Failover for High Availability in the Public Cloud

This chapter describes how to configure Active/Backup failover to accomplish high availability of the ASAv in a public cloud environment, such as Microsoft Azure.

About Failover in the Public Cloud

To ensure redundancy, you can deploy the ASAv in a public cloud environment in an Active/Backup high availability (HA) configuration. HA in the public cloud implements a stateless Active/Backup solution that allows for a failure of the active ASAv to trigger an automatic failover of the system to the backup ASAv.

The following list describes the primary components in the HA public cloud solution:

- **Active ASAv**—The ASAv in the HA pair that is set up to handle the firewall traffic for the HA peers.
- **Backup ASAv**—The ASAv in the HA pair that is not handling firewall traffic and takes over as the active ASAv in the event of an active ASAv failure. It is referred to as a Backup rather than a Standby because it is does not take on the identify of its peer in the event of a failover.
- **HA Agent**—A lightweight process that runs on the ASAv and determines the HA role (active/backup) of an ASAv, detects failures of its HA peer, and performs actions based on its HA role.

On the physical ASA and the non-public cloud virtual ASA, the system handles failover conditions using gratuitous ARP requests where the backup ASA sends out a gratuitous ARP indicating it is now associated with the active IP and MAC addresses. Most public cloud environments do not allow broadcast traffic of this nature. For this reason, an HA configuration in the public cloud requires ongoing connections be restarted when failover happens.

The health of the active unit is monitored by the backup unit to determine if specific failover conditions are met. If those conditions are met, failover occurs. The failover time can vary from a few seconds to over a minute depending on the responsiveness of the public cloud infrastructure.

About Active/Backup Failover

In Active/Backup failover, one unit is the active unit. It passes traffic. The backup unit does not actively pass traffic or exchange any configuration information with the active unit. Active/Backup failover lets you use a backup ASAv device to take over the functionality of a failed unit. When the active unit fails, it changes to the backup state while the backup unit changes to the active state.

Primary/Secondary Roles and Active/Backup Status

When setting up Active/Backup failover, you configure one unit to be primary and the other as secondary. At this point, the two units act as two separate devices for device and policy configuration, as well as for events, dashboards, reports, and health monitoring.

The main differences between the two units in a failover pair are related to which unit is active and which unit is backup, namely which unit actively passes traffic. Although both units are capable of passing traffic, only the primary unit responds to Load Balancer probes and programs any configured routes to use it as a route destination. The backup unit's primary function is to monitor the health of the primary unit. The primary unit always becomes the active unit if both units start up at the same time (and are of equal operational health).

Failover Connection

The backup ASAv monitors the health of the active ASAv using a failover connection established over TCP:

- The active ASAv acts as a connection server by opening a *listen port*.
- The backup ASAv connects to the active ASAv using *connect port*.
- Typically the *listen port* and the *connect port* are the same, unless your configuration requires some type of network address translation between the ASAv units.

The state of the failover connection detects the failure of the active ASAv. When the backup ASAv sees the failover connection come down, it considers the active ASAv as *failed*. Similarly, if the backup ASAv does not receive a response to a keepalive message sent to the active unit, it considers the active ASAv as *failed*

Related Topics

Polling and Hello Messages

The backup ASAv sends Hello messages over the failover connection to the active ASAv and expects a Hello Response in return. Message timing uses a polling interval, the time period between the receipt of a Hello Response by the backup ASAv unit and the sending of the next Hello message. The receipt of the response is enforced by a receive timeout, called the hold time. If the receipt of the Hello Response times out, the active ASAv is considered to have failed.

The polling and hold time intervals are configurable parameters; see Configure Failover Criteria and Other Settings, on page 10.

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 backup 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 backup unit.

Failover Events

In Active/Backup failover, failover occurs on a unit basis. 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 backup unit, and any special notes about the failover condition and actions.

Table 1: Failover Events

Failure Event	Policy	Active Action	Backup Action	Notes
Backup unit sees a failover connection close	Failover	n/a	Become active Mark active as failed	This is the standard failover use case.
Active unit sees a failover connection close	No failover	Mark backup as failed	n/a	Failover to an inactive unit should never occur.
Active unit sees a TCP timeout on failover link	No failover	Mark backup as failed	No action	Failover should not occur if the active unit is not getting a reponse from the backup unit.
Backup unit sees a TCP timeout on failover link	Failover	n/a	Become active Mark active as failed Try to send failover command to active unit	The backup unit assumes that the active unit is unable to continue operation and takes over. In case the active unit is still up, but fails to send a response in time, the backup unit sends the failover command to the active unit.
Active Authentication failed	No failover	No action	No action	Because the backup unit is changing the route tables, it is the only unit that needs to be authenticated to Azure. It does not matter if the active unit is authenticated to Azure or not.
Backup Authentication failed	No failover	Mark backup as unauthenticated	No action	Failover cannot happen if the backup unit is not authenticated to Azure.

Failure Event	Policy	Active Action	Backup Action	Notes
Active unit initiates intentional failover	Failover	Become backup	Become active	The active unit initiates failover by closing the Failover Link Connection. The backup unit sees the connection close and becomes the active unit.
Backup unit initiates intentional failover	Failover	Become backup	Become active	The backup unit initiates failover by sending a failover message to the active unit. When the active unit sees the message, it closes the connection and becomes the backup unit. The backup unit sees the connection close and becomes the active unit.
Formerly active unit recovers	No failover	Become backup	Mark mate as backup	Failover should not occur unless absolutely necessary.
Active unit sees failover message from backup unit	Failover	Become backup	Become active	Can occur if a manual failover was initiated by a user; or the backup unit saw the TCP timeout, but the active unit is able to receive messages from the backup unit.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

ASAv Failover for High Availability in the Public Cloud

To ensure redundancy, you can deploy the ASAv in a public cloud environment in an Active/Backup high availability (HA) configuration.

- Supported only on the Microsoft Azure public cloud; when configuring the ASAv VM, the maximum supported number of vCPUs is 8; and the maximum supported memory is 64GB RAM. See the ASAv Getting Started Guide for comprehensive list of supported instances.
- Implements a stateless Active/Backup solution that allows for a failure of the active ASAv to trigger an automatic failover of the system to the backup ASAv.

Limitations

- Failover is on the order of seconds rather than milliseconds.
- The HA role determination and the ability to participate as an HA unit depends on TCP connectivity between HA peers and between an HA unit and the Azure infrastructure. There are several situations where an ASAv will not be able participate as an HA unit:
  - The inability to establish a failover connection to its HA peer.

  - The inability to retrieve an authentication token from Azure.
  - The inability to authenticate with Azure.

- There is no synching of the configuration from the Active unit to the Backup unit. Each unit must be configured individually with similar configurations for handling failover traffic.
- Failover route-table limitations

  With respect to route-tables for HA in the public cloud:

  - You can configure a maximum of 16 route-tables.
  - Within a route-table, you can configure a maximum of 64 routes.

  In each case the system alerts you when you have reached the limit, with the recommendation to remove a route-table or route and retry.
- No ASDM support.
- No IPSec Remote Access VPN support.

Note See the Cisco Adaptive Security Virtual Appliance (ASAv) Quick Start Guide for information about supported VPN topologies in the public cloud.

- ASAv VM instances must be in the same availability set. If you are a current ASAv user in Azure, you will not be able to upgrade to HA from an existing deployment. You have to delete your instance and deploy the ASAv 4 NIC HA offering from the Azure Marketplace.

Licensing for Failover in the Public Cloud

The ASAv uses Cisco Smart Software Licensing. A smart license is required for regular operation. Each ASAv must be licensed independently with an ASAv platform license. Until you install a license, throughput is limited to 100 Kbps so you can perform preliminary connectivity tests. See the Cisco ASA Series Feature Licenses page to find precise licensing requirements for the ASAv.

Defaults for Failover in the Public Cloud

By default, the failover policy consists of the following:

- Stateless failover only.
- Each unit must be configured individually with similar configurations for handling failover traffic.
- The failover TCP control port number is 44442.
- The Azure Load Balancer health probe port number is 44441.
- The unit poll time is 5 seconds.
- The unit hold time is 15 seconds.

- The ASAv responds to health probes on the primary interface (Management 0/0).
- The ASAv authentication with Azure Service Principal is performed on the primary interface (Management 0/0).

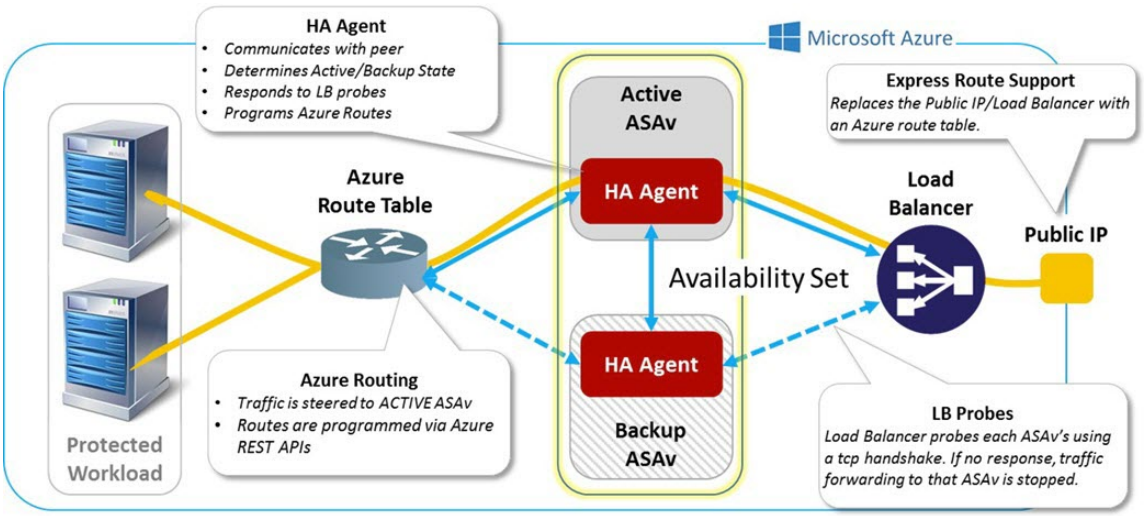
Note See Configure Optional Failover Parameters, on page 10 for options to change the failover port number, health probe port number, poll times, and primary interface.

About ASAv High Availability in Microsoft Azure

The following figure shows a high-level view of an ASAv HA deployment in Azure. A protected workload sits behind two ASAv instances in an Active/Backup failover configuration. An Azure Load Balancer probes both of the ASAv units using a three-way TCP handshake. The active ASAv completes the three way handshake indicating that it is healthy, while the backup ASAv intentionally does not respond. By not responding to the Load Balancer, the backup ASAv appears unhealthy to the Load Balancer, which in turn does not send traffic to it.

On failover, the active ASAv stops responding to the Load Balancer probes and the backup ASAv starts responding, causing all new connections to be sent to the backup ASAv. The backup ASAv sends API requests to the Azure Fabric to modify the route table, redirecting traffic from the active unit to the backup unit. At this point, the backup ASAv becomes the active unit and the active unit becomes the backup unit or is offline, depending on the reason for the failover.

Figure 1: ASAv HA Deployment in Azure



To be able to automatically make API calls to modify Azure route tables, the ASAv HA units need to have Azure Active Directory credentials. Azure employs the concept of a Service Principal which, in simple terms, is a service account. A Service Principal allows you to provision an account with only enough permissions and scope to run a task within a predefined set of Azure resources.

There are two steps to enable your ASAv HA deployment to manage your Azure subscription using a Service Principal:

1. Create an Azure Active Directory application and Service Principal; see About the Azure Service Principal, on page 7.
2. Configure the ASAv instances to authenticate with Azure using a Service Principal; see Configure Authentication Credentials for an Azure Service Principal, on page 12.

Related Topics

See the Azure documentation for more informaion about the Load Balancer.

About the Azure Service Principal

When you have an application that needs to access or modify Azure resources, such as route tables, you must set up an Azure Active Directory (AD) application and assign the required permissions to it. This approach is preferable to running the application under your own credentials because:

- You can assign permissions to the application identity that are different than your own permissions. Typically, these permissions are restricted to exactly what the application needs to do.
- You do not have to change the application's credentials if your responsibilities change.
- You can use a certificate to automate authentication when executing an unattended script.

When you register an Azure AD application in the Azure portal, two objects are created in your Azure AD tenant: an application object, and a service principal object.

- **Application object**—An Azure AD application is defined by its one and only application object, which resides in the Azure AD tenant where the application was registered, known as the application's "home" tenant.
- **Service principal object**—The service principal object defines the policy and permissions for an application's use in a specific tenant, providing the basis for a security principal to represent the application at run-time.

Azure provides instructions on how to create an Azure AD application and service principal in the *Azure Resource Manager Documentation*. See the following topics for complete instructions:

- Use portal to create an Azure Active Directory application and service principal that can access resources
- Use Azure PowerShell to create a service principal to access resource

Note After you set up the service principal, obtain the **Directory ID**, **Application ID**, and **Secret key**. These are required to configure Azure authentication credentials; see Configure Authentication Credentials for an Azure Service Principal, on page 12.

Configuration Requirements for ASAv High Availability in Azure

To deploy a configuration similar to the one described in Figure 1: ASAv HA Deployment in Azure, on page 6 you need the following :

- Azure Authentication information (see About the Azure Service Principal, on page 7):

- Directory ID
- Application ID
- Secret key

- Azure route information (see Configure Azure Route Tables, on page 13):
  - Azure Subscription ID
  - Route table resource group
  - Table names
  - Address prefix
  - Next hop address

- ASA configuration (see Configure Active/Backup Failover, on page 8, Defaults for Failover in the Public Cloud, on page 5):
  - Active/Backup IP addresses
  - HA Agent communication port
  - Load Balancer probe port
  - Polling intervals

Note Configure basic failover settings on both the primary and secondary units. There is no synching of configuration from the primary unit to the secondary unit. Each unit must be configured individually with similar configurations for handling failover traffic.

Configure Active/Backup Failover

To configure Active/Backup failover, configure basic failover settings on both the primary and secondary units. There is no synching of configuration from the primary unit to the secondary unit. Each unit must be configured individually with similar configurations for handling failover traffic.

Before you begin

- Deploy your ASAv HA pair in an Azure Availability Set.
- Have your Azure environment information available, including your Azure Subscription ID and Azure authentication credentials for the Service Principal.

Configure the Primary Unit for Active/Backup Failover

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

Before you begin

- Configure these settings in the system execution space in single context mode.

Example

The following example shows how to configure the failover parameters for the primary/active unit:

```
ciscoasa(config)# failover cloud unit primary
ciscoasa(config)# failover cloud peer ip 10.4.3.5 port 4444
ciscoasa(config)#
```

What to do next

Configure additional parameters as needed:

- Configure the backup unit; see Configure the Secondary Unit for Active/Backup Failover, on page 9.
- Configure Azure authentication; see Configure Authentication Credentials for an Azure Service Principal, on page 12.
- Configure Azure route information; see Configure Azure Route Tables, on page 13.
- Review additional parameters; see Configure Failover Criteria and Other Settings, on page 10.

Configure the Secondary Unit for Active/Backup Failover

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

Before you begin

- Configure these settings in the system execution space in single context mode.

Procedure

Step 1 Designate this unit as the backup unit:

failover cloud unit secondary

Step 2 Assign the active IP address to the failover link:

failover cloud peer ip *ip-address* [**port** *port-number*]

This IP address is used to establish a TCP failover control connection to the HA peer. The port is used when attempting to open a failover connection to the HA peer, which may already be the active unit. Configuring the port here may be needed if NAT is in place between the HA peers. In most cases you will not need to configure the port.

Example

The following example shows how to configure the failover parameters for the secondary/backup unit:

```
failover cloud unit secondary
failover cloud peer ip 10.4.3.4 port 4444
```

What to do next

Configure additional parameters as needed:

- Configure Azure authentication; see Configure Authentication Credentials for an Azure Service Principal, on page 12.
- Configure Azure route information; see Configure Azure Route Tables, on page 13.
- Review additional parameters; see Configure Failover Criteria and Other Settings, on page 10.

Configure Optional Failover Parameters

You can customize failover settings as necessary.

Configure Failover Criteria and Other Settings

See Defaults for Failover in the Public Cloud, on page 5 for the default settings for many parameters that you can change in this section.

Before you begin

- Configure these settings in the system execution space in single context mode.
- Configure these settings on both the primary and secondary units. There is no synching of configuration from the primary unit to the secondary unit.

Procedure

Step 1 Specify the TCP port to be used for communication with the HA peer:

failover cloud port control *port-number*

Example:

```
ciscoasa(config)# failover cloud port control 4444
```

The *port-number* argument assigns a number for the TCP port used for peer-to-peer communication.

This configures the failover connection TCP port on which to accept connections when in the active unit role. This is the port opened on the active ASAv to which the backup ASAv connects.

Note We recommend that you keep the default value of 44442, which is the default for both HA peers. If you change the default value for one HA peer, the best practice is to make the same change to the other HA unit.

Step 2 Change the unit poll and hold times:

failover cloud polltime *poll_time* [**holdtime** *time*]

Example:

```
ciscoasa(config)# failover cloud polltime 10 holdtime 30
```

The **polltime** range is between 1 and 15 seconds. The hold time determines how long it takes from the time a hello packet is missed to when the unit is marked as failed. The **holdtime** range is between 3 and 60 seconds.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.

Step 3 Specify the TCP port used for Azure Load Balancer health probes:

failover cloud port probe *port-number*

Example:

```
ciscoasa(config)# failover cloud port probe 4443
```

If your deployment uses an Azure Load Balancer, the active ASAv must respond to TCP probes from the load balancer so that incoming connections are directed to the active unit.

Step 4 Specify a secondary interface for Azure Load Balancer health probes:

failover cloud port probe *port-number* **interface** *if-name*

Example:

```
ciscoasa(config)# failover cloud port probe 4443 interface inside
```

The TCP probes used in Cloud HA have a source IP address of 168.63.129.16. This address is Azure's virtual public IP address. This address is the source address of Azure DHCP packets and is the address of the DNS name server in Azure.

By default, the ASAv responds to probes by which 168.63.129.16 is reachable, according to the ASA route tables. This ends up being the primary interface (Management0/0) because of the presence of the default route.

To support load balancers on interfaces other than Management0/0, you configure another interface for the port probe. You also need to configure two static routes: one for the primary interface, and one for the interface configured for load balancer probes.

Step 5 Add static routes for the primary interface and the interface configured for load balancer probes:

route *if-name dest_ip mask gateway_ip* **[distance]**

Example:

```
ciscoasa(config)# route outside 168.63.129.16 255.255.255.255 10.22.0.1 1
ciscoasa(config)# route inside 168.63.129.16 255.255.255.255 10.22.1.1 2
```

The *distance* argument is the administrative distance for the route. The default is **1** if you do not specify a value. Administrative distance is a parameter used to compare routes among different routing protocols. When multiple routes exist to the same destination (168.63.129.16), then the administrative distance for the route determines priority.

The static route for the primary interface (outside) with the the administrative distance of 1 establishes the primary interface as the preferred interface for packets destined to 168.63.129.16, but also allows the interface configured for load balancer probes to send packets to 168.63.129.16.

Note The mechanism for responding to probes is to create a TCP socket on an interface. Cloud HA uses the route lookup for 168.63.129.16 to decide which interface to create the socket on. This ends up being the primary interface because of the presence of the default route. Without the static route for the interface configured for probes, the ASA would not respond to the TCP packets sent by the load balancer.

Configure Authentication Credentials for an Azure Service Principal

You can enable your ASAv HA peers to access or modify Azure resources, such as route tables, using an Azure Service Principal. You must set up an Azure Active Directory (AD) application and assign the required permissions to it. The following commands allow the ASAv to authenticate with Azure using a Service Principal. See the ASAv Quick Start Guide's Azure chapter for more information about the Azure Service Principal.

Before you begin

- Configure these settings in the system execution space in single context mode.
- Configure these settings on both the primary and secondary units. There is no synching of configuration from the primary unit to the secondary unit.

Procedure

Step 1 Configure the Azure Subscription ID for the Azure Service Principal:

failover cloud subscription-id *subscription-id*

Example:

```
(config)# failover cloud subscription-id ab2fe6b2-c2bd-44
```

The Azure Subscription ID is needed to modify Azure route tables, for example, when the Cloud HA user wants to direct internal routes to the active unit.

Step 2 Configure Azure Service Principal credential information:

failover cloud authentication {**application-id** | **directory-id** | **key**}

To alter Azure route tables during a failover, you need to obtain an *access key* from the Azure infrastructure before you can access route tables. You obtain the *access key* using a application ID, a directory ID, and a secret key for the Azure Service Principal controlling the HA pair.

Step 3 Configure the Azure Service Principal's application ID:

failover cloud authentication application-id *appl-id*

Example:

```
(config)# failover cloud authentication application-id dfa92ce2-fea4-67b3-ad2a-6931704e4201
```

You need this application ID when you request an access key from the Azure infrastructure.

Step 4 Configure the Azure Service Principal's directory ID:

failover cloud authentication directory-id *dir-id*

Example:

```
(config)# failover cloud authentication directory-id 227b0f8f-684d-48fa-9803-c08138b77ae9
```

You need this directory ID when you request an access key from the Azure infrastructure.

Step 5 Configure the Azure Service Principal's secret key ID:

failover cloud authentication key *secret-key* [**encrypt**]

Example:

```
(config)# failover cloud authentication key 5yOhH593dtD/O8gzAlWgulrkWz5dH02d2STk3LDbI4c=
```

You need this secret key when requesting an access key from the Azure infrastructure. If the **encrypt** keyword is present the secret key is encrypted in the **running-config**.

Configure Azure Route Tables

The route table configuration consists of information about Azure user-defined routes that need to be updated when the ASAv assumes the active role. On failover, you want to direct internal routes to the active unit, which uses the configured route table information to automatically direct the routes to itself.

Note You need to configure any Azure route table information on both the active and backup units.

Before you begin

- Configure these settings in the system execution space in single context mode.
- Configure these settings on both the primary and secondary units. There is no synching of configuration from the primary unit to the secondary unit.

- Have your Azure environment information available, including your Azure Subscription ID and Azure authentication credentials for the Service Principal.

Procedure

Step 1 Configure an Azure route table that requires updating during a failover:

failover cloud route-table *table-name* [**subscription-id** *sub-id*]

Example:

```
ciscoasa(config)# failover cloud route-table inside-rt
```

(Optional) To update user-defined routes in more than one Azure subscription, include the **subscription-id** parameter.

Example:

```
ciscoasa(config)# failover cloud route-table inside-rt subscription-id cd5fe6b4-d2ed-45
```

The **subscription-id** parameter at the **route-table** command level overrides the Azure Subscription ID specified at the global level. If you enter the **route-table** command without specifying an Azure Subscription ID, the global **subscription-id** parameter is used. See Configure Authentication Credentials for an Azure Service Principal, on page 12 for information about the Azure Subscription ID .

Note When you enter the **route-table** command the ASAv switches to **cfg-fover-cloud-rt** mode.

Step 2 Configure an Azure Resource Group for a route table:

rg *resource-group*

Example:

```
ciscoasa(cfg-fover-cloud-rt)# rg east-rg
```

You need a resource group for the route table update requests in Azure.

Step 3 Configure a route that requires updating during a failover:

route name *route-name* **prefix** *address-prefix* **nexthop** *ip-address*

Example:

```
ciscoasa(cfg-fover-cloud-rt)# route route-to-outside prefix 10.4.2.0/24 nexthop 10.4.1.4
```

The address prefix is configured as an IP address prefix, a slash (‘/’) and a numerical netmask. For example *192.120.0.0/16*.

Example

Full configuration example:

```
ciscoasa(config)# failover cloud route-table inside-rt
ciscoasa(cfg-fover-cloud-rt)# rg east-rg
ciscoasa(cfg-fover-cloud-rt)# route route-to-outside prefix 10.4.2.0/24 nexthop 10.4.1.4

ciscoasa(config)# failover cloud route-table outside-rt
ciscoasa(cfg-fover-cloud-rt)# rg east-rg
ciscoasa(cfg-fover-cloud-rt)# route route-to-inside prefix 10.4.1.0/24 nexthop 10.4.2.4
```

Enable Active/Backup Failover

You enable Active/Backup failover after you configure settings on both the primary and secondary units. There is no synching of configuration from the primary unit to the secondary unit. Each unit must be configured individually with similar configurations for handling failover traffic.

Enable the Primary Unit for Active/Backup Failover

Follow the steps in this section to enable the primary in an Active/Backup failover configuration.

Before you begin

- Configure these settings in the system execution space in single context mode.

Procedure

Step 1 Enable failover:

ciscoasa(config)# failover

Step 2 Save the system configuration to flash memory:

ciscoasa(config)# write memory

Example

The following example shows a complete configuration for the primary unit:

```
ciscoasa(config)# failover cloud unit primary
ciscoasa(config)# failover cloud peer ip 10.4.3.4

ciscoasa(config)# failover cloud authentication application-id dfa92ce2-fea4-67b3-ad2a-693170
ciscoasa(config)# failover cloud authentication directory-id 227b0f8f-684d-48fa-9803-c08138
ciscoasa(config)# failover cloud authentication key 5yOhH593dtD/O8gzAWguH02d2STk3LDbI4c=
ciscoasa(config)# failover cloud authentication subscription-id ab2fe6b2-c2bd-44

ciscoasa(config)# failover cloud route-table inside-rt
ciscoasa(cfg-fover-cloud-rt)# rg east-rg
ciscoasa(cfg-fover-cloud-rt)# route route-to-outside prefix 10.4.2.0/24 nexthop 10.4.1.4
```

```
ciscoasa(config)# failover cloud route-table outside-rt
ciscoasa(cfg-fover-cloud-rt)# rg east-rg
ciscoasa(cfg-fover-cloud-rt)# route route-to-inside prefix 10.4.1.0/24 nexthop 10.4.2.4

ciscoasa(config)# failover
ciscoasa(config)# write memory
```

What to do next

Enable the secondary unit.

Enable the Secondary Unit for Active/Backup Failover

Follow the steps in this section to enable the secondary in an Active/Backup failover configuration.

Before you begin

- Configure these settings in the system execution space in single context mode.

Procedure

Step 1 Enable failover:

ciscoasa(config)# **failover**

Step 2 Save the system configuration to flash memory:

ciscoasa(config)# **write memory**

Example

The following example shows a complete configuration for the secondary unit:

```
ciscoasa(config)# failover cloud unit secondary
ciscoasa(config)# failover cloud peer ip 10.4.3.5

ciscoasa(config)# failover cloud authentication application-id dfa92ce2-fea4-67b3-ad2a-693170
ciscoasa(config)# failover cloud authentication directory-id 227b0f8f-684d-48fa-9803-c08138
ciscoasa(config)# failover cloud authentication key 5yOhH593dtD/O8gzAWguH02d2STk3LDbI4c=
ciscoasa(config)# failover cloud authentication subscription-id ab2fe6b2-c2bd-44

ciscoasa(config)# failover cloud route-table inside-rt
ciscoasa(cfg-fover-cloud-rt)# rg east-rg
ciscoasa(cfg-fover-cloud-rt)# route route-to-outside prefix 10.4.2.0/24 nexthop 10.4.1.4

ciscoasa(config)# failover cloud route-table outside-rt
ciscoasa(cfg-fover-cloud-rt)# rg east-rg
ciscoasa(cfg-fover-cloud-rt)# route route-to-inside prefix 10.4.1.0/24 nexthop 10.4.2.4

ciscoasa(config)# failover
```

```
ciscoasa(config)# write memory
```

Manage Failover in the Public Cloud

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

Force Failover

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

Before you begin

Use this command in the system execution space in single context mode.

Procedure

Step 1 Force a failover when entered on the *standby* unit:

failover active

Example:

```
ciscoasa# failover active
```

The standby unit becomes the active unit.

Step 2 Force a failover when entered on the *active* unit:

no failover active

Example:

```
ciscoasa# no failover active
```

The active unit becomes the standby unit.

Update Routes

If the state of the routes in Azure is inconsistent with the ASAv in the *active* role, you can force route updates on the ASAv using the following EXEC command:

Before you begin

Use this command in the system execution space in single context mode.

Procedure

Update the routes on the *active* unit:

failover cloud update routes

Example:

```
ciscoasa# failover cloud update routes
Beginning route-table updates
Routes changed
```

This command is only valid on the ASAv in the *active* role. If authentication fails the command output will be `Route changes failed`.

Validate Azure Authentication

For a successful ASAv HA deployment in Azure, the Service Principal configuration must be complete and accurate. Without proper Azure authorization, the ASAv units will be unable to access resources to handle failover and to perform route updates. You can test your failover configuration to detect errors related to the following elements of your Azure Service Principal:

- Directory ID
- Application ID
- Authentication Key

Before you begin

Use this command in the system execution space in single context mode.

Procedure

Test the Azure authentication elements in your ASAv HA configuration:

test failover cloud authentication

Example:

```
ciscoasa(config)# test failover cloud authentication
Checking authentication to cloud provider
Authentication Succeeded
```

If authentication fails the command output will be `Authentication Failed`.

If the Directory ID or Application ID is not configured properly, Azure will not recognize the resource addressed in the REST request to obtain an authentication token. The event history for this condition entry will read:

```
Error Connection - Unexpected status in response to access token request: Bad Request
```

If the Directory ID or Application ID are correct, but the authentication key is not configured properly, Azure will not grant permission to generate the authentication token. The event history for this condition entry will read:

```
Error Connection - Unexpected status in response to access token request: Unauthorized
```

Monitor Failover in the Public Cloud

This section explains how you monitor the failover status.

Failover Status

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

- **show failover**

  Displays information about the failover state of the unit. Values for configuration elements that have not been configured will display *not configured*.

  Route update information is presented only for the active unit.

- **show failover history**

  Displays failover event history with a timestamp, severity level, event type, and event text.

Failover 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. Syslog messages are in the ranges of 1045xx and 1055xx.

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

The following are sample syslogs generated during a switchover:

```
%ASA-3-105509: (Primary) Error sending Hello message to peer unit 10.22.3.5, error: Unknown
 error
%ASA-1-104500: (Primary) Switching to ACTIVE - switch reason: Unable to send message to
Active unit
%ASA-5-105522: (Primary) Updating route-table wc-rt-inside
%ASA-5-105523: (Primary) Updated route-table wc-rt-inside
%ASA-5-105522: (Primary) Updating route-table wc-rt-outside
%ASA-5-105523: (Primary) Updated route-table wc-rt-outside
%ASA-5-105542: (Primary) Enabling load balancer probe responses
%ASA-5-105503: (Primary) Internal state changed from Backup to Active no peer
%ASA-5-105520: (Primary) Responding to Azure Load Balancer probes
```

Each syslog related to a Public Cloud deployment is prefaced with the unit role: (Primary) or (Secondary).

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.

History for Failover in the Public Cloud

Feature Name	Releases	Feature Information
Active/Backup failover on Microsoft Azure	9.8(200)	This feature was introduced.