# VPN Interface IPsec



# Feature history for VPN interface IPsec

***Table 1: Feature History***

| Feature Name | Release Information | Description |
|---|---|---|
| SHA256 Support for IPSec Tunnels | Cisco IOS XE Catalyst SD-WAN Release 17.2.1r | This feature adds support for `HMAC_SHA256` algorithms for enhanced security. |

# Configure VPN interface IPsec

Use one of these methods to configure geofencing:

- Configuration group
- Feature template

**Note** Some configurations and protocols are identified as insecure and is a security risk for Cisco devices. Existing deployments continue to function, but new installations require intentional enablement. For more information on remediation, refer to Resilient Infrastructure: Cisco Catalyst SD-WAN and Routing

## Configure IPsec on the transport VPN using a configuration group

Follow these steps to configure IPSEC on the transport VPN using a configuration group.

If...

- you are running Cisco SD-WAN Manager releases from SD-WAN Manager 20.15.1 to SD-WAN Manager 20.15.3, and
- you are using the IPSEC feature to configure an edge device using Cisco IOS XE Catalyst SD-WAN Release 17.12.x or earlier,

then you must also configure a command using a CLI add-on profile. This command provides backward compatibility for edge devices using Cisco IOS XE Catalyst SD-WAN Release 17.12.x or earlier. Without this, the tunnel does not operate correctly.

To do this, create the CLI add-on profile and add it to the configuration group that you are using the configure the device. In the profile, include the **tunnel mode ipsec ipv4-old** command.

Using the CLI add-on profile with the **tunnel mode ipsec ipv4-old** command is not necessary in these releases:

- SD-WAN Manager 20.15.4 and later releases of 20.15.x
- SD-WAN Manager 20.18.1 and later releases

**Before you begin**

On the **Configuration** > **Configuration Groups** page, choose **SD-WAN** as the solution type.

## Procedure

**Step 1** From the Cisco SD-WAN Manager menu, choose **Configuration** > **Configuration Groups**.

**Step 2** Create and configure the basic IPSEC.

a) Configure a basic IPsec tunnel interface.

*Table 2: Basic Configuration*

| Field | Description |
|---|---|
| **Interface Name** | Enter the name of the IPsec interface. |
| **Description** | Enter a description of the IPsec interface. |
| **Tunnel Mode** | Choose from one of the following IPsec tunnel modes:<br>• **ipv4**: IPsec tunnel with IPv4 overlay and IPv4 underlay. IPv4 underlay is the default value.<br>• **ipv6**: IPsec tunnel with IPv6 overlay and IPv6 underlay.<br>• **ipv4-v6overlay**: IPsec tunnel with IPv6 overlay and IPv4 underlay. |
| **Multiplexing** | Choose **Yes** to enable multiplexing, if there is a tunnel in the transport VPN.<br>Default: No |
| **Interface Address** | Enter the IPv4 or IPv6 address of the IPsec interface, based on your choice from the **Tunnel Mode** drop-down list. |
| **Mask** | Enter the subnet mask. |

| Field | Description |
|---|---|
| **Preshared Key for IKE** | Enter the preshared key (PSK) for authentication. |
| **Associated Tracker / Tracker Group** | Choose a tracker or a tracker group from the drop-down list to associate with the IPsec tunnel. |
| **Tunnel Source** | Enter the source of the IPsec interface:<br>• **IP Address**: Enter the source IP address of the IPsec tunnel interface. Enter an IPv4 or IPv6 address that is based on your selection in the **Tunnel Mode** option. This address is on the local router.<br>• **Interface**: Enter the physical interface in the **IPsec Source Interface** field, which is the source of the IPsec tunnel. |
| **Tunnel Destination** | Enter the destination IP address of the IPsec tunnel interface. This address is on a remote device.<br>• **Address**: Enter the destination IP address of the IPsec tunnel interface. Enter an IPv4 or IPv6 address based on your selection in the **Tunnel Mode** option.<br>• **Application**: Choose an application from the drop-down list.<br>• **None**<br>• **Sig** |

b) Configure Internet Key Exchange fields.

***Table 3: Internet Key Exchange***

| Field | Description |
|---|---|
| **IKE Version** | Enter 1 to choose IKEv1.<br>Enter 2 to choose IKEv2.<br>Default: IKEv1 |
| **IKE Integrity Protocol** | Choose one of the following modes for the exchange of keying information and setting up IKE security associations:<br>• **Main**: Establishes an IKE SA session before starting IPsec negotiations.<br>• **Aggressive**: Negotiation is quicker, and the initiator and responder ID pass in the clear. Aggressive mode does not provide identity protection for communicating parties.<br>Default: Main mode |
| **IPsec Rekey Interval** | Specify the interval for refreshing IKE keys.<br>Range: 3600 through 1209600 seconds (1 hour through 14 days)<br>Default: 14400 seconds (4 hours) |

| Field | Description |
|---|---|
| **IKE Cipher Suite** | Specify the type of authentication and encryption to use during IKE key exchange.<br>Values: aes128-cbc-sha1, aes128-cbc-sha2, aes256-cbc-sha1, aes256-cbc-sha2<br>Default: aes256-cbc-sha1 |
| **IKE Diffie-Hellman Group** | Specify the Diffie-Hellman group to use in IKE key exchanges.<br>Values: 2, 14, 15, 16, 19, 20, 21, 24<br>Default: 16 |
| **IKE ID for Local End Point** | If the remote IKE peer requires a local endpoint identifier, specify it.<br>Range: 1 through 64 characters<br>Default: Source IP address of the tunnel |
| **IKE ID for Remote End Point** | If the remote IKE peer requires a remote endpoint identifier, specify it.<br>Range: 1 through 64 characters<br>Default: Destination IP address of the tunnel<br>There is no default option if you choose IKEv2. |

c) Configure IPSEC fields.

***Table 4: IPSEC***

| Field | Description |
|---|---|
| **IPsec Rekey Interval** | Specify the interval for refreshing IKE keys.<br>Range: 3600 through 1209600 seconds (1 hour through 14 days)<br>Default: 3600 seconds (1 hour) |
| **IPsec Replay Window** | Specify the replay window size for the IPsec tunnel.<br>Values: 64, 128, 256, 512, 1024, 2048, 4096, 8192 bytes<br>Default: 512 bytes |
| **IPsec Cipher Suite** | Specify the authentication and encryption to use on the IPsec tunnel.<br>Values: **aes256-cbc-sha1**, **aes256-gcm**, **null-sha1**<br>Default: **aes256-gcm** |

| Field | Description |
|---|---|
| **Perfect Forward Secrecy** | Specify the PFS settings to use on the IPsec tunnel by choosing one of the following values:<br>• **group-2**: Use the 1024 bit Diffie-Hellman prime modulus group<br>• **group-14**: Use the 2048 bit Diffie-Hellman prime modulus group<br>• **group-15**: Use the 3072 bit Diffie-Hellman prime modulus group<br>• **group-16**: Use the 4096 bit Diffie-Hellman prime modulus group<br>• **none**: Disable PFS<br>Default: **group-16** |

d) Configure advanced IPsec fields.

***Table 5: Advanced***

| Field | Description |
|---|---|
| **Associated VPN** | Select a VPN from the drop-down list to associate with the IPsec tunnel. |
| **Tunnel Route Via** | Specify the tunnel route details to steer the application traffic through.<br>**Note**<br>You cannot use the tunnel route via option to configure IPSec tunnels on a cellular interface because cellular interfaces do not include a next hop IP address for the default route. |
| **DPD Interval** | Specify the interval for IKE to send Hello packets on the connection.<br>Range: 10 through 3600 seconds (1 hour)<br>Default: 10 seconds |
| **DPD Retries** | Specify how many unacknowledged packets to accept before declaring an IKE peer to be dead and then removing the tunnel to the peer.<br>Range: 2 through 60<br>Default: 3 |
| **TCP MSS** | Specify the maximum segment size (MSS) of TPC SYN packets passing through the Cisco IOS XE Catalyst SD-WAN device. By default, the MSS is dynamically adjusted based on the interface or tunnel MTU such that TCP SYN packets are never fragmented.<br>Range: 552 through 1460 bytes<br>Default: None |
| **Clear-Dont-Fragment** | Click **On** to clear the Don't Fragment bit in the IPv4 packet header for packets being transmitted out the interface. |

| Field | Description |
|---|---|
| **IP MTU** | Based on your choice in the **Tunnel Mode** option, specify the maximum MTU size of the IPv4 or IPv4 packets on the interface.<br>Range: 576 through 9216<br>Default: 1500 bytes |
| **Shutdown** | Click **Off** to enable the interface. |

### What to do next

Also see Deploy a configuration group.

# Configure IPsec on the service VPN using a configuration group

Follow these steps to configure IPsec on the service VPN using a configuration group.

**Before you begin**

On the **Configuration** > **Configuration Groups** page, choose **SD-WAN** as the solution type.

### Procedure

**Step 1** From the Cisco SD-WAN Manager menu, choose **Configuration** > **Configuration Groups**.

**Step 2** Create and configure the VPN interface IPsec feature.

a) Configure basic configuration fields.

*Table 6: Basic Configuration*

| Field | Description |
|---|---|
| **Interface Name** | Enter the name of the IPsec interface. |
| **Description** | Enter a description of the IPsec interface. |
| **Tunnel Mode** | Choose from one of the following IPsec tunnel modes:<br>• **ipv4**: IPsec tunnel with IPv4 overlay and IPv4 underlay. IPv4 underlay is the default value.<br>• **ipv6**: IPsec tunnel with IPv6 overlay and IPv6 underlay.<br>• **ipv4-v6overlay**: IPsec tunnel with IPv6 overlay and IPv4 underlay. |
| **Interface Address** | Enter the IPv4 or IPv6 address of the IPsec interface, based on your choice from the **Tunnel Mode** drop-down list. |
| **Mask** | Enter the subnet mask. |

| Field | Description |
|---|---|
| **Tunnel Source** | Enter the source of the IPsec interface:<br>• **IP Address**: Enter the IPv4 or IPv6 address of the IPsec interface, based on your choice from the **Tunnel Mode** drop-down list.. This address is on the local router.<br>• **Interface**: Enter the physical interface that is the source of the IPsec tunnel. |
| **Tunnel Destination** | Enter the destination of the IPsec interface:<br>• **Address**: Enter the destination IPv4 or IPv6 address of the IPsec interface, based on your choice from the **Tunnel Mode** drop-down list. This address is on a remote device.<br>• **Application**: Choose an application from the drop-down list.<br>• None<br>• Sig |
| **TCP MSS** | Specify the maximum segment size (MSS) of TPC SYN packets passing through the vEdge router. By default, the MSS is dynamically adjusted based on the interface or tunnel MTU such that TCP SYN packets are never fragmented.<br>Range: 552 through 1460 bytes<br>Default: None |
| **Clear-Dont-Fragment** | Click On to clear the Don't Fragment bit in the IPv4 packet header for packets being transmitted out the interface. |
| **IP MTU** | Specify the maximum MTU size of packets on the interface.<br>Range: 576 through 1804<br>Default: 1500 bytes |

b) Configure IKE fields.

***Table 7: Internet Key Exchange***

| Field | Description |
|---|---|
| **IKE Version** | Enter 1 to choose IKEv1.<br>Enter 2 to choose IKEv2.<br>Default: IKEv1 |

| Field | Description |
|---|---|
| **IKE Integrity Protocol** | Choose one of the following modes for the exchange of keying information and setting up IKE security associations:<br>• **Main**: Establishes an IKE SA session before starting IPsec negotiations.<br>• **Aggressive**: Negotiation is quicker, and the initiator and responder ID pass in the clear. Aggressive mode does not provide identity protection for communicating parties.<br>Default: Main mode |
| **IPsec Rekey Interval (Seconds)** | Specify the interval for refreshing IKE keys.<br>Range: 3600 through 1209600 seconds (1 hour through 14 days)<br>Default: 14400 seconds (4 hours) |
| **IKE Cipher Suite** | Specify the type of authentication and encryption to use during IKE key exchange.<br>Values: aes128-cbc-sha1, aes128-cbc-sha2, aes256-cbc-sha1, aes256-cbc-sha2<br>Default: aes256-cbc-sha1 |
| **IKE Diffie-Hellman Group** | Specify the Diffie-Hellman group to use in IKE key exchanges.<br>Values: 2, 14, 15, 16, 19, 20, 21, 24<br>Default: 16 |
| **IKE ID for Local End Point** | If the remote IKE peer requires a local endpoint identifier, specify it.<br>Range: 1 through 64 characters<br>Default: Source IP address of the tunnel |
| **IKE ID for Remote End Point** | If the remote IKE peer requires a remote end point identifier, specify it.<br>Range: 1 through 64 characters<br>Default: Destination IP address of the tunnel<br>There is no default option if you have chosen IKEv2. |

c) Configure IPsec fields.

***Table 8: IPSEC***

| Field | Description |
|---|---|
| **IPsec Rekey Interval** | Specify the interval for refreshing IKE keys.<br>Range: 3600 through 1209600 seconds (1 hour through 14 days)<br>Default: 3600 seconds |

| Field | Description |
|---|---|
| **IPsec Replay Window** | Specify the replay window size for the IPsec tunnel.<br>Values: 64, 128, 256, 512, 1024, 2048, 4096, 8192 bytes<br>Default: 512 bytes |
| **IPsec Cipher Suite** | Specify the authentication and encryption to use on the IPsec tunnel.<br>Values: **aes256-cbc-sha1**, **aes256-gcm**, **null-sha1**<br>Default: **aes256-gcm** |
| **Perfect Forward Secrecy** | Specify the PFS settings to use on the IPsec tunnel by choosing one of the following values:<br>• **group-2**: Use the 1024-bit Diffie-Hellman prime modulus group<br>• **group-14**: Use the 2048-bit Diffie-Hellman prime modulus group<br>• **group-15**: Use the 3072-bit Diffie-Hellman prime modulus group<br>• **group-16**: Use the 4096-bit Diffie-Hellman prime modulus group<br>• **none**: Disable PFS<br>Default: **group-16** |

d) Configure advanced fields.

***Table 9: Advanced***

| Field | Description |
|---|---|
| **Associated VPN** | Select a VPN from the drop-down list to associate with the IPsec tunnel. |
| **Tunnel Route Via** | Specify the tunnel route details to steer the application traffic through.<br>**Note**<br>You cannot use the tunnel route via option to configure IPSec tunnels on a cellular interface because cellular interfaces do not include a next hop IP address for the default route. |
| **DPD Interval** | Specify the interval for IKE to send Hello packets on the connection.<br>Range: 10 through 3600 seconds (1 hour)<br>Default: 10 seconds |
| **DPD Retries** | Specify how many unacknowledged packets to accept before declaring an IKE peer to be dead and then removing the tunnel to the peer.<br>Range: 2 through 60<br>Default: 3 |

| Field | Description |
|---|---|
| **TCP MSS** | Specify the maximum segment size (MSS) of TPC SYN packets passing through the Cisco vEdge device. By default, the MSS is dynamically adjusted based on the interface or tunnel MTU such that TCP SYN packets are never fragmented.<br>Range: 552 through 1460 bytes<br>Default: None |
| **Clear-Dont-Fragment** | Click **On** to clear the Don't Fragment bit in the IPv4 packet header for packets being transmitted out the interface. |
| **IP MTU** | Based on your choice in the **Tunnel Mode** option, specify the maximum MTU size of the IPv4 or IPv4 packets on the interface.<br>Range: 576 through 9216<br>Default: 1500 bytes |
| **Shutdown** | Click **Off** to enable the interface. |

### What to do next

Also see Deploy a configuration group.

# Configure VPN interface IPsec using templates

Follow these steps to configure VPN interface IPsec using a feature template.

Use the VPN Interface IPsec feature template to configure IPsec tunnels on Cisco IOS XE service VPNs that are being used for Internet Key Exchange (IKE) sessions. You can configure IPsec on tunnels for VPN 1 through 65527, except for 512.

Cisco IOS XE Catalyst SD-WAN devices use VRFs in place of VPNs. However, the following steps still apply to configure Cisco IOS XE Catalyst SD-WAN devices through Cisco SD-WAN Manager. In Cisco SD-WAN Manager, the system automatically maps the VPN configurations to VRF configurations.

In controller mode, only Route based IPSec tunnels are supported.

### Procedure

**Step 1** From the Cisco SD-WAN Manager menu, choose **Configuration** > **Templates**.

**Step 2** Click **Feature Templates**.

In Cisco vManage Release 20.7.x and earlier releases, **Feature Templates** is titled **Feature**.

a) Click **Add Template**.
b) Choose a Cisco IOS XE Catalyst SD-WAN device from the list.
c) From the VPN section, click **VPN Interface IPsec**. The Cisco VPN Interface IPsec template displays.

d) In **Template Name**, enter a name for the template. The name can be up to 128 characters and can contain only alphanumeric characters.
e) In **Template Description**, enter a description of the template. The description can be up to 2048 characters and can contain only alphanumeric characters.

**Step 3** Configure the following VPN interface IPsec parameters:

a) Configure a basic IPsec tunnel interface.

| Parameter Name | Options/Format | Description |
|---|---|---|
| Shutdown* | **Yes** / **No** | Click **No** to enable the interface; click **Yes** to disable. |
| Interface Name* | **ipsec** *number* (1…255) | Enter the name of the IPsec interface. *Number* can be from 1 through 255. |
| Description | Enter a description of the IPsec interface. | |
| IPv4 Address* | *ipv4-prefix/length* | Enter the IPv4 address of the IPsec interface. The address must have a **/30** subnet. |
| Source * | Set the source of the IPsec tunnel that is being used for IKE key exchange: | |
| | **IP Address** | Click and enter the IPv4 address that is the source tunnel interface. This address must be configured in **VPN 0**. |
| | **Interface** | Click and enter the name of the physical interface that is the source of the IPsec tunnel. This interface must be configured in **VPN 0**.<br>• If you selected the Source as **Interface**, enter the name of the source interface. If you enter a loopback interface, an additional field **Tunnel Route-via Interface** displays where you enter the egress interface name.<br>**Note**<br>You cannot use the tunnel route via option to configure IPSec tunnels on a cellular interface because cellular interfaces do not include a next hop IP address for the default route. |

| Parameter Name | Options/Format | Description |
|---|---|---|
| Destination* | Set the destination of the IPsec tunnel that is being used for IKE key exchange. | |
| | **IPsec Destination IP Address** | Enter an IPv4 address that points to the destination. |
| | **TCP MSS** | Specify the maximum segment size (MSS) of TPC SYN packets passing through the router. By default, the MSS is dynamically adjusted based on the interface or tunnel MTU such that TCP SYN packets are never fragmented.<br>*Range:* 552 to 1960 bytes<br>*Default:* None |
| | **IP MTU** | Specify the maximum transmission unit (MTU) size of packets on the interface.<br>*Range:* 576 through 2000<br>*Default:* 1500 bytes |

b) Configure Internet key exchange (IKE) dead-peer detection (DPD) to determine whether the connection to an IKE peer is functional and reachable.

| Parameter Name | Description |
|---|---|
| DPD Interval | Specify the interval for IKE to send Hello packets on the connection.<br>Range: 10 through 3600 seconds<br>Default: Disabled |
| DPD Retries | Specify how many unacknowledged packets to accept before declaring an IKE peer to be dead and then tearing down the tunnel to the peer.<br>Range: 2 through 60<br>Default: 3 |

c) Configure IKE.

When you create an IPsec tunnel on a Cisco IOS XE Catalyst SD-WAN device, IKE Version 1 is enabled by default on the tunnel interface.

| Parameter Name | Options | Description |
|---|---|---|
| **IKE Version** | **1** IKEv1<br>**2** IKEv2 | Enter **1** to choose IKEv1.<br>Enter **2** to choose IKEv2.<br>Default: IKEv1<br>**Note**<br>In IKEv2 Preshared Keys (PSK), the '\' character is not supported and should not be used. |

| Parameter Name | Options | Description |
|---|---|---|
| **IKE Mode** | **Aggressive mode**<br>**Main mode** | For IKEv1 only, specify one of the following modes:<br>• Aggressive mode - Negotiation is quicker, and the initiator and responder ID pass in the clear.<br>• Establishes an IKE SA session before starting IPsec negotiations.<br>**Note**<br>For IKEv2, there is no mode.<br>**Note**<br>IKE aggressive mode with pre-shared keys should be avoided where possible. Otherwise a strong pre-shared key should be chosen.<br>Default: Main mode |
| **IPsec Rekey Interval** | 3600 - 1209600 seconds | Specify the interval for refreshing IKE keys.<br>Range: 1 hour through 14 days<br>Default: 14400 seconds (4 hours) |
| **IKE Cipher Suite** | • AES 256 CBC SHA 256<br>• AES 256 CBC SHA 384<br>• AES 256 CBC SHA 512<br>• AES 256 CBC SHA 1<br>• AES 256 GCM<br>• Nul SHA 256<br>• Nul SHA 384<br>• Nul SHA 512<br>• Nul SHA 1 | Specify the type of authentication and encryption to use during IKE key exchange.<br>Default: AES 256 CBC SHA 1 |

| Parameter Name | Options | Description |
|---|---|---|
| **IKE Diffie-Hellman Group** | **2**<br>**14**<br>**15**<br>**16** | Specify the Diffie-Hellman group to use in IKE key exchange, whether IKEv1 or IKEv2.<br>• 1024-bit modulus<br>• 2048-bit modulus<br>• 3072-bit modulus<br>• 4096-bit modulus<br>Default: 4096-bit modulus |
| **IKE Authentication** | Configure IKE authentication. | |
| | **Preshared Key** | Enter the password to use with the preshared key. |
| | **IKE ID for Local End Point** | If the remote IKE peer requires a local end point identifier, specify it.<br>Range: 1 through 64 characters<br>Default: Tunnel's source IP address |
| | **IKE ID for Remote End Point** | If the remote IKE peer requires a remote end point identifier, specify it.<br>Range: 1 through 64 characters<br>Default: Tunnel's destination IP address |

When you are pushing authentication from Cisco SD-WAN Manager, use the authentication string configured for the source and destination stations in double quotes as special characters are not supported. The string can be up to eight characters long.

d) Configure the IPsec tunnel that carries Internet Key Exchange (IKE) traffic.

| Parameter Name | Options | Description |
|---|---|---|
| **IPsec Rekey Interval** | 3600 - 1209600 seconds | Specify the interval for refreshing IKE keys.<br>Range: 1 hour through 14 days<br>Default: 3600 seconds |
| **IKE Replay Window** | 64, 128, 256, 512, 1024, 2048, 4096, 8192 | Specify the replay window size for the IPsec tunnel.<br>Default: 512 |
| **IPsec Cipher Suite** | aes256-cbc-sha1<br>aes256-gcm<br>null-sha1 | Specify the authentication and encryption to use on the IPsec tunnel<br>Default: aes256-gcm |

| Parameter Name | Options | Description |
|---|---|---|
| **Perfect Forward Secrecy** | **2** 1024-bit modulus<br>**14** 2048-bit modulus<br>**15** 3072-bit modulus<br>**16** 4096-bit modulus<br>**none** | Specify the PFS settings to use on the IPsec tunnel.<br>Choose one of the following Diffie-Hellman prime modulus groups:<br>1024-bit – group-2<br>2048-bit – group-14<br>3072-bit – group-15<br>4096-bit – group-16<br>none –disable PFS.<br>*Default*: group-16 |

From Cisco IOS XE Catalyst SD-WAN Release 17.11.1a, as part of the security hardening, the weaker ciphers are deprecated. As part of this change, the option to configure Diffie-Hellman (DH) groups 1, 2, and 5 is no longer supported. DH groups are used in IKE to establish session keys and are also available in IPsec as support for perfect forward secrecy.

# Change the IKE version from IKEv1 to IKEv2

Follow these steps to change the IKE version.

There is no single CLI for changing the IKE version. You need to follow the sequence of steps listed in the Change the IKE Version from IKEv1 to IKEv2 section.

### Procedure

**Step 1** From the Cisco SD-WAN Manager menu, choose **Configuration** > **Templates**.

**Step 2** Click **Feature Templates**, and then click **Add Template**.

In Cisco vManage Release 20.7.x and earlier releases, **Feature Templates** is called **Feature**.

**Step 3** Choose the device for which you are creating the template.

**Step 4** Click **Basic Configuration**.

**Step 5** Use the **shutdown** parameter with the **yes** option (**yes shutdown**) to shut down the tunnel.

**Step 6** Remove the ISAKMP profile from the IPsec profile.

**Step 7** Attach the IKEv2 profile with the IPsec profile.

Perform this step if you already have an IKEv2 profile. Otherwise, create an IKEv2 profile first.

**Step 8** Use the **shutdown** parameter with the **no** option (**no shutdown**) to start up the tunnel.

You must issue the **shutdown** operations in two separate operations.

# CLI configuration examples for VPN interface IPsec

### Basic configuration

The following is an example of the basic IPsec tunnel interface configuration.

```
crypto
   interface tunnel ifnum
      no shutdown
      vrf forwarding vrf_id
      ip address ip_address[mask]
      tunnel source wanif_ip
      tunnel mode {ipsec ipv4 | gre ip}
      tunnel destination gateway_ip
      tunnel protection ipsec profile ipsec_profile_name
```

### Dead-Peer detection

The following is an example of Internet key exchange (IKE) dead-peer detection (DPD) configuration.

```
crypto
   ikev2
      profile ikev2_profile_name
         dpd 10-3600 2-60 {on-demand | periodic}
```

### IKE

The following is an example of ISAKMP CLI configuration for IKEv1.

```
crypto
   isakmp
      keepalive 60-86400 2-60 {on-demand | periodic}
      policy policy_num
         encryption {AES128-CBC-SHA1 | AES256-CBC-SHA1}
         hash {sha384 | sha256 | sha}
         authentication pre-share
         group {2 | 14 | 16 | 19 | 20 | 21}
         lifetime 60-86400
      profile ikev1_profile_name
         match identity address ip_address [mask]
         keyring keyring_name
```

The following is an example of IPsec CLI configuration for IKEv1.

```
profile ipsec_profile_name
         set transform-set transform_set_name
         set isakmp-profile ikev1_profile_name
         set security-association
            lifetime {kilobytes disable | seconds 120-2592000}
            replay {disable | window-size [64 | 128 | 256 | 512 | 1024]}
         set pfs group {14 | 16 | 19 | 20 | 21}
   keyring keyring_name
      pre-shared-key address ip_address [mask] key key_string
   ipsec transform-set transform_set_name {esp-gcm 256 | esp-aes 256 [esp-sha384-hmac |
esp-sha256-hmac] mode tunnel
```

The following is an example configuration for IKE2.

```
crypto
   ikev2
      proposal proposal_name
         encryption {3des | aes-cbc-128 | aes-cbc-192 | aes-cbc-256 | des}
         integrity {sha256 | sha384 | sha512}
         group {2 | 14 | 15 | 16}
      keyring idev2_keyring_name
         peer peer_name
         address tunnel_dest_ip [mask]
         pre-shared-key key_string
      profile ikev2_profile_name
         match identity remote address ip_address
         authentication {remote | local} pre-share
         keyring local ikev2_keyring_name
         lifetime 120-86400
```

### IPsec tunnel

The following is an example configuration of IPsec tunnels.

```
crypto
   ipsec
      profile ipsec_profile_name
         set ikev2-profile ikev2_profile_name
         set security-association
            lifetime {seconds 120-2592000 | kilobytes disable}
            replay {disable | window-size {64 | 128 | 256 | 512 | 1024 | 4096 | 8192}
         set pfs group {2 | 14 | 15 | 16 | none}
         set transform-set transform_set_name
```