Configure ASA Active/Active Failover in Firepower 4100 Series

Contents

Introduction

This document describes how to configure Active/Active Failover in Cisco Firepower 4145 NGFW Appliance.

Prerequisites

Requirements

Cisco recommends that you have knowledge of this topic:

- Active/Standby failover in Cisco Adaptive Security Appliance (ASA).

Components Used

The information in this document is based on these software and hardware versions:

- Cisco Firepower 4145 NGFW Appliance (ASA) 9.18(3)56
- Firepower eXtensible Operating System (FXOS) 2.12(0.498)
- Windows 10

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, ensure that you understand the potential impact of any command.

Background Information

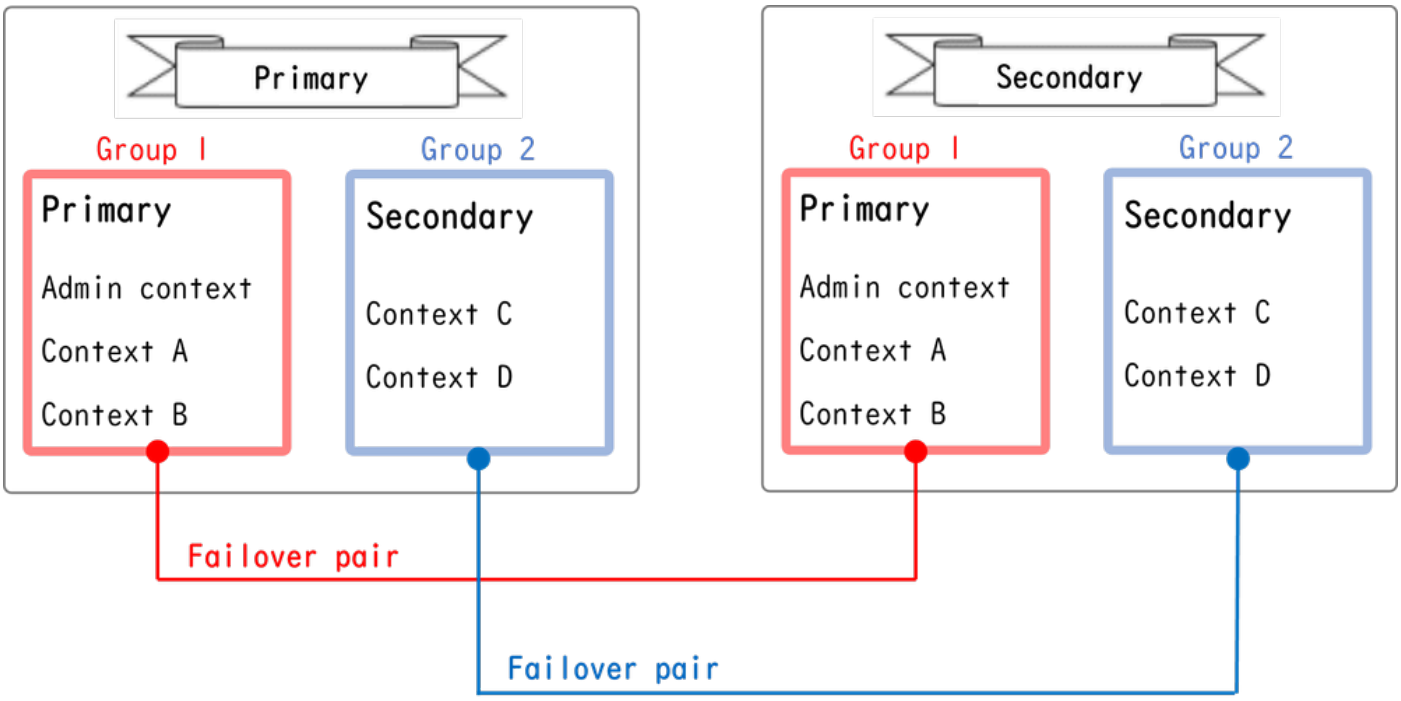
Active/Active failover is only available to security appliances that are running in multiple context mode. In this mode, the ASA is logically divided into multiple virtual devices, known as contexts. Each context operates as an independent device, with its own security policy, interfaces, and administrators.

The Active/Active failover is a feature of Adaptive Security Appliance (ASA) that allows two Firepower devices to pass the traffic simultaneously. This configuration is typically used for a load balancing scenario in which you want to split the traffic between two devices to maximize throughput. It is also used for redundancy purposes, so if one ASA fails, the other can take over without causing a disruption in service.

Mechanism of ASA Active/Active Failover

Each context in Active/Active failover is manually assigned to ether group 1 or group 2. The Admin context is assigned to group 1 by default. The same group (group1 or group2) in the two chassis (units) form a failover pair which is realizing the redundancy function. The behavior of each failover pair is basically same as the behavior in a Active/Standby failover. For more details about Active/Standby failover, please refer to Configure Active/Standby Failover. In Active/Active failover, in addition to the Role (Primary or Secondary) of each chassis, each group also has a Role (Primary or Secondary). These Roles are manually pre-set by the user and are used to decide the High Availability (HA) status (Active or Standby) for each failover group.

The Admin Context is a special context which is handling basic chassis management (such as SSH) connection. This is a image of Active/Active failover.



Failover Pair In Active/Active Failover

Traffic Flow

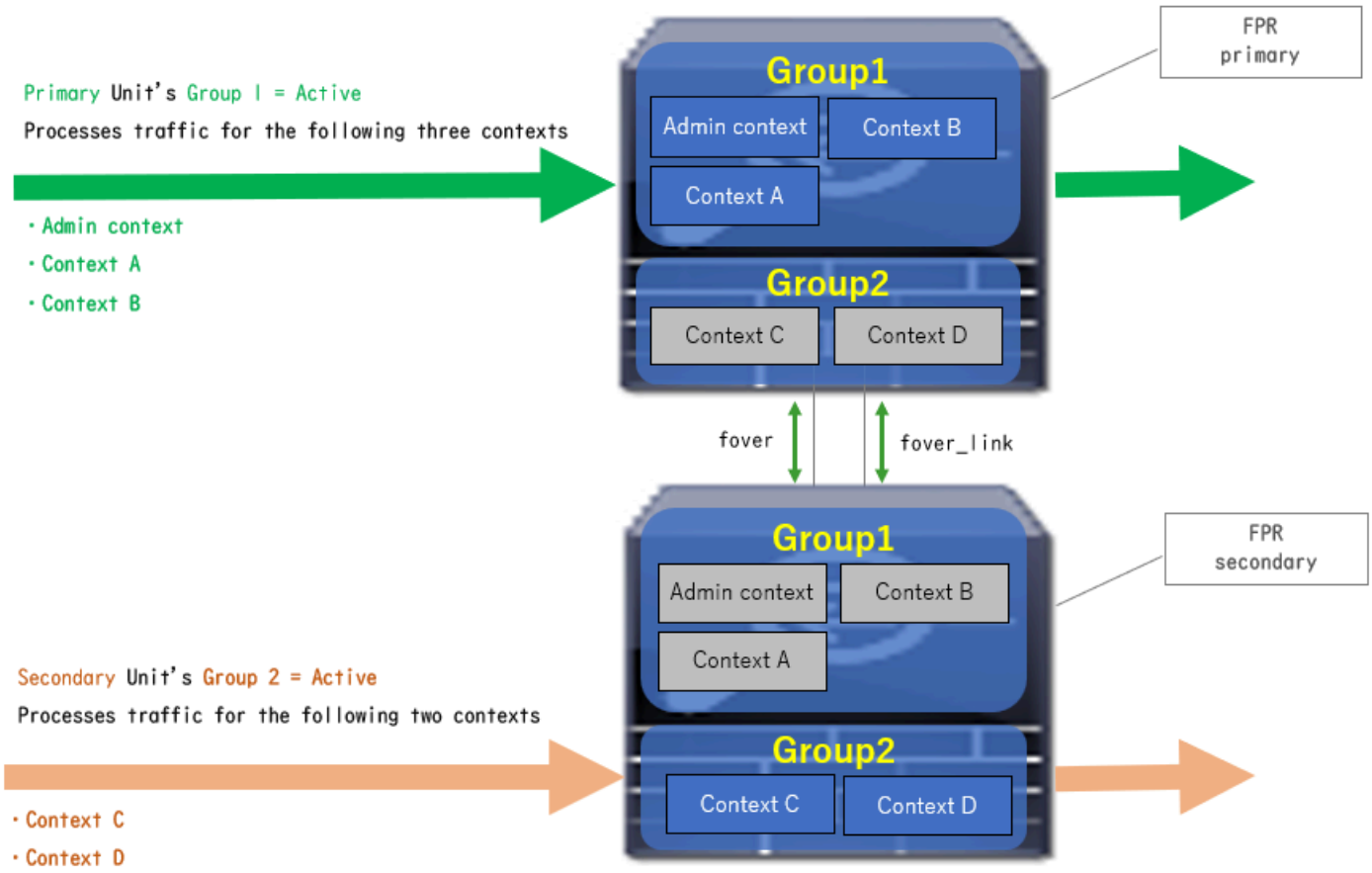
In Active/Active failover, traffic can be handled in the several patterns as shown in the next image.

Group	Primary Unit	Secondary Unit	
Group 1	Active	Standby	Both of ASAs process traffic simultaneously
Group 2	Standby	Active	
Group 1	Active	Standby	Only the Primary Unit processes traffic
Group 2	Active	Standby	
Group 1	Standby	Active	Both of ASAs process traffic simultaneously
Group 2	Active	Standby	
Group 1	Standby	Active	Only the Secondary Unit processes traffic
Group 2	Standby	Active	

Traffic Flow

Traffic Flow Condition 1

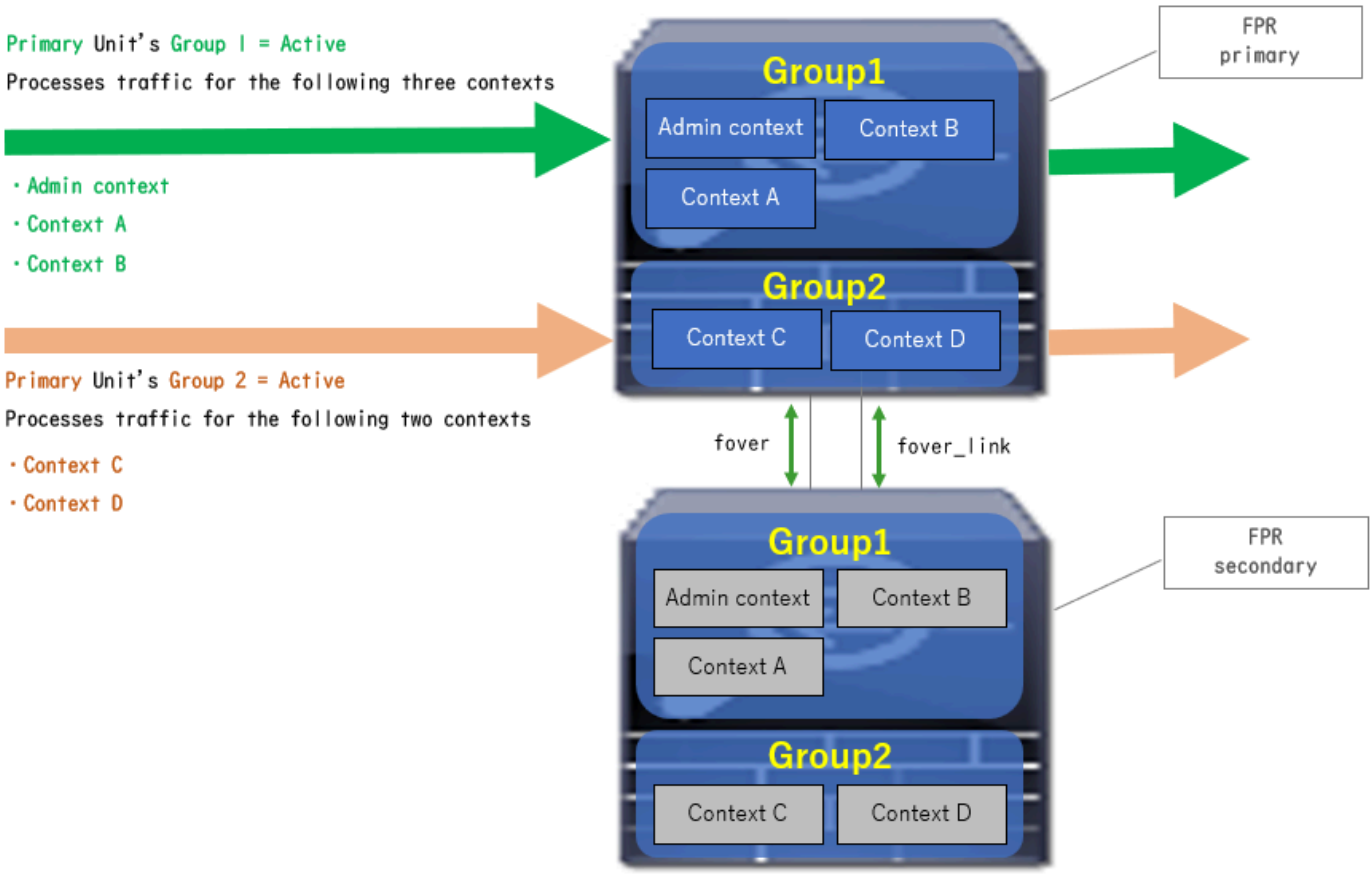
- Primary Unit: Group 1 = Active, Group 2 = Standby
- Secondary Unit: Group 1 = Standby, Group 2 = Active



Traffic Flow Condition 1

Traffic Flow Condition 2

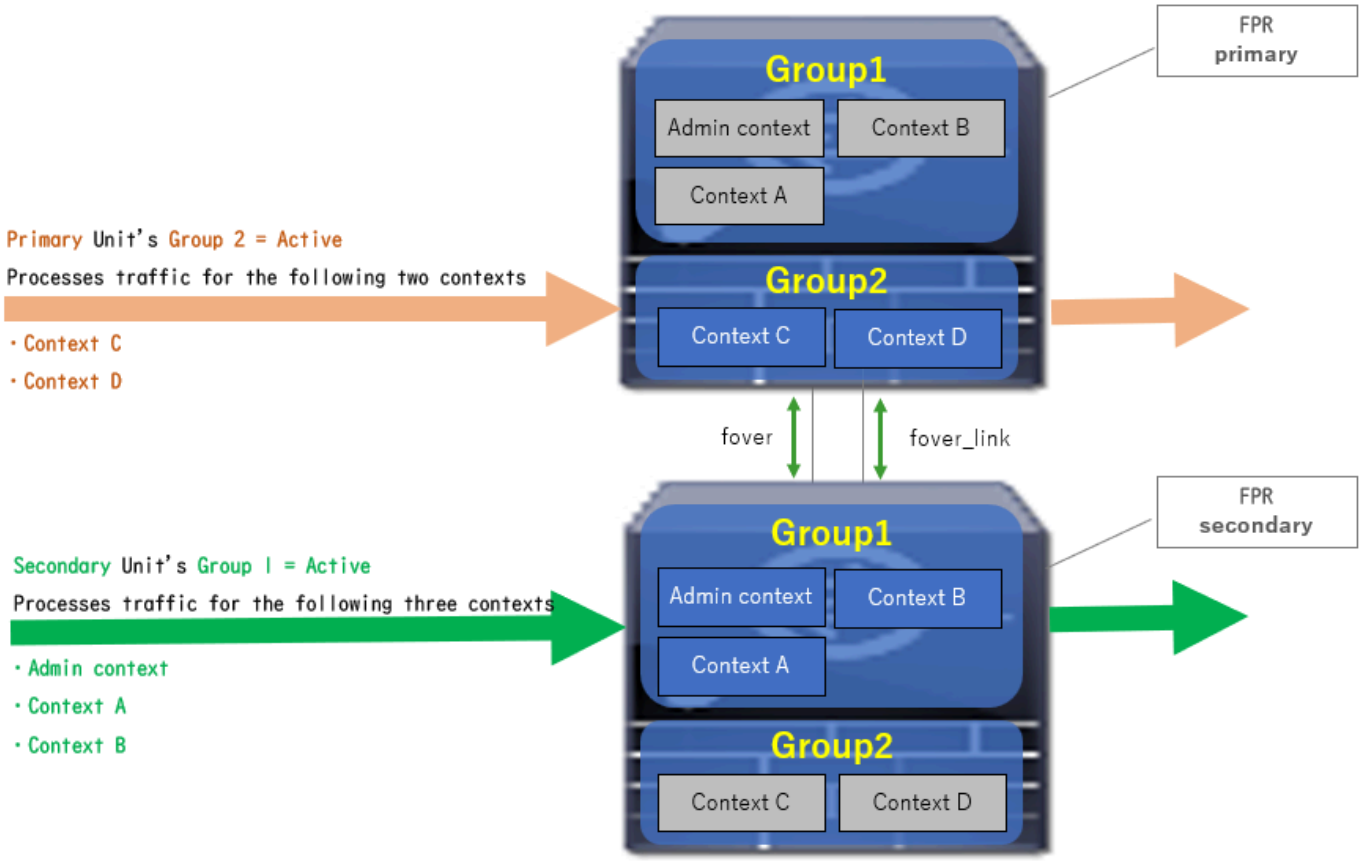
- Primary Unit: Group 1 = Active, Group 2 = Active
- Secondary Unit: Group 1 = Standby, Group 2 = Standby



Traffic Flow Condition 2

Traffic Flow Condition 3

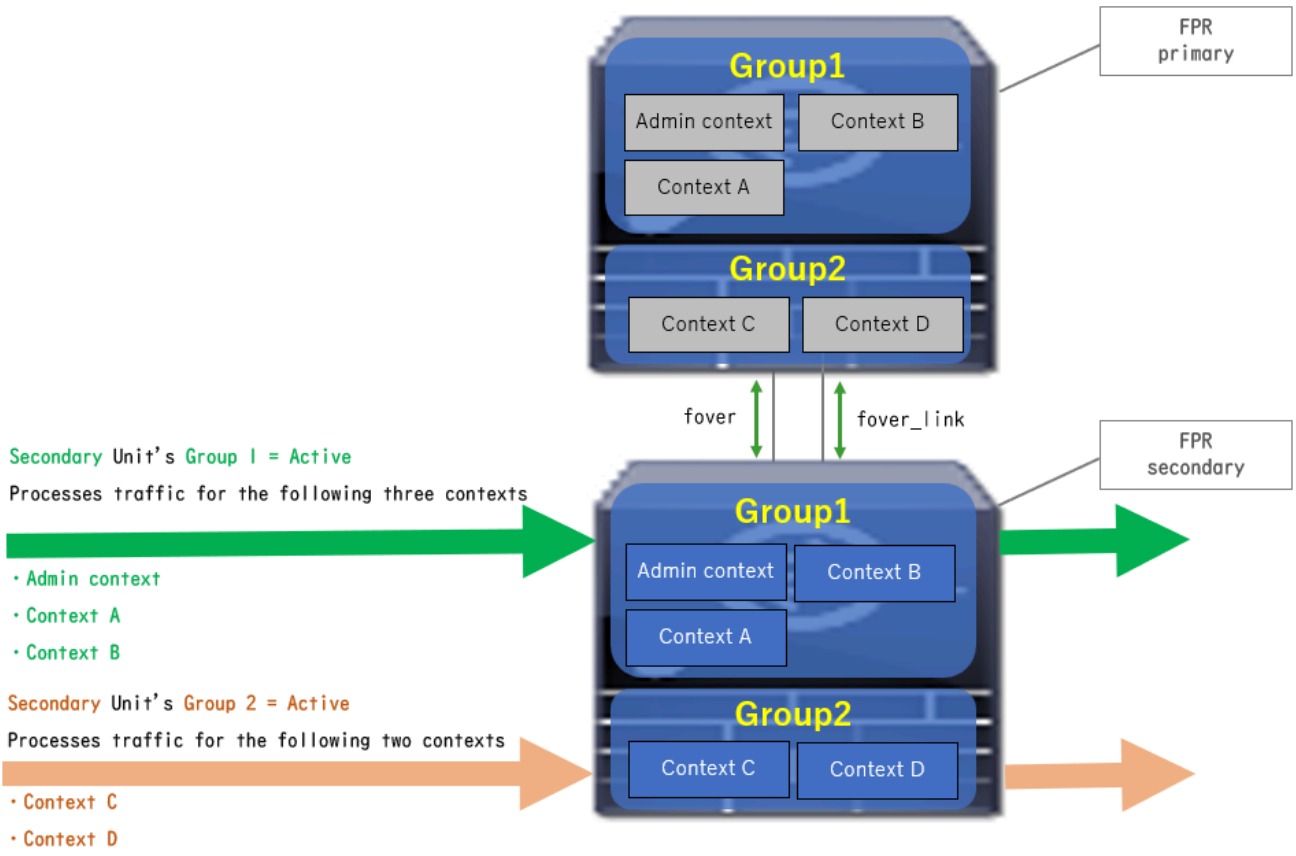
- Primary Unit: Group 1 = Standby, Group 2 = Active
- Secondary Unit: Group 1 = Active, Group 2 = Standby



Traffic Flow Condition 3

Traffic Flow Condition 4

- Primary Unit: Group 1 = Standby, Group 2 = Standby
- Secondary Unit: Group 1 = Active, Group 2 = Active



Traffic Flow Condition 4

Selection Rules for Active/Standby

In Active/Active failover , the status (active/standby) of each group is determined by these rules:

- Assume 2 devices are booting up almost at the same time, then one of the units (Primary or Secondary) becomes active firstly.
- When preempt time passed, the group which have same role in chassis and group becomes active.
- When there is a failover event (such as interface DOWN), the status of the group change in the same way as with Active/Standby failover.
- The preempt time does not work after doing manually failover.

This is an example of the status change.

- Both devices are booting up almost at the same time. Status A →
- Preempt time passed. Status B →
- Primary device failure (Failover is triggered). Status C →
- Preempt time passed since Primary device recovered from failure. Status D →
- Manually trigger failover. Status E

For details on Failover triggers and Health Monitoring, please refer to Failover Events.

1. Both devices are booting up almost at the same time.

Operation	Primary Unit		Secondary Unit	
	Group 1: primary	Group 2: secondary	Group 1: primary	Group 2: secondary
Both devices started simultaneously	Active	Active	Standby	Standby
	or			
	Standby	Standby	Active	Active

Status A

2. Preempt time (30s in this document) passed.

After 30 seconds (preempt time)	Active	Standby	Standby	Active

Status B

3. Failure (such as Interface Down) occurred in group 1 of Primary unit.

Failover event	Standby	Standby	Active	Active

Status C

4. Preempt time (30s in this document) passed since group 1 of Primary device recoveried from failure.

After 30 seconds since Primary Unit recovered	Active	Standby	Standby	Active

Status D

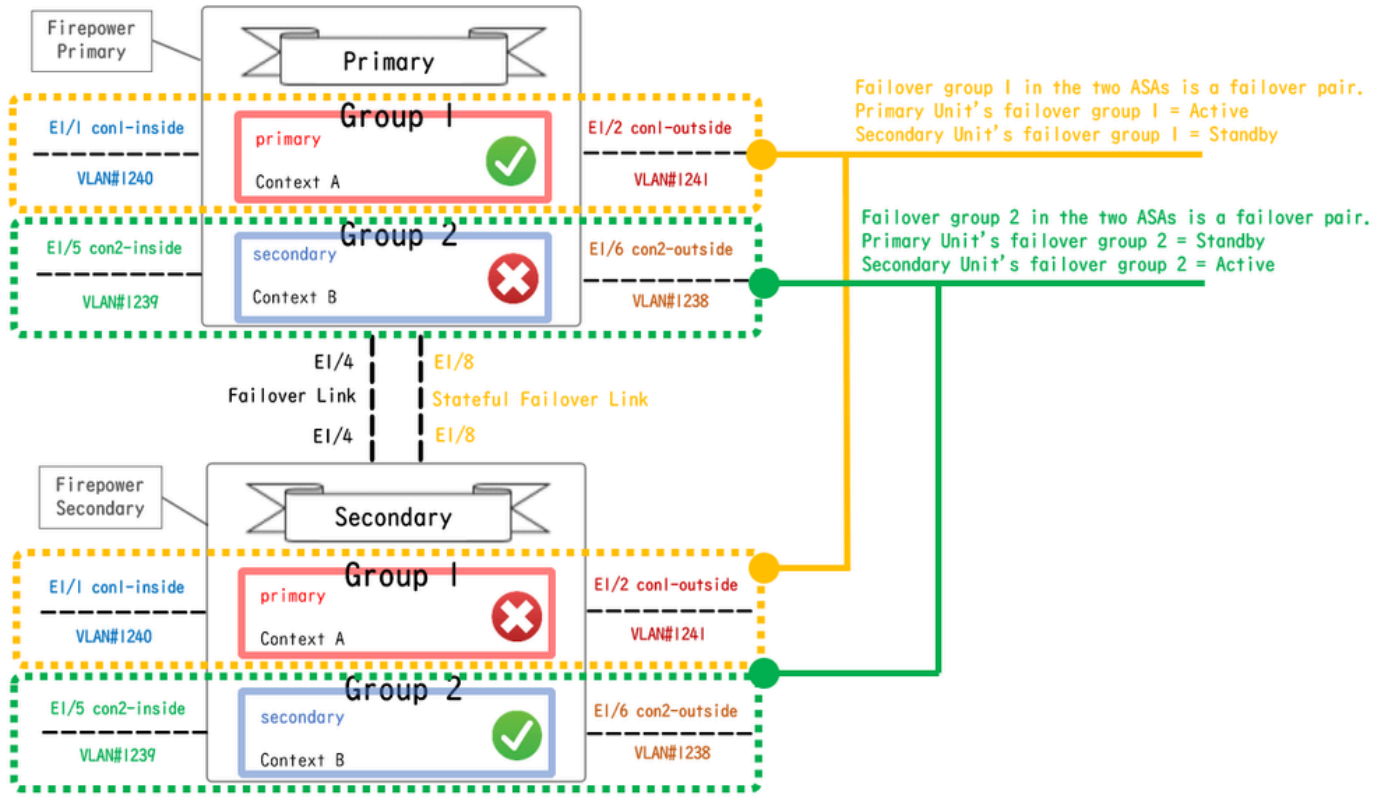
5. Manually setting group 2 of Primary Unit to Active.

Manual failover	Active	Active	Standby	Standby

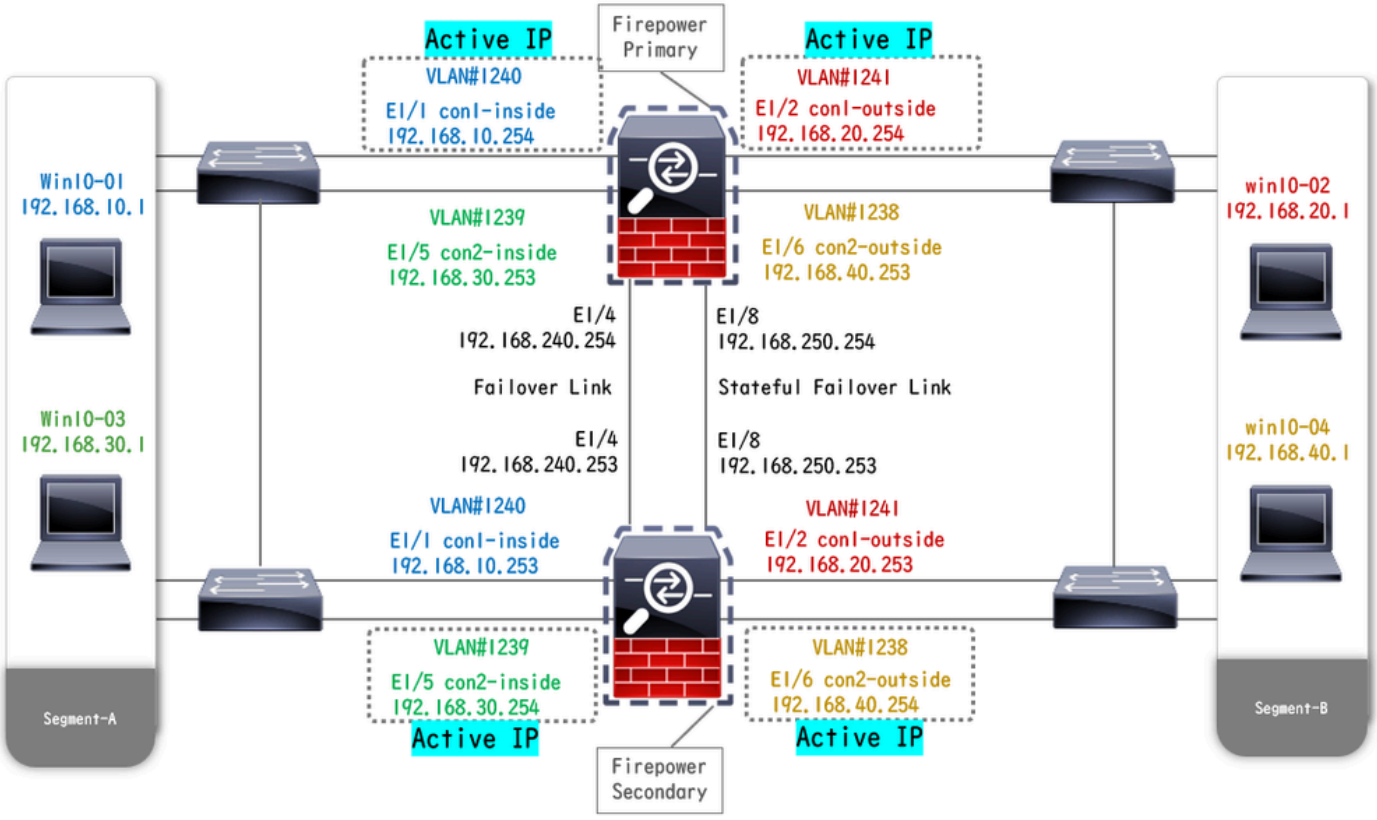
Status E

Network Diagram

This document introduce the configuration and verification for Active/Active failover base on this diagram.



Logical Configuration Diagram

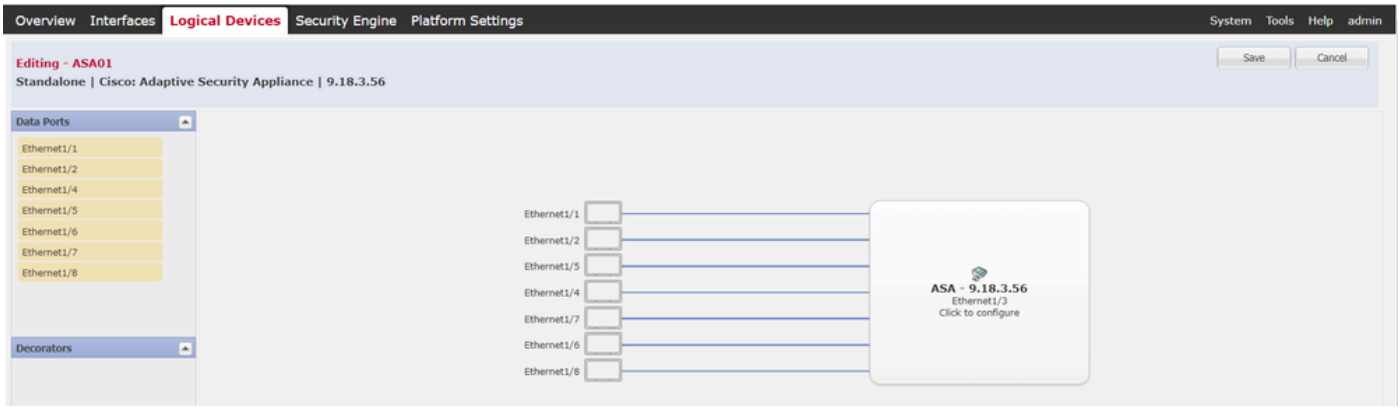


Physical Configuration Diagram

Configuration

Step 1. Pre-configure Interfaces

For both of Firepower, log in FCM GUI. Navigate to **Logical Devices** > **Edit**. Add data interface to ASA, as shown in the image.



Pre-configure Interfaces

Step 2. Configuration on Primary Unit

Connect to the Primary FXOS CLI via SSH or console. Run **connect module 1 console** and connect asa command to enter into ASA CLI.

a. Configure failover on the Primary unit (run the command in the system context of the Primary unit).

<#root>

failover lan unit primary
failover lan interface fover E1/4
failover link fover_link E1/8
failover interface ip fover 192.168.240.254 255.255.255.0 standby 192.168.240.253
failover interface ip fover_link 192.168.250.254 255.255.255.0 standby 192.168.250.253

```
failover group 1

□□□<--- group 1 is assigned to primary by default
preempt 30
failover group 2
secondary
preempt 30
failover
prompt hostname state priority context
```

b. Configure failover group for context (run the command in the system context of the Primary unit).

<#root>

admin-context admin

```
context admin

        <--- admin context is assigned to group 1 by default
allocate-interface E1/3
config-url disk0:/admin.cfg

context con1
allocate-interface E1/1
```

```
allocate-interface E1/2
config-url disk0:/con1.cfg
```

join-failover-group 1

```
 <--- add con1 context to group 1
!
context con2
allocate-interface E1/5
allocate-interface E1/6
config-url disk0:/con2.cfg
```

join-failover-group 2

```
 <--- add con2 context to group 2
```

c. Run changeto context con1 to connect con1 context from system context . Configure IP for Interface of the con1 context (run the command in con1 context of Primary unit).

interface E1/1
nameif con1-inside
ip address 192.168.10.254 255.255.255.0 standby 192.168.10.253
security-level 100
no shutdown
interface E1/2
nameif con1-outside
ip address 192.168.20.254 255.255.255.0 standby 192.168.20.253
no shutdown

d. Run changeto context con2 to connect con2 context from system context . Configure IP for Interface of the con2 context (run the command in con2 context of Primary unit).

interface E1/5
nameif con2-inside
ip address 192.168.30.254 255.255.255.0 standby 192.168.30.253
security-level 100
no shutdown
interface E1/6
nameif con2-outside
ip address 192.168.40.254 255.255.255.0 standby 192.168.40.253
no shutdown

Step 3. Configuration on Secondary Unit

a. Connect to the Secondary FXOS CLI via SSH or console. Configure failover on the Secondary unit (run the command in system context of Secondary unit).

failover lan unit secondary
failover lan interface fover E1/4

failover link fover_link E1/8
failover interface ip fover 192.168.240.254 255.255.255.0 standby 192.168.240.253
failover interface ip fover_link 192.168.250.254 255.255.255.0 standby 192.168.250.253

b. Run failover command (run in system context of Secondary unit).

failover

Step 4. Confirm Failover Status After Synchronization Finished Successfully

a. Run show failover in system context of Secondary unit.

<#root>

asa#

show failover

```
Failover On
Failover unit Secondary
Failover LAN Interface: fover Ethernet1/4 (up)
Version: Ours 9.18(3)56, Mate 9.18(3)56
Serial Number: Ours FCH23157YFY, Mate FCH23037U8R
Group 1 last failover at: 17:00:56 JST Jan 11 2024
Group 2 last failover at: 17:00:56 JST Jan 11 2024

This host:
```

Secondary

```
<--- group 1 and group 2 are Standby status in Secondary Unit
Group 1 State:
```

Standby Ready

```
Active time: 0 (sec)
Group 2 State:
```

Standby Ready

```
Active time: 945 (sec)

con1 Interface con1-inside (192.168.10.253): Unknown (Waiting)
con1 Interface con1-outside (192.168.20.253): Unknown (Waiting)
con2 Interface con2-inside (192.168.30.253): Unknown (Waiting)
con2 Interface con2-outside (192.168.40.253): Normal (Waiting)

Other host:
```

Primary

```
<--- group 1 and group 2 are Active status in Primary Unit
Group 1 State:
```

Active

```
Active time: 1637 (sec)
Group 2 State:
```

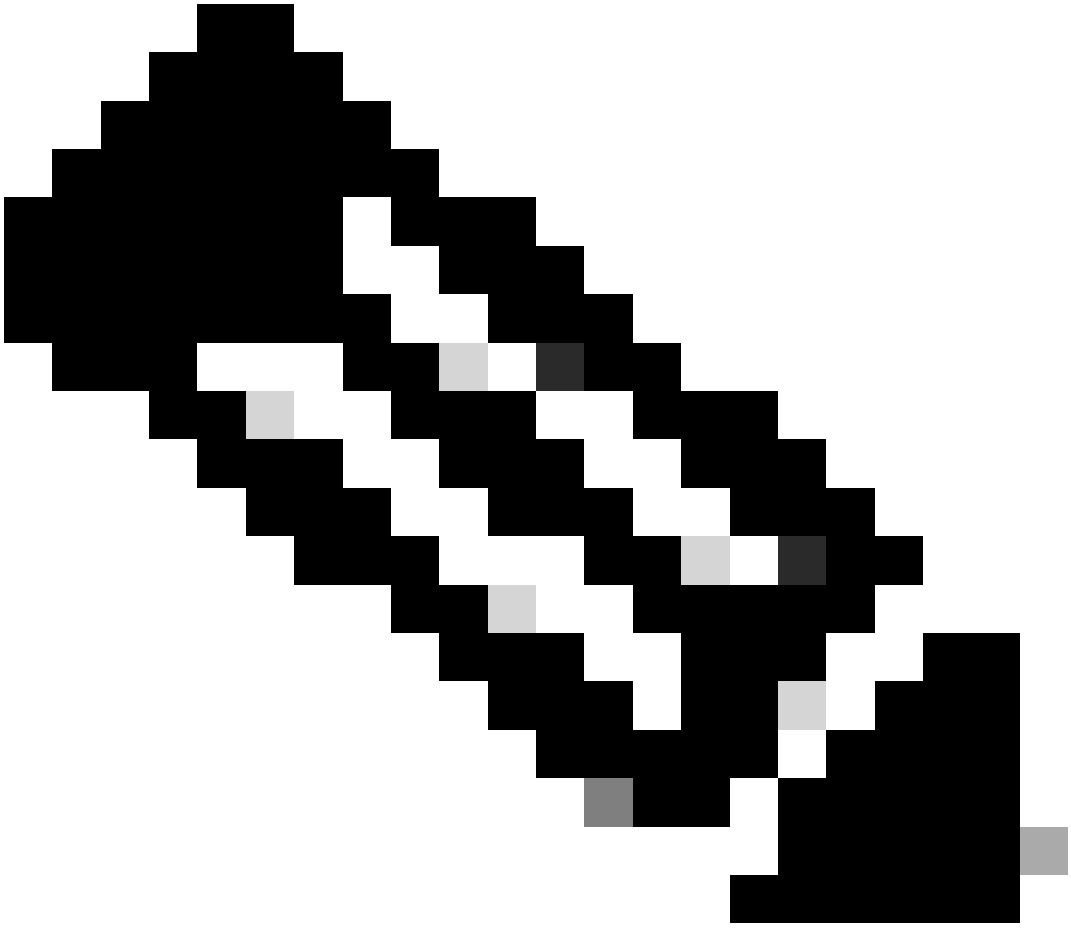
Active

```
Active time: 93 (sec)

con1 Interface con1-inside (192.168.10.254): Normal (Monitored)
con1 Interface con1-outside (192.168.20.254): Normal (Monitored)
con2 Interface con2-inside (192.168.30.254): Normal (Waiting)
con2 Interface con2-outside (192.168.40.254): Normal (Waiting)

Stateful Failover Logical Update Statistics
Link : fover_link Ethernet1/8 (up)
```

b. (Optional) Run **no failover active group 2** command to manually switch group 2 of Primary unit to Standby status (run in system context of Primary unit). This can balance the traffic load through firewall.

<#root>

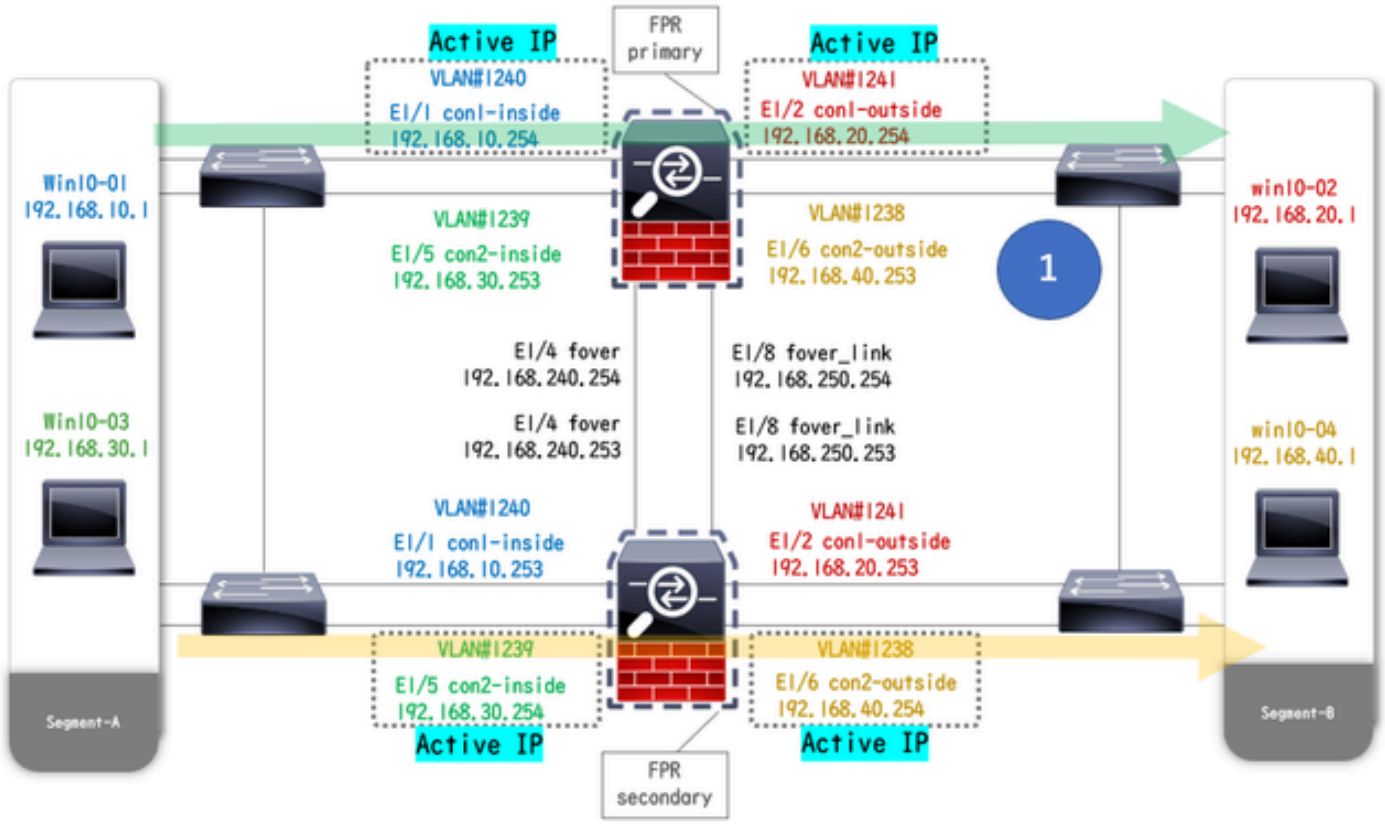
no failover active group 2



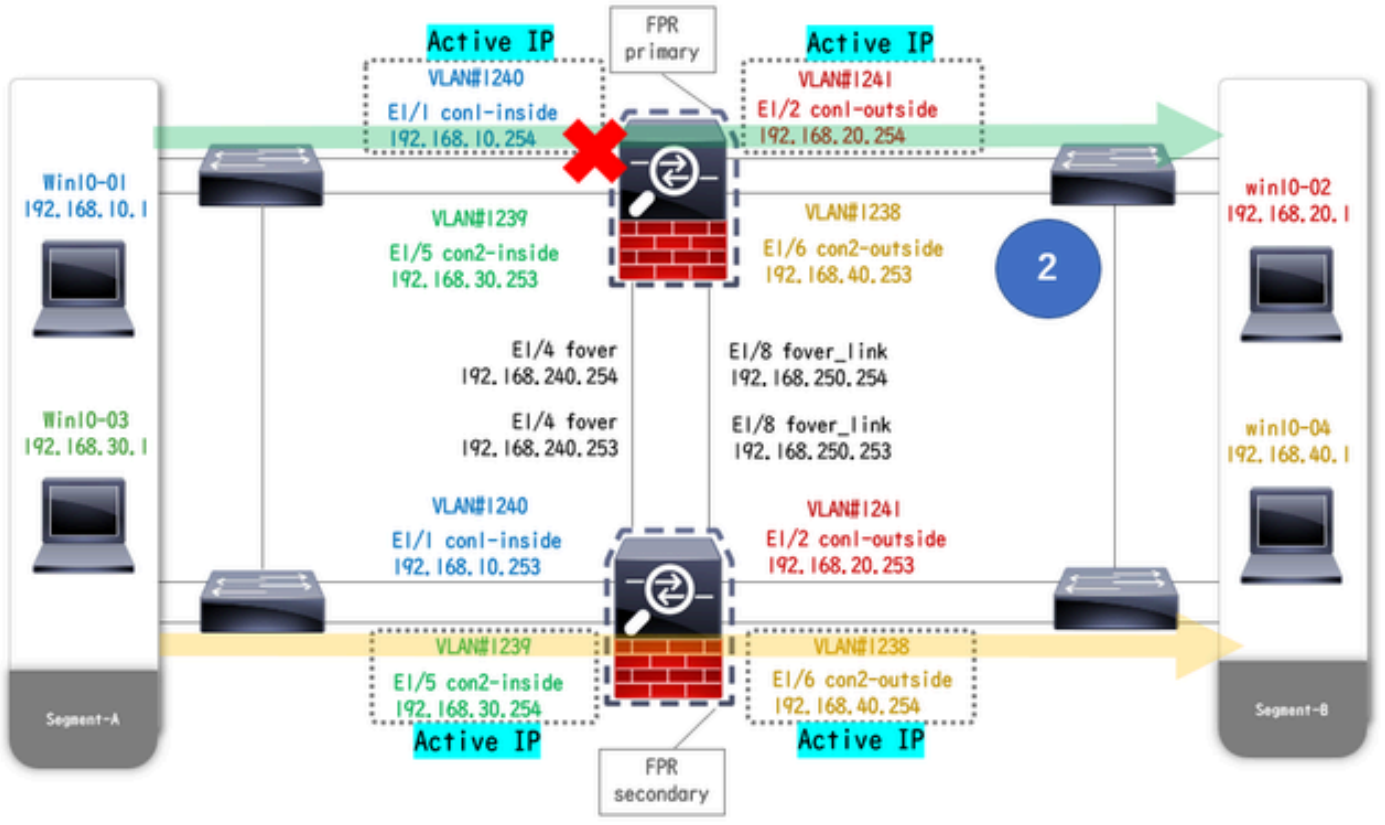
Note: If you run this command, the status of failover match traffic flow condition 1.

Verify

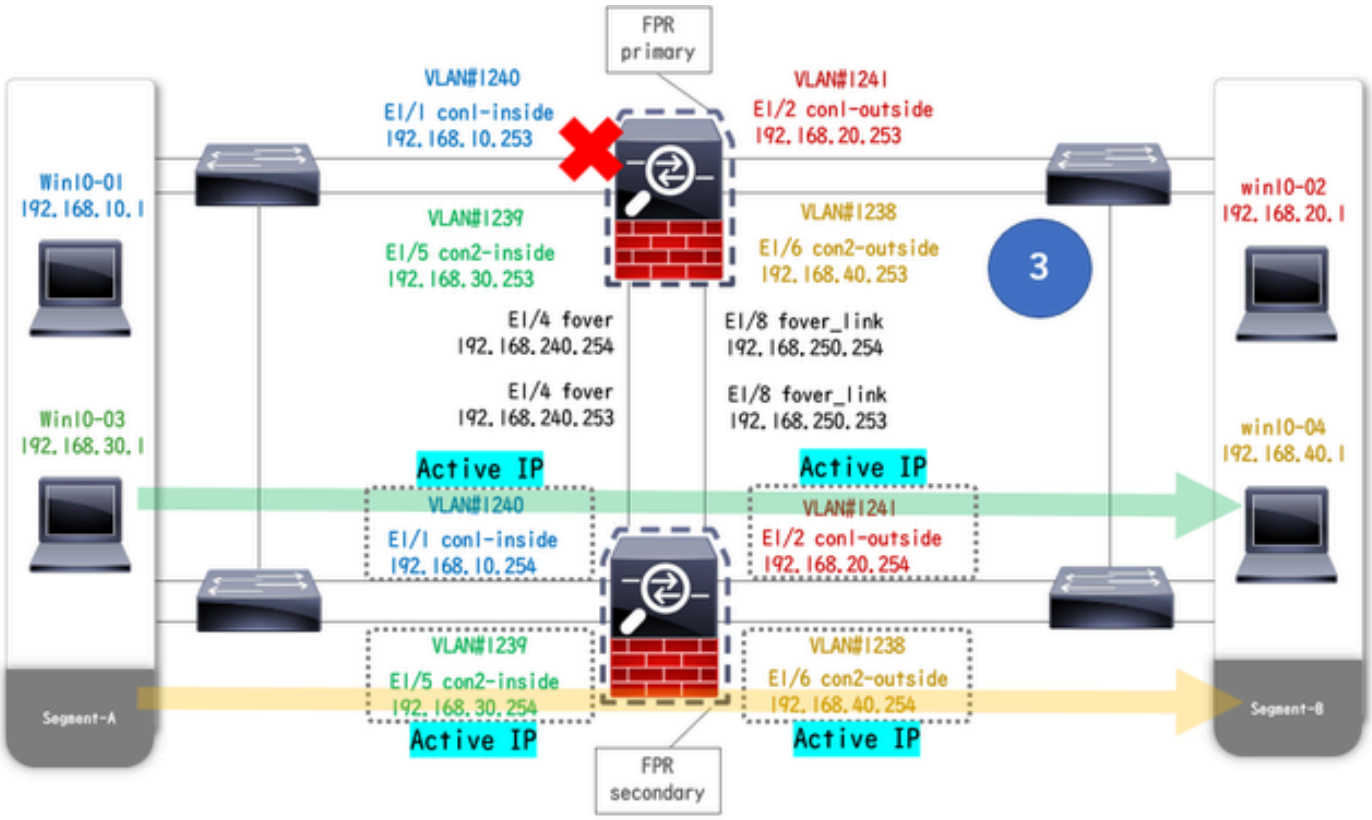
When E1/1 goes DOWN, the failover of group 1 is triggered and the data interfaces on the Standby side (Secondary Unit) takes over the IP and MAC address of the original Active Interface, ensuring the traffic (FTP connection in this document) to be continuously passed by ASAs.



Before Link Down



During Link Down



Failover Triggered

Step 1. Initiate FTP Connection From Win10-01 to Win10-02

Step 2. Confirm FTP Connection Before Failover

Run changeto context con1 to connect con1 context from system context. Confirm that an FTP connection is established in both ASA units.

<#root>

asa/act/pri/con1#

show conn

```
5 in use, 11 most used

! --- Confirm the connection in Primary Unit
TCP
```

con1-outside

192.168.20.1:21

con1-inside 192.168.10.1:49703

```
, idle 0:00:11, bytes 528, flags UIO

asa/stby/sec/con1#
```

show conn

```
5 in use, 11 most used

! --- Confirm the connection in Secondary Unit
TCP
```

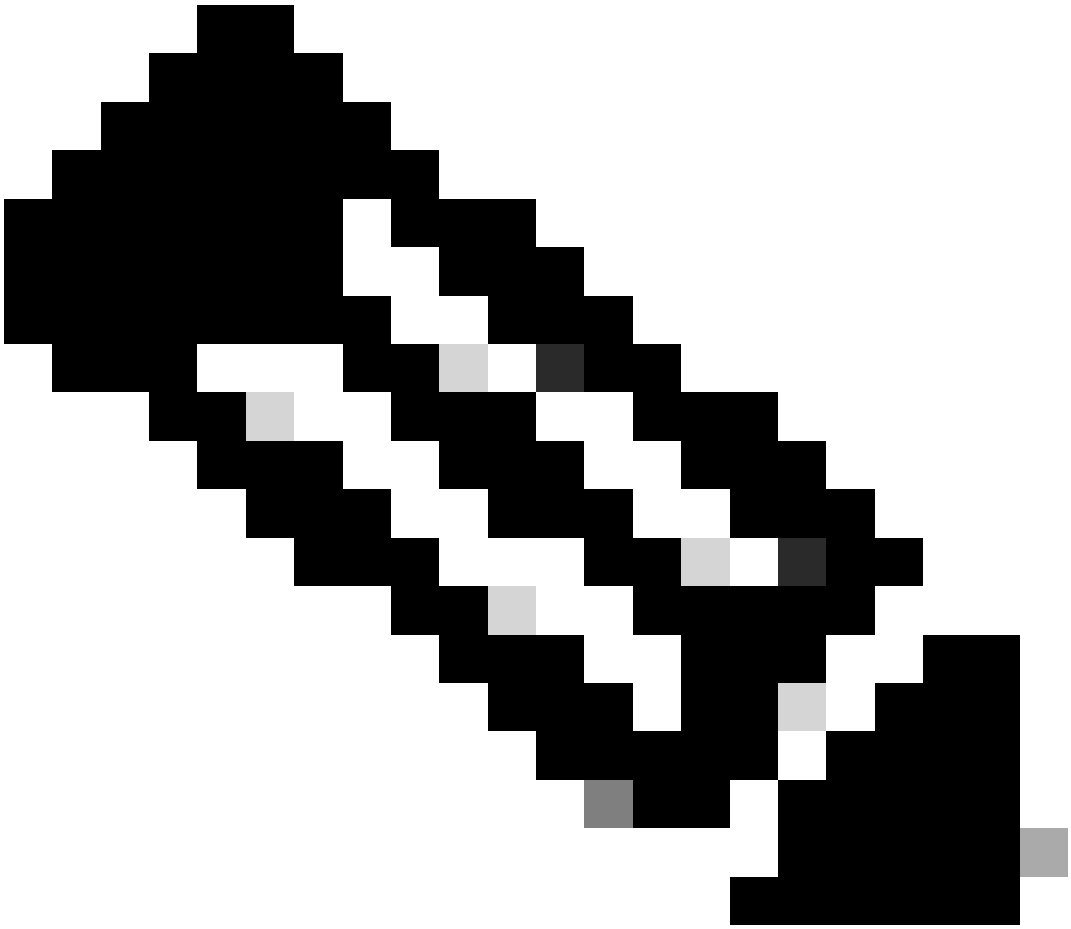
con1-outside 192.168.20.1:21 con1-inside 192.168.10.1:49703

```
, idle 0:00:14, bytes 528, flags UIO
```

Step 3. LinkDOWN E1/1 of Primary Unit

Step 4. Confirm Failover Status

In system context, confirm that failover occurs in group 1.



Note: The status of failover match traffic flow condition 4.

<#root>

asa/act/sec#

show failover

```
Failover On
Failover unit Secondary
Failover LAN Interface: fover Ethernet1/4 (up)
......
Group 1 last failover at: 20:00:16 JST Jan 11 2024
Group 2 last failover at: 17:02:33 JST Jan 11 2024

This host:
```

Secondary

```
Group 1 State:
```

Active

```
<--- group 1 of Secondary Unit is Switching to Active
Active time: 5 (sec)
Group 2 State:
```

Active

```
Active time: 10663 (sec)

con1 Interface con1-inside (192.168.10.254): Normal (Waiting)
con1 Interface con1-outside (192.168.20.254): Normal (Waiting)
con2 Interface con2-inside (192.168.30.254): Normal (Monitored)
con2 Interface con2-outside (192.168.40.254): Normal (Monitored)

Other host:
```

Primary

```
Group 1 State:
```

Failed

```
<--- group 1 of Primary Unit is Switching to Failed status
Active time: 434 (sec)
Group 2 State:
```

Standby Ready

```
Active time: 117 (sec)

con1 Interface con1-inside (192.168.10.253): Failed (Waiting)
con1 Interface con1-outside (192.168.20.253): Normal (Waiting)
con2 Interface con2-inside (192.168.30.253): Normal (Monitored)
con2 Interface con2-outside (192.168.40.253): Normal (Monitored)
```

Step 5. Confirm FTP Connection After Failover

Run changeto context con1 to connect con1 context from system context, confirm that the FTP connection is not interrupted.

<#root>

asa/act/sec#

changeto context con1

```
asa/act/sec/con1# show conn
11 in use, 11 most used

! --- Confirm the target FTP connection exists in group 1 of the Secondary Unit
TCP
```

con1-outside 192.168.20.1:21 con1-inside 192.168.10.1:49703

```
, idle 0:00:09, bytes 529, flags UIO
```

Step 6. Confirm Behavior of Preempt Time

LinkUP E1/1 of the Primary Unit and wait for 30s (preempt time), the failover state returns to the original state (match traffic flow in pattern 1).

<#root>

asa/stby/pri#

Group 1 preempt mate

□□□□<--- Failover is triggered automatically, after the preempt time has passed

```
asa/act/pri# show failover
Failover On
Failover unit Primary
Failover LAN Interface: fover Ethernet1/4 (up)
.......
Group 1 last failover at: 11:02:33 UTC Jan 11 2024
Group 2 last failover at: 08:02:45 UTC Jan 11 2024

This host:
```

Primary

```
Group 1 State:
```

Active

```
<--- group 1 of Primary Unit is switching to Active status
Active time: 34 (sec)
Group 2 State:
```

Standby Ready

```
Active time: 117 (sec)

con1 Interface con1-inside (192.168.10.254): Normal (Monitored)
con1 Interface con1-outside (192.168.20.254): Normal (Monitored)
con2 Interface con2-inside (192.168.30.253): Normal (Monitored)
con2 Interface con2-outside (192.168.40.253): Normal (Monitored)

Other host:
```

Secondary

```
Group 1 State:
```

Standby Ready

```
□□<---- group 1 of Secondary Unit is switching to Standby status
Active time: 125 (sec)
```

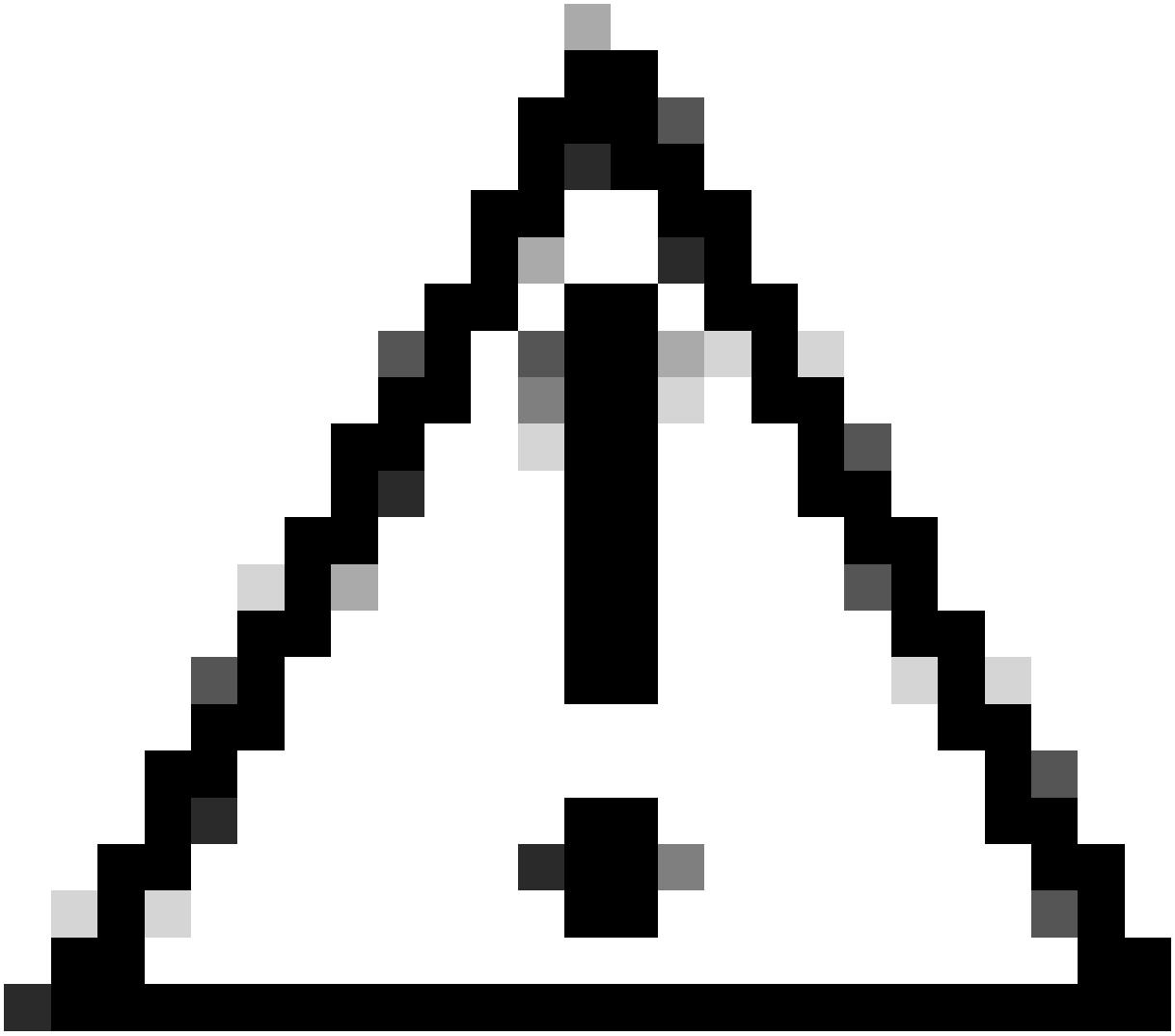
```
Group 2 State:
Active
Active time: 10816 (sec)

con1 Interface con1-inside (192.168.10.253): Normal (Monitored)
con1 Interface con1-outside (192.168.20.253): Normal (Monitored)
con2 Interface con2-inside (192.168.30.254): Normal (Monitored)
con2 Interface con2-outside (192.168.40.254): Normal (Monitored)
```

Virtual MAC Address

In Active/Active failover, virtual MAC address (manually set value, or automatically generated value, or default value) is always used. The active virtual MAC address is associated with the Active Interface.

Manually Setting of Virtual MAC Address

In order to set the virtual MAC address for physical interfaces manually, the `mac address` command or the `mac-address` command (within I/F setting mode) can be used. This is an example of manually setting a virtual MAC address for the physical Interface E1/1.



Caution: Please avoid using these two types of commands within same device.

<#root>

asa/act/pri(config)# failover group 1
asa/act/pri(config-fover-group)#

mac address E1/1 1234.1234.0001 1234.1234.0002

```
asa/act/pri(config-fover-group)# changeto context con1
asa/act/pri/con1(config)# show interface E1/1 | in MAC
MAC address
```

1234.1234.0001

```
, MTU 1500 <--- Checking virtual MAC on the Primary Unit(con1) side

asa/stby/sec# changeto context con1
asa/stby/sec/con1# show interface E1/1 | in MAC
MAC address
```

1234.1234.0002

```
, MTU 1500 <--- Checking virtual MAC on the Secondary Unit(con1) side
```

OR

<#root>

asa/act/pri(config)# changeto context con1
asa/act/pri/con1(config)# int E1/1
asa/act/pri/con1(config-if)#

mac-addr

1234.1234.0001 standby 1234.1234.0002

```
asa/act/pri/con1(config)# show interface E1/1 | in MAC
MAC address
```

1234.1234.0001

```
, MTU 1500 <--- Checking virtual MAC on the Primary Unit(con1) side
```

```
asa/stby/sec# changeto context con1
asa/stby/sec/con1# show interface E1/1 | in MAC
MAC address
```

1234.1234.0002

, MTU 1500<--- Checking virtual MAC on the Secondary Unit(con1) side

Automatically Setting of Virtual MAC Address

Automatically generating of virtual MAC address is also supported. It can be achieved by using the mac-address auto <prefix prefix> command. The format of virtual MAC address is A2 xx.yyzz.zzzz which is being generated automatically.
A2 : fixed value
xx.yy : generated by the <prefix prefix> specified in the command option (The prefix is converted to hexadecimal and then inserted by reverse order).
zz.zzzz : generated by an internal counter

This is an example about generating virtual MAC address by **mac-address auto** command for interface.

<#root>

asa/act/pri(config)#

mac-address auto

```
INFO: Converted to mac-address auto prefix 31
```

```
asa/act/pri(config)#
```

show run all context con1

```
 <--- Checking the virtual MAC addresses generated on con1 context
allocate-interface Ethernet1/1
mac-address auto Ethernet1/1 a21f.0000.0008 a21f.0000.0009
allocate-interface Ethernet1/2
mac-address auto Ethernet1/2 a21f.0000.000a a21f.0000.000b
config-url disk0:/con1.cfg
join-failover-group 1

asa/act/pri(config)#
```

show run all context con2

```
<--- Checking the virtual MAC addresses generated on con2 context
context con2
allocate-interface Ethernet1/5
mac-address auto Ethernet1/5 a21f.0000.000c a21f.0000.000d
allocate-interface Ethernet1/6
mac-address auto Ethernet1/6 a21f.0000.000e a21f.0000.000f
config-url disk0:/con2.cfg
join-failover-group 2
```

Default Setting of Virtual MAC Address

In case neither automatic nor manual generation of a virtual MAC address is set, the default virtual MAC address is used.

For more information about default virtual MAC address, please refer to the Command Default of mac address in Cisco Secure Firewall ASA Series Command Reference Guide.

Upgrade

You can achieve zero downtime upgrade of an Active/Active failover pair using CLI or ASDM. For more information, please refer to Upgrade an Active/Active Failover Pair.

Related Information

- Upgrade an Active/Active Failover Pair Using the CLI
- MAC Address
- Cisco Technical Support & Downloads