Failover for High Availability

This chapter describes how to configure Active/Standby or Active/Active failover to accomplish high availability of the Cisco ASA.

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About Failover

Configuring failover requires two identical ASAs connected to each other through a dedicated failover link and, optionally, a state link. The health of the active units and interfaces is monitored to determine if specific failover conditions are met. If those conditions are met, failover occurs.

Failover Modes

The ASA supports two failover modes, Active/Active failover and Active/Standby failover. Each failover mode has its own method for determining and performing failover.

- In Active/Standby failover, one unit is the active unit. It passes traffic. The standby unit does not actively pass traffic. When a failover occurs, the active unit fails over to the standby unit, which then becomes active. You can use Active/Standby failover for ASAs in single or multiple context mode.
In an Active/Active failover configuration, both ASAs can pass network traffic. Active/Active failover is only available to ASAs in multiple context mode. In Active/Active failover, you divide the security contexts on the ASA into 2 failover groups. A failover group is simply a logical group of one or more security contexts. One group is assigned to be active on the primary ASA, and the other group is assigned to be active on the secondary ASA. When a failover occurs, it occurs at the failover group level.

Both failover modes support stateful or stateless failover.

Failover System Requirements

This section describes the hardware, software, and license requirements for ASAs in a Failover configuration.

Hardware Requirements

The two units in a Failover configuration must:

- Be the same model.
- For the Firepower 9300 chassis, both units in the Failover pair must have the same interfaces assigned to the Failover logical devices.
- Have the same number and types of interfaces. For the Firepower 9300 chassis, all interfaces must be preconfigured in FXOS identically before you enable Failover.
- Have the same modules installed (if any)
- Have the same RAM installed.

If you are using units with different flash memory sizes in your Failover configuration, make sure the unit with the smaller flash memory has enough space to accommodate the software image files and the configuration files. If it does not, configuration synchronization from the unit with the larger flash memory to the unit with the smaller flash memory will fail.

Software Requirements

The two units in a Failover configuration must:

- Be in the same firewall mode (routed or transparent).
- Be in the same context mode (single or multiple).
- Have the same major (first number) and minor (second number) software version. However, you can temporarily use different versions of the software during an upgrade process; for example, you can upgrade one unit from Version 8.3(1) to Version 8.3(2) and have failover remain active. We recommend upgrading both units to the same version to ensure long-term compatibility.
- Have the same AnyConnect images. If the failover pair has mismatched images when a hitless upgrade is performed, then the clientless SSL VPN connection terminates in the final reboot step of the upgrade process, the database shows an orphaned session, and the IP pool shows that the IP address assigned to the client is “in use.”
Related Topics

License Requirements
The two units in a failover configuration do not need to have identical licenses; the licenses combine to make a failover cluster license.

Related Topics
Failover or ASA Cluster Licenses

Failover and Stateful Failover Links
The failover link and the optional stateful failover link are dedicated connections between the two units.

Caution
All information sent over the failover and state links is sent in clear text unless you secure the communication with an IPsec tunnel or a failover key. If the ASA is used to terminate VPN tunnels, this information includes any usernames, passwords and preshared keys used for establishing the tunnels. Transmitting this sensitive data in clear text could pose a significant security risk. We recommend securing the failover communication with an IPsec tunnel or a failover key if you are using the ASA to terminate VPN tunnels.

Failover Link
The two units in a failover pair constantly communicate over a failover link to determine the operating status of each unit.

Failover Link Data
The following information is communicated over the failover link:
- The unit state (active or standby)
- Hello messages (keep-alives)
- Network link status
- MAC address exchange
- Configuration replication and synchronization

Interface for the Failover Link
You can use any unused data interface (physical, redundant, or EtherChannel) as the failover link; however, you cannot specify an interface that is currently configured with a name. The failover link interface is not configured as a normal networking interface; it exists for failover communication only. This interface can only be used for the failover link (and also for the state link). The ASA does not support sharing interfaces between user data and the failover link even if different subinterfaces are configured for user data and failover. A separate physical, EtherChannel, or redundant interface must be used for the failover link.
See the following guidelines for the failover link:

- **5506-X through 5555-X**—You cannot use the Management interface as the failover link; you must use a data interface. The only exception is for the 5506H-X, where you can use the management interface as the failover link.

- **5506H-X**—You can use the Management 1/1 interface as the failover link. If you configure it for failover, you must reload the device for the change to take effect. In this case, you cannot also use the ASA Firepower module, because it requires the Management interface for management purposes.

- **5585-X**—Do not use the Management 0/0 interface, even though it can be used as a data interface. It does not support the necessary performance for this use.

- **ASA on the Firepower 9300 and Firepower 4100**—We recommend that you use a 10 GB interface for the combined failover and state link. You can use either a management type or data type interface as the failover link. For the Firepower 9300, to conserve interfaces and to share a failover link between modules in the same chassis, use a management type interface. For example, you have 2 chassis, each with 3 ASA security modules. You can create 3 failover pairs between the chassis. You can use a single 10 GigabitEthernet management interface between the chassis to act as the failover link. Just configure a unique VLAN subinterface within each module.

- **All other models**—1 GB interface is large enough for a combined failover and state link.

For a redundant interface used as the failover link, see the following benefits for added redundancy:

- When a failover unit boots up, it alternates between the member interfaces to detect an active unit.

- If a failover unit stops receiving keepalive messages from its peer on one of the member interfaces, it switches to the other member interface.

For an EtherChannel used as the failover link, to prevent out-of-order packets, only one interface in the EtherChannel is used. If that interface fails, then the next interface in the EtherChannel is used. You cannot alter the EtherChannel configuration while it is in use as a failover link.

### Connecting the Failover Link

Connect the failover link in one of the following two ways:

- Using a switch, with no other device on the same network segment (broadcast domain or VLAN) as the failover interfaces of the ASA.

- Using an Ethernet cable to connect the units directly, without the need for an external switch.

If you do not use a switch between the units, if the interface fails, the link is brought down on both peers. This condition may hamper troubleshooting efforts because you cannot easily determine which unit has the failed interface and caused the link to come down.

The ASA supports Auto-MDI/MDIX on its copper Ethernet ports, so you can either use a crossover cable or a straight-through cable. If you use a straight-through cable, the interface automatically detects the cable and swaps one of the transmit/receive pairs to MDIX.

### Stateful Failover Link

To use Stateful Failover, you must configure a Stateful Failover link (also known as the state link) to pass connection state information.
Shared with the Failover Link

Sharing a failover link is the best way to conserve interfaces. If you experience performance problems on that interface, consider dedicating a separate interface for the state link.

Dedicated Interface

You can use a dedicated data interface (physical, redundant, or EtherChannel) for the state link. For an EtherChannel used as the state link, to prevent out-of-order packets, only one interface in the EtherChannel is used. If that interface fails, then the next interface in the EtherChannel is used.

Connect a dedicated state link in one of the following two ways:

- Using a switch, with no other device on the same network segment (broadcast domain or VLAN) as the failover interfaces of the ASA device.
- Using an Ethernet cable to connect the appliances directly, without the need for an external switch.

If you do not use a switch between the units, if the interface fails, the link is brought down on both peers. This condition may hamper troubleshooting efforts because you cannot easily determine which unit has the failed interface and caused the link to come down.

The ASA supports Auto-MDI/MDIX on its copper Ethernet ports, so you can either use a crossover cable or a straight-through cable. If you use a straight-through cable, the interface automatically detects the cable and swaps one of the transmit/receive pairs to MDIX.

For optimum performance when using long distance failover, the latency for the state link should be less than 10 milliseconds and no more than 250 milliseconds. If latency is more than 10 milliseconds, some performance degradation occurs due to retransmission of failover messages.

Avoiding Interrupted Failover and Data Links

We recommend that failover links and data interfaces travel through different paths to decrease the chance that all interfaces fail at the same time. If the failover link is down, the ASA can use the data interfaces to determine if a failover is required. Subsequently, the failover operation is suspended until the health of the failover link is restored.

See the following connection scenarios to design a resilient failover network.
Scenario 1—Not Recommended

If a single switch or a set of switches are used to connect both failover and data interfaces between two ASAs, then when a switch or inter-switch-link is down, both ASAs become active. Therefore, the following two connection methods shown in the following figures are NOT recommended.

**Figure 1: Connecting with a Single Switch—Not Recommended**

**Figure 2: Connecting with a Double-Switch—Not Recommended**

Scenario 2—Recommended

We recommend that failover links NOT use the same switch as the data interfaces. Instead, use a different switch or use a direct cable to connect the failover link, as shown in the following figures.

**Figure 3: Connecting with a Different Switch**

**Figure 4: Connecting with a Cable**
Scenario 3—Recommended

If the ASA data interfaces are connected to more than one set of switches, then a failover link can be connected to one of the switches, preferably the switch on the secure (inside) side of network, as shown in the following figure.

*Figure 5: Connecting with a Secure Switch*
**Scenario 4—Recommended**

The most reliable failover configurations use a redundant interface on the failover link, as shown in the following figures.

*Figure 6: Connecting with Redundant Interfaces*

*Figure 7: Connecting with Inter-switch Links*
MAC Addresses and IP Addresses in Failover

When you configure your interfaces, you can specify an active IP address and a standby IP address on the same network. Although recommended, the standby address is not required. Without a standby IP address, the active unit cannot perform network tests to check the standby interface health; it can only track the link state. You also cannot connect to the standby unit on that interface for management purposes.

1. When the primary unit or failover group fails over, the secondary unit assumes the IP addresses and MAC addresses of the primary unit and begins passing traffic.

2. The unit that is now in standby state takes over the standby IP addresses and MAC addresses.

Because network devices see no change in the MAC to IP address pairing, no ARP entries change or time out anywhere on the network.

If the secondary unit boots without detecting the primary unit, the secondary unit becomes the active unit and uses its own MAC addresses, because it does not know the primary unit MAC addresses. However, when the primary unit becomes available, the secondary (active) unit changes the MAC addresses to those of the primary unit, which can cause an interruption in your network traffic. Similarly, if you swap out the primary unit with new hardware, a new MAC address is used.

Virtual MAC addresses guard against this disruption because the active MAC addresses are known to the secondary unit at startup, and remain the same in the case of new primary unit hardware. In multiple context mode, you can configure the ASA to generate virtual active and standby MAC addresses automatically. In single context mode, you can manually configure virtual MAC addresses.

If you do not configure virtual MAC addresses, you might need to clear the ARP tables on connected routers to restore traffic flow. The ASA does not send gratuitous ARPs for static NAT addresses when the MAC address changes, so connected routers do not learn of the MAC address change for these addresses.

The IP address and MAC address for the state link do not change at failover; the only exception is if the state link is configured on a regular data interface.

Related Topics

- About MAC Addresses
- Configure Active/Active Failover, on page 32

Intra- and Inter-Chassis Module Placement for the ASA Services Module

You can place the primary and secondary ASASMs within the same switch or in two separate switches.

Intra-Chassis Failover

If you install the secondary ASASM in the same switch as the primary ASASM, you protect against module-level failure.

Even though both ASASMs are assigned the same VLANs, only the active module takes part in networking. The standby module does not pass any traffic.
The following figure shows a typical intra-switch configuration.

**Figure 8: Intra-Switch Failover**

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**Inter-Chassis Failover**

To protect against switch-level failure, you can install the secondary ASASM in a separate switch. The ASASM does not coordinate failover directly with the switch, but it works harmoniously with the switch failover operation. See the switch documentation to configure failover for the switch.

For the best reliability of failover communications between ASASMs, we recommend that you configure an EtherChannel trunk port between the two switches to carry the failover and state VLANs.

For other VLANs, you must ensure that both switches have access to all firewall VLANs, and that monitored VLANs can successfully pass hello packets between both switches.

The following figure shows a typical switch and ASASM redundancy configuration. The trunk between the two switches carries the failover ASASM VLANs (VLANs 10 and 11).
Note

ASASM failover is independent of the switch failover operation; however, ASASM works in any switch failover scenario.

Figure 9: Normal Operation
If the primary ASASM fails, then the secondary ASASM becomes active and successfully passes the firewall VLANs.

*Figure 10: ASASM Failure*
If the entire switch fails, as well as the ASASM (such as in a power failure), then both the switch and the ASASM fail over to their secondary units.

**Figure 11: Switch Failure**

### Stateless and Stateful Failover

The ASA supports two types of failover, stateless and stateful for both the Active/Standby and Active/Active modes.

#### Note

Some configuration elements for clientless SSL VPN (such as bookmarks and customization) use the VPN failover subsystem, which is part of Stateful Failover. You must use Stateful Failover to synchronize these elements between the members of the failover pair. Stateless failover is not recommended for clientless SSL VPN.

### Stateless Failover

When a failover occurs, all active connections are dropped. Clients need to reestablish connections when the new active unit takes over.
Some configuration elements for clientless SSL VPN (such as bookmarks and customization) use the VPN failover subsystem, which is part of Stateful Failover. You must use Stateful Failover to synchronize these elements between the members of the failover pair. Stateless (regular) failover is not recommended for clientless SSL VPN.

**Stateful Failover**

When Stateful Failover is enabled, the active unit continually passes per-connection state information to the standby unit, or in Active/Active failover, between the active and standby failover groups. After a failover occurs, the same connection information is available at the new active unit. Supported end-user applications are not required to reconnect to keep the same communication session.

**Supported Features**

The following state information is passed to the standby ASA when Stateful Failover is enabled:

- NAT translation table
- TCP connection states
- UDP connection states
- The ARP table
- The Layer 2 bridge table (for bridge groups)
- The HTTP connection table (unless HTTP replication is enabled)
- The HTTP connection states (if HTTP replication is enabled)—By default, the ASA does not replicate HTTP session information when Stateful Failover is enabled. Because HTTP sessions are typically short-lived, and because HTTP clients typically retry failed connection attempts, not replicating HTTP sessions increases system performance without causing serious data or connection loss.
- The ISAKMP and IPsec SA table
- GTP PDP connection database
- SIP signalling sessions
- ICMP connection state—ICMP connection replication is enabled only if the respective interface is assigned to an asymmetric routing group.
- Dynamic Routing Protocols—Stateful Failover participates in dynamic routing protocols, like OSPF and EIGRP, so routes that are learned through dynamic routing protocols on the active unit are maintained in a Routing Information Base (RIB) table on the standby unit. Upon a failover event, packets travel normally with minimal disruption to traffic because the active secondary ASA initially has rules that mirror the primary ASA. Immediately after failover, the re-convergence timer starts on the newly Active unit. Then the epoch number for the RIB table increments. During re-convergence, OSPF and EIGRP routes become updated with a new epoch number. Once the timer is expired, stale route entries (determined by the epoch number) are removed from the table. The RIB then contains the newest routing protocol forwarding information on the newly Active unit.
Routes are synchronized only for link-up or link-down events on an active unit. If the link goes up or down on the standby unit, dynamic routes sent from the active unit may be lost. This is normal, expected behavior.

- Cisco IP SoftPhone sessions—If a failover occurs during an active Cisco IP SoftPhone session, the call remains active because the call session state information is replicated to the standby unit. When the call is terminated, the IP SoftPhone client loses connection with the Cisco Call Manager. This connection loss occurs because there is no session information for the CTIQBE hangup message on the standby unit. When the IP SoftPhone client does not receive a response back from the Call Manager within a certain time period, it considers the Call Manager unreachable and unregisters itself.

- VPN—VPN end users do not have to reauthenticate or reconnect the VPN session after a failover. However, applications operating over the VPN connection could lose packets during the failover process and not recover from the packet loss.

Unsupported Features

The following state information is not passed to the standby ASA when Stateful Failover is enabled:

- The user authentication (uauth) table
- Application inspections that are subject to advanced TCP-state tracking—The TCP state of these connections is not automatically replicated. While these connections are replicated to the standby unit, there is a best-effort attempt to re-establish a TCP state.
- TCP state bypass connections
- DHCP client
- DHCP server address leases
- Multicast routing
- State information for modules, such as the ASA FirePOWER module.
- Selected clientless SSL VPN features:
  - Smart Tunnels
  - Port Forwarding
  - Plugins
  - Java Applets
  - IPv6 clientless or Anyconnect sessions
  - Citrix authentication (Citrix users must reauthenticate after failover)

Transparent Firewall Mode Bridge Group Requirements for Failover

There are special considerations for failover when using bridge groups.
**Transparent Mode Bridge Group Requirements for Appliances, ASA**

When the active unit fails over to the standby unit, the connected switch port running Spanning Tree Protocol (STP) can go into a blocking state for 30 to 50 seconds when it senses the topology change. To avoid traffic loss while the port is in a blocking state, you can configure one of the following workarounds depending on the switch port mode:

- **Access mode**—Enable the STP PortFast feature on the switch:

  ```
  interface interface_id
  spanning-tree portfast
  ```

  The PortFast feature immediately transitions the port into STP forwarding mode upon linkup. The port still participates in STP. So if the port is to be a part of the loop, the port eventually transitions into STP blocking mode.

- **Trunk mode**—Block BPDUs on the ASA on a bridge group's member interfaces with an EtherType access rule.

  ```
  access-list id ethertype deny bpdu
  access-group id in interface name1
  access-group id in interface name2
  ```

  Blocking BPDUs disables STP on the switch. Be sure not to have any loops involving the ASA in your network layout.

If neither of the above options are possible, then you can use one of the following less desirable workarounds that impacts failover functionality or STP stability:

- Disable interface monitoring.
- Increase interface holdtime to a high value that will allow STP to converge before the ASAs fail over.
- Decrease STP timers to allow STP to converge faster than the interface holdtime.

**Transparent Mode Bridge Group Requirements for the ASA Services Module**

To avoid loops when you use failover with bridge groups, you should allow BPDUs to pass (the default), and you must use switch software that supports BPDU forwarding.

Loops can occur if both modules are active at the same time, such as when both modules are discovering each other's presence, or due to a bad failover link. Because the ASASMs bridge packets between the same two VLANs, loops can occur when packets between bridge group member interfaces get endlessly replicated by...
both ASASMs. The spanning tree protocol can break such loops if there is a timely exchange of BPDUs. To break the loop, BPDUs sent between VLAN 200 and VLAN 201 need to be bridged.

Figure 12: Bridge Group Loop

Failover Health Monitoring

The ASA monitors each unit for overall health and for interface health. This section includes information about how the ASA performs tests to determine the state of each unit.

Unit Health Monitoring

The ASA determines the health of the other unit by monitoring the failover link with hello messages. When a unit does not receive three consecutive hello messages on the failover link, the unit sends LANTEST messages on each data interface, including the failover link, to validate whether or not the peer is responsive. The action that the ASA takes depends on the response from the other unit. See the following possible actions:

- If the ASA receives a response on the failover link, then it does not fail over.

- If the ASA does not receive a response on the failover link, but it does receive a response on a data interface, then the unit does not failover. The failover link is marked as failed. You should restore the failover link as soon as possible because the unit cannot fail over to the standby while the failover link is down.

- If the ASA does not receive a response on any interface, then the standby unit switches to active mode and classifies the other unit as failed.
Interface Monitoring

You can monitor up to 1025 interfaces (in multiple mode, divided between all contexts). You should monitor important interfaces. For example in multiple mode, you might configure one context to monitor a shared interface: because the interface is shared, all contexts benefit from the monitoring.

When a unit does not receive hello messages on a monitored interface for 2 polling periods, it runs interface tests. If all interface tests fail for an interface, but this same interface on the other unit continues to successfully pass traffic, then the interface is considered to be failed. If the threshold for failed interfaces is met, then a failover occurs. If the other unit interface also fails all the network tests, then both interfaces go into the “Unknown” state and do not count towards the failover limit.

An interface becomes operational again if it receives any traffic. A failed ASA returns to standby mode if the interface failure threshold is no longer met.

If you have a services module, such as the ASA FirePOWER SSP, then the ASA also monitors the health of the module over the backplane interface. Failure of the module is considered a unit failure and will trigger failover. This setting is configurable.

If an interface has IPv4 and IPv6 addresses configured on it, the ASA uses the IPv4 addresses to perform the health monitoring.

If an interface has only IPv6 addresses configured on it, then the ASA uses IPv6 neighbor discovery instead of ARP to perform the health monitoring tests. For the broadcast ping test, the ASA uses the IPv6 all nodes address (FE02::1).

Note

If a failed unit does not recover and you believe it should not be failed, you can reset the state by entering the **failover reset** command. If the failover condition persists, however, the unit will fail again.

Interface Tests

The ASA uses the following interface tests:

1. **Link Up/Down test**—A test of the interface status. If the Link Up/Down test indicates that the interface is down, then the ASA considers it failed. If the status is Up, then the ASA performs the Network Activity test.

2. **Network Activity test**—A received network activity test. The purpose of this test is to generate network traffic using LANTEST messages to determine which (if either) unit has failed. At the start of the test, each unit clears its received packet count for its interfaces. As soon as a unit receives any packets during the test (up to 5 seconds), then the interface is considered operational. If one unit receives traffic and the other unit does not, then the unit that received no traffic is considered failed. If neither unit received traffic, then the ASA starts the ARP test.

3. **ARP test**—A reading of the unit ARP cache for the 2 most recently acquired entries. One at a time, the unit sends ARP requests to these machines, attempting to stimulate network traffic. After each request, the unit counts all received traffic for up to 5 seconds. If traffic is received, the interface is considered operational. If no traffic is received, an ARP request is sent to the next machine. If at the end of the list no traffic has been received, the ASA starts the ping test.

4. **Broadcast Ping test**—A ping test that consists of sending out a broadcast ping request. The unit then counts all received packets for up to 5 seconds. If any packets are received at any time during this interval, the
interface is considered operational and testing stops. If no traffic is received, the testing starts over again with the ARP test.

**Interface Status**

Monitored interfaces can have the following status:

- **Unknown**—Initial status. This status can also mean the status cannot be determined.
- **Normal**—The interface is receiving traffic.
- **Testing**—Hello messages are not heard on the interface for five poll times.
- **Link Down**—The interface or VLAN is administratively down.
- **No Link**—The physical link for the interface is down.
- **Failed**—No traffic is received on the interface, yet traffic is heard on the peer interface.

**Failover Times**

The following table shows the minimum, default, and maximum failover times.

> **Note**  
> If you manually fail over using the CLI or ASDM, or you reload the ASA, the failover starts immediately and is not subject to the timers listed below.

<table>
<thead>
<tr>
<th>Failover Condition</th>
<th>Minimum</th>
<th>Default</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active unit loses power or stops normal operation.</td>
<td>800 ms</td>
<td>15 s</td>
<td>45 s</td>
</tr>
<tr>
<td>Active unit main board interface link down.</td>
<td>500 ms</td>
<td>5 s</td>
<td>15 s</td>
</tr>
<tr>
<td>Active unit 4GE module interface link down.</td>
<td>2 s</td>
<td>5 s</td>
<td>15 s</td>
</tr>
<tr>
<td>Active unit FirePOWER module fails.</td>
<td>2 s</td>
<td>2 s</td>
<td>2 s</td>
</tr>
<tr>
<td>Active unit interface up, but connection problem causes interface testing.</td>
<td>5 s</td>
<td>25 s</td>
<td>75 s</td>
</tr>
</tbody>
</table>

**Configuration Synchronization**

Failover includes various types of configuration synchronization.
Running Configuration Replication

Running configuration replication occurs when one or both devices in the failover pair boot.

In Active/Standby failover, configurations are always synchronized from the active unit to the standby unit.

In Active/Active failover, whichever unit boots second obtains the running configuration from the unit that boots first, regardless of the primary or secondary designation of the booting unit. After both units are up, commands entered in the system execution space are replicated from the unit on which failover group 1 is in the active state.

When the standby/second unit completes its initial startup, it clears its running configuration (except for the failover commands needed to communicate with the active unit), and the active unit sends its entire configuration to the standby/second unit. When the replication starts, the ASA console on the active unit displays the message "Beginning configuration replication: Sending to mate," and when it is complete, the ASA displays the message "End Configuration Replication to mate." Depending on the size of the configuration, replication can take from a few seconds to several minutes.

On the unit receiving the configuration, the configuration exists only in running memory. You should save the configuration to flash memory according to Save Configuration Changes. For example, in Active/Active failover, enter the write memory all command in the system execution space on the unit that has failover group 1 in the active state. The command is replicated to the peer unit, which proceeds to write its configuration to flash memory.

**Note**

During replication, commands entered on the unit sending the configuration may not replicate properly to the peer unit, and commands entered on the unit receiving the configuration may be overwritten by the configuration being received. Avoid entering commands on either unit in the failover pair during the configuration replication process.

**Note**

The crypto ca server command and related subcommands are not supported with failover; you must remove them using the no crypto ca server command.

File Replication

Configuration syncing does not replicate the following files and configuration components, so you must copy these files manually so they match:

- AnyConnect images
- CSD images
- AnyConnect profiles

The ASA uses a cached file for the AnyConnect client profile stored in cache:/stc/profiles, and not the file stored in the flash file system. To replicate the AnyConnect client profile to the standby unit, perform one of the following:

- Enter the write standby command on the active unit.
- Reapply the profile on the active unit.
«Reload the standby unit.

• Local Certificates Authorities (CAs)
• ASA images
• ASDM images

**Command Replication**

After startup, commands that you enter on the active unit are immediately replicated to the standby unit. You do not have to save the active configuration to flash memory to replicate the commands.

In Active/Active failover, commands entered in the system execution space are replicated from the unit on which failover group 1 is in the active state.

Failure to enter the commands on the appropriate unit for command replication to occur causes the configurations to be out of synchronization. Those changes may be lost the next time the initial configuration synchronization occurs.

The following commands are replicated to the standby ASA:

• All configuration commands except for **mode**, **firewall**, and **failover lan unit**
• **copy running-config startup-config**
• **delete**
• **mkdir**
• **rename**
• **rmdir**
• **write memory**

The following commands are *not* replicated to the standby ASA:

• All forms of the **copy** command except for **copy running-config startup-config**
• All forms of the **write** command except for **write memory**
• **debug**
• **failover lan unit**
• **firewall**
• **show**
• **terminal pager** and **pager**

**About Active/Standby Failover**

Active/Standby failover lets you use a standby ASA to take over the functionality of a failed unit. When the active unit fails, it changes to the standby state while the standby unit changes to the active state.
For multiple context mode, the ASA can fail over the entire unit (including all contexts) but cannot fail over individual contexts separately.

**Primary/Secondary Roles and Active/Standby Status**

The main differences between the two units in a failover pair are related to which unit is active and which unit is standby, namely which IP addresses to use and which unit actively passes traffic.

However, a few differences exist between the units based on which unit is primary (as specified in the configuration) and which unit is secondary:

- The primary unit always becomes the active unit if both units start up at the same time (and are of equal operational health).
- The primary unit MAC addresses are always coupled with the active IP addresses. The exception to this rule occurs when the secondary unit becomes active and cannot obtain the primary unit MAC addresses over the failover link. In this case, the secondary unit MAC addresses are used.

**Active Unit Determination at Startup**

The active unit is determined by the following:

- If a unit boots and detects a peer already running as active, it becomes the standby unit.
- If a unit boots and does not detect a peer, it becomes the active unit.
- If both units boot simultaneously, then the primary unit becomes the active unit, and the secondary unit becomes the standby unit.

**Failover Events**

In Active/Standby failover, failover occurs on a unit basis. Even on systems running in multiple context mode, you cannot fail over individual or groups of contexts.

The following table shows the failover action for each failure event. For each failure event, the table shows the failover policy (failover or no failover), the action taken by the active unit, the action taken by the standby unit, and any special notes about the failover condition and actions.

**Table 2: Failover Events**

<table>
<thead>
<tr>
<th>Failure Event</th>
<th>Policy</th>
<th>Active Group Action</th>
<th>Standby Group Action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active unit failed (power or hardware)</td>
<td>Failover</td>
<td>n/a</td>
<td>Become active Mark active as failed</td>
<td>No hello messages are received on any monitored interface or the failover link.</td>
</tr>
<tr>
<td>Formerly active unit recovers</td>
<td>No failover</td>
<td>Become standby</td>
<td>No action</td>
<td>None.</td>
</tr>
</tbody>
</table>
### About Active/Active Failover

This section describes Active/Active failover.

**Active/Active Failover Overview**

In an Active/Active failover configuration, both ASAs can pass network traffic. Active/Active failover is only available to ASAs in multiple context mode. In Active/Active failover, you divide the security contexts on the ASA into a maximum of 2 failover groups.

A failover group is simply a logical group of one or more security contexts. You can assign failover group to be active on the primary ASA, and failover group 2 to be active on the secondary ASA. When a failover occurs, it occurs at the failover group level. For example, depending on interface failure patterns, it is possible for failover group 1 to fail over to the secondary ASA, and subsequently failover group 2 to fail over to the primary ASA. This event could occur if the interfaces in failover group 1 are down on the primary ASA but up on the secondary ASA, while the interfaces in failover group 2 are down on the secondary ASA but up on the primary ASA.

<table>
<thead>
<tr>
<th>Failure Event</th>
<th>Policy</th>
<th>Active Group Action</th>
<th>Standby Group Action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standby unit failed (power or hardware)</td>
<td>No failover</td>
<td>Mark standby as failed</td>
<td>n/a</td>
<td>When the standby unit is marked as failed, then the active unit does not attempt to fail over, even if the interface failure threshold is surpassed.</td>
</tr>
<tr>
<td>Failover link failed during operation</td>
<td>No failover</td>
<td>Mark failover link as failed</td>
<td>Mark failover link as failed</td>
<td>You should restore the failover link as soon as possible because the unit cannot fail over to the standby unit while the failover link is down.</td>
</tr>
<tr>
<td>Failover link failed at startup</td>
<td>No failover</td>
<td>Mark failover link as failed</td>
<td>Become active</td>
<td>If the failover link is down at startup, both units become active.</td>
</tr>
<tr>
<td>State link failed</td>
<td>No failover</td>
<td>No action</td>
<td>No action</td>
<td>State information becomes out of date, and sessions are terminated if a failover occurs.</td>
</tr>
<tr>
<td>Interface failure on active unit above threshold</td>
<td>Failover</td>
<td>Mark active as failed</td>
<td>Become active</td>
<td>None.</td>
</tr>
<tr>
<td>Interface failure on standby unit above threshold</td>
<td>No failover</td>
<td>No action</td>
<td>Mark standby as failed</td>
<td>When the standby unit is marked as failed, then the active unit does not attempt to fail over even if the interface failure threshold is surpassed.</td>
</tr>
</tbody>
</table>

---

---
The admin context is always a member of failover group 1. Any unassigned security contexts are also members of failover group 1 by default. If you want Active/Active failover, but are otherwise uninterested in multiple contexts, the simplest configuration would be to add one additional context and assign it to failover group 2.

**Note**
When configuring Active/Active failover, make sure that the combined traffic for both units is within the capacity of each unit.

**Note**
You can assign both failover groups to one ASA if desired, but then you are not taking advantage of having two active ASAs.

### Primary/Secondary Roles and Active/Standby Status for a Failover Group

As in Active/Standby failover, one unit in an Active/Active failover pair is designated the primary unit, and the other unit the secondary unit. Unlike Active/Standby failover, this designation does not indicate which unit becomes active when both units start simultaneously. Instead, the primary/secondary designation does two things:

- The primary unit provides the running configuration to the pair when they boot simultaneously.
- Each failover group in the configuration is configured with a primary or secondary unit preference. When used with preemption, this preference ensures that the failover group runs on the correct unit after it starts up. Without preemption, both groups run on the first unit to boot up.

### Active Unit Determination for Failover Groups at Startup

The unit on which a failover group becomes active is determined as follows:

- When a unit boots while the peer unit is not available, both failover groups become active on the unit.
- When a unit boots while the peer unit is active (with both failover groups in the active state), the failover groups remain in the active state on the active unit regardless of the primary or secondary preference of the failover group until one of the following occurs:
  - A failover occurs.
  - You manually force a failover.
  - You configured preemption for the failover group, which causes the failover group to automatically become active on the preferred unit when the unit becomes available.

### Failover Events

In an Active/Active failover configuration, failover occurs on a failover group basis, not a system basis. For example, if you designate both failover groups as active on the primary unit, and failover group 1 fails, then failover group 2 remains active on the primary unit while failover group 1 becomes active on the secondary unit.
Because a failover group can contain multiple contexts, and each context can contain multiple interfaces, it is possible for all interfaces in a single context to fail without causing the associated failover group to fail. The following table shows the failover action for each failure event. For each failure event, the policy (whether or not failover occurs), actions for the active failover group, and actions for the standby failover group are given.

**Table 3: Failover Events**

<table>
<thead>
<tr>
<th>Failure Event</th>
<th>Policy</th>
<th>Active Group Action</th>
<th>Standby Group Action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A unit experiences a power or software failure</td>
<td>Failover</td>
<td>Become standby Mark as failed</td>
<td>Become active Mark active as failed</td>
<td>When a unit in a failover pair fails, any active failover groups on that unit are marked as failed and become active on the peer unit.</td>
</tr>
<tr>
<td>Interface failure on active failover group above threshold</td>
<td>Failover</td>
<td>Mark active group as failed</td>
<td>Become active</td>
<td>None.</td>
</tr>
<tr>
<td>Interface failure on standby failover group above threshold</td>
<td>No failover</td>
<td>No action</td>
<td>Mark standby group as failed</td>
<td>When the standby failover group is marked as failed, the active failover group does not attempt to fail over, even if the interface failure threshold is surpassed.</td>
</tr>
<tr>
<td>Formerly active failover group recovers</td>
<td>No failover</td>
<td>No action</td>
<td>No action</td>
<td>Unless failover group preemption is configured, the failover groups remain active on their current unit.</td>
</tr>
<tr>
<td>Failover link failed at startup</td>
<td>No failover</td>
<td>Become active</td>
<td>Become active</td>
<td>If the failover link is down at startup, both failover groups on both units become active.</td>
</tr>
<tr>
<td>State link failed</td>
<td>No failover</td>
<td>No action</td>
<td>No action</td>
<td>State information becomes out of date, and sessions are terminated if a failover occurs.</td>
</tr>
<tr>
<td>Failover link failed during operation</td>
<td>No failover</td>
<td>n/a</td>
<td>n/a</td>
<td>Each unit marks the failover link as failed. You should restore the failover link as soon as possible because the unit cannot fail over to the standby unit while the failover link is down.</td>
</tr>
</tbody>
</table>

**Licensing for Failover**

Failover units do not require the same license on each unit. If you have licenses on both units, they combine into a single running failover cluster license. There are some exceptions to this rule. See the following table for precise licensing requirements for failover.
<table>
<thead>
<tr>
<th>Model</th>
<th>License Requirement</th>
</tr>
</thead>
</table>
| ASA 5506-X and ASA 5506W-X | • Active/Standby—Security Plus License.  
• Active/Active—No Support.  
  **Note** Each unit must have the same encryption license. |
| ASA 5512-X through ASA 5555-X | • ASA 5512-X—Security Plus License.  
• Other models—Base License.  
  **Note** Each unit must have the same encryption license.  
  • In multiple context mode, each unit must have the same AnyConnect Apex license.  
  • Each unit must have the same IPS module license. You also need the IPS signature subscription on the IPS side for both units. See the following guidelines:  
  ◦ To buy the IPS signature subscription you need to have the ASA with IPS pre-installed (the part number must include "IPS", for example ASA5515-IPS-K9); you cannot buy the IPS signature subscription for a non-IPS part number ASA.  
  ◦ You need the IPS signature subscription on both units; this subscription is not shared in failover, because it is not an ASA license.  
  ◦ The IPS signature subscription requires a unique IPS module license per unit. Like other ASA licenses, the IPS module license is technically shared in the failover cluster license. However, because of the IPS signature subscription requirements, you must buy a separate IPS module license for each unit in. |
| ASA | See [Failover Licenses for the ASA](#). |
| ASA on the Firepower 9300 Chassis | See [Failover Licenses for the ASA on the Firepower 9300 Chassis](#). |
| All other models | Base License or Standard License.  
  **Note** Each unit must have the same encryption license.  
  • In multiple context mode, each unit must have the same AnyConnect Apex license. |

---

**Note**

A valid permanent key is required; in rare instances, your PAK authentication key can be removed. If your key consists of all 0's, then you need to reinstall a valid authentication key before failover can be enabled.
Guidelines for Failover

Context Mode

• Active/Active mode is supported only in multiple context mode.
• For multiple context mode, perform all steps in the system execution space unless otherwise noted.
• Stateful failover is not supported for AnyConnect connections in multiple context mode.

Model Support

• ASA 5506W-X—You must disable interface monitoring for the internal GigabitEthernet 1/9 interface. These interfaces will not be able to communicate to perform the default interface monitoring checks, resulting in a switch from active to standby and back again because of expected interface communication failures.
• ASA on the Firepower 9300—We recommend that you use inter-chassis Failover for the best redundancy.
• The ASAv on public cloud networks such as Microsoft Azure and Amazon Web Services are not supported with Failover because Layer 2 connectivity is required.

Additional Guidelines

• When the active unit fails over to the standby unit, the connected switch port running Spanning Tree Protocol (STP) can go into a blocking state for 30 to 50 seconds when it senses the topology change. To avoid traffic loss while the port is in a blocking state, you can enable the STP PortFast feature on the switch:

```plaintext
interface interface_id spanning-tree portfast
```

This workaround applies to switches connected to both routed mode and bridge group interfaces. The PortFast feature immediately transitions the port into STP forwarding mode upon linkup. The port still participates in STP. So if the port is to be a part of the loop, the port eventually transitions into STP blocking mode.

• You cannot enable failover if a local CA server is configured. Remove the CA configuration using the `no crypto ca server` command.

• Configuring port security on the switch(es) connected to the ASA failover pair can cause communication problems when a failover event occurs. This problem occurs when a secure MAC address configured or learned on one secure port moves to another secure port, a violation is flagged by the switch port security feature.

• You can monitor up to 1025 interfaces on a unit, across all contexts.

• For Active/Standby Failover and a VPN IPsec tunnel, you cannot monitor both the active and standby units using SNMP over the VPN tunnel. The standby unit does not have an active VPN tunnel, and will drop traffic destined for the NMS. You can instead use SNMPv3 with encryption so the IPsec tunnel is not required.

• For Active/Active failover, no two interfaces in the same context should be configured in the same ASR group.

• For Active/Active failover, you can define a maximum of two failover groups.
For Active/Active failover, when removing failover groups, you must remove failover group 1 last. Failover group 1 always contains the admin context. Any context not assigned to a failover group defaults to failover group 1. You cannot remove a failover group that has contexts explicitly assigned to it.

**Related Topics**

- Auto Update Server Support in Failover Configurations

**Defaults for Failover**

By default, the failover policy consists of the following:

- No HTTP replication in Stateful Failover.
- A single interface failure causes failover.
- The interface poll time is 5 seconds.
- The interface hold time is 25 seconds.
- The unit poll time is 1 second.
- The unit hold time is 15 seconds.
- Virtual MAC addresses are disabled in multiple context mode, except for the ASASM, where they are enabled by default.
- Monitoring on all physical interfaces, or for the ASASM, all VLAN interfaces.

**Configure Active/Standby Failover**

To configure Active/Standby failover, configure basic failover settings on both the primary and secondary units. All other configuration occurs only on the primary unit, and is then synched to the secondary unit.

**Configure the Primary Unit for Active/Standby Failover**

Follow the steps in this section to configure the primary in an Active/Standby failover configuration. These steps provide the minimum configuration needed to enable failover on the primary unit.

**Before You Begin**

- We recommend that you configure standby IP addresses for all interfaces except for the failover and state links.
- Do not configure a `nameif` for the failover and state links.
- For multiple context mode, complete this procedure in the system execution space. To change from the context to the system execution space, enter the `changeto system` command.
Procedure

**Step 1** Designate this unit as the primary unit:
```
failover lan unit primary
```

**Step 2** Specify the interface to be used as the failover link:
```
failover lan interface if_name interface_id
```

Example:
```
ciscoasa(config)# failover lan interface folink gigabitethernet0/3
```
This interface cannot be used for any other purpose (except, optionally, the state link).
The `if_name` argument assigns a name to the interface.
The `interface_id` argument can be a data physical interface, subinterface, redundant interface, or EtherChannel interface ID. On the ASASM, the `interface_id` specifies a VLAN ID. For the ASA 5506H-X only, you can specify the Management 1/1 interface as the failover link. If you do so, you must save the configuration with `write memory`, and then `reload` the device. You then cannot use this interface for failover and also use the ASA Firepower module; the module requires the interface for management, and you can only use it for one function. For the Firepower 9300 ASA security module, you can use any data or management type interface.

**Step 3** Assign the active and standby IP addresses to the failover link:
```
failover interface ip failover_if_name {ip_address mask | ipv6_address / prefix} standby ip_address
```

Example:
```
ciscoasa(config)# failover interface ip folink 172.27.48.1 255.255.255.0 standby 172.27.48.2
```
Or:
```
ciscoasa(config)# failover interface ip folink 2001:a0a:b00::a0a:b70/64 standby 2001:a0a:b00::a0a:b71
```
This address should be on an unused subnet.
The standby IP address must be in the same subnet as the active IP address.

**Step 4** Enable the failover link:
```
interface failover_interface_id
no shutdown
```

Example:
```
ciscoasa(config)# interface gigabitethernet 0/3
ciscoasa(config-if)# no shutdown
```

**Step 5** (Optional) Specify the interface you want to use as the state link:
```
failover link if_name interface_id
```

Example:
```
ciscoasa(config)# failover link if_name interface_id
```
Configure the Primary Unit for Active/Standby Failover

Example:

ciscoasa(config)# failover link folink gigabitethernet0/3

You can share the failover link with the statelink.

The if_name argument assigns a name to the interface.

The interface_id argument can be a physical interface, subinterface, redundant interface, or EtherChannel interface ID. On the ASASM, the interface_id specifies a VLAN ID.

Step 6 If you specified a separate state link, assign the active and standby IP addresses to the state link:

failover interface ip state_if_name {ip_address mask | ipv6_address/prefix} standby ip_address

Example:

ciscoasa(config)# failover interface ip statelink 172.27.49.1 255.255.255.0 standby 172.27.49.2

Or:

ciscoasa(config)# failover interface ip statelink 2001:a0a:b00:a::a0a:b70/64 standby 2001:a0a:b00:a::a0a:b71

This address should be on an unused subnet, different from the failover link.

The standby IP address must be in the same subnet as the active IP address.

Skip this step if you are sharing the state link.

Step 7 If you specified a separate state link, enable the state link.

interface state_interface_id

no shutdown

Example:

ciscoasa(config)# interface gigabitethernet 0/4
ciscoasa(config-if)# no shutdown

Skip this step if you are sharing the state link.

Step 8 (Optional) Do one of the following to encrypt communications on the failover and state links:

- (Preferred) Establish IPsec LAN-to-LAN tunnels on the failover and state links between the units to encrypt all failover communications:

  failover ipsec pre-shared-key [0 | 8] key

  Example:

  ciscoasa(config)# failover ipsec pre-shared-key a3rynsun

  The key can be up to 128 characters in length. Identify the same key on both units. The key is used by IKEv2 to establish the tunnels.

  If you use a master passphrase (see Configure the Master Passphrase), then the key is encrypted in the configuration. If you are copying from the configuration (for example, from more system:running-config)
output), specify that the key is encrypted by using the 8 keyword. 0 is used by default, specifying an unencrypted password.

The failover ipsec pre-shared-key shows as ***** in show running-config output; this obscured key is not copyable.

If you do not configure failover and state link encryption, failover communication, including any passwords or keys in the configuration that are sent during command replication, will be in clear text.

You cannot use both IPsec encryption and the legacy failover key encryption. If you configure both methods, IPsec is used. However, if you use the master passphrase, you must first remove the failover key using the no failover key command before you configure IPsec encryption.

Failover LAN-to-LAN tunnels do not count against the IPsec (Other VPN) license.

• (Optional) Encrypt failover communication on the failover and state links:

  failover key [0 | 8] {hex key | shared_secret}

  Example:

  ciscoasa(config)# failover key johnclicht0n

  Use a shared secret from 1 to 63 characters or a 32-character hex key. For the shared secret, you can use any combination of numbers, letters, or punctuation. The shared secret or hex key is used to generate the encryption key. Identify the same key on both units.

  If you use a master passphrase (see Configure the Master Passphrase), then the shared secret or hex key is encrypted in the configuration. If you are copying from the configuration (for example, from more system:running-config output), specify that the shared secret or hex key is encrypted by using the 8 keyword. 0 is used by default, specifying an unencrypted password.

  The failover key shared secret shows as ***** in show running-config output; this obscured key is not copyable.

  If you do not configure failover and state link encryption, failover communication, including any passwords or keys in the configuration that are sent during command replication, will be in clear text.

**Step 9** Enable failover:

  failover

**Step 10** Save the system configuration to flash memory:

  write memory

---

**Examples**

The following example configures the failover parameters for the primary unit:

```
failover lan unit primary
failover lan interface folink gigabitethernet0/3
failover interface ip folink 172.27.48.1 255.255.255.0 standby 172.27.48.2
interface gigabitethernet 0/3
no shutdown
failover link folink gigabitethernet0/3
failover ipsec pre-shared-key a3rnsun
```
failover

Configure the Secondary Unit for Active/Standby Failover

The only configuration required on the secondary unit is for the failover link. The secondary unit requires these commands to communicate initially with the primary unit. After the primary unit sends its configuration to the secondary unit, the only permanent difference between the two configurations is the failover lan unit command, which identifies each unit as primary or secondary.

Before You Begin

- Do not configure a nameif for the failover and state links.
- For multiple context mode, complete this procedure in the system execution space. To change from the context to the system execution space, enter the changeto system command.

Procedure

Step 1  Re-enter the exact same commands as on the primary unit except for the failover lan unit primary command. You can optionally replace it with the failover lan unit secondary command, but it is not necessary because secondary is the default setting. See Configure the Primary Unit for Active/Standby Failover, on page 28. For example:

ciscoasa(config)# failover lan interface folink gigabitethernet0/3
INFO: Non-failover interface config is cleared on GigabitEthernet0/3 and its sub-interfaces

ciscoasa(config)# failover interface ip folink 172.27.48.1 255.255.255.0 standby 172.27.48.2

ciscoasa(config)# interface gigabitethernet 0/3

ciscoasa(config-ifc)# no shutdown

ciscoasa(config-ifc)# failover link folink gigabitethernet0/3

ciscoasa(config)# failover ipsec pre-shared-key a3rynsun

ciscoasa(config)# failover

Step 2  After the failover configuration syncs, save the configuration to flash memory:

ciscoasa(config)# write memory

Configure Active/Active Failover

This section tells how to configure Active/Active failover.

Configure the Primary Unit for Active/Active Failover

Follow the steps in this section to configure the primary unit in an Active/Active failover configuration. These steps provide the minimum configuration needed to enable failover on the primary unit.
Before You Begin

- Enable multiple context mode according to Enable or Disable Multiple Context Mode.
- We recommend that you configure standby IP addresses for all interfaces except for the failover and state links according to Routed and Transparent Mode Interfaces.
- Do not configure a nameif for the failover and state links.
- Complete this procedure in the system execution space. To change from the context to the system execution space, enter the `changeto system` command.

Procedure

Step 1  Designate this unit as the primary unit:  
`failover lan unit primary`

Step 2  Specify the interface to be used as the failover link:  
`failover lan interface if_name interface_id`

Example:  
ciscoasa(config)# failover lan interface folink gigabitethernet0/3

This interface cannot be used for any other purpose (except, optionally, the state link).  
The `if_name` argument assigns a name to the interface.  
The `interface_id` argument can be a physical interface, subinterface, redundant interface, or EtherChannel interface ID. On the ASASM, the `interface_id` specifies a VLAN ID.

Step 3  Assign the active and standby IP addresses to the failover link:  
`standby failover interface ip if_name {ip_address mask | ipv6_address /prefix } standby ip_address`

Example:  
ciscoasa(config)# failover interface ip folink 172.27.48.1 255.255.255.0 standby 172.27.48.2

Or:  
ciscoasa(config)# failover interface ip folink 2001:a0a:b00::a0a:b70/64 standby 2001:a0a:b00::a0a:b71

This address should be on an unused subnet.  
The standby IP address must be in the same subnet as the active IP address.

Step 4  Enable the failover link:  
`interface failover_interface_id`  
`no shutdown`

Example:  
ciscoasa(config)# interface gigabitethernet 0/3
ciscoasa(config-if)# no shutdown

**Step 5** *(Optional)* Specify the interface you want to use as the state link:

`failover link if_name interface_id`

**Example:**

```bash
ciscoasa(config)# failover link statelink gigabitethernet0/4
```

We recommend specifying a separate interface from the failover link or data interfaces.

The `if_name` argument assigns a name to the interface.

The `interface_id` argument can be a physical interface, subinterface, redundant interface, or EtherChannel interface ID. On the ASASM, the `interface_id` specifies a VLAN ID.

**Step 6**

If you specified a separate state link, assign the active and standby IP addresses to the state link:

This address should be on an unused subnet, different from the failover link.

The standby IP address must be in the same subnet as the active IP address.

Skip this step if you are sharing the state link.

`failover interface ip state if_name {ip_address mask | ipv6_address/prefix} standby ip_address`

**Example:**

```bash
ciscoasa(config)# failover interface ip statelink 172.27.49.1 255.255.255.0 standby 172.27.49.2
```

Or:

```bash
ciscoasa(config)# failover interface ip statelink 2001:a0a:b00:a::a0a:b70/64 standby 2001:a0a:b00:a::a0a:b71
```

**Step 7**

If you specified a separate state link, enable the state link:

`interface state_interface_id`

`no shutdown`

**Example:**

```bash
ciscoasa(config)# interface gigabitethernet 0/4
ciscoasa(config-if)# no shutdown
```

Skip this step if you are sharing the state link.

**Step 8** *(Optional)* Do one of the following to encrypt communications on the failover and state links:

- *(Preferred)* Establish IPsec LAN-to-LAN tunnels on the failover and state links between the units to encrypt all failover communications:

  `failover ipsec pre-shared-key [0 | 8] key`

  ```bash
ciscoasa(config)# failover ipsec pre-shared-key a3rynsun
  ```

  The `key` can be up to 128 characters in length. Identify the same key on both units. The key is used by IKEv2 to establish the tunnels.
If you use a master passphrase (see Configure the Master Passphrase), then the key is encrypted in the configuration. If you are copying from the configuration (for example, from `more system:running-config` output), specify that the key is encrypted by using the `8` keyword. `0` is used by default, specifying an unencrypted password.

The `failover ipsec pre-shared-key` shows as ***** in `show running-config` output; this obscured key is not copyable.

If you do not configure failover and state link encryption, failover communication, including any passwords or keys in the configuration that are sent during command replication, will be in clear text.

You cannot use both IPsec encryption and the legacy `failover key` encryption. If you configure both methods, IPsec is used. However, if you use the master passphrase, you must first remove the failover key using the `no failover key` command before you configure IPsec encryption.

Failover LAN-to-LAN tunnels do not count against the IPsec (Other VPN) license.

- (Optional) Encrypt failover communication on the failover and state links:

```
failover key [0 | 8] {hex key | shared_secret}
```

Use a `shared_secret`, from 1 to 63 characters, or a 32-character `hex key`.

For the `shared_secret`, you can use any combination of numbers, letters, or punctuation. The shared secret or hex key is used to generate the encryption key. Identify the same key on both units.

If you use a master passphrase (see Configure the Master Passphrase), then the shared secret or hex key is encrypted in the configuration. If you are copying from the configuration (for example, from `more system:running-config` output), specify that the shared secret or hex key is encrypted by using the `8` keyword. `0` is used by default, specifying an unencrypted password.

The `failover key` shared secret shows as ***** in `show running-config` output; this obscured key is not copyable.

If you do not configure failover and state link encryption, failover communication, including any passwords or keys in the configuration that are sent during command replication, will be in clear text.

**Step 9** Create failover group 1:
```
failover group 1
primary
preempt [delay]
```

**Example:**
```
ciscoasa(config)# failover group 1
```
```
ciscoasa(config)# primary
```
```
ciscoasa(config)# preempt 1200
```

Typically, you assign group 1 to the primary unit, and group 2 to the secondary unit. Both failover groups become active on the unit that boots first (even if it seems like they boot simultaneously, one unit becomes active first), despite the primary or secondary setting for the group. The `preempt` command causes the failover group to become active on the designated unit automatically when that unit becomes available.
You can enter an optional \textit{delay} value, which specifies the number of seconds the failover group remains active on the current unit before automatically becoming active on the designated unit. Valid values are from 1 to 1200.

If Stateful Failover is enabled, the preemption is delayed until the connections are replicated from the unit on which the failover group is currently active.

If you manually fail over, the \texttt{preempt} command is ignored.

**Step 10** Create failover group 2 and assign it to the secondary unit:
\begin{verbatim}
failover group 2
  secondary
  preempt \texttt{[delay]}
\end{verbatim}

**Example:**
\begin{verbatim}
ciscoasa(config-fover-group)# failover group 2
ciscoasa(config-fover-group)# secondary

ciscoasa(config-fover-group)# preempt 1200
\end{verbatim}

**Step 11** Enter the context configuration mode for a given context, and assign the context to a failover group:
\begin{verbatim}
context \texttt{name}
  \texttt{join-failover-group} \texttt{1 | 2}
\end{verbatim}

**Example:**
\begin{verbatim}
ciscoasa(config)# context Eng
ciscoasa(config-ctx)# join-failover-group 2
\end{verbatim}

Repeat this command for each context.

Any unassigned contexts are automatically assigned to failover group 1. The admin context is always a member of failover group 1; you cannot assign it to group 2.

**Step 12** Enable failover:
\begin{verbatim}
failover
\end{verbatim}

**Step 13** Save the system configuration to flash memory:
\begin{verbatim}
write memory
\end{verbatim}

**Examples**
The following example configures the failover parameters for the primary unit:
\begin{verbatim}
failover lan unit primary
failover lan interface folink gigabitethernet0/3
failover interface ip folink 172.27.48.1 255.255.255.0 standby 172.27.48.2

interface gigabitethernet 0/3
  no shutdown
failover link statelink gigabitethernet0/4
failover interface ip statelink 172.27.49.1 255.255.255.0 standby 172.27.49.2

interface gigabitethernet 0/4
  no shutdown
\end{verbatim}
Configure the Secondary Unit for Active/Active Failover

The only configuration required on the secondary unit is for the failover link. The secondary unit requires these commands to communicate initially with the primary unit. After the primary unit sends its configuration to the secondary unit, the only permanent difference between the two configurations is the `failover lan unit` command, which identifies each unit as primary or secondary.

**Before You Begin**

- Enable multiple context mode according to Enable or Disable Multiple Context Mode.
- Do not configure a `nameif` for the failover and state links.
- Complete this procedure in the system execution space. To change from the context to the system execution space, enter the `changeto system` command.

**Procedure**

**Step 1**
Re-enter the exact same commands as on the primary unit except for the `failover lan unit primary` command. You can optionally replace it with the `failover lan unit secondary` command, but it is not necessary because `secondary` is the default setting. You also do not need to enter the `failover group` and `join-failover-group` commands, as they are replicated from the primary unit. See Configure the Primary Unit for Active/Active Failover, on page 32.

For example:

```cisco
    failover lan interface folink gigabitethernet0/3
    INFO: Non-failover interface config is cleared on GigabitEthernet0/3 and its sub-interfaces
    failover interface ip folink 172.27.48.1 255.255.255.0 standby 172.27.48.2
    interface gigabitethernet 0/3
    no shutdown
    failover link statelink gigabitethernet0/4
    INFO: Non-failover interface config is cleared on GigabitEthernet0/4 and its sub-interfaces
    failover interface ip statelink 172.27.49.1 255.255.255.0 standby 172.27.49.2
    interface gigabitethernet 0/4
    no shutdown
    failover ipsec pre-shared-key a3rynsun
    failover
```

**Step 2**
After the failover configuration syncs from the primary unit, save the configuration to flash memory:

```cisco
    write memory
```
Configure Optional Failover Parameters

You can customize failover settings as desired.

Configure Failover Criteria and Other Settings

See Defaults for Failover, on page 28 for the default settings for many parameters that you can change in this section. For Active/Active mode, you set most criteria per failover group.

Before You Begin

• Configure these settings in the system execution space in multiple context mode.

Procedure

Step 1 Change the unit poll and hold times:

```
failover polltime [unit] [msec] poll_time [holdtime [msec] time]
```

Example:

```
ciscoasa(config)# failover polltime unit msec 200 holdtime msec 800
```

The polltime range is between 1 and 15 seconds or between 200 and 999 milliseconds. The holdtime range is between 1 and 45 seconds or between 800 and 999 milliseconds. You cannot enter a holdtime value that is less than 3 times the unit poll time. With a faster poll time, the ASA can detect failure and trigger failover faster. However, faster detection can cause unnecessary switchovers when the network is temporarily congested.

If a unit does not hear hello packet on the failover communication interface for one polling period, additional testing occurs through the remaining interfaces. If there is still no response from the peer unit during the hold time, the unit is considered failed and, if the failed unit is the active unit, the standby unit takes over as the active unit.

In Active/Active mode, you set this rate for the system; you cannot set this rate per failover group.

Step 2 Set the session replication rate in connections per second:

```
failover replication rate conns
```

Example:

```
ciscoasa(config)# failover replication rate 20000
```

The minimum and maximum rate is determined by your model. The default is the maximum rate. In Active/Active mode, you set this rate for the system; you cannot set this rate per failover group.
Step 3  Disable the ability to make any configuration changes directly on the standby unit or context:

```
failover standby config-lock
```

By default, configurations on the standby unit/context are allowed with a warning message.

Step 4  (Active/Active mode only) Specify the failover group you want to customize:

```
failover group {1 | 2}
```

Example:

```c
Ciscoasa(config)# failover group 1
Ciscoasa(config-fover-group)#
```

Step 5  Enable HTTP state replication:

- For Active/Standby mode:

```
failover replication http
```

- For Active/Active mode:

```
replication http
```

To allow HTTP connections to be included in the state information replication, you need to enable HTTP replication. Because HTTP connections are typically short-lived, and because HTTP clients typically retry failed connection attempts, HTTP connections are not automatically included in the replicated state information.

Note Because of a delay when deleting HTTP flows from the standby unit when using failover, the `show conn count` output might show different numbers on the active unit vs. the standby unit; if you wait several seconds and re-issue the command, you will see the same count on both units.

Step 6  Set the threshold for failover when interfaces fail:

- For Active/Standby mode:

```
failover interface-policy num [%]
```

Example:

```c
Ciscoasa (config)# failover interface-policy 20%
```

- For Active/Active mode:

```
interface-policy num [%]
```

Example:

```c
Ciscoasa(config-fover-group)# interface-policy 20%
```

By default, one interface failure causes failover.

When specifying a specific number of interfaces, the `num` argument can be from 1 to 1025.

When specifying a percentage of interfaces, the `num` argument can be from 1 to 100.

Step 7  Change the interface poll and hold times:

- For Active/Standby mode:
Configure the virtual MAC address for an interface:

- For Active/Standby mode:

  **failover mac address phy_if active_mac standby_mac**

  Example:

  ```
ciscoasa(config)# failover mac address gigabitethernet0/2 00a0.c969.87c8 00a0.c918.95d8
  ```

- For Active/Active mode:

  **mac address phy_if active_mac standby_mac**

  Example:

  ```
ciscoasa(config-fover-group)# mac address gigabitethernet0/2 00a0.c969.87c8 00a0.c918.95d8
  ```

The **phy_if** argument is the physical name of the interface, such as gigabitethernet0/1.

The **active_mac** and **standby_mac** arguments are MAC addresses in H.H.H format, where H is a 16-bit hexadecimal digit. For example, the MAC address 00-0C-F1-42-4C-DE would be entered as 000C.F142.4CDE.

The **active_mac** address is associated with the active IP address for the interface, and the **standby_mac** is associated with the standby IP address for the interface.

You can also set the MAC address using other commands or methods, but we recommend using only one method. If you set the MAC address using multiple methods, the MAC address used depends on many variables, and might not be predictable.
Use the `show interface` command to display the MAC address used by an interface.

**Step 9**
(Active/Active mode only) Repeat this procedure for the other failover group.

---

## Configure Interface Monitoring

By default, monitoring is enabled on all physical interfaces, or for the ASASM, all VLAN interfaces, and on any hardware or software modules installed on the ASA, such as the ASA FirePOWER module. You might want to exclude interfaces attached to less critical networks from affecting your failover policy.

**Before You Begin**

- You can monitor up to 1025 interfaces on a unit (across all contexts in multiple context mode).
- In multiple context mode, configure interfaces within each context.

**Procedure**

Enable or disable health monitoring for an interface:

```
[no] monitor-interface {if_name | service-module}
```

**Example:**

```
ciscoasa(config)# monitor-interface inside
```

```
ciscoasa(config)# no monitor-interface eng1
```

If you do not want a hardware or software module failure, such as the ASA FirePOWER module, to trigger failover, you can disable module monitoring using the `no monitor-interface service-module` command. Note that for the ASA 5585-X, if you disable monitoring of the service module, you may also want to disable monitoring of the interfaces on the module, which are monitored separately.

## Configure Support for Asymmetrically Routed Packets (Active/Active Mode)

When running in Active/Active failover, a unit might receive a return packet for a connection that originated through its peer unit. Because the ASA that receives the packet does not have any connection information for the packet, the packet is dropped. This drop most commonly occurs when the two ASAs in an Active/Active failover pair are connected to different service providers and the outbound connection does not use a NAT address.

You can prevent the return packets from being dropped by allowing asymmetrically routed packets. To do so, you assign the similar interfaces on each ASA to the same ASR group. For example, both ASAs connect to the inside network on the inside interface, but connect to separate ISPs on the outside interface. On the primary unit, assign the active context outside interface to ASR group 1; on the secondary unit, assign the active context outside interface to the same ASR group 1. When the primary unit outside interface receives a packet for which it has no session information, it checks the session information for the other interfaces in standby contexts that are in the same group; in this case, ASR group 1. If it does not find a match, the packet is dropped. If it finds a match, then one of the following actions occurs:
• If the incoming traffic originated on a peer unit, some or all of the layer 2 header is rewritten and the packet is redirected to the other unit. This redirection continues as long as the session is active.

• If the incoming traffic originated on a different interface on the same unit, some or all of the layer 2 header is rewritten and the packet is reinjected into the stream.

---

Note

This feature does not provide asymmetric routing; it restores asymmetrically routed packets to the correct interface.

The following figure shows an example of an asymmetrically routed packet.

Figure 13: ASR Example

1 An outbound session passes through the ASA with the active SecAppA context. It exits interface outside ISP-A (192.168.1.1).

2 Because of asymmetric routing configured somewhere upstream, the return traffic comes back through the interface outside ISP-B (192.168.2.2) on the ASA with the active SecAppB context.

3 Normally the return traffic would be dropped because there is no session information for the traffic on interface 192.168.2.2. However, the interface is configured as part of ASR group 1. The unit looks for the session on any other interface configured with the same ASR group ID.

4 The session information is found on interface outside ISP-A (192.168.1.2), which is in the standby state on the unit with SecAppB. Stateful Failover replicated the session information from SecAppA to SecAppB.

5 Instead of being dropped, the layer 2 header is rewritten with information for interface 192.168.1.1 and the traffic is redirected out of the interface 192.168.1.2, where it can then return through the interface on
the unit from which it originated (192.168.1.1 on SecAppA). This forwarding continues as needed until the session ends.

**Before You Begin**

- **Stateful Failover**—Passes state information for sessions on interfaces in the active failover group to the standby failover group.
- **Replication HTTP**—HTTP session state information is not passed to the standby failover group, and therefore is not present on the standby interface. For the ASA to be able to re-route asymmetrically routed HTTP packets, you need to replicate the HTTP state information.
- **Perform this procedure within each active context on the primary and secondary units.**
- **You cannot configure both ASR groups and traffic zones within a context. If you configure a zone in a context, none of the context interfaces can be part of an ASR group.**

**Procedure**

**Step 1** On the primary unit, specify the interface for which you want to allow asymmetrically routed packets: `interface phy_if`

**Example:**

```
primary/admin(config)# interface gigabitethernet 0/0
```

**Step 2** Set the ASR group number for the interface:

```
asr-group num
```

**Example:**

```
primary/admin(config-ifc)# asr-group 1
```

Valid values for `num` range from 1 to 32.

**Step 3** On the secondary unit, specify the similar interface for which you want to allow asymmetrically routed packets:

```
interface phy_if
```

**Example:**

```
secondary/ctx1(config)# interface gigabitethernet 0/1
```

**Step 4** Set the ASR group number for the interface to match the primary unit interface:

```
asr-group num
```

**Example:**

```
secondary/ctx1(config-ifc)# asr-group 1
```
Examples

The two units have the following configuration (configurations show only the relevant commands). The device labeled SecAppA in the diagram is the primary unit in the failover pair.

Primary Unit System Configuration

```plaintext
interface GigabitEthernet0/1
    description LAN/STATE Failover Interface
interface GigabitEthernet0/2
    no shutdown
interface GigabitEthernet0/3
    no shutdown
interface GigabitEthernet0/4
    no shutdown
interface GigabitEthernet0/5
    no shutdown
    failover
    failover lan unit primary
    failover lan interface folink GigabitEthernet0/1
    failover link folink
    failover interface ip folink 10.0.4.1 255.255.255.0 standby 10.0.4.11
    failover group 1
        primary
    failover group 2
        secondary
    admin-context SecAppA
    context admin
        allocate-interface GigabitEthernet0/2
        allocate-interface GigabitEthernet0/3
        config-url flash:/admin.cfg
        join-failover-group 1
    context SecAppB
        allocate-interface GigabitEthernet0/4
        allocate-interface GigabitEthernet0/5
        config-url flash:/ctx1.cfg
        join-failover-group 2

SecAppA Context Configuration

interface GigabitEthernet0/2
    nameif outsideISP-A
    security-level 0
    ip address 192.168.1.1 255.255.255.0 standby 192.168.1.2
    asr-group 1
interface GigabitEthernet0/3
    nameif inside
    security-level 100
    ip address 10.1.0.1 255.255.255.0 standby 10.1.0.11
    monitor-interface outside

SecAppB Context Configuration

interface GigabitEthernet0/4
    nameif outsideISP-B
    security-level 0
    ip address 192.168.2.2 255.255.255.0 standby 192.168.2.1
    asr-group 1
interface GigabitEthernet0/5
    nameif inside
    security-level 100
    ip address 10.2.20.1 255.255.255.0 standby 10.2.20.11
```
Manage Failover

This section describes how to manage Failover units after you enable Failover, including how to change the Failover setup and how to force failover from one unit to another.

Related Topics

Configure Optional Failover Parameters, on page 38

Force Failover

To force the standby unit to become active, perform the following procedure.

Before You Begin

In multiple context mode, perform this procedure in the System execution space.

Procedure

Step 1  Force a failover when entered on the standby unit. The standby unit becomes the active unit.
If you specify the group group_id, then this command forces a failover when entered on the standby unit for the specified Active/Active failover group. The standby unit becomes the active unit for the failover group.

- For Active/Standby mode on the standby unit:
  failover active
- For Active/Active mode on the standby unit:
  failover active [group group_id]

Example:

standby# failover active group 1

Step 2  Force a failover when entered on the active unit. The active unit becomes the standby unit.
If you specify the group group_id, then this command forces a failover when entered on the active unit for the specified failover group. The active unit becomes the standby unit for the failover group.

- For Active/Standby mode on the active unit:
  no failover active
- For Active/Active mode on the active unit:
  no failover active [group group_id]

Example:

active# no failover active group 1
Disable Failover

Disabling failover on one or both units causes the active and standby state of each unit to be maintained until you reload. For an Active/Active failover pair, the failover groups remain in the active state on whichever unit they are active, no matter which unit they are configured to prefer.

See the following characteristics when you disable failover:

- The standby unit/context remains in standby mode so that both units do not start passing traffic (this is called a pseudo-standby state).
- The standby unit/context continues to use its standby IP addresses even though it is no longer connected to an active unit/context.
- The standby unit/context continues to listen for a connection on the failover link. If failover is re-enabled on the active unit/context, then the standby unit/context resumes ordinary standby status after re-synchronizing the rest of its configuration.
- Do not enable failover manually on the standby unit to make it active; instead see Force Failover, on page 45. If you enable failover on the standby unit, you will see a MAC address conflict that can disrupt IPv6 traffic.
- To truly disable failover, save the no failover configuration to the startup configuration, and then reload.

Before You Begin

In multiple context mode, perform this procedure in the system execution space.

Procedure

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Disable failover:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no failover</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2</th>
<th>To completely disable failover, save the configuration and reload:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>write memory</td>
</tr>
<tr>
<td></td>
<td>reload</td>
</tr>
</tbody>
</table>

Restore a Failed Unit

To restore a failed unit to an unfailed state, perform the following procedure.

Before You Begin

In multiple context mode, perform this procedure in the System execution space.
Procedure

Step 1 Restore a failed unit to an unfailed state:

- For Active/Standby mode:
  
  ```
  failover reset
  ```

- For Active/Active mode:
  
  ```
  failover reset [group group_id]
  ```

Example:

```
ciscoasa(config)# failover reset group 1
```

Restoring a failed unit to an unfailed state does not automatically make it active; restored units remain in the standby state until made active by failover (forced or natural). An exception is a failover group (Active/Active mode only) configured with failover preemption. If previously active, a failover group becomes active if it is configured with preemption and if the unit on which it failed is the preferred unit.

If you specify the `group group_id`, this command restores a failed Active/Active failover group to an unfailed state.

Step 2 (Active/Active mode only) To reset failover at the failover group level:

a) In the System choose Monitoring > Failover > Failover Group #, where # is the number of the failover group you want to control.

b) Click Reset Failover.

Re-Sync the Configuration

If you enter the write standby command on the active unit, the standby unit clears its running configuration (except for the failover commands used to communicate with the active unit), and the active unit sends its entire configuration to the standby unit.

For multiple context mode, when you enter the `write standby` command in the system execution space, all contexts are replicated. If you enter the `write standby` command within a context, the command replicates only the context configuration.

Replicated commands are stored in the running configuration.

Test the Failover Functionality

To test failover functionality, perform the following procedure.
**Procedure**

**Step 1** Test that your active unit is passing traffic as expected by using FTP (for example) to send a file between hosts on different interfaces.

**Step 2** Force a failover by entering the following command on the active unit:

Active/Standby mode:

`ciscoasa(config)# no failover active`

Active/Active mode:

`ciscoasa(config)# no failover active group group_id`

**Step 3** Use FTP to send another file between the same two hosts.

**Step 4** If the test was not successful, enter the `show failover` command to check the failover status.

**Step 5** When you are finished, you can restore the unit to active status by enter the following command on the newly active unit:

Active/Standby mode:

`ciscoasa(config)# no failover active`

Active/Active mode:

`ciscoasa(config)# failover active group group_id`

**Note** When an ASA interface goes down, for failover it is still considered to be a unit issue. If the ASA detects that an interface is down, failover occurs immediately, without waiting for the interface holdtime. The interface holdtime is only useful when the ASA considers its status to be OK, although it is not receiving hello packets from the peer. To simulate interface holdtime, shut down the VLAN on the switch to prevent peers from receiving hello packets from each other.

---

**Remote Command Execution**

Remote command execution lets you send commands entered at the command line to a specific failover peer.

**Send a Command**

Because configuration commands are replicated from the active unit or context to the standby unit or context, you can use the `failover exec` command to enter configuration commands on the correct unit, no matter which unit you are logged in to. For example, if you are logged in to the standby unit, you can use the `failover exec active` command to send configuration changes to the active unit. Those changes are then replicated to the standby unit. Do not use the `failover exec` command to send configuration commands to the standby unit or context; those configuration changes are not replicated to the active unit and the two configurations will no longer be synchronized.

Output from configuration, exec, and `show` commands is displayed in the current terminal session, so you can use the `failover exec` command to issue `show` commands on a peer unit and view the results in the current terminal.

You must have sufficient privileges to execute a command on the local unit to execute the command on the peer unit.
Procedure

**Step 1** If you are in multiple context mode, use the `changeto contextname` command to change to the context you want to configure. You cannot change contexts on the failover peer with the `failover exec` command.

**Step 2** Use the following command to send commands to the specified failover unit:
```
ciscoasa(config)# failover exec {active | mate | standby}
```

Use the `active` or `standby` keyword to cause the command to be executed on the specified unit, even if that unit is the current unit. Use the `mate` keyword to cause the command to be executed on the failover peer.

Commands that cause a command mode change do not change the prompt for the current session. You must use the `show failover exec` command to display the command mode the command is executed in. See Change Command Modes for more information.

**Change Command Modes**

The `failover exec` command maintains a command mode state that is separate from the command mode of your terminal session. By default, the `failover exec` command mode starts in global configuration mode for the specified device. You can change that command mode by sending the appropriate command (such as the `interface` command) using the `failover exec` command. The session prompt does not change when you change modes using `failover exec`.

For example, if you are logged in to global configuration mode of the active unit of a failover pair, and you use the `failover exec active` command to change to interface configuration mode, the terminal prompt remains in global configuration mode, but commands entered using `failover exec` are entered in interface configuration mode.

The following examples show the difference between the terminal session mode and the `failover exec` command mode. In the example, the administrator changes the `failover exec` mode on the active unit to interface configuration mode for the interface GigabitEthernet0/1. After that, all commands entered using `failover exec active` are sent to interface configuration mode for interface GigabitEthernet0/1. The administrator then uses failover exec active to assign an IP address to that interface. Although the prompt indicates global configuration mode, the `failover exec active` mode is in interface configuration mode.

```
ciscoasa(config)# failover exec active interface GigabitEthernet0/1
```
```
ciscoasa(config)# failover exec active ip address 192.168.1.1 255.255.255.0 standby 192.168.1.2
```
```
ciscoasa(config)# router rip
```
```
ciscoasa(config-router)#
```

Changing commands modes for your current session to the device does not affect the command mode used by the `failover exec` command. For example, if you are in interface configuration mode on the active unit, and you have not changed the `failover exec` command mode, the following command would be executed in global configuration mode. The result would be that your session to the device remains in interface configuration mode, while commands entered using `failover exec active` are sent to router configuration mode for the specified routing process.

```
ciscoasa(config-if)# failover exec active router ospf 100
```
```
ciscoasa(config-if)#
```
Use the `show failover exec` command to display the command mode on the specified device in which commands sent with the `failover exec` command are executed. The `show failover exec` command takes the same keywords as the `failover exec` command: `active`, `mate`, or `standby`. The `failover exec` mode for each device is tracked separately.

For example, the following is sample output from the `show failover exec` command entered on the standby unit:

```plaintext
ciscoasa(config)# failover exec active interface GigabitEthernet0/1
Active unit Failover EXEC is at interface sub-command mode

ciscoasa(config)# sh failover exec active
Active unit Failover EXEC is at interface sub-command mode

ciscoasa(config)# sh failover exec standby
Standby unit Failover EXEC is at config mode

ciscoasa(config)# sh failover exec mate
Active unit Failover EXEC is at interface sub-command mode
```

### Security Considerations

The `failover exec` command uses the failover link to send commands to and receive the output of the command execution from the peer unit. You should enable encryption on the failover link to prevent eavesdropping or man-in-the-middle attacks.

### Limitations of Remote Command Execution

When you use remote commands you face the following limitations:

- If you upgrade one unit using the zero-downtime upgrade procedure and not the other, both units must be running software that supports the `failover exec` command for the command to work.

- Command completion and context help is not available for the commands in the `cmd_string` argument.

- In multiple context mode, you can only send commands to the peer context on the peer unit. To send commands to a different context, you must first change to that context on the unit to which you are logged in.

- You cannot use the following commands with the `failover exec` command:
  
  - `changoeto`
  
  - `debug` (undebug)

- If the standby unit is in the failed state, it can still receive commands from the `failover exec` command if the failure is due to a service card failure; otherwise, the remote command execution will fail.

- You cannot use the `failover exec` command to switch from privileged EXEC mode to global configuration mode on the failover peer. For example, if the current unit is in privileged EXEC mode, and you enter `failover exec mate configure terminal`, the `show failover exec mate` output will show that the failover exec session is in global configuration mode. However, entering configuration commands for the peer unit using `failover exec` will fail until you enter global configuration mode on the current unit.

- You cannot enter recursive failover exec commands, such as `failover exec mate failover exec mate` command.
• Commands that require user input or confirmation must use the `noconfirm` option. For example, to reload the mate, enter:

```
failover exec mate reload noconfirm
```

### Monitoring Failover

This section lets you monitor the Failover status.

### Failover Messages

When a failover occurs, both ASAs send out system messages.

#### Failover Syslog Messages

The ASA issues a number of syslog messages related to failover at priority level 2, which indicates a critical condition. To view these messages, see the syslog messages guide. The ranges of message IDs associated with failover are: 101xxx, 102xxx, 103xxx, 104xxx, 105xxx, 210xxx, 311xxx, 709xxx, 727xxx. For example, 105032 and 105043 indicate a problem with the failover link.

**Note**

During failover, the ASA logically shuts down and then brings up interfaces, generating syslog messages 411001 and 411002. This is normal activity.

#### Failover Debug Messages

To see debug messages, enter the `debug fover` command. See the command reference for more information.

**Note**

Because debugging output is assigned high priority in the CPU process, it can drastically affect system performance. For this reason, use the `debug fover` commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco TAC.

#### SNMP Failover Traps

To receive SNMP syslog traps for failover, configure the SNMP agent to send SNMP traps to SNMP management stations, define a syslog host, and compile the Cisco syslog MIB into your SNMP management station.

### Monitoring Failover Status

To monitor failover status, enter one of the following commands:

```
• show failover
```
Displays information about the failover state of the unit.

- **show failover group**
  Displays information about the failover state of the failover group. The information displayed is similar to that of the `show failover` command but limited to the specified group.

- **show monitor-interface**
  Displays information about the monitored interface.

- **show running-config failover**
  Displays the failover commands in the running configuration.

## History for Failover

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active/Standby failover</td>
<td>7.0(1)</td>
<td>This feature was introduced.</td>
</tr>
<tr>
<td>Active/Active failover</td>
<td>7.0(1)</td>
<td>This feature was introduced.</td>
</tr>
<tr>
<td>Support for a hex value for the failover key</td>
<td>7.0(4)</td>
<td>You can now specify a hex value for failover link encryption. We modified the following command: <code>failover key hex</code>.</td>
</tr>
<tr>
<td>Support for the master passphrase for the failover key</td>
<td>8.3(1)</td>
<td>The failover key now supports the master passphrase, which encrypts the shared key in the running and startup configuration. If you are copying the shared secret from one ASA to another, for example from the <code>more system:running-config</code> command, you can successfully copy and paste the encrypted shared key.</td>
</tr>
<tr>
<td>IPv6 support for failover added</td>
<td>8.2(2)</td>
<td>We modified the following commands: <code>failover interface ip</code>, <code>show failover</code>, <code>ipv6 address</code>, <code>show monitor-interface</code>.</td>
</tr>
<tr>
<td>Change to failover group unit preference during &quot;simultaneous&quot; bootup</td>
<td>9.0(1)</td>
<td>Earlier software versions allowed &quot;simultaneous&quot; boot up so that the failover groups did not require the <code>preempt</code> command to become active on the preferred unit. However, this functionality has now changed so that both failover groups become active on the first unit to boot up.</td>
</tr>
</tbody>
</table>
### Failover for High Availability

**Feature Name**

- Support for IPsec LAN-to-LAN tunnels to encrypt failover and state link communications
- Disable health monitoring of a hardware module
- Lock configuration changes on the standby unit or standby context in a failover pair
- Enable use of the Management 1/1 interface as the failover link on the ASA 5506H
- Carrier Grade NAT enhancements now supported in failover and ASA clustering

**Releases**

- 9.1(2)
- 9.3(1)
- 9.3(2)
- 9.5(1)
- 9.5(2)

**Feature Information**

- Instead of using the proprietary encryption for the failover key (the `failover-key` command), you can now use an IPsec LAN-to-LAN tunnel for failover and state link encryption.
  - **Note**: Failover LAN-to-LAN tunnels do not count against the IPsec (Other VPN) license.
  - We introduced or modified the following commands: `failover`, `ipsec pre-shared-key`, `show vpn-sessiondb`.

- By default, the ASA monitors the health of an installed hardware module such as the ASA FirePOWER module. If you do not want a hardware module failure to trigger failover, you can disable module monitoring.
  - We modified the following command: `monitor-interface service-module`.

- You can now lock configuration changes on the standby unit (Active/Standby failover) or the standby context (Active/Active failover) so you cannot make changes on the standby unit outside normal configuration syncing.
  - We introduced the following command: `failover standby config-lock`.

- On the ASA 5506H only, you can now configure the Management 1/1 interface as the failover link. This feature lets you use all other interfaces on the device as data interfaces. Note that if you use this feature, you cannot use the ASA Firepower module, which requires the Management 1/1 interface to remain as a regular management interface.
  - We modified the following commands: `failover lan interface`, `failover link`.

- For carrier-grade or large-scale PAT, you can allocate a block of ports for each host, rather than have NAT allocate one port translation at a time (see RFC 6888). This feature is now supported in failover and ASA cluster deployments.
  - We modified the following command: `show local-host`.