Service health by Region
  - Site-to-Site VPN connections
  - VPN tunnel status (In the navigation pane, choose **Site-to-Site VPN Connections**, select a Site-to-Site VPN connection, and then choose **Tunnel Details**)
- The CloudWatch home page shows:
  - Current alarms and status
  - Graphs of alarms and resources
  - Service health status

  In addition, you can use CloudWatch to do the following:

  - Create customized dashboards to monitor the services you care about
  - Graph metric data to troubleshoot issues and discover trends
  - Search and browse all your AWS resource metrics
  - Create and edit alarms to be notified of problems

## AWS Site-to-Site VPN logs

AWS Site-to-Site VPN logs provide you with deeper visibility into your Site-to-Site VPN deployments. With this feature, you have access to Site-to-Site VPN connection logs that provide details on IP Security (IPsec) tunnel establishment, Internet Key Exchange (IKE) negotiations, dead peer detection (DPD) protocol messages, Border Gateway protocol (BGP) status and routing updates.

Site-to-Site VPN logs can be published to Amazon CloudWatch Logs. This feature provides customers with a single consistent way to access and analyze detailed logs for all of their Site-to-Site VPN connections.

**Topics**

## Benefits of Site-to-Site VPN logs

- **Simplified VPN troubleshooting:** Site-to-Site VPN logs help you to pinpoint configuration mismatches between AWS and your customer gateway device, and address initial VPN connectivity issues. VPN connections can intermittently flap over time due to misconfigured settings (such as poorly tuned timeouts), there can be issues in the underlying transport networks (like internet weather), or routing changes or path failures can cause disruption of connectivity over VPN. This feature allows you to accurately diagnose the cause of intermittent connection failures and fine-tune low-level tunnel configuration for reliable operation.
- **Centralized AWS Site-to-Site VPN visibility:** Site-to-Site VPN logs can provide tunnel activity and BGP routing logs across all Site-to-Site VPN connection types. This feature provides customers with a single consistent way to access and analyze detailed logs for all of their Site-to-Site VPN connections.
- **Security and compliance:** Site-to-Site VPN logs can be sent to Amazon CloudWatch Logs for retrospective analysis of VPN connection status and activity over time. This can help you meet compliance and regulatory requirements.

## Amazon CloudWatch Logs resource policy size restrictions

CloudWatch Logs resource policies are limited to 5120 characters. When CloudWatch Logs detects that a policy approaches this size limit, it automatically enables log groups that start with `/aws/vendedlogs/`. When you enable logging, Site-to-Site VPN must update your CloudWatch Logs resource policy with the log group you specify. To avoid reaching the CloudWatch Logs resource policy size limit, prefix your log group names with `/aws/vendedlogs/`.

# Site-to-Site VPN log contents

The following information is included in the Site-to-Site VPN tunnel activity log. The log stream file name uses VpnConnectionID and TunnelOutsideIPAddress.

| Field | Description |
|---|---|
| VpnLogCreationTimestamp (`event_timestamp`) | Log creation timestamp in epoch time format. |
| VpnLogCreationTimestampReadable (`timestamp`) | Log creation timestamp in human readable time format. |
| TunnelDPDEnabled (`dpd_enabled`) | Dead Peer Detection Protocol Enabled Status (True/False). |
| TunnelCGWNATTDetectionStatus (`nat_t_detected`) | NAT-T detected on customer gateway device (True/False). |
| TunnelIKEPhase1State (`ike_phase1_state`) | IKE Phase 1 Protocol State (Established \| Rekeying \| Negotiating \| Down). |
| TunnelIKEPhase2State (`ike_phase2_state`) | IKE Phase 2 Protocol State (Established \| Rekeying \| Negotiating \| Down). |
| VpnLogDetail (`details`) | Verbose messages for IPsec, IKE and DPD protocols. |

The following information is included in the Site-to-Site VPN tunnel BGP log. The log stream file name uses VpnConnectionID and TunnelOutsideIPAddress.

| Field | Description |
|---|---|
| resource_id | A unique ID to identify the tunnel and the VPN connection the log is associated with. |
| event_timestamp | Log creation timestamp in epoch time format. |

| Field | Description |
|---|---|
| timestamp | Log creation timestamp in human readable time format. |
| type | Type of BGP Log Event (BGPStatus \| RouteStatus). |
| status | status update for a specific type of log event (BGPStatus: UP \| DOWN) (RouteStatus: ADVERTISED {route was advertised by the peer} \| UPDATED: {existing route was updated by the peer} \| WITHDRAWN: {route was withdrawn by peer}) . |
| message | Provides additional details on the log even and status. This field will help you understand why the BGPStatus is down what route attributes were exchanged in the RouteStatus message. |

**Contents**

## IKEv1 Error Messages

| Message | Explanation |
|---|---|
| Peer is not responsive - Declaring peer dead | Peer has not responded to DPD Messages, enforcing DPD time-out action. |

| Message | Explanation |
|---|---|
| AWS tunnel payload decryption was unsuccess ful due to invalid Pre-shared Key | Same Pre-Shared key needs to be configured on both IKE Peers. |
| No Proposal Match Found by AWS | Proposed Attributes for Phase 1 (Encryption, Hashing and DH Group) are not supported by AWS VPN Endpoint— for example, `3DES`. |
| No Proposal Match Found. Notifying with "No proposal chosen" | No Proposal Chosen error message is exchanged between Peers to inform that correct Proposals/Policies must be configured for phase 2 on IKE Peers. |
| AWS tunnel received DELETE for Phase 2 SA with SPI: xxxx | CGW has sent the Delete_SA message for Phase 2. |
| AWS tunnel received DELETE for IKE_SA from CGW | CGW has sent the Delete_SA message for Phase 1. |

## IKEv2 Error Messages

| Message | Explanation |
|---|---|
| AWS tunnel DPD timed out after {retry_count} retransmits | Peer has not responded to DPD Messages, enforcing DPD time-out action. |
| AWS tunnel received DELETE for IKE_SA from CGW | Peer has sent the Delete_SA message for Parent/IKE_SA. |
| AWS tunnel received DELETE for Phase 2 SA with SPI: xxxx | Peer has sent the Delete_SA message for CHILD_SA. |
| AWS tunnel detected a (CHILD_REKEY) collision as CHILD_DELETE | CGW has sent the Delete_SA message for the Active SA, which is being rekeyed. |

| Message | Explanation |
|---|---|
| AWS tunnel (CHILD_SA) redundant SA is being deleted due to detected collision | Due to Collision, If redundant SAs are generated, Peers will close redundant SA after matching the nonce values as per RFC. |
| AWS tunnel Phase 2 was unable to establish while keeping Phase 1 | Peer was unable to establish CHILD_SA due to negotiation error — for example, incorrect proposal. |
| AWS: Traffic Selector: TS_UNACCEPTABLE: received from responder | Peer has proposed Incorrect Traffic Selectors/ Encryption Domain. Peers should be configure d with identical and correct CIDRs. |
| AWS tunnel is sending AUTHENTICATION_FAI LED as the response | Peer is unable to Authenticate the Peer by verifying IKE_AUTH message's contents |
| AWS tunnel detected a pre-shared key mismatch with cgw: xxxx | Same Pre-Shared key needs to be configured on both IKE Peers. |
| AWS tunnel Timeout: deleting un-established Phase 1 IKE_SA with cgw: xxxx | Deleting the half-opened IKE_SA as peer has not proceeded with negotiations |
| No Proposal Match Found. Notifying with "No proposal chosen" | No Proposal Chosen error message is exchanged between Peers to inform that correct Proposals must be configured on IKE Peers. |
| No Proposal Match Found by AWS | Proposed Attributes for Phase 1 or Phase 2 (Encryption, Hashing and DH Group) are not supported by AWS VPN Endpoint— for example, 3DES. |

## IKEv2 Negotiation Messages

| Message | Explanation |
|---|---|
| AWS tunnel processed request (id=xxx) for CREATE_CHILD_SA | AWS has received the CREATE_CHILD_SA request from CGW. |
| AWS tunnel is sending response (id=xxx) for CREATE_CHILD_SA | AWS is sending CREATE_CHILD_SA response to CGW. |
| AWS tunnel is sending request (id=xxx) for CREATE_CHILD_SA | AWS is sending CREATE_CHILD_SA request to CGW. |
| AWS tunnel processed response (id=xxx) for CREATE_CHILD_SA | AWS has received CREATE_CHILD_SA response form CGW. |

## BGP Status Messages

BGP Status messages contain information related to BGP Session state transitions, prefix limit warnings, limit violations, BGP session notifications, BGP OPEN messages, and attribute updates for a BGP neighbor for a given BGP session.

| Message | BGP Status | Explanation |
|---|---|---|
| AWS-side peer BGP session state has changed from Idle to Connect with neighbor {ip: xxx} | DOWN | BGP Connection state on the AWS side has been updated to Connect. |
| AWS-side peer BGP session state has changed from Connect to OpenSent with neighbor {ip: xxx} | DOWN | BGP Connection state on the AWS side has been updated to OpenSent. |
| AWS-side peer BGP session state has changed from | DOWN | BGP Connection state on the AWS side has been updated to OpenConfirm. |

| Message | BGP Status | Explanation |
|---|---|---|
| OpenSent to OpenConfirm with neighbor {ip: xxx} | | |
| AWS-side peer BGP session state has changed from OpenConfirm to Established with neighbor {ip: xxx} | UP | BGP Connection state on the AWS side has been updated to Established. |
| AWS-side peer BGP session state has changed from Established to Idle with neighbor {ip: xxx} | DOWN | BGP Connection state on the AWS side has been updated to Idle. |
| AWS-side peer BGP session state has changed from Connect to Active with neighbor {ip: xxx} | DOWN | BGP Connection state on the AWS side transitioned from Connect to Active. Check TCP port 179 availability on CGW if BGP session is stuck in Connect state. |
| AWS-side peer is reporting a maximum prefix limit warning - received {prefixes (count): xxx} prefixes from neighbor {ip: xxx}, limit is {limit (numeric): xxx} | UP | The AWS side periodically generates a log message when the number of prefixes received from the CGW nears the allowed limit. |
| AWS-side peer detected the maximum prefix limit was exceeded - received {prefixes (count): xxx} prefixes from neighbor {ip: xxx}, limit is {limit (numeric): xxx} | DOWN | The AWS side generates a log message when the number of prefixes received from the CGW exceeded the allowed limit. |

| Message | BGP Status | Explanation |
|---|---|---|
| AWS-side peer sent a notification 6/1 (Cease/Maximum Number of Prefixes Reached) to neighbor {ip: xxx} | DOWN | The AWS side sent a notification to the CGW BGP peer to indicate that the BGP session was terminated due to a prefix limit violation. |
| AWS-side peer received notification 6/1 (Cease/Maximum Number of Prefixes Reached) from neighbor {ip: xxx} | DOWN | The AWS side received a notification from the CGW peer to indicate that the BGP session was terminated due to a prefix limit violation. |
| AWS-side peer sent a notification 6/2 (Cease/Administrative Shutdown) to neighbor {ip: xxx} | DOWN | The AWS side sent a notification to the CGW BGP peer to indicate that the BGP session was terminated. |
| AWS-side peer received notification 6/2 (Cease/Administrative Shutdown) from neighbor {ip: xxx} | DOWN | The AWS side received a notification from the CGW peer to indicate that the BGP session was terminated. |
| AWS-side peer sent a notification 6/3 (Cease/Peer Unconfigured) to neighbor {ip: xxx} | DOWN | The AWS side sent a notification to the CGW peer to indicate that the peer is not configured or has been removed from configuration. |
| AWS-side peer received notification 6/3 (Cease/Peer Unconfigured) from neighbor {ip: xxx} | DOWN | The AWS side received a notification from the CGW peer to indicate that the peer is not configured or has been removed from configuration. |

| Message | BGP Status | Explanation |
|---|---|---|
| AWS-side peer sent a notificat ion 6/4 (Cease/Administrative Reset) to neighbor {ip: xxx} | DOWN | The AWS side sent a notificat ion to the CGW BGP peer to indicate that the BGP session was reset. |
| AWS-side peer received notification 6/4 (Cease/Ad ministrative Reset) from neighbor {ip: xxx} | DOWN | The AWS side received a notification from the CGW peer to indicate that the BGP session was reset. |
| AWS-side peer sent a notificat ion 6/5 (Cease/Connection Rejected) to neighbor {ip: xxx} | DOWN | The AWS side sent a notificat ion to the CGW BGP peer to indicate that the BGP session was rejected. |
| AWS-side peer received notification 6/5 (Cease/Co nnection Rejected) from neighbor {ip: xxx} | DOWN | The AWS side received a notification from the CGW peer to indicate that the BGP session was rejected. |
| AWS-side peer sent a notificat ion 6/6 (Cease/Other Configuration Change) to neighbor {ip: xxx} | DOWN | The AWS side sent a notificat ion to the CGW BGP peer to indicate that a BGP session configuration change took place. |
| AWS-side peer received notification 6/6 (Cease/Other Configuration Change) from neighbor {ip: xxx} | DOWN | The AWS side received a notification from the CGW peer which indicates that a BGP session configuration change took place. |

| Message | BGP Status | Explanation |
|---|---|---|
| AWS-side peer sent a notification 6/7 (Cease/Connection Collision Resolution) to neighbor {ip: xxx} | DOWN | The AWS side sent a notification to the CGW peer to resolve a connection collision when both peers attempt to establish a connection simultaneously. |
| AWS-side peer received notification 6/7 (Cease/Connection Collision Resolution) from neighbor {ip: xxx} | DOWN | The AWS side received a notification from the CGW peer indicating resolution of a connection collision when both peers attempt to establish a connection simultaneously. |
| AWS-side peer sent a Hold Timer Expired notification to neighbor {ip: xxx} | DOWN | The BGP hold timer expired and a notification was sent by the AWS side to the CGW. |
| AWS-side peer detected a bad OPEN message from neighbor {ip: xxx}- remote AS is {asn: xxx}, expected {asn: xxx} | DOWN | The AWS side detected a bad OPEN message was received from the CGW peer which is indicative of a configuration mismatch. |
| AWS-side peer received an OPEN message from neighbor {ip: xxx}- version 4, AS {asn: xxx}, holdtime {holdtime (seconds): xxx}, router-id {id: xxx}} | DOWN | The AWS side received a BGP open message to initiate a BGP session with the CGW peer. |

| Message | BGP Status | Explanation |
|---|---|---|
| AWS-side peer sent an OPEN message to neighbor {ip: xxx}- version 4, AS {asn: xxx}, holdtime {holdtime (seconds): xxx}, router-id {id: xxx} | DOWN | The CGW peer sent a BGP open message to initiate a BGP session with the AWS side BGP peer. |
| AWS-side peer is initiating a connection (via Connect) to neighbor {ip: xxx} | DOWN | The AWS side is attempting to connect with the CGW BGP neighbor. |
| AWS-side peer sent an End-of-RIB message to neighbor {ip: xxx} | UP | The AWS side has finished transmitting routes to the CGW after BGP session establishment. |
| AWS-side peer received update with attributes from neighbor {ip: xxx}- AS path: {aspath (list): xxx xxx xxx} | UP | The AWS side received a BGP session attribute update from the neighbor. |

## Route Status Messages

Unlike BGP Status Messages, Route Status Messages contain data about BGP attributes of a given prefix such as AS path, local preference, Multi-Exit Discriminator (MED), next hop IP address, and weight. A Route Status message will only contain a details field when there is an error with a route that was ADVERTISED, UPDATED, or WITHDRAWN. Examples of which are as follows

| Message | Explanation |
|---|---|
| DENIED due to: as-path contains our own AS | BGP update messages for a new prefix from CGW was denied by AWS due to the route containing the AWS-side peers own AS. |
| DENIED due to: non-connected next-hop | AWS rejected a BGP route advertisement for the prefix from the CGW due to a non-conne |

| Message | Explanation |
|---|---|
| | cted next-hop validation failure. Ensure the route is reachable on the CGW side. |

## Example log format for Tunnel BGP logs

```
{
    "resource_id": "vpn-1234abcd_1.2.3.4",
    "event_timestamp": 1762580429641,
    "timestamp": "2025-11-08 05:40:29.641Z",
    "type": "BGPStatus",
    "status": "UP",
    "message": {
        "details": "AWS-side peer BGP session state has changed from OpenConfirm to
 Established with neighbor 169.254.50.85"
    }
}

{
    "resource_id": "vpn-1234abcd_1.2.3.4",
    "event_timestamp": 1762579573243,
    "timestamp": "2025-11-08 05:26:13.243Z",
    "type": "RouteStatus",
    "status": "UPDATED",
    "message": {
        "prefix": "172.31.0.0/16",
        "asPath": "64512",
        "localPref": 100,
        "med": 100,
        "nextHopIp": "169.254.50.85",
        "weight": 32768,
        "details": "DENIED due to: as-path contains our own AS"
    }
}
```

## IAM requirements to publish to CloudWatch Logs

For the logging feature to work properly, the IAM policy attached to the IAM principal being used to configure the feature, must include the following permissions at minimum. More details can also be found in the Enabling logging from certain AWS services section of the *Amazon CloudWatch Logs User Guide*.

JSON

```
{
  "Version":"2012-10-17",
  "Statement": [
    {
      "Action": [
        "logs:CreateLogDelivery",
        "logs:GetLogDelivery",
        "logs:UpdateLogDelivery",
        "logs:DeleteLogDelivery",
        "logs:ListLogDeliveries"
      ],
      "Resource": [
        "*"
      ],
      "Effect": "Allow",
      "Sid": "S2SVPNLogging"
    },
    {
      "Sid": "S2SVPNLoggingCWL",
      "Action": [
        "logs:PutResourcePolicy",
        "logs:DescribeResourcePolicies",
        "logs:DescribeLogGroups"
      ],
      "Resource": [
        "*"
      ],
      "Effect": "Allow"
    }
  ]
}
```

# View AWS Site-to-Site VPN logs configuration

View the activity log for a Site-to-Site VPN connection. Here you can view details about the configuration such encryption algorithms, or whether tunnel VPN logs are enabled. You can also view the tunnel state. This helps you to better track any issues or conflicts you might have with a VPN connection.

**To view current tunnel logging settings**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Select the VPN connection that you want to view from the **VPN connections** list.
4. Choose the **Tunnel details** tab.
5. Expand the **Tunnel 1 options** and **Tunnel 2 options** sections to view all tunnel configuration details.
6. You can view the current status **Tunnel VPN log** feature, and the currently configured CloudWatch log group (if any) under **CloudWatch log group for tunnel VPN log** and the log output format under **Output format for tunnel VPN log**.
7. You can view the current status **Tunnel BGP log** feature, and the currently configured CloudWatch log group (if any) under **CloudWatch log group for tunnel VPN log** and the log output format under **Output format for tunnel BGP log**.

**To view current tunnel logging settings on a Site-to-Site VPN connection using the AWS command line or API**

- DescribeVpnConnections (Amazon EC2 Query API)
- describe-vpn-connections (AWS CLI)

# Enable AWS Site-to-Site VPN logs

Enable Site-to-Site VPN logs to log VPN activity, such as tunnel state and other details. You can enable logging on a new connection or modify an existing connection to start logging activity. If you want to disable logging for a connection, see Disable Site-to-Site VPN logs.

**Note**

When you enable Site-to-Site VPN logs for an existing VPN connection tunnel, your connectivity over that tunnel can be interrupted for several minutes. However, each VPN connection offers two tunnels for high availability, so you can enable logging on one tunnel at a time while maintaining connectivity over the tunnel not being modified. For more information, see AWS Site-to-Site VPN tunnel endpoint replacements.

### To enable VPN logging during creation of a new Site-to-Site VPN connection

Follow the procedure Step 5: Create a VPN connection. During Step 9 **Tunnel Options**, you can specify all the options you want to use for both tunnels, including **VPN logging** options. For more information about these options, see Tunnel options for your AWS Site-to-Site VPN connection.

### To enable tunnel logging on a new Site-to-Site VPN connection using the AWS command line or API

- CreateVpnConnection (Amazon EC2 Query API)
- create-vpn-connection (AWS CLI)

### To enable tunnel activity logging on an existing Site-to-Site VPN connection

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Select the VPN connection that you want to modify from the **VPN connections** list.
4. Select **Actions**, **Modify VPN tunnel options**.
5. Select the tunnel that you want to modify by choosing the appropriate IP address from the **VPN tunnel outside IP address** list.
6. Under **Tunnel activity log**, select **Enable**.
7. Under **Amazon CloudWatch log group**, select the Amazon CloudWatch log group where you want the logs to be sent.
8. (Optional) Under **Output format**, choose the desired format for the log output, either **json** or **text**.
9. Select **Save changes**.
10. (Optional) Repeat steps 4 through 9 for the other tunnel if desired.

**To enable tunnel BGP logging on an existing Site-to-Site VPN connection**

1. Open the Amazon VPC console at [https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/](https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/).
2. In the navigation pane, choose **Site-to-Site VPN connections**.
3. Select the VPN connection that you want to modify from the **VPN connections** list.
4. Select **Actions**, **Modify VPN tunnel options**.
5. Select the tunnel that you want to modify by choosing the appropriate IP address from the **VPN tunnel outside IP address** list.
6. Under **Tunnel BGP log**, select **Enable**.
7. Under **Amazon CloudWatch log group**, select the Amazon CloudWatch log group where you want the logs to be sent.
8. (Optional) Under **Output format**, choose the desired format for the log output, either **json** or **text**.
9. Select **Save changes**.
10. (Optional) Repeat steps 4 through 9 for the other tunnel if desired.

**To enable tunnel logging on an existing Site-to-Site VPN connection using the AWS command line or API**

- ModifyVpnTunnelOptions (Amazon EC2 Query API)
- modify-vpn-tunnel-options (AWS CLI)

## Disable AWS Site-to-Site VPN logs

Disable VPN logging on a connection if you no longer want to track any activity on that connection. This action only disables logging and does not affect anything else for that connection. To enable or re-enable logging on a connection, see Enable Site-to-Site VPN logs.

**To disable tunnel activity logging on a Site-to-Site VPN connection**

1. Open the Amazon VPC console at [https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/](https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/).
2. In the navigation pane, choose **Site-to-Site VPN Connections**.
3. Select the VPN connection that you want to modify from the **VPN connections** list.
4. Select **Actions**, **Modify VPN tunnel options**.

5. Select the tunnel that you want to modify by choosing the appropriate IP address from the **VPN tunnel outside IP address** list.
6. Under **Tunnel activity log**, clear **Enable**.
7. Select **Save changes**.
8. (Optional) Repeat steps 4 through 7 for the other tunnel if desired.

**To disable tunnel BGP logging on a Site-to-Site VPN connection**

1. Open the Amazon VPC console at https://eusc-de-east-1.console.amazonaws-eusc.eu/vpc/.
2. In the navigation pane, choose **Site-to-Site VPN Connections**.
3. Select the VPN connection that you want to modify from the **VPN connections** list.
4. Select **Actions**, **Modify VPN tunnel options**.
5. Select the tunnel that you want to modify by choosing the appropriate IP address from the **VPN tunnel outside IP address** list.
6. Under **Tunnel BGP log**, clear **Enable**.
7. Select **Save changes**.
8. (Optional) Repeat steps 4 through 7 for the other tunnel if desired.

**To disable tunnel logging on a Site-to-Site VPN connection using the AWS command line or API**

- ModifyVpnTunnelOptions (Amazon EC2 Query API)
- modify-vpn-tunnel-options (AWS CLI)

# Monitor AWS Site-to-Site VPN tunnels using Amazon CloudWatch

You can monitor VPN tunnels using CloudWatch, which collects and processes raw data from the VPN service into readable, near real-time metrics. These statistics are recorded for a period of 15 months, so that you can access historical information and gain a better perspective on how your web application or service is performing. VPN metric data is automatically sent to CloudWatch as it becomes available.

For more information, see the Amazon CloudWatch User Guide.

**Contents**

## VPN metrics and dimensions

The following CloudWatch metrics are available for your Site-to-Site VPN connections.

| Metric | Description |
|---|---|
| `TunnelState` | The state of the tunnels. For static VPNs, 0 indicates DOWN and 1 indicates UP. For BGP VPNs, 1 indicates ESTABLISHED and 0 is used for all other states. For both types of VPNs, values between 0 and 1 indicate at least one tunnel is not UP.<br>Units: Fractional value between 0 and 1 |
| `TunnelDataIn` † | The bytes received on the AWS side of the connection through the VPN tunnel from a customer gateway. Each metric data point represents the number of bytes received after the previous data point. Use the Sum statistic to show the total number of bytes received during the period.<br>This metric counts the data after decryption.<br>Units: Bytes |
| `TunnelDataOut` † | The bytes sent from the AWS side of the connection through the VPN tunnel to the customer gateway. Each metric data point represents the number of bytes sent after the previous data point. Use the Sum statistic to |

| Metric | Description |
|---|---|
| | show the total number of bytes sent during the period.<br>This metric counts the data before encryption.<br>Units: Bytes |
| `ConcentratorBandwidthUsage` | The bandwidth usage for a Site-to-Site VPN Concentrator connection. This metric is available for VPN connections that use a Site-to-Site VPN Concentrator. Use the Average statistic to show the average bandwidth usage during the period.<br>Units: Bits per second |

† These metrics can report network usage even when the tunnel is down. This is due to periodic status checks performed on the tunnel, and background ARP and BGP requests.

To filter the metric data, use the following dimensions.

| Dimension | Description |
|---|---|
| `VpnId` | Filters the metric data by the Site-to-Site VPN connection ID. |
| `TunnelIpAddress` | Filters the metric data by the IP address of the tunnel for the virtual private gateway. |

## View Amazon CloudWatch Logs metrics for AWS Site-to-Site VPN

When you create a Site-to-Site VPN connection, the VPN service sends metrics about your VPN connection to CloudWatch, as they become available. You can view the metrics for your VPN connection as follows.

### To view metrics using the CloudWatch console

Metrics are grouped first by the service namespace, and then by the various dimension combinations within each namespace.

1. Open the CloudWatch console at [https://eusc-de-east-1.console.amazonaws-eusc.eu/cloudwatch/](https://eusc-de-east-1.console.amazonaws-eusc.eu/cloudwatch/).
2. In the navigation pane, choose **Metrics**.
3. Under **All metrics**, choose the **VPN** metric namespace.
4. Select the metric dimension to view the metrics— for example, **VPN Tunnel Metrics**.

> **Note**
>
> The VPN namespace will not appear in the CloudWatch console until after a Site-to-Site VPN connection has been created in the AWS region you are viewing.

### To view metrics using the AWS CLI

At a command prompt, use the following command:

```
aws cloudwatch list-metrics --namespace "AWS/VPN"
```

## Create Amazon CloudWatch alarms to monitor AWS Site-to-Site VPN tunnels

You can create a CloudWatch alarm that sends an Amazon SNS message when the alarm changes state. An alarm watches a single metric over a time period you specify, and sends a notification to an Amazon SNS topic based on the value of the metric relative to a given threshold over a number of time periods.

For example, you can create an alarm that monitors the state of a single VPN tunnel, and sends a notification when the tunnel state is DOWN for 3 datapoints within 15 minutes.

### To create an alarm for a single tunnel state

1. Open the CloudWatch console at [https://eusc-de-east-1.console.amazonaws-eusc.eu/cloudwatch/](https://eusc-de-east-1.console.amazonaws-eusc.eu/cloudwatch/).

2. In the navigation pane, expand **Alarms**, then choose **All alarms**.
3. Choose **Create alarm**, then choose **Select metric**.
4. Choose **VPN**, then **VPN Tunnel Metrics**.
5. Select the IP address of the desired tunnel, on the same line with the **TunnelState** metric. Choose **Select metric**.
6. For **Whenever TunnelState is...**, select **Lower**, and then enter "1" in the input field under **than...**.
7. Under **Additional configuration**, set the inputs to "3 out of 3" for **Datapoints to alarm**.
8. Choose **Next**.
9. Under **Send a notification to the following SNS topic**, select an existing notification list or create a new one.
10. Choose **Next**.
11. Enter a name for your alarm. Choose **Next**.
12. Check the settings for your alarm, and then choose **Create alarm**.

You can create an alarm that monitors the state of the Site-to-Site VPN connection. For example, you can create an alarm that sends a notification when the status of one or both tunnels is DOWN for one 5-minute period.

**To create an alarm for Site-to-Site VPN connection state**

1. Open the CloudWatch console at https://eusc-de-east-1.console.amazonaws-eusc.eu/cloudwatch/.
2. In the navigation pane, expand **Alarms**, then choose **All alarms**.
3. Choose **Create alarm**, then choose **Select metric**.
4. Choose **VPN**, then choose **VPN Connection Metrics**.
5. Select your Site-to-Site VPN connection and the **TunnelState** metric. Choose **Select metric**.
6. For **Statistic**, specify **Maximum**.

   Alternatively, if you've configured your Site-to-Site VPN connection so that both tunnels are up, you can specify a statistic of **Minimum** to send a notification when at least one tunnel is down.
7. For **Whenever**, choose **Lower/Equal** (**<=**) and enter **0** (or **0.5** for when at least one tunnel is down). Choose **Next**.

8. Under **Select an SNS topic**, select an existing notification list or choose **New list** to create a new one. Choose **Next**.
9. Enter a name and description for your alarm. Choose **Next**.
10. Check the settings for your alarm, and then choose **Create alarm**.

You can also create alarms that monitor the amount of traffic coming in or leaving the VPN tunnel. For example, the following alarm monitors the amount of traffic coming into the VPN tunnel from your network, and sends a notification when the number of bytes reaches a threshold of 5,000,000 during a 15 minute period.

**To create an alarm for incoming network traffic**

1. Open the CloudWatch console at https://eusc-de-east-1.console.amazonaws-eusc.eu/cloudwatch/.
2. In the navigation pane, expand **Alarms**, then choose **All alarms**.
3. Choose **Create alarm**, then choose **Select metric**.
4. Choose **VPN**, then choose **VPN Tunnel Metrics**.
5. Select the IP address of the VPN tunnel and the **TunnelDataIn** metric. Choose **Select metric**.
6. For **Statistic**, specify **Sum**.
7. For **Period**, select **15 minutes**.
8. For **Whenever**, choose **Greater/Equal(>=)** and enter **5000000**. Choose **Next**.
9. Under **Select an SNS topic**, select an existing notification list or choose **New list** to create a new one. Choose **Next**.
10. Enter a name and description for your alarm. Choose **Next**.
11. Check the settings for your alarm, and then choose **Create alarm**.

The following alarm monitors the amount of traffic leaving the VPN tunnel to your network, and sends a notification when the number of bytes is less than 1,000,000 during a 15 minute period.

**To create an alarm for outgoing network traffic**

1. Open the CloudWatch console at https://eusc-de-east-1.console.amazonaws-eusc.eu/cloudwatch/.
2. In the navigation pane, expand **Alarms**, then choose **All alarms**.

3. Choose **Create alarm**, then choose **Select metric**.
4. Choose **VPN**, then choose **VPN Tunnel Metrics**.
5. Select the IP address of the VPN tunnel and the **TunnelDataOut** metric. Choose **Select metric**.
6. For **Statistic**, specify **Sum**.
7. For **Period**, select **15 minutes**.
8. For **Whenever**, choose **Lower/Equal** (**<=**) and enter `1000000`. Choose **Next**.
9. Under **Select an SNS topic**, select an existing notification list or choose **New list** to create a new one. Choose **Next**.
10. Enter a name and description for your alarm. Choose **Next**.
11. Check the settings for your alarm, and then choose **Create alarm**.

For more examples of creating alarms, see Creating Amazon CloudWatch alarms in the *Amazon CloudWatch User Guide*.

# AWS Health and AWS Site-to-Site VPN events

AWS Site-to-Site VPN automatically sends notifications to the AWS Health Dashboard. This dashboard requires no setup, and is ready to use for authenticated AWS users. You can configure multiple actions in response to event notifications through the AWS Health Dashboard.

The AWS Health Dashboard provides the following types of notifications for your VPN connections:

- Tunnel endpoint replacement notifications
- Single tunnel VPN notifications

## Tunnel endpoint replacement notifications

You receive a **Tunnel endpoint replacement notification** in the AWS Health Dashboard when one or both of the VPN tunnel endpoints in your VPN connection is replaced. A tunnel endpoint is replaced when AWS performs tunnel updates, or when you modify your VPN connection. For more information, see AWS Site-to-Site VPN tunnel endpoint replacements.

When a tunnel endpoint replacement is complete, AWS sends the **Tunnel endpoint replacement notification** through a AWS Health Dashboard event.

# Single tunnel VPN notifications

A Site-to-Site VPN connection consists of two tunnels for redundancy. We strongly recommend that you configure both tunnels for high availability. If your VPN connection has one tunnel up but the other is down for more than one hour in a day, you receive a *monthly* **VPN single tunnel notification** through an AWS Health Dashboard event. This event will be updated daily with any new VPN connections detected as single tunnel, with notifications sent weekly. A new event will be created each month, which will clear any VPN connections no longer detected as single tunnel.

# AWS Site-to-Site VPN quotas

Your AWS account has the following quotas, formerly referred to as limits, related to Site-to-Site VPN. Unless otherwise noted, each quota is Region-specific. You can request increases for some quotas, and other quotas cannot be increased.

To request a quota increase for an adjustable quota, choose **Yes** in the **Adjustable** column. For more information, see Requesting a quota increase in the *Service Quotas User Guide*.

## Site-to-Site VPN resources

| Name | Default | Adjustable |
|---|---|---|
| Customer gateways per Region | 50 | Yes |
| Virtual private gateways per Region | 5 | Yes |
| Site-to-Site VPN connections per Region | 50 | Yes |
| Site-to-Site VPN connections per virtual private gateway | 10 | Yes |
| Accelerated Site-to-Site VPN connections per Region | 10 | Yes |
| Unassociated Site-to-Site VPN connections per Region | 10 | Yes |
| Large Bandwidth Tunnel connections per Region | 50 | Yes |
| Site-to-Site VPN Concentrators per Region | 50 | Yes |
| Site-to-Site VPN Concentrators per Transit Gateway or Cloud WAN | 5 | Yes |
| Remote sites per Site-to-Site VPN Concentra tor | 100 | Yes |

> **Note**
>
> Both Accelerated and Unassociated connections count towards the total Site-to-Site VPN connections per Region quota.

You can attach one virtual private gateway to a VPC at a time. To connect the same Site-to-Site VPN connection to multiple VPCs, we recommend that you explore using a transit gateway instead. For more information, see Transit gateways in *Amazon VPC Transit Gateways*.

Site-to-Site VPN connections on a transit gateway are subject to the total transit gateway attachments limit. For more information, see Transit gateway quotas.

## Routes

Advertised route sources include VPC routes, other VPN routes, and routes from Direct Connect virtual interfaces. Advertised routes come from the route table that's associated with the VPN attachment.

> **Note**
>
> If you are using a virtual private gateway and route propagation is enabled on your VPC route table, both dynamic and static routes will automatically be added for your VPN connection, up to the limit of the VPC's route table. See Amazon VPC quotas in the *Amazon VPC User Guide* for further details.

| Name | Default | Adjustable |
|---|---|---|
| Dynamic routes advertised from a customer gateway device to a Site-to-Site VPN connection on a virtual private gateway | 100 | No |
| Routes advertised from a Site-to-Site VPN connection on a virtual private gateway to a customer gateway device | 1,000 | No |

| Name | Default | Adjustable |
|---|---|---|
| Dynamic routes advertised from a customer gateway device to a Site-to-Site VPN connection on a transit gateway | 1,000 | No |
| Routes advertised from a Site-to-Site VPN connection on a transit gateway to a customer gateway device | 5,000 | No |
| Static routes from a customer gateway device to a Site-to-Site VPN connection on a virtual private gateway | 100 | No |

## Bandwidth and throughput

There are many factors that can affect realized bandwidth through a Site-to-Site VPN connection, including but not limited to: packet size, traffic mix (TCP/UDP), shaping or throttling policies on intermediate networks, internet weather, and specific application requirements.

| Name | Default | Adjustable |
|---|---|---|
| Maximum bandwidth per VPN Concentrator VPN tunnel | Up to 100 Mbps | No |
| Maximum packets per second (PPS) per VPN Concentrator VPN tunnel | Up to 10,000 | No |
| Maximum bandwidth per standard VPN tunnel | Up to 1.25 Gbps | No |
| Maximum packets per second (PPS) per standard VPN tunnel | Up to 140,000 | No |
| Maximum bandwidth per large bandwidth VPN tunnel | Up to 5 Gbps | No |
| Maximum packets per second (PPS) per large bandwidth VPN tunnel | Up to 400,000 | No |

For Site-to-Site VPN connections on a transit gateway, you can use ECMP to get higher VPN bandwidth by aggregating multiple VPN tunnels. To use ECMP, the VPN connection must be configured for dynamic routing. ECMP is not supported on VPN connections that use static routing. For more information, see Transit gateways.

**Note**

IPv6 VPNs support the same throughput (Gbps and PPS), MTU, and route limits as IPv4 VPNs. There are no performance differences between IPv4 and IPv6 VPN connections.

## Maximum transmission unit (MTU)

Site-to-Site VPN supports a maximum transmission unit (MTU) of 1446 bytes and a corresponding maximum segment size (MSS) of 1406 bytes. However, certain algorithms that use larger TCP headers can effectively reduce that maximum value. To avoid fragmentation, we recommend that you set the MTU and MSS based on the algorithms selected. For more details on MTU, MSS, and the optimal values, see Best practices for an AWS Site-to-Site VPN customer gateway device.

Jumbo frames are not supported. For more information, see Jumbo frames in the *Amazon EC2 User Guide*.

A Site-to-Site VPN connection does not support Path MTU Discovery.

The MTU limitations apply to both IPv4 and IPv6 VPN connections.

## Additional quota resources

For quotas related to transit gateways, including the number of attachments on a transit gateway, see Quotas for your transit gateways in the *Amazon VPC Transit Gateways Guide*.

For additional VPC quotas, see Amazon VPC quotas in the *Amazon VPC User Guide*.

# Document history for the Site-to-Site VPN User Guide

The following table describes the AWS Site-to-Site VPN User Guide updates.

| Change | Description | Date |
|---|---|---|
| Site-to-Site VPN Concentrators | Site-to-Site VPN Concentrators provide a centralized hub for managing multiple VPN connections with enhanced scalability and simplified network architecture. | November 15, 2025 |
| Site-to-Site VPN support for Large Bandwidth Tunnels | Site-to-Site VPN now supports Large Tunnel Bandwidth, enabling transit gateway and Cloud WAN VPN attachments with up to 5 Gbps throughput. | September 25, 2025 |
| IPv6 support for AWS Site-to-Site VPN for outer tunnel IPs | Site-to-Site VPN now supports IPv6 addresses for the outer tunnel IPs on Transit Gateway and Cloud WAN VPN connections. This enables full IPv6 migration with IPv6 addresses for both outer tunnel IPs and inner packet IPs (IPv6-in-IPv6), as well as IPv6 outer tunnel IPs with IPv4 inner packet IPs (IPv4-in-IPv6). | July 1, 2025 |
| Updated the AWSVPCS2SVpnServiceRolePolicy AWS managed policy | Added new permissions to the AWS managed policy allowing  Site-to-Site VPN to manage the VPN connectio | May 27, 2025 |

| | | |
|---|---|---|
| | n's AWS Secrets Manager managed secret. | |
| Updated pre-shared key storage options | Site-to-Site VPN now supports AWS Secrets Manager for storing a pre-shared key. | May 27, 2025 |
| Classic VPN info removed | Removed info about classic VPN from guide. | January 19, 2023 |
| VPN log example messages | Sample logs added for Site-to-Site VPN connections. | December 9, 2022 |
| Updated Download Configuration utility | Site-to-Site VPN customers can generate configuration templates for compatible Customer Gateway (CGW) devices, making it easier to create VPN connections to AWS. This update adds support for Internet Key Exchange version 2 (IKEv2) parameters for many popular CGW devices and includes two new APIs — GetVpnConnectionDeviceTypes and GetVpnConnectionDeviceSampleConfiguration. | September 21, 2021 |
| VPN connection notifications | Site-to-Site VPN automatically sends notifications about your VPN connection to the AWS Health Dashboard. | October 29, 2020 |
| VPN tunnel initiation | You can configure your VPN tunnels so that AWS brings up the tunnels. | August 27, 2020 |

| | | |
|---|---|---|
| Modify VPN connection options | You can modify the connection options for your Site-to-Site VPN connection. | August 27, 2020 |
| Additional security algorithms | You can apply additional security algorithms to your VPN tunnels. | August 14, 2020 |
| IPv6 support | Your VPN tunnels can support IPv6 traffic inside the tunnels. | August 12, 2020 |
| Merge AWS Site-to-Site VPN guides | This release merges the contents of the AWS Site-to-Site VPN Network Administrator Guide into this guide. | March 31, 2020 |
| Accelerated AWS Site-to-Site VPN connections | You can enable acceleration for your AWS Site-to-Site VPN connection. | December 3, 2019 |
| Modify AWS Site-to-Site VPN tunnel options | You can modify the options for a VPN tunnel in an AWS Site-to-Site VPN connection. You can also configure additional tunnel options. | August 29, 2019 |
| AWS Private Certificate Authority private certificate support | You can use a private certificate from AWS Private Certificate Authority to authenticate your VPN. | August 15, 2019 |
| New Site-to-Site VPN User Guide | This release separates the AWS Site-to-Site VPN (previously known as AWS Managed VPN) content from the *Amazon VPC User Guide*. | December 18, 2018 |

| | | |
|---|---|---|
| Modify the target gateway | You can modify the target gateway of AWS Site-to-Site VPN connection. | December 18, 2018 |
| Custom ASN | When you create a virtual private gateway, you can specify the private Autonomous System Number (ASN) for the Amazon side of the gateway. | October 10, 2017 |
| VPN tunnel options | You can specify inside tunnel CIDR blocks and custom pre-shared keys for your VPN tunnels. | October 3, 2017 |
| VPN metrics | You can view CloudWatch metrics for your VPN connections. | May 15, 2017 |
| VPN enhancements | A VPN connection now supports the AES 256-bit encryption function, SHA-256 hashing function, NAT traversal, and additional Diffie-Hellman groups during Phase 1 and Phase 2 of a connection. In addition, you can now use the same customer gateway IP address for each VPN connection that uses the same customer gateway device. | October 28, 2015 |

| | | |
|---|---|---|
| VPN connections using static routing configuration | You can create IPsec VPN connections to Amazon VPC using static routing configurations. Previously, VPN connections required the use of the Border Gateway Protocol (BGP). We now support both types of connections and you can now establish connectivity from devices that do not support BGP, including Cisco ASA and Microsoft Windows Server 2008 R2. | September 13, 2012 |
| Automatic route propagation | You can now configure automatic propagation of routes from your VPN and AWS Direct Connect links to your VPC routing tables. | September 13, 2012 |
| Site-to-Site VPN CloudHub and redundant VPN connections | You can securely communicate from one site to another with or without a VPC. You can use redundant VPN connections to provide a fault-tolerant connection to your VPC. | September 29, 2011 |