PIX/ASA: Active/Standby Failover Configuration Example

Document ID: 77809

Introduction

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

The security appliance supports two failover configurations: Active/Active Failover and Active/Standby Failover. Each failover configuration has its own method to determine and perform failover. With Active/Active Failover, both units can pass network traffic. This lets you configure load balancing on your network. Active/Active Failover is only available on units that run in multiple context mode. With Active/Standby Failover, only one unit passes traffic while the other unit waits in a standby state. Active/Standby Failover is available on units that run in either single or multiple context mode. Both failover configurations support stateful or stateless (regular) failover.

This document focuses on how to configure an Active/Standby Failover in PIX Security Appliance.

Note: VPN failover is not supported on units that run in multiple context mode as VPN is not supported in multiple context. VPN failover is available only for **Active/Standby Failover** configurations in single context configurations.

Cisco recommends that you do not use the management interface for failover, especially for stateful failover in which the security appliance constantly sends the connection information from one security appliance to the other. The interface for failover must be at least of the same capacity as the interfaces that pass regular traffic, and while the interfaces on the ASA 5540 are gigabit, the management interface is FastEthernet only. The management interface is designed for management traffic only and is specified as management0/0. However, you can use the **management−only** command in order to configure any interface to be a management−only interface. Also, for Management 0/0, you can disable management−only mode so the interface can pass through traffic just like any other interface. For more information about the **management−only** command, refer to Cisco Security Appliance Command Reference, Version 8.0.

This configuration guide provides a sample configuration to include a brief introduction to the PIX/ASA 7.x Active/Standby technology. Refer to the ASA/PIX Command Reference Guide for a more in−depth sense of the theory based behind this technology.

Prerequisites

Requirements

Hardware Requirement

The two units in a failover configuration must have the same hardware configuration. They must be the same model, have the same number and types of interfaces, and the same amount of RAM.

Note: The two units do not need to have the same size Flash memory. If you use 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 fails.

Software Requirement

The two units in a failover configuration must be in the operational modes (routed or transparent, single or multiple context). They must have the same major (first number) and minor (second number) software version, but you can use different versions of the software within an upgrade process; for example, you can upgrade one unit from Version 7.0(1) to Version 7.0(2) and have failover remain active. We recommend that you upgrade both units to the same version to ensure long−term compatibility.

Refer to the Performing Zero Downtime Upgrades for Failover Pairs section of *Cisco Security Appliance Command Line Configuration Guide, Version 8.0* for more information about upgrading the software on a failover pair.

License Requirements

On the PIX security appliance platform, at least one of the units must have an **unrestricted (UR) license**.

Note: It might be necessary to upgrade the licenses on a failover pair in order to obtain additional features and benefits. For more information on upgrade, refer to License Key Upgrade on a Failover Pair

Note: The licensed features (such as SSL VPN peers or security contexts) on both security appliances that participate in failover must be identical.

Components Used

The information in this document is based on the PIX Security Appliance with version 7.x and above.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Related Products

This configuration can also be used with the ASA Security Appliance with version 7.x and above.

Conventions

Refer to the Cisco Technical Tips Conventions for more information on document conventions.

Active/Standby Failover

This section describes Active/Standby Failover and includes these topics:

- Active/Standby Failover Overview
- Primary/Secondary Status and Active/Standby Status
- Device Initialization and Configuration Synchronization
- Command Replication
- Failover Triggers
- Failover Actions

Active/Standby Failover Overview

Active/Standby Failover lets you use a standby security appliance 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. The unit that becomes active assumes the IP addresses (or, for a transparent firewall, the management IP address) and MAC addresses of the failed unit and begins to pass traffic. 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.

Note: For multiple context mode, the security appliance can fail over the entire unit (which includes all contexts) but cannot fail over individual contexts separately.

Primary/Secondary Status 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 is primary and actively passes traffic.

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 address is always coupled with the active IP addresses. The exception to this rule occurs when the secondary unit is active and cannot obtain the primary MAC address over the failover link. In this case, the secondary MAC address is used.

Device Initialization and Configuration Synchronization

Configuration synchronization occurs when one or both devices in the failover pair boot. Configurations are always synchronized from the active unit to the standby unit. When the standby unit completes its initial startup, it clears its running configuration (except for the failover commands that are needed to communicate with the active unit), and the active unit sends its entire configuration to the standby unit.

The active unit is determined by these:

- If a unit boots and detects a peer already operative 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, the primary unit becomes the active unit, and the secondary unit becomes the standby unit.

Note: If the secondary unit boots and does not detect the primary unit, it becomes the active unit. It uses its own MAC addresses for the active IP addresses. When the primary unit becomes available, the secondary unit changes the MAC addresses to those of the primary unit, which can cause an interruption in your network traffic. In order to avoid this, configure the failover pair with virtual MAC addresses. See the Configuring Active/Standby Failover section of this document for more information.

When the replication starts, the security appliance console on the active unit displays the message "**Beginning configuration replication: Sending to mate**," and, when it is complete, the security appliance displays the message "**End Configuration Replication to mate.**" Within replication, commands entered on the active unit cannot replicate properly to the standby unit, and commands entered on the standby unit can be overwritten by the configuration that is replicated from the active unit. Do not enter commands on either unit in the failover pair within the configuration replication process. Dependent upon the size of the configuration, replication can take from a few seconds to several minutes.

From the secondary unit, you can observe the replication message (as it synchronizes) from the primary unit:

```
pix> .
```

```
        Detected an Active mate
Beginning configuration replication from mate.
End configuration replication from mate.

pix>
```

On the standby unit, the configuration exists only in running memory. In order to save the configuration to Flash memory after synchronization, enter these commands:

- For single context mode, enter the **copy running−config startup−config** command on the active unit. The command is replicated to the standby unit, which proceeds to write its configuration to Flash memory.
- For multiple context mode, enter the **copy running−config startup−config** command on the active unit from the system execution space and from within each context on disk. The command is replicated to the standby unit, which proceeds to write its configuration to Flash memory. Contexts with startup configurations on external servers are accessible from either unit over the network and do not need to be saved separately for each unit. Alternatively, you can copy the contexts on disk from the active unit to an external server, and then copy them to disk on the standby unit, where they become available when the unit reloads.

Command Replication

Command replication always flows from the active unit to the standby unit. As commands are entered on the active unit, they are sent across the failover link to the standby unit. You do not have to save the active configuration to Flash memory to replicate the commands.

Note: Changes made on the standby unit are not replicated to the active unit. If you enter a command on the standby unit, the security appliance displays the message `**** WARNING **** Configuration Replication is NOT performed from Standby unit to Active unit.` Configurations are no longer synchronized. This message is displayed even if you enter commands that do not affect 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. In order to save the replicated commands to the Flash memory on the standby unit, enter these commands:

- For single context mode, enter the **copy running−config startup−config** command on the active unit. The command is replicated to the standby unit, which proceeds to write its configuration to Flash memory.
- For multiple context mode, enter the **copy running−config startup−config** command on the active unit from the system execution space and within each context on disk. The command is replicated to the standby unit, which proceeds to write its configuration to Flash memory. Contexts with startup configurations on external servers are accessible from either unit over the network and do not need to be saved separately for each unit. Alternatively, you can copy the contexts on disk from the active unit to an external server, and then copy them to disk on the standby unit.

Failover Triggers

The unit can fail if one of these events occurs:

- The unit has a hardware failure or a power failure.
- The unit has a software failure.
- Too many monitored interfaces fail.
- The **no failover active** command is entered on the active unit, or the **failover active** command is entered on the standby unit.

Failover Actions

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

This 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. The table shows the failover behavior.

Failure Event	Policy	Active Action	Standby Action	Notes
Active unit failed (power or hardware)	Failover	n/a	Become active; mark active as failed	No hello messages are received on any monitored interface or the failover link.
Formerly active unit recovers	No failover	Become standby	No action	None
Standby unit failed (power or hardware)	No failover	Mark standby as failed	n/a	When the standby unit is marked as failed, the active unit does not attempt to failover, even if the interface failure threshold is surpassed.
Failover link failed within operation	No failover	Mark failover interface as failed	Mark failover interface as failed	You must restore the failover link as soon as possible because the unit cannot failover to the standby unit while the failover link is down.
Failover link failed	No failover	Mark failover	Become active	If the failover link is down at

at startup		interface as failed		startup, both units become active.
Stateful failover link failed	No failover	No action	No action	State information becomes out of date, and sessions are terminated if a failover occurs.
Interface failure on active unit above threshold	Failover	Mark active as failed	Become active	None
Interface failure on standby unit above threshold	No failover	No action	Mark standby as failed	When the standby unit is marked as failed, the active unit does not attempt to fail over even if the interface failure threshold is surpassed.

Regular and Stateful Failover

The security appliance supports two types of failover, regular and stateful. This section includes these topics:

- Regular Failover
- Stateful Failover

Regular Failover

When a failover occurs, all active connections are dropped. Clients need to reestablish connections when the new active unit takes over.

Stateful Failover

When stateful failover is enabled, the active unit continually passes per−connection state information to the standby unit. 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.

The state information passed to the standby unit includes these:

- The NAT translation table
- The TCP connection states
- The UDP connection states
- The ARP table
- The Layer 2 bridge table (when it runs in the transparent firewall mode)
- The HTTP connection states (if HTTP replication is enabled)

- The ISAKMP and IPSec SA table
- The GTP PDP connection database

The information that is not passed to the standby unit when stateful failover is enabled includes these:

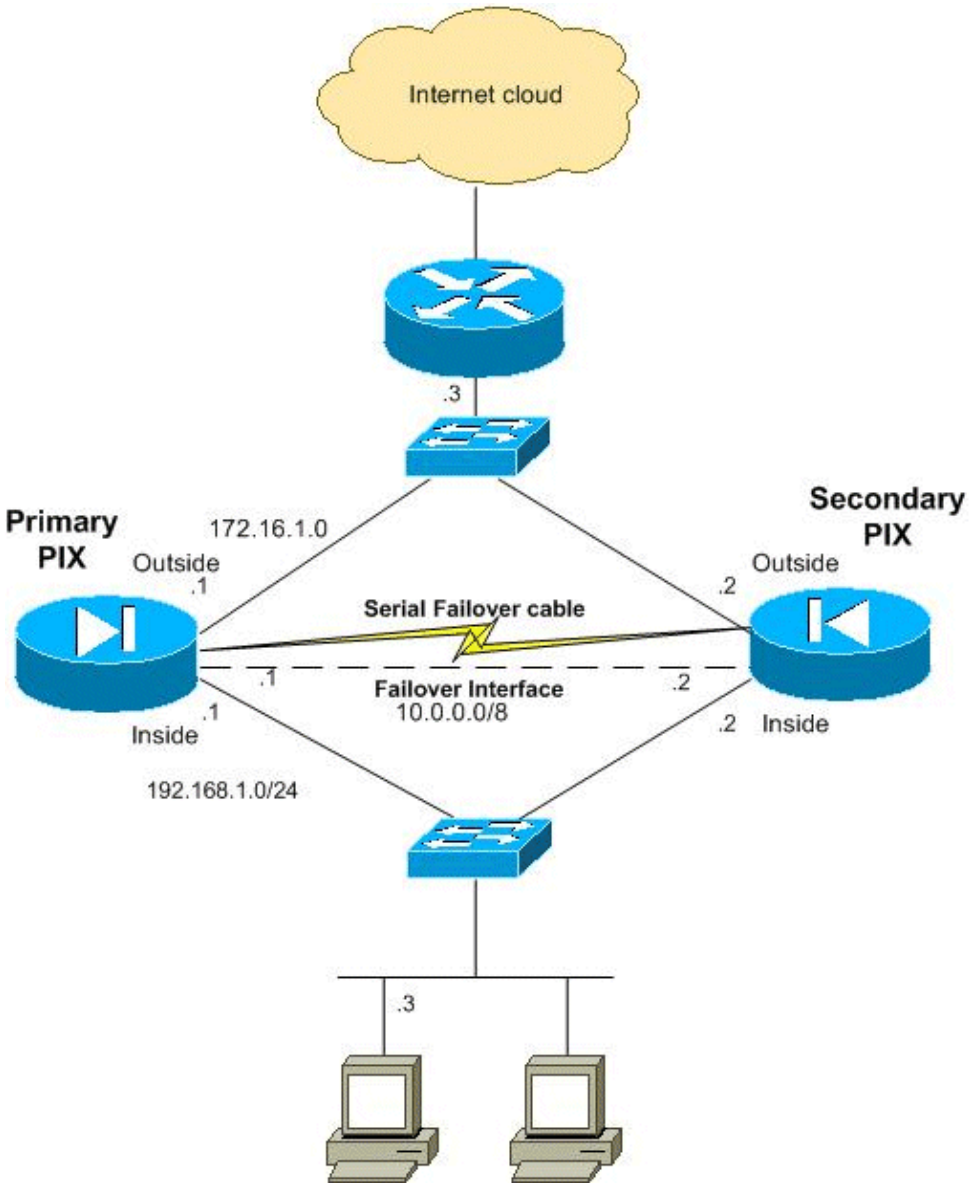
- The HTTP connection table (unless HTTP replication is enabled)
- The user authentication (uauth) table
- The routing tables
- State information for security service modules

Note: If failover occurs within 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 Call Manager. This occurs because there is no session information for the CTIQBE hang−up 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.

Cable−Based Active/Standby Failover Configuration (PIX Security Appliance Only)

Network Diagram

This document uses this network setup:



Note: Cable−based failover is available only on the PIX 500 Series Security Appliance.

In this section, you are presented with the information to configure the features described in this document.

Follow these steps to configure Active/Standby Failover with a serial cable as the failover link. The commands in this task are entered on the primary unit in the failover pair. The primary unit is the unit that has the end of the cable labeled **"Primary"** plugged into it. For devices in multiple context mode, the commands are entered in the system execution space unless otherwise noted.

You do not need to bootstrap the secondary unit in the failover pair when you use cable−based failover. Leave the secondary unit powered off until instructed to power it on.

Complete these steps in order to configure cable−based Active/Standby Failover:

1. Connect the failover cable to the PIX security appliances. Make sure that you attach the end of the cable marked "Primary" to the unit that you use as the primary unit, and that you attach the end of the cable marked "Secondary" to the other unit.
2. Power on the primary unit.
3. If you have not done so already, configure the active and standby IP addresses for each data interface (routed mode) or for the management interface (transparent mode). The standby IP address is used on

the security appliance that is currently the standby unit. It must be in the same subnet as the active IP address.

Note: Do not configure an IP address for the stateful failover link if you use a dedicated stateful failover interface. You use the **failover interface ip** command to configure a dedicated stateful failover interface in a later step.

```
hostname(config−if)#ip address <active_addr> <netmask>
                          standby <standby_addr>
```

In the example, the outside interface of the primary PIX is configured this way:

```
hostname(config−if)#ip address 172.16.1.1 255.255.0.0 standby 172.16.1.2
```

Here, 172.16.1.1 is used for the primary unit outside interface IP Address, and 172.16.1.2 assigns to the secondary (standby) unit outside interface.

Note: In multiple context mode, you must configure the interface addresses from within each context. Use the **changeto context** command to switch between contexts. The command prompt changes to hostname/context(config−if)#, where context is the name of the current context.

4. In order to enable stateful failover, configure the stateful failover link.

    a. Specify the interface to be used as the stateful failover link

    ```
    hostname(config)#failover link if_name phy_if
    ```

    In this example the Ethernet2 interface is used to exchange the stateful failover link state information.

    ```
    hostname(config)#failover link state Ethernet2
    ```

    The *nameif* argument assigns a logical name to the interface specified by the *phy_if* argument. The *phy_if* argument can be the physical port name, such as Ethernet1, or a previously created subinterface, such as Ethernet0/2.3. This interface must not be used for any other purpose.

    b. Assign an active and standby IP address to the stateful failover link:

    ```
    hostname(config)#failover interface ip <if_name> <ip_addr> <mask>
                          standby <ip_addr>
    ```

    In this example , 10.0.0.1 is used as an active, and 10.0.0.2 is used as a standby IP address for the stateful failover link.

    ```
    hostname(config)#failover interface ip state 10.0.0.1 255.0.0.0
                          standby 10.0.0.2
    ```

    Note: If the stateful failover link uses a data interface, skip this step. You have already defined the active and standby IP addresses for the interface.

    The standby IP address must be in the same subnet as the active IP address. You do not need to identify the standby IP address subnet mask.

    The stateful failover link IP address and MAC address do not change at failover unless they use a data interface. The active IP address always stays with the primary unit, while the

standby IP address stays with the secondary unit.

c. Enable the interface:

```
hostname(config)#interface phy_if

hostname(config-if)#no shutdown
```

5. Enable failover:

```
hostname(config)#failover
```

6. Power on the secondary unit and enable failover on the unit if it is not already enabled:

```
hostname(config)#failover
```

The active unit sends the configuration in running memory to the standby unit. As the configuration synchronizes, the messages "Beginning configuration replication: sending to mate" and "End Configuration Replication to mate" appear on the primary console.

Note: Issue the **failover** command on the primary device first, and then issue it on the secondary device. After you issue the **failover** command on the secondary device, the secondary device immediately pulls the configuration from the primary device and sets itself as *standby*. The primary ASA stays up and passes traffic normally and marks itself as the *active* device. From that point on, whenever a failure occurs on the active device, the standby device comes up as active.

7. Save the configuration to Flash memory on the primary unit. Because the commands entered on the primary unit are replicated to the secondary unit, the secondary unit also saves its configuration to Flash memory.

```
hostname(config)#copy running-config startup-config
```

Note: Use the Command Lookup Tool (registered customers only) to obtain more information on the commands used in this section.

Configurations

This document uses these configurations:

PIX

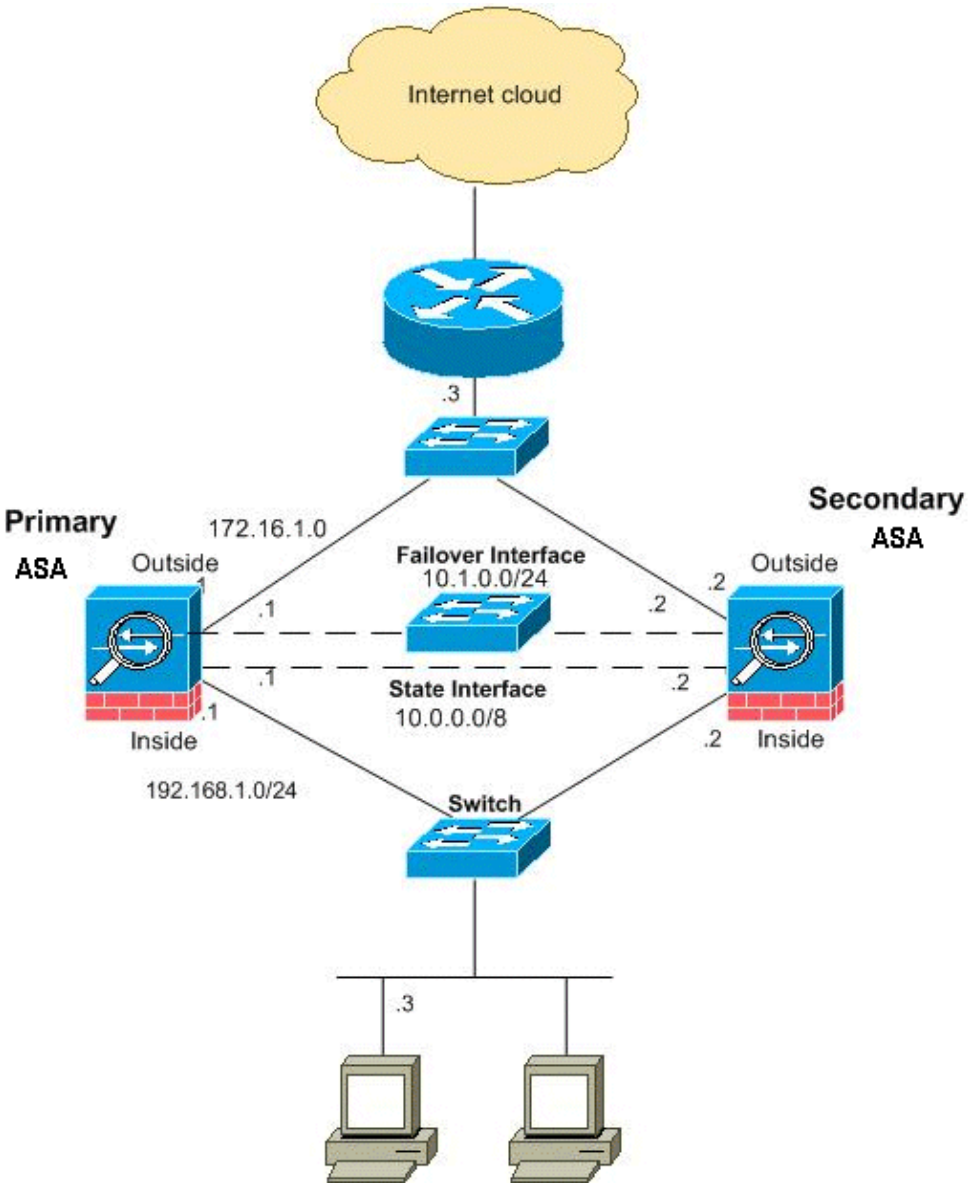
```
pix#show running-config
 PIX Version 7.2(1)
!
hostname pix
domain-name default.domain.invalid
enable password 2KFQnbNIdI.2KYOU encrypted
names
!
interface Ethernet0
 nameif outside
 security-level 0
 ip address 172.16.1.1 255.255.0.0 standby 172.16.1.2
!
interface Ethernet1
 nameif inside
 security-level 100
 ip address 192.168.1.1 255.255.255.0 standby 192.168.1.2
!

!--- Configure "no shutdown" in the stateful failover interface
!--- of both Primary and secondary PIX.
```

```
interface Ethernet2
 description STATE Failover Interface
!
interface Ethernet3
 shutdown
 no nameif
 no security-level
 no ip address
!
interface Ethernet4
 shutdown
 no nameif
 no security-level
 no ip address
!
interface Ethernet5
 shutdown
 no nameif
 no security-level
 no ip address
!
passwd 2KFQnbNIdI.2KYOU encrypted
ftp mode passive
dns server-group DefaultDNS
 domain-name default.domain.invalid
access-list 101 extended permit ip any any
pager lines 24
mtu outside 1500
mtu inside 1500
failover
failover link state Ethernet2
failover interface ip state 10.0.0.1 255.0.0.0 standby 10.0.0.2
asdm image flash:/asdm-521.bin
no asdm history enable
arp timeout 14400
nat (inside) 0 access-list 101
access-group 101 in interface outside
route outside 0.0.0.0 0.0.0.0 172.16.1.3 1
timeout xlate 3:00:00
timeout conn 1:00:00 half-closed 0:10:00 udp 0:02:00 icmp 0:00:02
!

!--- Output Suppressed

!
service-policy global_policy global
prompt hostname context
Cryptochecksum:d41d8cd98f00b204e9800998ecf8427e
: end
```

LAN-Based Active/Standby Failover Configuration

Network Diagram

This document uses this network setup:



This section describes how to configure Active/Standby Failover with an Ethernet failover link. When you configure LAN−based failover, you must bootstrap the secondary device to recognize the failover link before the secondary device can obtain the running configuration from the primary device.

Note: Instead of using a crossover Ethernet cable to directly link the units, Cisco recommends that you use a dedicated switch between the primary and secondary units.

Primary Unit Configuration

Follow these steps to configure the primary unit in a LAN−based, Active/Standby Failover configuration. These steps provide the minimum configuration needed to enable failover on the primary unit. For multiple context mode, all steps are performed in the system execution space unless otherwise noted.

In order to configure the primary unit in an Active/Standby Failover pair, perform these steps:

1. If you have not done so already, configure the active and standby IP addresses for each interface (routed mode) or for the management interface (transparent mode). The standby IP address is used on the security appliance that is currently the standby unit. It must be in the same subnet as the active IP address.

Note: Do not configure an IP address for the stateful failover link if you use a dedicated stateful failover interface. You use the **failover interface ip** command to configure a dedicated stateful failover interface in a later step.

```
hostname(config−if)#ip address active_addr netmask
                        standby standby_addr
```

In this example, the outside interface of the primary PIX is configured this way:

```
hostname(config−if)#ip address 172.16.1.1 255.255.0.0 standby 172.16.1.2
```

Here, 172.16.1.1 is used for the primary unit outside interface IP address, and 172.16.1.2 assigns to the secondary (standby) unit outside interface.

Note: In multiple context mode, you must configure the interface addresses from within each context. Use the **changeto context** command to switch between contexts. The command prompt changes to hostname/context(config−if)#, where context is the name of the current context.

2. (PIX security appliance platform only) Enable the LAN−based failover.

```
hostname(config)#failover lan enable
```

3. Designate the unit as the primary unit.

```
hostname(config)#failover lan unit primary
```

4. Define the failover interface.

   a. Specify the interface to be used as the failover interface.

```
hostname(config)#failover lan interface if_name phy_if
```

   In this documentation, the "failover" (interface name for Ethernet3) is used for a failover interface.

```
hostname(config)#failover lan interface failover Ethernet3
```

   The *if_name* argument assigns a name to the interface specified by the *phy_if* argument. The *phy_if* argument can be the physical port name, such as Ethernet1, or a previously created subinterface, such as Ethernet0/2.3.

   b. Assign the active and standby IP address to the failover link

```
hostname(config)#failover interface ip if_name ip_addr mask
                        standby ip_addr
```

   In this documentation, to configure the failover link, 10.1.0.1 is used for active, 10.1.0.2 for the standby unit, and "failover" is an interface name of Ethernet3.

```
hostname(config)#failover interface ip failover 10.1.0.1
                        255.255.255.0 standby 10.1.0.2
```

   The standby IP address must be in the same subnet as the active IP address. You do not need to identify the standby address subnet mask.

   The failover link IP address and MAC address do not change at failover. The active IP address for the failover link always stays with the primary unit, while the standby IP address stays with the secondary unit.

c. Enable the interface

```
hostname(config)#interface phy_if


hostname(config-if)#no shutdown
```

In the example, Ethernet3 is used for failover:

```
hostname(config)#interface ethernet3

hostname(config-if)#no shutdown
```

5. (Optional) In order to enable stateful failover, configure the stateful failover link.

a. Specify the interface to be used as the stateful failover link.

```
hostname(config)#failover link if_name phy_if
```

This example used "state" as an interface name for Ethernet2 to exchange the failover link state information:

```
hostname(config)#failover link state Ethernet2
```

Note: If the stateful failover link uses the failover link or a data interface, you only need to supply the *if_name* argument.

The *if_name* argument assigns a logical name to the interface specified by the *phy_if* argument. The *phy_if* argument can be the physical port name, such as Ethernet1, or a previously created subinterface, such as Ethernet0/2.3. This interface must not be used for any other purpose, except, optionally, as the failover link.

b. Assign an active and standby IP address to the stateful failover link.

Note: If the stateful failover link uses the failover link or data interface, skip this step. You have already defined the active and standby IP addresses for the interface.

```
hostname(config)#failover interface ip if_name ip_addr
                        mask standby ip_addr
```

The 10.0.0.1 is used as an active and the 10.0.0.2 as a standby IP address for the stateful failover link in this example.

```
hostname(config)#failover interface ip state 10.0.0.1 255.0.0.0
                        standby 10.0.0.2
```

The standby IP address must be in the same subnet as the active IP address. You do not need to identify the standby address subnet mask.

The stateful failover link IP address and MAC address do not change at failover unless they use a data interface. The active IP address always stays with the primary unit, while the standby IP address stays with the secondary unit.

c. Enable the interface.

Note: If the stateful failover link uses the failover link or data interface, skip this step. You have already enabled the interface.

```
hostname(config)#interface phy_if

hostname(config-if)#no shutdown
```

Note: For example, in this scenario, Ethernet2 is used for the stateful failover link:

```
hostname(config)#interface ethernet2

hostname(config-if)#no shutdown
```

6. Enable failover.

```
hostname(config)#failover
```

Note: Issue the **failover** command on the primary device first, and then issue it on the secondary device. After you issue the **failover** command on the secondary device, the secondary device immediately pulls the configuration from the primary device and sets itself as *standby*. The primary ASA stays up and passes traffic normally and marks itself as the *active* device. From that point on, whenever a failure occurs on the active device, the standby device comes up as active.

7. Save the system configuration to Flash memory.

```
hostname(config)#copy running-config startup-config
```

Secondary Unit Configuration

The only configuration required on the secondary unit is for the failover interface. The secondary unit requires these commands to initially communicate 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.

For multiple context mode, all steps are performed in the system execution space unless noted otherwise.

In order to configure the secondary unit, perform these steps:

1. (PIX security appliance platform only) Enable LAN-based failover.

```
hostname(config)#failover lan enable
```

2. Define the failover interface. Use the same settings that you used for the primary unit.

   a. Specify the interface to be used as the failover interface.

```
hostname(config)#failover lan interface if_name phy_if
```

   In this documentation, the "failover" (interface name for Ethernet3) is used for a LAN failover interface.

```
hostname(config)#failover lan interface failover Ethernet3
```

   The *if_name* argument assigns a name to the interface specified by the *phy_if* argument.

   b. Assign the active and standby IP address to the failover link.

```
hostname(config)#failover interface ip if_name ip_addr mask
                        standby ip_addr
```

In this documentation, to configure the failover link, 10.1.0.1 is used for active, 10.1.0.2 for the standby unit, and "failover" is an interface name of Ethernet3.

```
hostname(config)#failover interface ip failover 10.1.0.1
                        255.255.255.0 standby 10.1.0.2
```

Note: Enter this command exactly as you entered it on the primary unit when you configured the failover interface on the primary unit.

c. Enable the interface.

```
hostname(config)#interface phy_if


hostname(config-if)#no shutdown
```

For example, in this scenario, Ethernet3 is used for failover.

```
hostname(config)#interface ethernet3

hostname(config-if)#no shutdown
```

3. (Optional) Designate this unit as the secondary unit.

```
hostname(config)#failover lan unit secondary
```

Note: This step is optional because, by default, units are designated as secondary unless previously configured.

4. Enable failover.

```
hostname(config)#failover
```

Note: After you enable failover, the active unit sends the configuration in running memory to the standby unit. As the configuration synchronizes, the messages *Beginning configuration replication: Sending to mate* and *End Configuration Replication to mate* appear on the active unit console.

5. After the running configuration has completed replication, save the configuration to Flash memory.

```
hostname(config)#copy running-config startup-config
```

Configurations

This document uses these configurations:

Primary PIX

```
pix#show running-config
 PIX Version 7.2(1)
!
hostname pix
domain-name default.domain.invalid
enable password 2KFQnbNIdI.2KYOU encrypted
names
!
interface Ethernet0
 nameif outside
 security-level 0
 ip address 172.16.1.1 255.255.0.0 standby 172.16.1.2
!
interface Ethernet1
 nameif inside
```

```
 security-level 100
 ip address 192.168.1.1 255.255.255.0 standby 192.168.1.2
!

!--- Configure "no shutdown" in the stateful failover interface
!--- of both Primary and secondary PIX.


interface Ethernet2
nameif state

         description STATE Failover Interface

interface ethernet3
nameif failover

  description LAN Failover Interface

!
interface Ethernet4
 shutdown
 no nameif
 no security-level
 no ip address
!
interface Ethernet5
 shutdown
 no nameif
 no security-level
 no ip address
!
passwd 2KFQnbNIdI.2KYOU encrypted
ftp mode passive
dns server-group DefaultDNS
 domain-name default.domain.invalid
access-list 101 extended permit ip any any
pager lines 24
mtu outside 1500
mtu inside 1500

failover
failover lan unit primary
failover lan interface failover Ethernet3
failover lan enable
failover key ******
failover link state Ethernet2
failover interface ip failover 10.1.0.1 255.255.255.0 standby 10.1.0.2
failover interface ip state 10.0.0.1 255.0.0.0 standby 10.0.0.2

asdm image flash:/asdm-521.bin
no asdm history enable
arp timeout 14400
nat (inside) 0 access-list 101
access-group 101 in interface outside
route outside 0.0.0.0 0.0.0.0 172.16.1.3 1
timeout xlate 3:00:00
timeout conn 1:00:00 half-closed 0:10:00 udp 0:02:00 icmp 0:00:02
timeout sunrpc 0:10:00 h323 0:05:00 h225 1:00:00 mgcp 0:05:00 mgcp-pat 0:05:00
timeout sip 0:30:00 sip_media 0:02:00 sip-invite 0:03:00 sip-disconnect 0:02:00
timeout uauth 0:05:00 absolute
no snmp-server location
no snmp-server contact
snmp-server enable traps snmp authentication linkup linkdown coldstart
telnet timeout 5
ssh timeout 5
console timeout 0
```

```
!
class-map inspection_default
 match default-inspection-traffic
!
!
policy-map type inspect dns preset_dns_map
 parameters
  message-length maximum 512
policy-map global_policy
 class inspection_default
  inspect dns preset_dns_map
  inspect ftp
  inspect h323 h225
  inspect h323 ras
  inspect netbios
  inspect rsh
  inspect rtsp
  inspect skinny
  inspect esmtp
  inspect sqlnet
  inspect sunrpc
  inspect tftp
  inspect sip
  inspect xdmcp
!
service-policy global_policy global
prompt hostname context
Cryptochecksum:d41d8cd98f00b204e9800998ecf8427e
: end
```

Secondary PIX

```
pix#show running-config

failover
failover lan unit secondary
failover lan interface failover Ethernet3
failover lan enable
failover key ******
failover interface ip failover 10.1.0.1 255.255.255.0 standby 10.1.0.2
```

Verify

Use of the show failover Command

This section describes the **show failover** command output. On each unit, you can verify the failover status with the **show failover** command.

Primary PIX

```
pix#show failover
Failover On
Cable status: Normal
Failover unit Primary
Failover LAN Interface: N/A - Serial-based failover enabled
Unit Poll frequency 15 seconds, holdtime 45 seconds
Interface Poll frequency 5 seconds, holdtime 25 seconds
Interface Policy 1
Monitored Interfaces 2 of 250 maximum
Version: Ours 7.2(1), Mate 7.2(1)
Last Failover at: 06:07:44 UTC Dec 26 2006
        This host: Primary - Active
```

```
                Active time: 1905 (sec)
                  Interface outside (172.16.1.1): Normal
                  Interface inside (192.168.1.1): Normal
        Other host: Secondary − Standby Ready
                Active time: 0 (sec)
                  Interface outside (172.16.1.2): Normal
                  Interface inside (192.168.1.2): Normal

Stateful Failover Logical Update Statistics
        Link : state Ethernet2 (down)
        Stateful Obj    xmit       xerr       rcv        rerr
        General         0          0          0          0
        sys cmd         0          0          0          0
        up time         0          0          0          0
        RPC services    0          0          0          0
        TCP conn        0          0          0          0
        UDP conn        0          0          0          0
        ARP tbl         0          0          0          0
        Xlate_Timeout   0          0          0          0
        VPN IKE upd     0          0          0          0
        VPN IPSEC upd   0          0          0          0
        VPN CTCP upd    0          0          0          0
        VPN SDI upd     0          0          0          0
        VPN DHCP upd    0          0          0          0

        Logical Update Queue Information
                        Cur     Max     Total
        Recv Q:         0       0       0
        Xmit Q:         0       0       0
```

Secondary PIX

```
pix(config)#show failover
Failover On
Cable status: Normal
Failover unit Secondary
Failover LAN Interface: N/A − Serial−based failover enabled
Unit Poll frequency 15 seconds, holdtime 45 seconds
Interface Poll frequency 5 seconds, holdtime 25 seconds
Interface Policy 1
Monitored Interfaces 2 of 250 maximum
Version: Ours 7.2(1), Mate 7.2(1)
Last Failover at: 00:00:18 UTC Jan 1 1993
        This host: Secondary − Standby Ready
                Active time: 0 (sec)
                  Interface outside (172.16.1.2): Normal
                  Interface inside (192.168.1.2): Normal
        Other host: Primary − Active
                Active time: 154185 (sec)
                  Interface outside (172.16.1.1): Normal
                  Interface inside (192.168.1.1): Normal

Stateful Failover Logical Update Statistics
        Link : state Ethernet2 (down)
        Stateful Obj    xmit       xerr       rcv        rerr
        General         0          0          0          0
        sys cmd         0          0          0          0
        up time         0          0          0          0
        RPC services    0          0          0          0
        TCP conn        0          0          0          0
        UDP conn        0          0          0          0
        ARP tbl         0          0          0          0
        Xlate_Timeout   0          0          0          0
        VPN IKE upd     0          0          0          0
        VPN IPSEC upd   0          0          0          0
        VPN CTCP upd    0          0          0          0
```

```
VPN SDI upd     0          0          0          0
VPN DHCP upd    0          0          0          0

Logical Update Queue Information
                Cur     Max     Total
Recv Q:         0       0       0
Xmit Q:         0       0       0
```

Use the **show failover state** command to verify the state.

Primary PIX

```
pix#show failover state
====My State===
Primary | Active |
====Other State===
Secondary | Standby |
====Configuration State===
        Sync Done
====Communication State===
        Mac set
=========Failed Reason==============
My Fail Reason:
Other Fail Reason:
        Comm Failure
```

Secondary unit

```
pix#show failover state
====My State===
Secondary | Standby |
====Other State===
Primary | Active |
====Configuration State===
        Sync Done - STANDBY
====Communication State===
        Mac set
=========Failed Reason==============
My Fail Reason:
Other Fail Reason:
```

In order to verify the IP addresses of the failover unit, use the **show failover interface**command.

Primary unit

```
pix#show failover interface
        interface state Ethernet2
                System IP Address: 10.0.0.1 255.0.0.0
                My IP Address    : 10.0.0.1
                Other IP Address : 10.0.0.2
```

Secondary unit

```
pix#show failover interface
        interface state Ethernet2
                System IP Address: 10.0.0.1 255.0.0.0
                My IP Address    : 10.0.0.2
                Other IP Address : 10.0.0.1
```

View of Monitored Interfaces

In order to view the status of monitored interfaces: In single context mode, enter the **show monitor−interface** command in global configuration mode. In multiple context mode, enter the **show monitor−interface** within a context.

Note: In order to enable health monitoring on a specific interface, use the **monitor−interface** command in global configuration mode:

```
monitor−interface <if_name>
```

Primary PIX

```
pix(config)#show monitor−interface
        This host: Primary − Active
                Interface outside (172.16.1.1): Normal
                Interface inside (192.168.1.1): Normal
        Other host: Secondary − Standby Ready
                Interface outside (172.16.1.2): Normal
                Interface inside (192.168.1.2): Normal
```

Secondary PIX

```
pix(config)#show monitor−interface
        This host: Secondary − Standby Ready
                Interface outside (172.16.1.2): Normal
                Interface inside (192.168.1.2): Normal
        Other host: Primary − Active
                Interface outside (172.16.1.1): Normal
                Interface inside (192.168.1.1): Normal
```

Note: If you do not enter a failover IP address, the **show failover** command displays 0.0.0.0 for the IP address and interface monitoring remains in a *waiting* state. Refer to the show failover section of the *Cisco Security Appliance Command Reference, Version 7.2* for more information about the different failover states.

Display of the Failover Commands in the Running Configuration

In order to view the failover commands in the running configuration, enter this command:

```
hostname(config)#show running−config failover
```

All of the failover commands are displayed. On units that run in multiple context mode, enter the **show running−config failover** command in the system execution space. Enter the command **show running−config all failover** to display the failover commands in the running configuration and include commands for which you have not changed the default value.

Failover Functionality Tests

In order to test failover functionality, perform these steps:

1. Test that your active unit or failover group passes traffic as expected with FTP (for example) to send a file between hosts on different interfaces.
2. Force a failover to the standby unit with this command:

    - For Active/Standby Failover, enter this command on the active unit:

```
hostname(config)#no failover active
```

3. Use FTP to send another file between the same two hosts.
4. If the test was not successful, enter the **show failover command** to check the failover status.
5. When you are finished, you can restore the unit or failover group to active status with this command:

   For Active/Standby Failover, enter this command on the active unit:

   ```
   hostname(config)#failover active
   ```

Forced Failover

In order to force the standby unit to become active, enter one of these commands:

Enter this command on the standby unit:

```
hostname#failover active
```

Enter this command on the active unit:

```
hostname#no failover active
```

Disabled Failover

In order to disable failover, enter this command:

```
hostname(config)#no failover
```

If you disable failover on an Active/Standby pair, it causes the active and standby state of each unit to be maintained until you restart. For example, the standby unit remains in standby mode so that both units do not start to pass traffic. In order to make the standby unit active (even with failover disabled), see the Forcing Failover section.

If you disable failover on an Active/Active pair, it causes the failover groups to remain in the active state on whichever unit they are currently active on, no matter which unit they are configured to prefer. The **no failover** command can be entered in the system execution space.

Restoration of a Failed Unit

In order to restore a failed unit to an unfailed state, enter this command:

```
hostname(config)#failover reset
```

If you restore a failed unit to an unfailed state, it does not automatically make it active; restored units or groups remain in the standby state until made active by failover (forced or natural). An exception is a failover group configured with the preempt command. If previously active, a failover group becomes active if it is configured with the preempt command and if the unit on which it failed is its preferred unit.

Replace the Failed Unit with a New Unit

Complete these steps in order to replace a failed unit with a new unit:

1. Run the **no failover** command on the primary unit.

   The status of the secondary unit shows **standby unit as not detected**.

2. Unplug the primary unit, and connect the replacement primary unit.
3. Verify that the replacement unit runs the same software and ASDM version as the secondary unit.
4. Run these commands on the replacement unit:

```
ASA(config)#failover lan unit primary
ASA(config)#failover lan interface failover Ethernet3
ASA(config)#failover interface ip failover 10.1.0.1 255.255.255.0 standby 10.1.0.2
ASA(config)#interface Ethernet3
ASA(config-if)#no shut
ASA(config-if)#exit
```

5. Plug the replacement primary unit to the network, and run this command:

```
ASA(config)#failover
```

Troubleshoot

When a failover occurs, both security appliances send out system messages. This section includes these topics:

- Failover Monitoring
- Unit Failure
- %ASA−3−210005: LU allocate connection failed
- %PIX|ASA−1−105005: (Primary) Lost Failover communications with mate on interface *interface_name*
- Failover System Messages
- Debug Messages
- SNMP
- NAT 0 Issue
- Known Issues

Failover Monitoring

This example demonstrates what happens when failover has not started to monitor the network interfaces. Failover does not start to monitor the network interfaces until it has heard the second "hello" packet from the other unit on that interface. This takes about 30 seconds. If the unit is attached to a network switch that runs Spanning Tree Protocol (STP), this takes twice the "forward delay" time configured in the switch (typically configured as 15 seconds), plus this 30 second delay. This is because at PIX bootup and immediately after a failover event, the network switch detects a temporary bridge loop. Upon detection of this loop, it stops forwarding packets on these interfaces for the "forward delay" time. It then enters the "listen" mode for an additional "forward delay" time, within which time the switch listens for bridge loops but does not forward traffic (or forward failover "hello" packets). After twice the forward delay time (30 seconds), traffic flow resumes. Each PIX remains in a "waiting" mode until it hears 30 seconds worth of "hello" packets from the other unit. Within the time that the PIX passes traffic, it does not fail the other unit based on not hearing the "hello" packets. All other failover monitoring still occurs (that is, Power, Interface Loss of Link, and Failover Cable "hello").

For failover, Cisco strongly recommends that customers enable portfast on all switch ports that connect to PIX interfaces. In addition, channeling and trunking must be disabled on these ports. If the interface of the PIX goes down within failover, the switch does not have to wait 30 seconds while the port transitions from a state of listening to learning to forwarding.

```
Failover On
        Cable status: Normal
        Reconnect timeout 0:00:00
                This host: Primary − Active
                        Active time: 6930 (sec)
```

```
                        Interface 0 (192.168.89.1): Normal (Waiting)
                        Interface 1 (192.168.89.1): Normal (Waiting)
                Other host: Secondary - Standby
                        Active time: 15 (sec)
                        Interface 0 (192.168.89.2): Normal (Waiting)
                        Interface 1 (192.168.89.2): Normal (Waiting)
```

In summary, check these steps to narrow down the failover problems:

- Check the network cables connected to the interface in the waiting/failed state and, if it is possible, replace them.
- If there is a switch connected between the two units, verify that the networks connected to the interface in the waiting/failed state function correctly.
- Check the switch port connected to the interface in the waiting/failed state and, if it is possible, use the another FE port on the switch..
- Check that you have enabled port fast and disabled both trunking and channeling on the switch ports that are connected to the interface.

Unit Failure

In this example, failover has detected a failure. Note that Interface 1 on the primary unit is the source of the failure. The units are back in "waiting" mode because of the failure. The failed unit has removed itself from the network (interfaces are down) and is no longer sending "hello" packets on the network. The active unit remains in a "waiting" state until the failed unit is replaced and failover communications starts again.

```
Failover On
        Cable status: Normal
        Reconnect timeout 0:00:00
                This host: Primary - Standby (Failed)
                        Active time: 7140 (sec)
                        Interface 0 (192.168.89.2): Normal (Waiting)
                        Interface 1 (192.168.89.2): Failed (Waiting)
                Other host: Secondary - Active
                        Active time: 30 (sec)
                        Interface 0 (192.168.89.1): Normal (Waiting)
                        Interface 1 (192.168.89.1): Normal (Waiting)
```

LU allocate connection failed

A memory problem might exist if you receive this error message:

LU allocate connection failed

Upgrade the PIX/ASA software in order to resolve this issue.

Primary Lost Failover communications with mate on interface interface_name

This failover message is displayed if the unit of the failover pair can no longer communicate with the other unit of the pair. Primary can also be listed as Secondary for the secondary unit.

(Primary) Lost Failover communications with mate on interface interface_name

Verify that the network that is connected to the specified interface is functioning correctly.

Failover System Messages

The security appliance issues a number of system messages related to failover at priority level 2, which indicates a critical condition. In order to view these messages, refer to the Cisco Security Appliance Logging Configuration and System Log Messages to enable logging and to see descriptions of the system messages.

Note: Within switchover, failover logically shuts down and then brings up interfaces, which generates syslog **411001** and **411002** messages. This is normal activity.

Debug Messages

In order to see debug messages, enter the **debug fover** command. Refer to the Cisco Security Appliance 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 within troubleshooting sessions with Cisco technical support staff.

SNMP

In order 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. Refer to the **snmp−server** and **logging** commands in the Cisco Security Appliance Command Reference for more information.

NAT 0 Issue

When the power on the Cisco Security Appliance is cycled, the NAT 0 command disappears from the working configuration. This issue occurs even after the configuration is saved. Other commands are saved, but the **nat 0** command is not saved.

This issue is due to the Cisco bug ID CSCsk18083 (registered customers only) . In order to resolve this issue, do not configure invalid access−lists to **nat exemption** access−lists. Use `ip permit` or `deny` ace entries.

Failover Polltime

In order to specify the failover unit poll and hold times, use the **failover polltime** command in global configuration mode.

The `failover polltime unit msec [time]` represents the time interval in order to check the standby unit's existence by polling hello messages.

Similarly, the `failover holdtime unit msec [time]` represents the setting a time period during which a unit must receive a hello message on the failover link, after which the peer unit is declared failed.

In order to specify the data interface poll and hold times in an Active/Standby failover configuration, use the **failover polltime interface** command in global configuration mode. In order to restore the default poll and hold times, use the **no** form of this command.

failover polltime interface [msec] *time* **[holdtime** *time***]**

Use the **failover polltime interface** command in order to change the frequency at which hello packets are sent out on data interfaces. This command is available for Active/Standby failover only. For Active/Active

failover, use the **polltime interface** command in the failover group configuration mode instead of the **failover polltime interface** command.

You cannot enter a *holdtime* value that is less than 5 times the interface poll time. With a faster poll time, the security appliance can detect failure and trigger failover faster. However, faster detection can cause unnecessary switchovers when the network is temporarily congested. Interface testing begins when a hello packet is not heard on the interface for over half the hold time.

You can include both failover polltime unit and failover polltime interface commands in the configuration.

This example sets the interface poll time frequency to 500 milliseconds and the hold time to 5 seconds:

```
hostname(config)#failover polltime interface msec 500 holdtime 5
```

Refer to the failover polltime section of the *Cisco Security Appliance Command Reference, Version 7.2* for more information.

Export Certificate/Private Key in Failover Configuration

The primary device automatically replicates the private key/certificate to the secondary unit. Issue the command **write memory** in the active unit in order to replicate the configuration (which includes the certificate/private key) to the standby unit. All the keys/certificates on the standby unit are erased and repopulated by the active unit configuration.

Note: You must not manually import the certificates, keys, and trust points from the active device and then export to the standby device.

WARNING: Failover message decryption failure.

Error message:

```
Failover message decryption failure. Please make sure both units have the
same failover shared key and crypto license or system is not out of memory
```

This problem occurs due to failover key configuration. In order to resolve this issue, remove the failover key, and configure the new shared key.

ASA Modules Failover

If Advanced Inspection and Prevention Security Services Module (AIP−SSM) or Content Security and Control Security Services Module (CSC−SSM) are used in active and standby units, then it operates independently of the ASA in terms of failover. **Modules must be configured manually in active and standby units, the failover will not replicate the module configuration.**

In terms of failover, both ASA units that have AIP−SSM or CSC−SSM modules must be of the same hardware type. For example, if the primary unit have the ASA−SSM−10 module, the secondary unit must have the ASA−SSM−10 module.

Failover message block alloc failed

Error Message `%PIX|ASA-3-105010: (Primary) Failover message block alloc failed`

Explanation: Block memory was depleted. This is a transient message, and the security appliance should recover. *Primary* can also be listed as *Secondary* for the secondary unit.

Recommended Action: Use the **show blocks** command in order to monitor the current block memory.

AIP Module Failover Problem

If you have two ASAs in a failover configuration and each has an AIP−SSM, you must manually replicate the configuration of the AIP−SSMs. Only the configuration of the ASA is replicated by the failover mechanism. The AIP−SSM is not included in the failover.

First, the AIP−SSM operates independently of the ASA in terms of failover. For failover, all that is needed from an ASA perspective is that the AIP modules be of the same hardware type. Beyond that, as with any other portion of failover, the configuration of the ASA between the active and standby must be in sync.

As for the set up of the AIPs, they are effectively independent sensors. There is no failover between the two, and they have no awareness of each other. They can run independent versions of code. That is, they do not have to match, and the ASA does not care about the version of code on the AIP with respect to failover.

ASDM initiates a connection to the AIP through the management interface IP that you configured on the AIP. In other words, it connects to the sensor typically through HTTPS depending on how you set up the sensor.

You could have a failover of the ASA independent of the IPS (AIP) modules. You will still be connected to the same one because you connect to its management IP. In order to connect to the other AIP, you must reconnect to its manangement IP to configure it and access it.

For sample configurations on how to send network traffic that passes through the Cisco ASA 5500 Series Adaptive Security Appliance (ASA) to the Advanced Inspection and Prevention Security Services Module (AIP−SSM) (IPS), refer to ASA: Send Network Traffic from the ASA to the AIP SSM Configuration Example.

Unable to Upgrade the ASA Failover Pair from Ethernet Card to Optical Interface

Complete these steps in order to upgrade the ASA failover pair from Ethernet card to optical interface:

1. Ensure that the primary device is active, shut down the secondary/standby ASA, and add the new interface card.
2. Remove all cables and boot the secondary/standby ASA to test that the new hardware is operational.
3. Shut down the secondary/standby ASA again, and reconnect the cables.
4. Shut down the primary/active ASA, and boot the secondary ASA.

   Note: Do not allow both ASAs to become active at the same time.
5. Confirm that the secondary ASA is up and passing traffic, and then make the secondary device active with the **failover active** command.
6. Install the new interface on the primary ASA, and remove the cables.
7. Boot the primary ASA, and test the new hardware.
8. Shut down the primary ASA, and reconnect the cables.
9. Boot the primary ASA, and make the primary device active with the **failover active** command.

Note: Verify the failover status on both devices with the **show failover** command. If failover status is OK, you can configure the interfaces on the primary active device, which will be replicated on the secondary standby.

Known Issues

When a user attempts to access the ASDM on the secondary ASA with version 8.x software and ASDM version 6.x for failover configuration, this error is received:

```
Error: The name on the security certificate is invalid or does not match
the name of the site
```

In the certificate, the Issuer and the Subject Name is the IP address of the *active* unit (not the IP address of the *standby* unit).

In ASA version 8.x, the internal (ASDM) certificate is replicated from the active unit to the standby unit, which causes the error message. However, if the same firewall runs on version 7.x code with 5.x ASDM and you try to access ASDM, you will receive the regular security warning:

```
The security certificate has a valid name matching the name of the page
you are trying to view
```

When you check the certificate, the issuer and the subject name is the IP address of the standby unit.

Related Information

- **Cisco PIX Firewall Software**
- **Firewall Services Module (FWSM) Failover Configuration**
- **FWSM Failover Troubleshooting**
- **How Failover Works on the Cisco Secure PIX Firewall**
- **Technical Support & Documentation − Cisco Systems**

Updated: Nov 04, 2009 Document ID: 77809