

# CCNP Security FIREWALL Notes

## **Introduction:**

642-617 (this test) >> ASA Software v8.2  
642-618 >> ASA Software v8.3

## **Firewall Solutions and Types**

### **Restrictive (Proactive) Approach:**

The firewall is going to stop all communication by default, and only allows communication explicitly permitted. For example, a Stateful Packet Inspection firewall with ACLs.

### **Permissive (Reactive) Approach:**

Permits all communication by default, and only blocks traffic it believes to be malicious based on signatures or other information. For example, IPS.

#### **1. Stateless Packet Filters:**

Rule based, static ACLs. Can't support dynamically negotiated sessions. Vulnerable to reconnaissance attacks. Used for applications that use the same ports all the time. Often used for restrictive approach.

#### **2. Stateful Packet Filters:**

Better solution, fundamental firewall approach upon which other technologies are added. Reliable access control for L3-L4. Transparency, good performance.

#### **3. Application Inspection and Control (AIC):**

Adds L5-L7 visibility. Restrictive approach.

#### **4. Network-based Intrusion Prevention System (IPS):**

Creates a strong database to look at known attacks (worms, spyware, Trojans, etc.). This is typically a permissive approach – everything is allowed by default, but if a signature matches malicious traffic, that traffic can be stopped. Has to be updated and tuned on a regular basis.

#### **5. Network Behavior Analysis (NBA):**

Anomaly-based IPS. What is normal? Once you know what normal is, you can look for anomalies in traffic.

#### **6. Application Layer Gateway (ALG):**

Also known as a Proxy Server – URL filters, HTTP proxies, etc. The proxy opens a session on behalf of a client and then sends the data back to the client. Can support L3-L7, can do deep content analysis, antivirus scanning, spam filtering, etc. Can be used for permissive and restrictive services.

## Initial Setup and Configuration

To enter **rommon**, use **Break** or **ESC**:

Can perform password recovery and other functions including the ability to copy an image from a TFTP server – just like router or switch.

Entering **rommon** brings up the **Management0/0** interface. Commonly used variables include: ADDRESS, GATEWAY, IMAGE, SERVER.

To change the Configuration Register, use **confreg** – just like router or switch.

To exit, use **reboot**, **reload** or **reset**.

To start the TFTP download: **tftpdnld**

---

### **Defaults for Management0/0:**

```
nameif management
security-level 100
ip address 192.168.1.1 255.255.255.0
management-only
```

### **Other Defaults:**

```
http server enable
http 192.168.1.0 255.255.255.0 management
dhcpd enable management
dhcpd address 192.168.1.2-192.168.1.254 management
```

*\*All other ASA interfaces are, by default, administratively down – just like a router*

---

To change the ASA image used on boot:

```
boot system flash:asa821-k8.bin
```

To change the ASDM image used:

```
asdm image flash:asdm-621.bin
```

To see current boot variables:

```
show bootvar
```

To erase startup configuration:

```
write erase
```

To reload:

```
reload, or reload at to reload at a certain time
```

Just like router or switch, **show version** provides many important details as well ...

## To choose our inside interface:

```
int e0/0  
nameif inside
```

## Default Security Levels:

**Outside: 0**  
**Inside: 100**  
**DMZ: 50** (*not really “default”, but commonly used*)

0 → Lowest Trust  
100 → Highest Trust  
1-99 → Available for Assignment

---

By default, interfaces with the SAME security level can NOT exchange traffic – even with an ACL!

There is an option in ASDM called “**Enable traffic between two or more interfaces which are configured with same security levels**” to allow this ...

CLI: **same-security-traffic permit inter-interface**

There is also another option called “**Enable traffic between two or more hosts connected to the same interface**” ... if this device was a hub in a hub and spoke topology, traffic would enter an interface and be routed back out of the same interface.

CLI: **same-security-traffic permit intra-interface**

---

**Traffic from a HIGHER security level to a LOWER security level is ALLOWED!**

**Example:** traffic from INSIDE to OUTSIDE, traffic from DMZ to OUTSIDE

**Traffic from a LOWER security level to a HIGHER security level is DENIED!**

**Example:** traffic from OUTSIDE to INSIDE, or DMZ to INSIDE = NOT allowed

## Jumbo Frame Support (frames > 1518 bytes):

```
(config-if)# jumbo-frame reservation
```

## Configuring VLANs via sub-interfaces example:

... can also be done in ASDM by editing interface ...

First, prepare the physical interface before creating the sub-interfaces:

```
interface e0/0  
no shutdown  
no nameif
```

```
interface e0/0.10
vlan 10
nameif SUB1
security-level 60
ip address 172.16.10.1 255.255.255.0
```

```
interface e0/0.20
vlan 20
nameif SUB2
security-level 60
ip address 172.16.20.1 255.255.255.0
```

*End example*

## **ASA Routing:**

ASA's support RIPv2, EIGRP, OSPF

To configure static routing (very popular in small deployments) go to:  
**ASDM > Configuration > Device Setup > Routing > Static Routes**

Simply enter 0.0.0.0 for the IP Address and Netmask fields to create a default static route ...

## **DHCP Services:**

**ASDM > Configuration > Device Management > DHCP > DHCP Server**

The rest is pretty self explanatory, just like any DHCP server setup ...

## **ASA Management**

This section covers very basic topics such as: hostname, domain name, DNS, enable password, host-address mappings (object), time, logging, files system, etc.

To configure DNS servers:

**ASDM > Configuration > Device Management > DNS > DNS Client**

To create a host-address mapping (object):

**ASDM > Configuration > Firewall > Objects > Network Objects/Groups**

To configure time / NTP:

**ASDM > Configuration > Device Setup > System Time > [Clock | NTP]**

To configure Netflow collectors:

**ASDM > Configuration > Device Management > Logging > Netflow**

To filter out certain types of logs:

**ASDM > Configuration > Device Management > Logging > Event List**

To configure Syslog:

**ASDM > Configuration > Device Management > Logging > Syslog Servers**

**Syslog Levels 7 >> 0**

**Debugging > Informational > Notifications > Warnings > Errors > Critical > Alerts > Emergencies**

Use **ASDM > Monitoring** to see real-time logs

To manage the file system:

**ASDM > Tools Menu > File Management**

CLI: **show flash, dir flash:, dir /all, copy** (disk0 == flash)

### **Upgrades:**

Hint – upgrade ASDM first, then ASA ...

To specify image boot order:

**ASDM > Device Management > System Image / Configuration > Boot**

### **Licensing:**

**ASDM > Device Management > Licensing > Activation Key**

## **Basic ASA Access Control**

- Consider security policies such as least privilege, dual control, duty rotation
- Use RBAC when possible

To generate RSA keys, it's the same as a router or switch:

**crypto key generate rsa modulus 2048**

To manage certificates in ASDM:

**ASDM > Configuration > Device Management > Certificate Management**

To configure CLI banners:

**ASDM > Configuration > Device Management > Management Access > Command Line (CLI) > Banner**

... ASDM, HTTPS, Telnet, SSH, SNMP also under Management Access

AAA is covered next. Self-explanatory:

**ASDM > Configuration > Device Management > Users/AAA**

## Modular Policy Framework (MPF) and Objects

### **ASA Tables (Databases):**

#### ❖ **Translation Table (Xlate)**

- Shows NAT/PAT translations
- IOS equivalent → *show ip nat translations*
- **NAT Control** is mentioned here – it requires that packets traversing from an inside interface to an outside interface match a NAT rule; for any host on the inside network to access a host on the outside network, you must configure NAT to translate the inside host address.
- **show xlate [detail]**

#### ❖ **Connection Table (Conn)**

- TCP/UDP/ICMP and other connections are tracked here
- IOS equivalent → *show ip nat translations verbose*
- **show conn [detail]**

#### **Connection State Flags:**

Flag	Meaning	Flag	Meaning
a	Awaiting outside ACK to SYN	O	Outbound data
A	Awaiting inside ACK to SYN	r	Inside acknowledged FIN
B	Initial SYN from outside	R	Outside acknowledged FIN
f	Inside FIN	s	Awaiting outside SYN
F	Outside FIN	S	Awaiting inside SYN
I	Inbound data	U	Up

#### ❖ **Local Host Table**

- Displays network states of local hosts. A local-host is created for any host that forwards traffic to, or through, the security appliance.
- **show local-host [detail | embryonic]**  
*\*embryonic shows incomplete 3-way handshakes – maybe DoS attack?*

### **Default Adaptive Security Algorithm Access Rules:**

All outbound connections going to LOWER security level are permitted (example: INSIDE to OUTSIDE, DMZ to OUTSIDE). Return traffic will be allowed if it is part of this initial session.

All sessions initiating in a LOWER security level to a HIGHER security level are blocked (example: OUTSIDE to INSIDE, DMZ to INSIDE)

Notice the **IMPLICIT** rules in place by default:

#	Enabled	Source	Destination	Service	Action	Hits
dmz (2 implicit incoming rules)						
1		any	Any less secure networks	ip	Permit	
2		any	any	ip	Deny	
inside (2 implicit incoming rules)						
1		any	Any less secure networks	ip	Permit	
2		any	any	ip	Deny	
management (1 implicit incoming rules)						
1		any	any	ip	Deny	
outside (1 implicit incoming rules)						
1		any	any	ip	Deny	

### Remember:

The same security level assigned to two interfaces means the interfaces can NOT communicate by default. You need to enable the checkbox in ASDM or use the “**same-security-traffic permit inter-interface**” command ... if there is an ACL on either interface involved, you’ll still need to explicitly permit the necessary connections.

There are also situations in which traffic will be ingress and egress on the same interface – for example a hub and spoke VPN scenario. This is denied by default. You need to enable the checkbox in ASDM or use the “**same-security-traffic permit intra-interface**” command.

### Objects:

#### Network Objects/Groups:

**ASDM > Configuration > Firewall > Objects > Network Objects/Groups**

For example, you could add individual hosts or networks and map them to names. You could map “www” to “192.168.1.100 255.255.255.255” ... or you could map “inside-network” to “172.16.10.0 255.255.255.0” ... you can also aggregate one or more of these objects into groups.

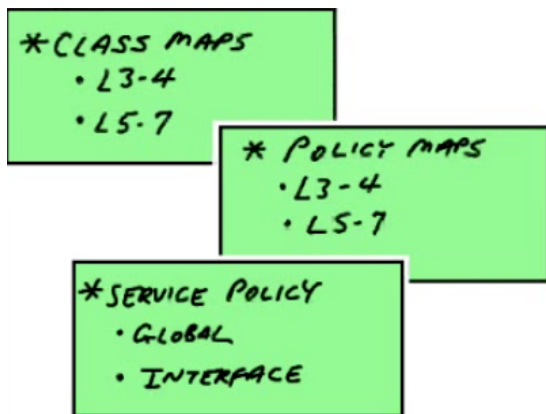
#### Service Groups:

**ASDM > Configuration > Firewall > Objects > Service Groups**

For example, you could create a “WEBSERVICES” group and add all of the relevant services for which that server listens (http, https, smtp, ssh, etc.).



## Modular Policy Framework (MPF):



One of the most popular protocols to control with MPF is HTTP

Service Policies can be applied **globally** or on a **per-interface** basis

This works pretty much the same as it does in IOS, except that when creating the class-maps, policy-maps, and service policies in ASDM it is done in a weird order – the service policy comes first, then the class-map, then last the policy-map).

\*There is a default policy-map on the ASA called **global\_policy** and a default class-map called **inspection\_default** ... it is applied globally (not to an interface)

### MPF Configuration Wizard:

#### ASDM > Configuration > Firewall > Service Policy Rules

#### STEP 1 – Add Service Policy:

*Is this going to be applied globally, or on a specific interface?*

#### STEP 2 – Add Class-Map:

*What traffic is going to be classified/matched?*

*Default Inspection Traffic, Source and Destination IP (using ACL), Tunnel Group, TCP/UDP Destination Port, DSCP, IP Precedence, etc.*

#### STEP 3 – Add Policy-Map:

*What action will be taken on the matched traffic?*

*Inspect (and specifically what are you inspecting? HTTP, ICMP, DNS, etc.), Intrusion Prevention (shows up if AIP-SSM is installed), Content Security (shows up if CSC-SSM is installed), Connection Settings (max connections, etc.), QoS, Netflow (global only), etc.*

**If you are creating L5-7 maps for DPI (more limited than L3-4), they must be NESTED in L3-4 maps:**

We often use RegEx to search for custom data patterns or certain URLs, etc. There is a RegEx tool under “Configuration > Firewall > Objects > Regular Expressions” – use this to create a RegEx pattern, then go to “Configuration > Firewall > Objects > Class Maps”, add a new HTTP class-map and choose the RegEx you just created, then add



a new HTTP inspect-map under “Configuration > Firewall > Objects > Inspect Map”, URI filtering, match Regular Expressions, find the RegEx you created, and Drop / Log.

To apply it, create a new Service Policy as described above, but in the class-map section you will choose HTTP under protocol inspection, then use the HTTP inspect-map you just created.

## Stateful Inspection

### **ASDM > Configuration > Firewall > Access Rules**

To use MPF to control management traffic (traffic destined for the ASA itself):

### **ASDM > Configuration > Firewall > Service Policy Rules**

... then choose “*Add Management Service Policy Rule...*”

ASAs, unlike an ISR, do not show up as a “hop” in traceroute – we have to explicitly make the ASA appear as such. TTL fields are not decremented as they traverse the device. To do this, add a “Service Policy Rule”, choose “Global”, choose “Any traffic”, then choose “Connection Settings”, then check the box under “Time to Live” that says “*Decrement time to live for a connection*” ...

You can also tune the default IP Virtual Reassembly settings. To do this, go to “Advanced” under the Firewall configuration section, click “Fragment”, choose an interface and click edit, adjust as necessary ...

### **To modify ASA TCP Normalizer features:**

### **ASDM > Configuration > Firewall > Objects > TCP Maps**

... this can help you verify that your TCP sessions are adhering to the specifications of the protocol. We want to prevent malformed TCP packets from getting to a protected host.

We may also want to use this to create exceptions, like say for BGP traffic between two routers. The normalizer would break BGP authentication, so we need to create an exception to prevent this. In this case, we want to create a **TCP Map** to allow **TCP Option 19**, used by BGP for authentication. Add a Service Policy Rule, match a source/destination of any/any with a service of TCP/179 (BGP), go to “Connection Settings”, “TCP Normalization”, “Use TCP map”, then choose the map you just created.

There is also an option under “**Advanced Options**” to enable “**TCP state bypass**” to skip TCP state tracking and sequence checking when traffic flows across the ASA. It may be necessary to create such exceptions if applications are broken by the inspection behavior.

By default, “**Randomize Sequence Number**” is enabled on the ASA. This randomizes the sequence number of TCP/IP packets. It’s a countermeasure against injection attacks.

For servers using non-default ports, you can still enable inspection for those ports. For example, let's say we have an FTP server listening on port 2121 (instead of 21). We can create a new Service Policy Rule and tell it to match TCP/2121, then go to "Protocol Inspection" and choose the checkbox next to "FTP" ...

## Common Syslog Messages for Troubleshooting:

```
%ASA-4-106023: Deny tcp src inside:10.10.2.21/2121 dst outside:10.0.1.2/1347
  by access-group "inside_access_in" [0xbe9efe96, 0x0]
%ASA-4-106023: Deny udp src outside:10.0.2.46/17002 dst inside:10.12.217.3/16672 by
  access-group "outside_access_in" [0x2clc6a65, 0x0]
```

---

```
%ASA-6-106015: Deny TCP (no connection) from 10.0.0.100/3764 to 10.20.3.31/80 flags
  ACK PSH on interface inside
```

---

```
%ASA-6-302014: Teardown TCP connection 3920 for outside:10.0.24.103/22 to
  inside:10.0.0.103/11005 duration 0:00:00 bytes 0 TCP invalid SYN
%ASA-4-419002: Duplicate TCP SYN from inside:10.0.24.103/1212 to outside:10.0.0.2/80
  with different initial sequence number
```

## Application Layer Controls (L5-7 Inspection)

### ❖ Protocol Minimization

- Only allow a certain group of protocol features to get through to the endpoint. We want to minimize the **Attack Surface**. We can prevent both **known** and **unknown** attacks by blocking any traffic that's not part of the *minimum specification* of the application.

### ❖ Payload Minimization

- We are only going to allow a certain required set (a minimum level) of payload through to the endpoint. This also prevents both **known** and **unknown** attacks. We are blocking any data that's not part of a *minimum specification* policy.

### ❖ Application Layer Signatures

- These are predefined patterns. We are looking for certain things inside of application layer protocols and payloads. We are only preventing **known** attacks because of the signatures. This is a lot like an IPS. This can be done with an AIP-SSM ASA module or some other type of IPS module in an upstream device.

### ❖ Protocol Verification

- The appliance drops packets that have non-standard protocol units in them. This also prevents both **known** and **unknown** attacks. It can help prevent tunneling (or covert channeling) of other protocols inside of legitimate protocols. This is very common with port 80 (HTTP).

This section focuses primarily on HTTP inspection because of its popularity ...

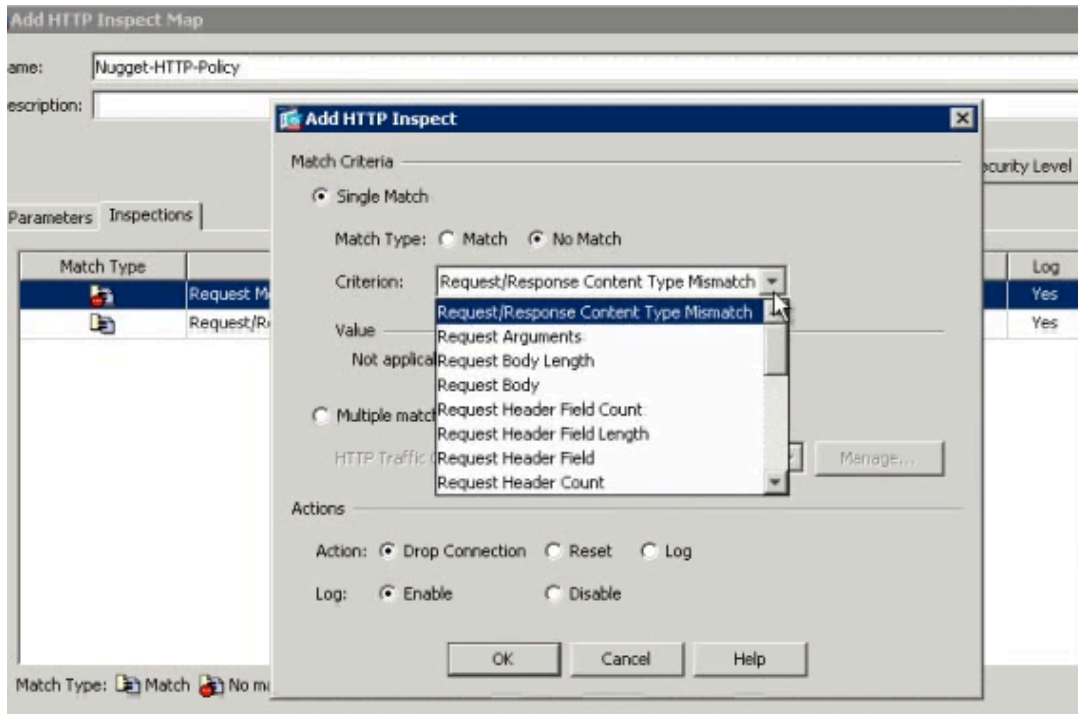
We can go to ASDM and create an HTTP Inspection Map:

**ASDM > Configuration > Firewall > Objects > Inspect Maps > HTTP**

We can choose Low, Medium, or High Security Levels ...

You can specify criterion to “*Match*” or “*No Match*” things like “Request/Response Content Type Mismatch”, “Request Body”, etc.

**\*\*\* Review how to do this in ASDM demo! \*\*\***



The “Multiple matches” section has predefined traffic classes to detect covert channeling / tunnels ...

URL Filtering Servers (Websense, Secure Computing):

**ASDM > Configuration > Firewall > URL Filtering Servers**

We can also create an FTP Inspection Map:

**ASDM > Configuration > Firewall > Objects > Inspect Maps > FTP**

... many other protocols are available (DNS, H.323, ESMTP, Instant Messaging, etc.)

**\*\*\* End Video 10/20 \*\*\***

## Advanced Access Controls

### TCP Intercept:

- TCP Intercept can be used to mitigate TCP SYN Attacks
- TCP SYN Attacks are Denial of Service attacks
- Configured via MPF (create policy with action to set connection limits)

A bad host sends TCP SYN segments with invalid or spoofed source addresses, then the target answers with a SYN/ACK but never receives the ACK. This creates an **embryonic** connection that never completes. This can exhaust resources of the target by causing TCP connection tables to overflow.

To prevent an attacker from filling the **Connection Table** with half-open TCP connections, Cisco enhanced the TCP Intercept feature with **TCP SYN Cookies** in version 6.2. Instead of proxying the half-open TCP connections and maintaining them in the conn table, the appliance generates a cookie by hashing certain parts of the TCP header—this is then included in the SYN/ACK sent back to the source. Nothing about the original TCP SYN connection is maintained in the state table by the appliance. If a connection attempt is legitimate, the source will respond with the TCP ACK, which should contain the cookie information in the TCP header. At this point, the appliance itself will proxy the connection to the destination and add the new connection to the state table. With the SYN cookie feature, the appliance doesn't have to maintain any connection information for the initial SYN connection attempt, greatly reducing the overhead involved when dealing with a TCP SYN flood attack.

### MPF Configuration Wizard:

#### ASDM > Configuration > Firewall > Service Policy Rules

The screenshot shows the 'Add Service Policy Rule Wizard - Rule Actions' window. The 'Connection Settings' tab is selected. The configuration is divided into several sections:

- Maximum Connections:** Four dropdown menus for 'Maximum TCP & UDP Connections' (Default (0)), 'Maximum Embryonic Connections' (50), 'Maximum Per Client Connections' (Default (0)), and 'Maximum Per Client Embryonic Connections' (10).
- Randomize Sequence Number:** A checkbox is checked. Text below reads: 'Randomize the sequence number of TCP/IP packets. Disable this feature only if another inline ASA is also randomizing sequence numbers and the result is scrambling the data. Disabling this feature may leave systems with weak TCP Sequence number randomization vulnerable.'
- TCP Timeout:** Three dropdown menus for 'Embryonic Connection Timeout' (Default (0:00:30)), 'Half Closed Connection Timeout' (Default (0:10:00)), and 'Connection Timeout' (Default (1:00:00)). Below are two unchecked checkboxes: 'Send reset to TCP endpoints before timeout' and 'Dead connection detection:'. Under 'Dead connection detection', there is a 'Retries' field set to 5 and a 'Timeout' dropdown set to Default (0:15:00).
- TCP Normalization:** An unchecked checkbox 'Use TCP map' and a 'TCP Map' dropdown menu with 'Edit...' and 'New...' buttons.
- Time to Live:** An unchecked checkbox 'Decrement time to live for a connection'.

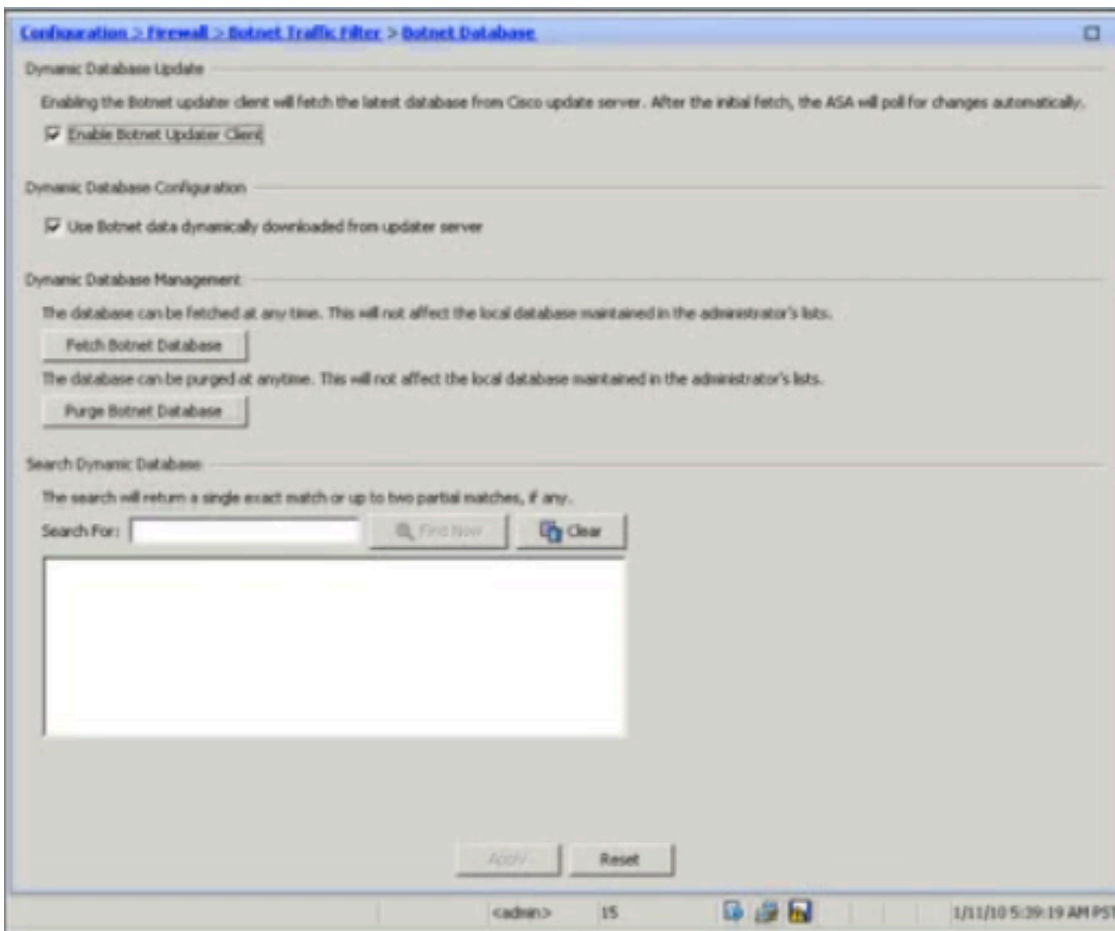
At the bottom of the window are buttons for '< Back', 'Finish', 'Cancel', and 'Help'.

## Botnets:

### ASDM > Configuration > Firewall > Botnet Traffic Filter > Botnet Database

The ASA has a **Botnet Traffic Filter** feature that can be added to the appliance. It will compare IPs to a database (either an automatically updated database from Cisco or a manual database created by you) ... Requires ASA Software v8.2+

- Generates Syslog message by default
- Can optionally drop traffic



To manage black and white lists:

### ASDM > Configuration > Firewall > Botnet Traffic Filter > Black and White Lists

- **White List** matches will generate a **Syslog** message
- **Black List** matches will result in **dropped** traffic

**DNS Snooping** must be enabled to support the Botnet Traffic Filter:

### ASDM > Configuration > Firewall > Botnet Traffic Filter > DNS Snooping

**To enable the Botnet Traffic Filter:**

### ASDM > Configuration > Firewall > Botnet Traffic Filter > Traffic Settings

... choose the interface(s) to be filtered (usually outside Internet-facing), can also specify an ACL or filter ALL TRAFFIC by default ...

This section is also used to define **Blacklisted Traffic Actions**. You can specify interfaces/actions and threat levels (Very Low, Low, Medium, High, Very High) ... again an ACL can be specified here to define traffic to be dropped.

**Botnet Traffic Filter CLI commands:**

**dynamic-filter xxx**

**dynamic-filter enable interface *outside***

### **Threat Detection:**

**Basic Threat Detection** is enabled by default on the ASA:

**ASDM > Configuration > Firewall > Threat Detection**

It monitors the rate of dropped packets on the appliance, security events per second, etc. and generates a Syslog message (**733100**) when a certain threshold has been reached. This is kind of like “IDS Junior.”

**Basic Threat Detection CLI command:**

**threat-detection basic-threat**

**Scanning Threat Detection** is NOT enabled by default on the ASA. It is more CPU intensive than Basic Threat Detection. This will detect hosts that are scanning or sweeping the network and generate a Syslog message (**733101**). You can enable “Shun hosts detected by scanning threat” and then specify a shun duration in seconds (default is 3600). You can also exclude certain networks from the shun (e.g. management networks, etc.).

**Scanning Threat Detection CLI command:**

**threat-detection scanning-threat**

**Scanning Threat Statistics** can also be enabled. You can “Enable all statistics” or “Enable only following statistics: Host, Access rules, Port, Protocol, TCP Intercept” ... you can also specify rate intervals for the statistics collection.

**TCP Intercept Threat Detection** is another option within this section. You can use it to tune rate thresholds such as “Monitoring Window Size”, “Burst Threshold Rate” and “Average Threshold Rate” ...

**Show commands:**

**show threat-detection statistics host**

**show threat-detection statistics top tcp-intercept**



## Resource Configuration

### **Configuring Connection Limits:**

This works like any other MPF (Modular Policy Framework) configuration:

**ASDM > Configuration > Firewall > Service Policy Rules**

#### 1. Configure a service policy

For example, we will choose the DMZ interface and call this "TRAFFIC\_TO\_DMZ"

#### 2. Configure the class-map

For example, we will call this "TRAFFIC\_TO\_DMZ\_CLASS" and choose "Source and Destination IP Address (uses ACL)" ... source "any" and destination "the DMZ network's subnet" with a service of "ip" ... we can use "More Options" to specify a "Time Range" if necessary

#### 3. Configure the policy-map

Choose the "**Connection Settings**" tab and specify:

Maximum TCP & UDP Connections (*really TCP connections, UDP flows*)

Maximum Embryonic Connections

Maximum Per Client Connections

Maximum Per Client Embryonic Connections

**CLI: set connection conn-max x per-client-max x**

### **Traffic Policing vs. Traffic Shaping:**

#### **Policing:**

- Trying to make traffic conform with a rate limit
- Does not introduce delay, simply drops non-compliant traffic
- Drops cause TCP Retransmits
- Supported for **inbound** AND **outbound** traffic!





## Configure policing in ASDM via MPF (QoS tab):

Add Service Policy Rule Wizard - Rule Actions

Protocol Inspection | Intrusion Prevention | Connection Settings | **QoS**

Enable priority for this flow

Enable policing

Input policing

Committed Rate: 1000000 bits/second

Conform Action: transmit

Exceed Action: drop

Burst size may be recalculated by the device based on the committed rate.

Burst Size: 1500 bytes

Output policing

Committed Rate: bits/second

Conform Action: transmit

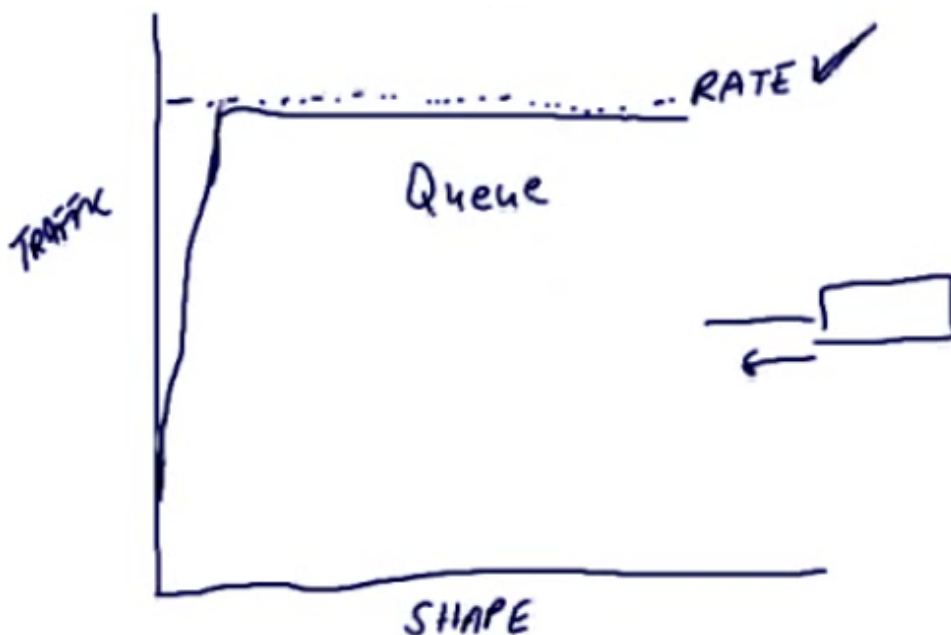
Exceed Action: drop

Burst size may be recalculated by the device based on the committed rate.

Burst Size: 1500 bytes

## Shaping:

- We are trying to actually “shape” the traffic to conform to a particular rate
- Any excess traffic will be buffered so that the traffic flow can stay within rate
- All traffic “bursts” will be smoothed via a **queueing** process
- Introduces delay, causes jitter, but fewer TCP Retransmits
- Supported for sending / **outbound ONLY** traffic!



## CLI configuration for traffic policing and shaping:

```
class-map HTTP_TRAFFIC
  match port tcp eq http
!
policy-map INSIDE-POLICY
  class HTTP_TRAFFIC
    police input 1000000 1500 conform-action transmit
      exceed-action drop
!
policy-map OUTSIDE-POLICY
  class class-default
    shape average 10000000 40000
!
service-policy OUTSIDE-POLICY interface outside
service-policy INSIDE-POLICY interface inside
```

## Priority Queueing:

- VoIP traffic (using RTP) would be a great example of when to use this
- You could mark this traffic with a DSCP value of EF (46)
- Not as robust as router or switch IOS

To enable this we must first create an **Output Priority Queue** on an interface:  
**ASDM > Configuration > Device Management > Advanced > Priority Queue**  
... specify "Interface", "Queue Limit" and "Transmission Ring Limit"

CLI: **priority-queue outside**  
**queue-limit 2048**  
**tx-ring-limit 80**

This works like any other MPF (Modular Policy Framework) configuration. For the class-map, choose "**IP DiffServ CodePoints (DSCP)**" instead of "ACL" as we have in previous examples ...

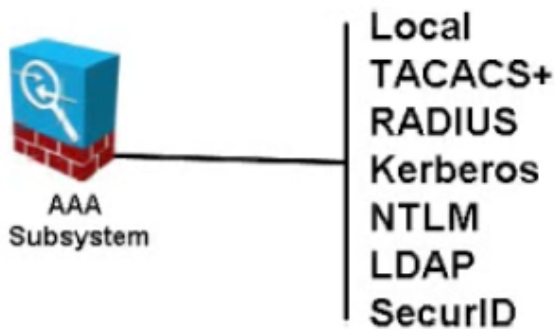
CLI: **match dscp ef**

Then under the **QoS tab**, choose "**Enable priority for this flow**" ...

## User-based Policies

### Cut-through Proxy:

- Different policies and access for different users
- Implemented using AAA features



By default, the local database is used – this is the most basic functionality

Remember, **Authentication** is always recommended, but **Authorization** may not be used – for example, if all users require the same exact level of access, Authorization may not be necessary.

**That being said, you NEVER have Authorization without Authentication**

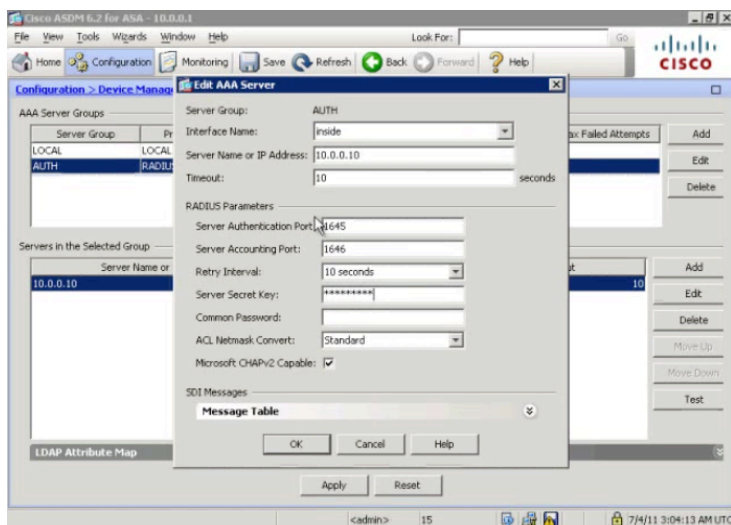
**ACS 4.2** is the Access Control Server recommended by Cisco

You can use Cut-through Proxy to require AAA for ANY type of traffic, however to **challenge the end user** and ask for credentials you can **ONLY** use: **http, https, telnet** or **ftp** – once the user authenticates, the credentials are cached for a configurable time period.

### AAA Configuration:

**ASDM > Configuration > Device Management > Users/AAA > ...**

- **AAA Server Groups**  
Configure local, RADIUS, TACACS+, etc.  
You add a server group first, then you add servers to that group



- **Authentication Prompt**  
Customize various banners  
**CLI: `auth-prompt [prompt | accept | reject] text here`**

To add AAA Rules (in other words, to actually turn ON AAA):

**ASDM > Configuration > Firewall > AAA Rules**

Remember, the local database can do Authentication and Authorization, but NOT Accounting ...

The screenshot shows the 'Add Authentication Rule' dialog box. The 'Interface' is set to 'outside'. The 'Action' is 'Authenticate'. The 'AAA Server Group' is 'AUTH'. The 'Source' is 'any', the 'Destination' is '172.16.0.11', and the 'Service' is 'tcp/http, tcp/ftp, tcp/telnet'. The 'Description' field is empty. In the 'More Options' section, the 'Enable Rule' checkbox is checked. The 'Source Service' field is empty, and the 'Time Range' field is also empty. The 'OK', 'Cancel', and 'Help' buttons are visible at the bottom.

\*\*\* On the exam, this would likely show up in a scenario-based question – remember how to navigate to the AAA Rules to determine which rules are enabled and applied to which interfaces!

Note: **AAA Rules Advanced Options** contains Interactive Authentication options. By default, the authentication behavior will listen to HTTP/HTTPS requests on all interfaces using 80/443 respectively. Configuration of interactive authentication can override this.

Note: **ASDM > Configuration > Firewall > Advanced > Virtual Access** to configure virtual Telnet and HTTP servers for redirection ... you'll also find **Global Timeouts** under the "Advanced" tree – you can specify authentication inactivity timers, etc.

To provide per user downloadable ACLs, you must use RADIUS  
You can also use TACACS+ Session Authorization, but NOT recommended

## Troubleshooting Commands

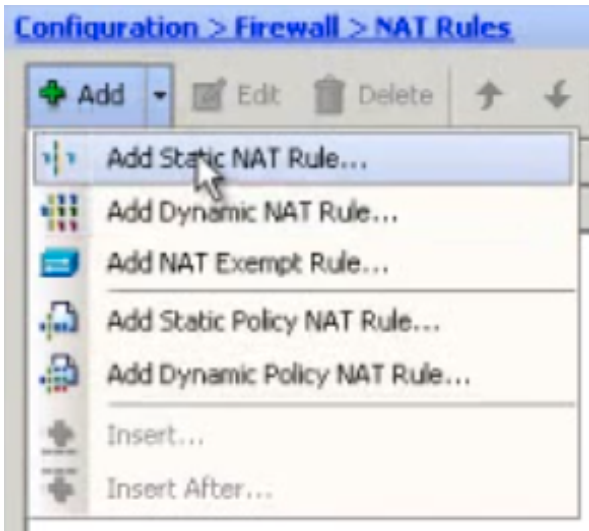
```
show uauth ↵  
show aaa-server  
test aaa-server
```

## NAT / PAT

This section starts off with a simple review of NAT. The test primarily focuses on inside NAT, but outside NAT is mentioned. A typical scenario for the use of outside NAT would be to resolve conflicting address space if one company acquired another company, and the acquired company was using the same internal address space.

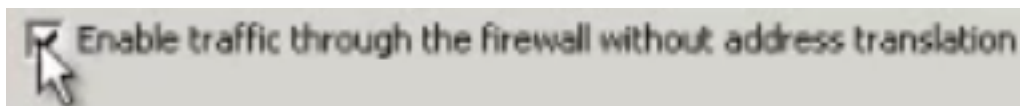
### NAT Configuration:

#### ASDM > Configuration > Firewall > NAT Rules



### NAT Control:

- Force translation of addresses from a **MORE** secure to a **LESS** secure interface
- **Disabled** by default
- Turning **ON** NAT Control requires **UNCHECKING BOX** in ASDM



CLI: **nat-control**

- Exceptions can be created to exempt certain traffic

### There are 3 ways to bypass NAT Control:

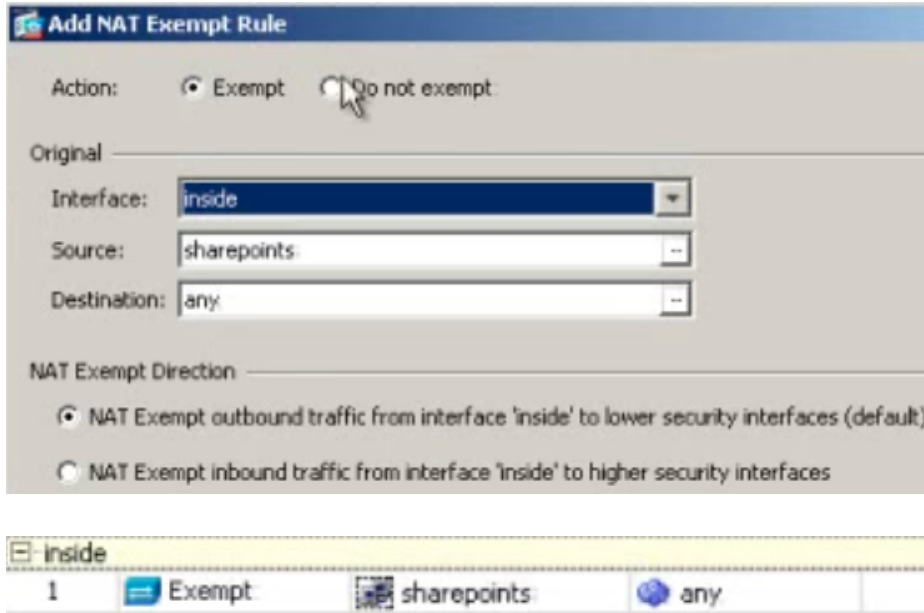
#### 1. **Dynamic Identity NAT**

Creates a dynamic translation from / to the same address  
This is called **NAT ZERO**

#### 2. **Static Identity NAT**

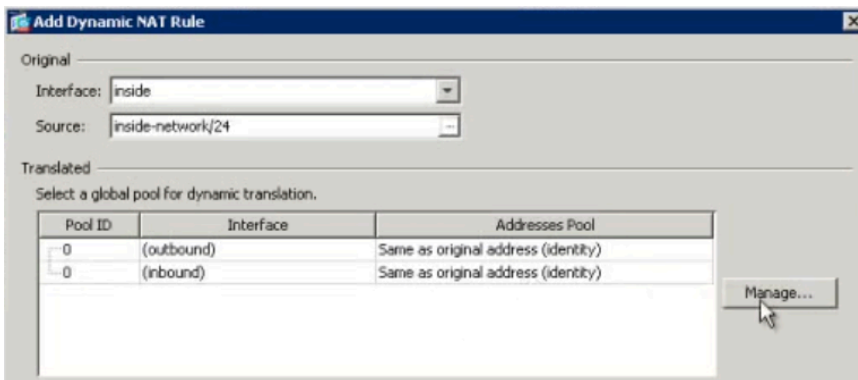
Creates a static translation from / to the same address

### 3. NAT Exemption (*Preferred*)

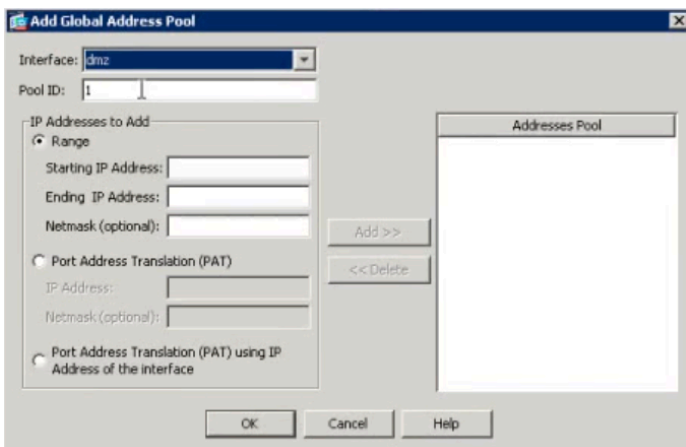


CLI: **nat (inside) 0 access-list NONAT**

### Dynamic NAT Configuration:



You will notice the two **NAT ZERO** pools (used to get around **NAT Control** mentioned above) that are there by default. To add a new pool, click “**Manage...**” then “**Add**”:



- The Pool ID begins with 1
- You can add a starting / ending range just like you would in IOS with:  
“ip nat pool RICHARD 68.57.66.20 68.57.66.30 netmask 255.255.255.0”
- You can create multiple pools
- You can enable PAT here as well, or you can combine Dynamic NAT and PAT, using PAT as a fallback incase the pool is exhausted
- PAT can use a specific overloaded address, or it can use the address associated with a particular interface (commonly done with cable/DSL or any time dynamic addressing is involved)

Here’s how the created rule appears in ASDM:

The screenshot shows the ASDM configuration window for NAT Rules. The title bar reads "Configuration > Firewall > NAT Rules". Below the title bar is a toolbar with buttons for Add, Edit, Delete, and other actions. The main area is a table with columns for #, Type, Original (Source, Destination, Service), Interface, and Translated (Address). A single rule is listed with #1, Type Dynamic, Source inside-network/24, Interface outside, and Translated Address 209.165.200.230 - 209.165.200.250 and 209.165.200.251.

#	Type	Original			Translated	
		Source	Destination	Service	Interface	Address
1	Dynamic	inside-network/24			outside	209.165.200.230 - 209.165.200.250 209.165.200.251

### Dynamic Policy NAT Configuration:

This allows you to create a Dynamic NAT rule that only applies to traffic that is headed to a specific destination. The created rule appears in ASDM as follows:

The screenshot shows the ASDM configuration window for NAT Rules. The title bar reads "Configuration > Firewall > NAT Rules". Below the title bar is a toolbar with buttons for Add, Edit, Delete, and other actions. The main area is a table with columns for #, Type, Original (Source, Destination, Service), Interface, and Translated (Address). Two rules are listed: rule 1 is a Dynamic Policy rule with Source inside-network/24, Destination 10.0.1.0/24, Interface outside, and Translated Address 192.168.2.10; rule 2 is a Dynamic rule with Source inside-network/24, Interface outside, and Translated Address 209.165.200.251.

#	Type	Original			Translated	
		Source	Destination	Service	Interface	Address
1	Dynamic Policy	inside-network/24	10.0.1.0/24		outside	192.168.2.10
2	Dynamic	inside-network/24			outside	209.165.200.251

### Static Inside NAT Configuration:

Creates a fixed translation just like you would in IOS with:

“ip nat inside source static 172.16.10.99 68.57.66.20” or ...

“ip nat inside source static tcp 172.16.10.99 22 68.57.66.20 22”



**Add Static NAT Rule**

Original

Interface: dmz

Source: 172.16.0.11

Translated

Interface: outside

Use IP Address: 209.165.200.11

Use Interface IP Address

Port Address Translation (PAT)

Enable Port Address Translation (PAT)

Protocol:  TCP  UDP

Original Port: 80

Translated Port: 8080

Connection Settings

OK Cancel Help

inside							
1:	Dynamic Policy	inside-network/24	10.0.1.0/24		outside	192.168.2.10	
2:	Dynamic	inside-network/24			outside	209.165.200.251	
dmz							
1	Static	172.16.0.11		http	outside	209.165.200.11	8080
2	Static	172.0.0.10			outside	209.165.200.10	

### CLI Static NAT Example:

**static (dmz, outside) 68.57.66.20 172.16.10.99**

**\*\*Watch the order! In paren, it's FROM, TO, then the IPs are listed as TO, FROM. In other words, the first IP is inside GLOBAL, the second IP is inside LOCAL!**

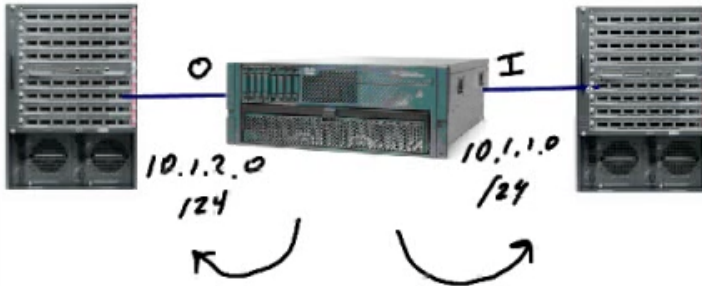
### CLI Static PAT Example:

**static (dmz, outside) tcp 68.57.66.20 22 172.16.10.99 22**

## Transparent vs. Routed Mode

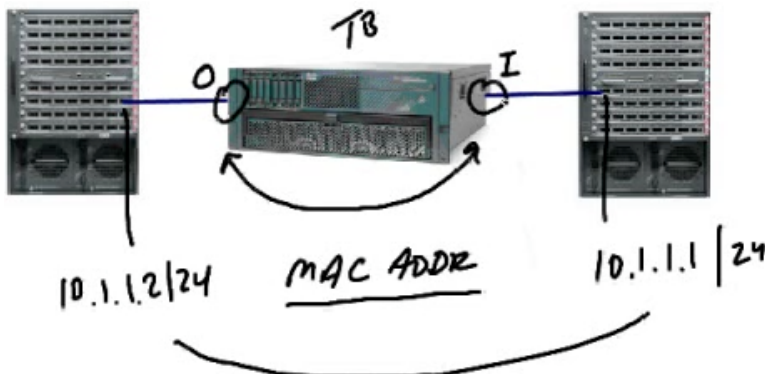
By default, the ASA operates in **Routed Mode**. In this mode, the ASA behaves as a router. Though, as discussed previously, by default it does **NOT modify** the **TTL field** for packets that traverse it. It's still a "hop" in every other sense of the word. It routes from one **ingress** interface to one **egress** interface.

### **Routed Mode:**



Obviously introducing an ASA in Routed Mode into an existing infrastructure may require readdressing of your network and possible reconfiguration of any dynamic routing protocols and/or static routes.

### **Transparent Mode ("Bump in the Wire"):**



Traffic forwarding is no longer based on IP addresses as it is in Routed Mode. Our traffic forwarding is based on **Layer 2 (MAC addresses)**. This is referred to as **Secured Transparent Bridging** between the two interfaces.

### **The only IP address assignment is to the Management Interface**

The other IP addresses in the diagram above are assigned to the multi-layer switch. The actual inside and outside ASA interfaces have NO IP addresses.

You still have access controls in Transparent Mode: Access Lists, AAA, SPI, AIC

### **However, the following features are UNSUPPORTED in Transparent Mode:**

**DDNS, DHCP Relay, Dynamic Routing, Multicast IP Routing, QoS, VPN Termination, IPv6 (Before 8.2(1)), NAT (Before 8.0.2)**

... there is no inspection of the L3 header, so you can see why QoS and other features would be unsupported in Transparent Mode.

## Switching between Routed Mode and Transparent Mode:

**firewall transparent**

**no firewall transparent**

**show firewall**

**show int ip bri**

^^^^^

<< Switch to Transparent Mode

<< Switch to Routed Mode

<< Show command for verification

<< Show interfaces and IP addresses

watch this – it's backwards from the IOS command "show ip int bri"

## Sample Configuration:

int eth 0/0

nameif inside

security-level xxx (default is 100)

no shut

int eth 0/1

nameif outside

security-level xxx (default is 0)

no shut

→ NO IP addresses are assigned to these interfaces – only management interface!

domain-name nuggetlab.com

ip address 10.0.1.1 255.255.255.0

<< issued in GLOBAL config mode,  
assigns IP to management interface

http server enable

http 10.0.1.10 255.255.255.255 inside

## Notice how many fewer options there are in Transparent Mode in ASDM:



- One new section that appears ONLY in Transparent Mode is **Ethertype Rules**: You can specify a **hex value > 0x600**, or choose BPDUs, IPX, MPLS-multicast and MPLS-unicast from the dropdown menu. CDP packets and other packets that do not have a value greater than 0x600 cannot be allowed.



- NON-IP traffic (IPX, etc.) is supported. From a bridging standpoint, the appliance CAN allow this traffic whereas Routed Mode cannot.
- You can still use Access Rules, Service Policy Rules, AIP-SSM / CSC-SSM modules.
- Remember, we are only operating on TWO INTERFACES
- **ARP traffic is allowed in both directions by default – this is obviously important.** You can enable DAI or create static ARP mappings by going to ASDM > Configuration > Device Management > Advanced > ARP > xxx.
- You can **DISABLE MAC Address Learning** by going to ASDM > Configuration > Device Management > Advanced > Bridging > MAC Learning – then choose the proper interface and click “Disable” to turn off. Obviously this means static MAC address entries must be created (one per interface).

## Troubleshooting Transparent Mode

```
show mac-address-table
show mac-learn
debug mac-address-table
show arp
show arp-inspection
debug arp-inspection
show access-lists
```

Common Syslog Messages →

322002 (Bad ARP mapping), 106006 (Denied multicast packet)

## ASA Virtualization:

On an **ASA 5510 or higher**, we can create **Security Contexts** and by doing so create multiple “virtual firewalls” within a single appliance (up to 4 for most appliances). Each context can have its own administrator, its own interfaces and its own firewall configuration. Even multiple AIP-SSM configurations are supported via contexts.

By **default**, the ASA is in **Single Mode**. We have to enable **Multiple Mode** to have this functionality.

The following features are **NOT** supported in Multiple Mode:

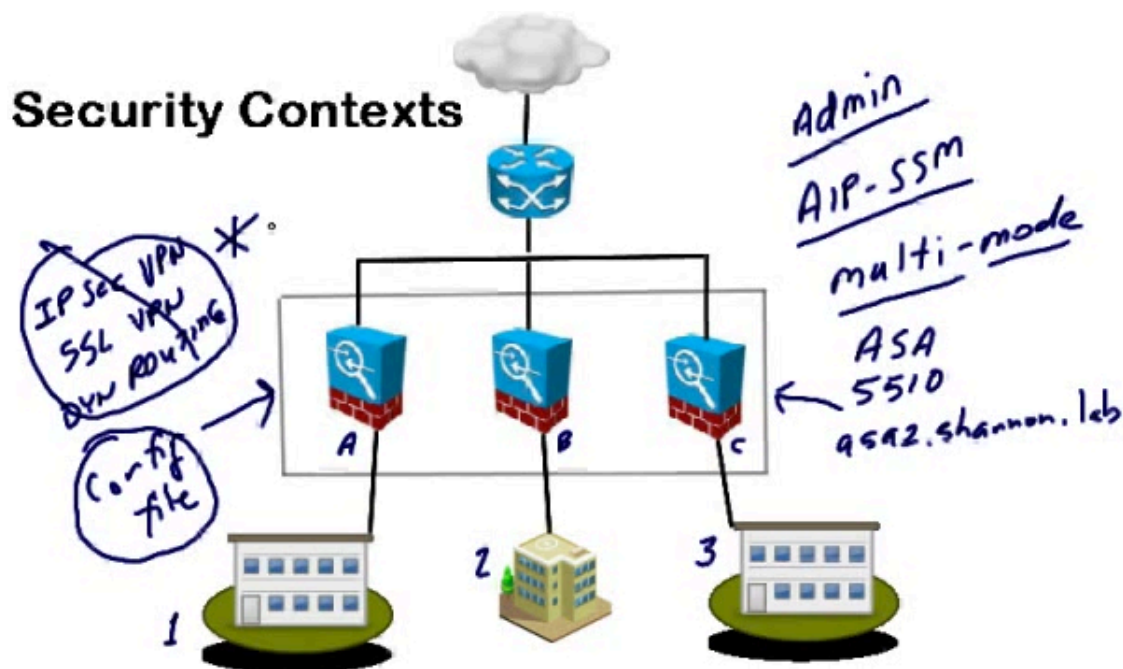
- IPsec VPN
- SSL VPN
- Dynamic Routing
- Multicast IP Routing

**In the simplest terms, a context is basically a separate configuration file on the box. There will be a system configuration file, as well as a specific configuration file for every context created.**

The system configuration is your startup configuration for the appliance. It resides in flash memory.

When you convert from Single Mode to Multiple Mode, you will have by default a System Configuration File and an Admin Context. The Admin Context is used to create other contexts.

Even though it isn't done often, you CAN use Transparent Mode (discussed in previous section) with the Multiple Mode configuration. You won't be able to share interfaces if you do so.



## Switching between Single Mode and Multiple Mode:

**mode multiple**  
**mode single**

<< Switch to Multiple Mode\*  
<< Switch to Single Mode\*

**\*Reboot required!**

If you look in flash (“dir flash” or “show flash”) after switching to Multiple Mode, you will see two new files:

- old\_running.cfg << Backup of the previous running configuration
- admin.cfg << The default admin context configuration file

The admin context has to be stored in internal flash, but when you create new contexts they can be stored in flash or elsewhere (http, ftp, tftp, etc.).



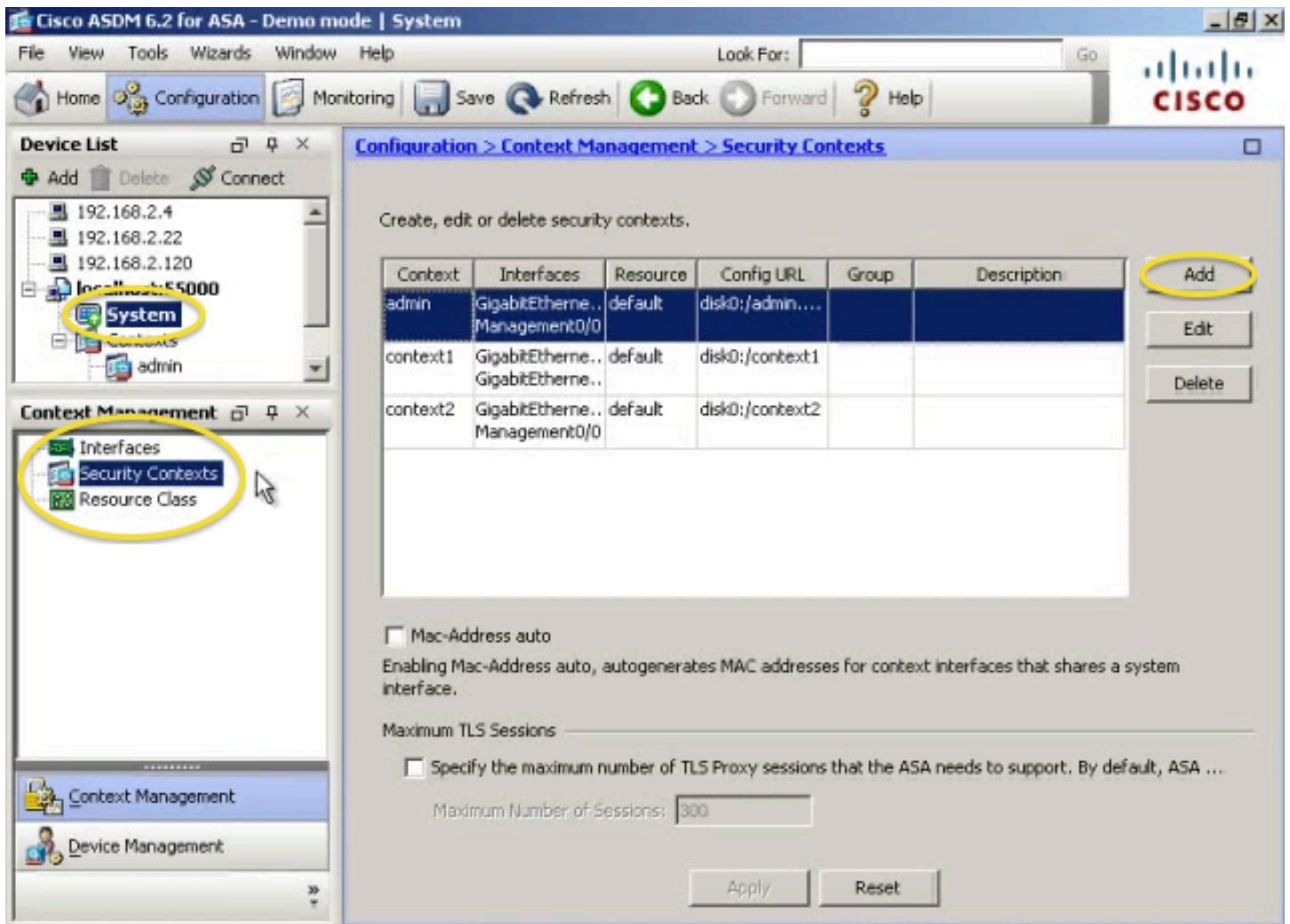
Notice the **System** section highlighted above – it uses the **admin** context to derive its settings – these are both present by default. Even though the admin context is “special”, it can still be configured and assigned just like any other context.

To create a new context, go to **System**, then choose **Security Contexts** in the section below, then “**Add**” ... there is also another setting in this section called **Mac-Address auto**. This is significant because MAC addresses are automatically generated for context interfaces that share a system interface if this box is checked. This can be accomplished in the CLI with the command “**mac-address auto**” ...

You’ll also notice a **Resource Class** section. A Resource Class called **default** already exists. **By default, all contexts (in this example, admin, context1, context2) are using the default Resource Class. However, you can create a new class per each context, and assign them accordingly.** Within the class you can specify such things as: ASDM Sessions, Connections (absolute / percent), Hosts, Xlates, Telnet/SSH, Conns/sec, Inspects/sec, Syslogs/sec. This is an object-oriented approach. If you don’t specify each value, the value will be inherited from the parent default class!

*To assign a Resource Class to a context, use System, then Security Contexts. Find the context and click “Edit”, then choose the class under “Resource Assignment” ...*





In ASDM, moving between contexts is just as easy as double-clicking the context you want to use. In the CLI, use the **changeto** command:

**changeto context admin**                      << Changes to admin context  
**changeto context system**                    << Changes back to system

The prompt will change to reflect the active context:  
ASA/admin#

You can also make another context the admin context:  
**admin-context name**

## Troubleshooting Commands

```
show interface
show context
show resource usage
```

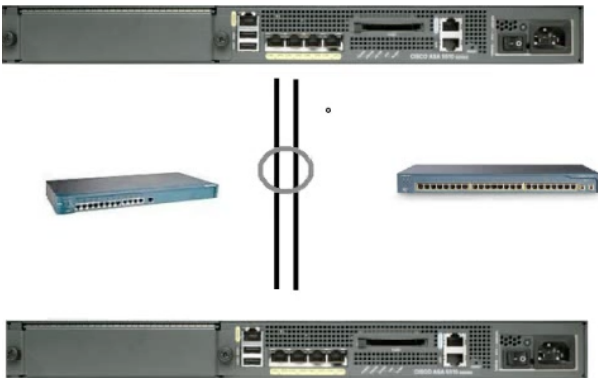
```
syslog: 321001 (limits reached)
```



## Active/Standby Failover:

Active/Standby Failover is one of two failover modes available on the ASA, the other being Active/Active Failover.

### Redundant Interfaces



### **A Redundant Interface is a logical interface supported by two physical interfaces**

- The **FIRST** physical interface you configure will become the **ACTIVE** interface, with the **SECOND** becoming the **STANDBY**
- The **redundant interface** uses the **MAC address of the FIRST physical interface** in the bundle
- If the secondary interface becomes active, a **GARP Reply** (Gratuitous ARP) is issued so that CAM/MAC tables can be updated with the new MAC address (that of the secondary interface)
- The interface name, security level, IP address, etc. is stripped away from the physical interfaces and all that configuration is instead applied to the redundant interface
- You can have up to **8 redundant interface pairs** (depending on device's port density)
- You can NOT assign sub-interfaces to a redundant interface
- They have to be the same physical type of interface (copper-copper, fiber-fiber, etc.)

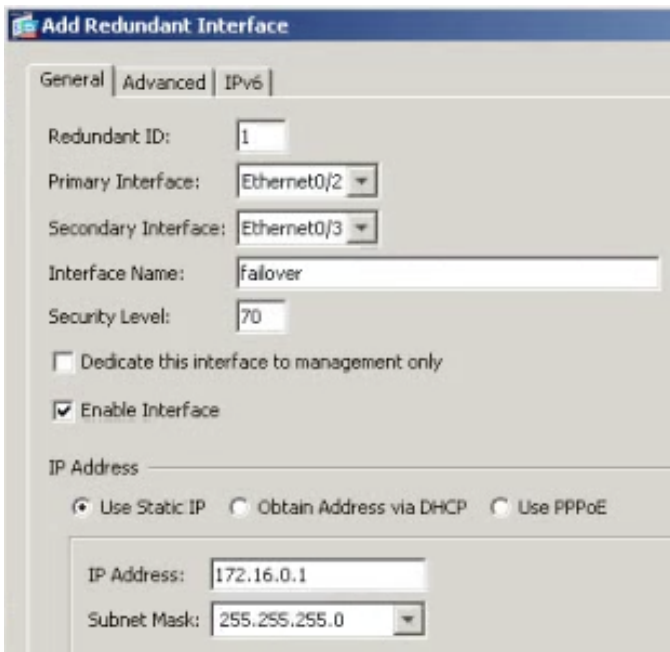
### **To add/configure a Redundant Interface:**

**ASDM > Configuration > Device Setup > Interfaces**

Click Add, then Redundant Interface...

The screenshot shows the ASDM interface configuration page. The table below lists the interfaces and their configurations. The 'Add' button is highlighted, and the 'Redundant Interface...' option is selected in the dropdown menu.

Interface	Name	Enabled	Security Level	IP Address	Subnet Prefix L...
Ethernet0/0		No			
Ethernet0/1	inside	Yes	100	192.168.2.22	
Ethernet0/2		No			
Ethernet0/3		No			
Management0/0		No			



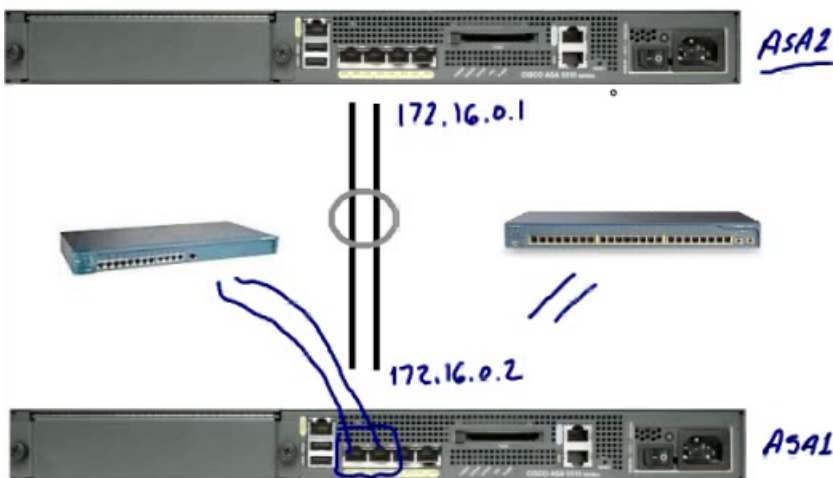
- In the example above, the interface will be named **redundant1**
- Ethernet0/2 will be the active interface, and its MAC address will be used
- Ethernet0/3 will be the standby interface
- 172.16.0.1 /24 will be the IP address of the redundant interface
- The other side would be on the same subnet (for example, 172.16.0.2 /24)
- **Now we can use the redundant interfaces as a Failover Link**

### Helpful Troubleshooting Commands:

- **show interface**
- **debug redundant-interface event**

*Keep in mind that the two physical interfaces that make up the redundant interface should be connected to the other ASA via a switch and on a dedicated vlan, NOT directly cabled!*

### Active/Standby Failover



## In the event the active device fails:

- The standby device will become active and a switchover will occur
- **The standby device will assume the identity of the active device**, which includes the IP and MAC addresses of the previously active device on ALL interfaces except the failover interfaces – those addresses will remain the same
- The roles of primary and secondary device don't change – but in this scenario the primary device is now standby and the secondary device is active.

## How it works:

- Both devices are managed as a single device/unit
- All configuration is performed from the active unit
- The configuration is automatically replicated to the standby device via the failover link
- **Stateless Failover** and **Stateful Failover** is available
- Obviously with Stateless, all active connections will be dropped
- With Stateful, the connections will be moved to the other ASA
- Stateful requires more port density – ideally a redundant pair, but at least one interface that can carry the state information (a Stateful Link)
- You **CAN** use the Failover Link as a **Stateful Link** too if necessary

## Stateful Failover Information:

State Information Passed to Standby Unit	State Information Not Passed to Standby Unit
NAT translation table	HTTP connection table (unless HTTP replication is enabled)
TCP connection states	User authentication table
UDP connection states →	Routing tables
ARP table	State information for Cisco AIP-SSM
MAC address table (applies to transparent mode only)	DHCP server leases
ISAKMP SAs, IPsec SAs, SSL sessions	Phone proxy sessions
GTP PDP connection database	
SIP signaling sessions	

## Prerequisites for Active/Standby Failover Configuration:

You must have the same hardware model, same number and type of interfaces, same modules (SSMs), same RAM *recommended*, same mode, same major/minor OS version, same licensed features, and a license for active/standby failover!

## Configuring Active/Standby Failover:

**ASDM > Wizards > High Availability and Scalability Wizard -- or --  
ASDM > Configuration > Device Management > High Availability**

- Step 1: Choose Active/Active failover or Active/Standby failover
- Step 2: Specify the Peer IP Address (NOT the failover IP)  
*\*During this step, the prerequisites mentioned above will be verified*
- Step 3: Specify LAN Link (Failover Link) (example, "redundant1")  
Logical Name (example, "FAILOVER")  
Active IP Address (example, "172.16.0.1")  
Standby IP Address (example, "172.16.0.2")  
Subnet Mask (example, "255.255.255.252")  
Optional Encryption Key
- Step 4: Stateful Failover?  
You can disable, use LAN Link as Stateful Link, or use separate interface  
*If you disable, you have HARDWARE FAILOVER only!*
- Step 5: Standby Address Configuration →

Device/Interface	Active IP Address	Subnet Mask	Standby IP Address	Monitored
asa1				
dmz	172.16.0.2	255.255.255.0	172.16.0.1	<input checked="" type="checkbox"/>
inside	192.168.2.23	255.255.255.0	192.168.2.22	<input checked="" type="checkbox"/>
outside	209.165.200.2	255.255.255.0	209.165.200.1	<input checked="" type="checkbox"/>

- Step 6: Summary

### **In ASDM > Configuration > Device Management > High Availability:**

**You can specify the number or percentage of failed interfaces that triggers a failover, failover poll times (seconds or milliseconds (sub-seconds)), and specify MAC addresses for physical interfaces. << TEST TIP!**

### **Helpful Troubleshooting Commands:**

- **show failover**
- **show failover exec [active | standby | mate]**
- **show monitor-interface**

### **Common Failover-related Syslog Messages:**

105043 (failover occurred), 103001 (primary not getting response from mate), 105005 (primary device lost failover communication with mate), 105009 (interface testing failed)

## Active/Active Failover:

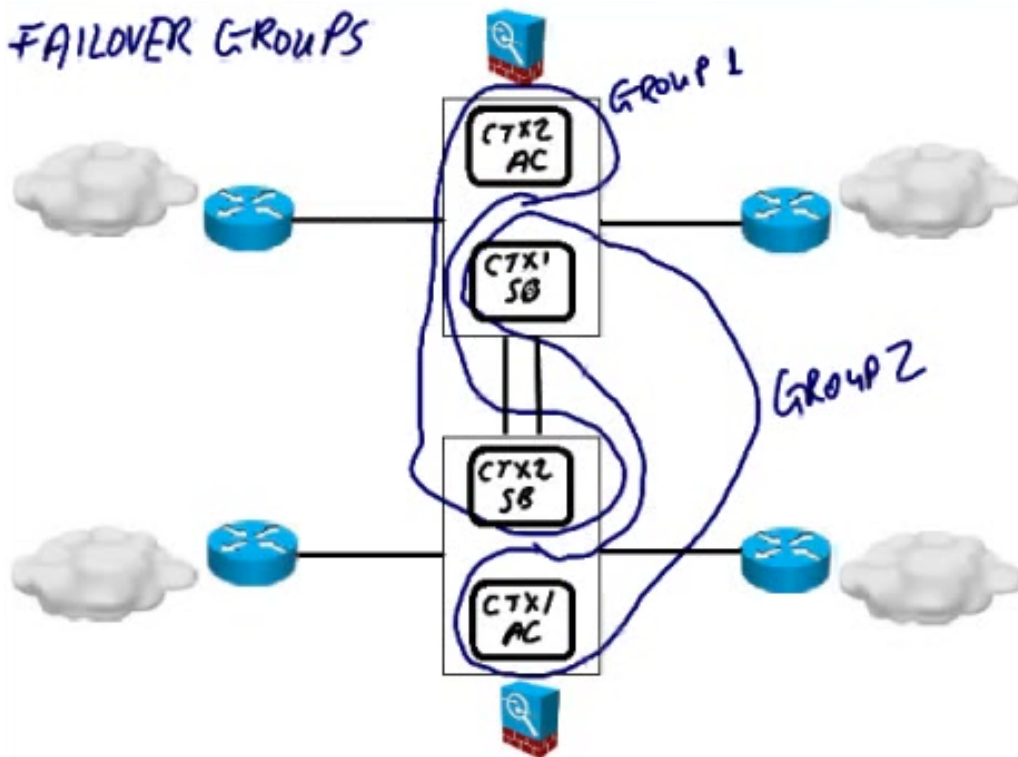
- Requires minimum of **ASA 5510 w/ Security Plus License** (NOT Base)
- Requires device to be in **Multiple Mode** (NOT Single Mode)
- Requires security contexts (thus the requirement for Multiple Mode)
- Both ASAs are passing traffic **simultaneously**
- We still have redundancy as with Active/Standby, but also **load balancing**

To configure, use the same **High Availability and Scalability Wizard** used to configure Active/Standby Failover.

For example, we could have two contexts on each ASA, each protecting **DIFFERENT** traffic. For example, one context could protect Internet traffic, while the other protects datacenter traffic.

If you have two or more contexts that supported the **SAME** traffic (e.g. both protecting Internet traffic), the configuration becomes much more complex. This involves **ECLB (Equal Cost Load Balancing)** and **PBR (Policy Based Routing)**.

## **Failover Groups:**



- When an ASA boots, it will begin a **Failover Election** process. If an ASA detects a negotiating device on a failover interface, it will become active for the locally configured failover group
- If it notices a device active for both groups, it will become the standby for both failover groups
- If it doesn't detect a device, it will become active for both failover groups



This assumes a “**healthy**” environment – in other words, all interfaces are up, the AIP-SSMs or CSC-SSMs are up. The appliance with the “healthier” context will become active for a particular Failover Group.

### **Switchover Events:**

For example, in group 1 when do we switch from the active context on ASA1 to the standby context on ASA2? **Answer:** when the entire ASA fails (hardware, software or power failures). This is referred to as a **Failover Group Level Switchover**.

The switchover event will trigger the standby context from the same group to become active. When you restore the failed context, it will become a standby context, unless **preemption** is configured (just like HSRP!).

*It is important to note that the primary appliance will always be the primary appliance, and the secondary will always be the secondary – no matter which is active!*

IP and MAC addresses are exchanged between the failover group members. Obviously the IP addresses on the active and standby contexts have to be in the same subnet.

Remember, you still have Failover Links and Stateful Links just as with Active/Standby Failover. You still have the option of combining them into a single link, and you have the option of setting up redundant interfaces.

### **Prerequisites for Active/Active Failover Configuration:**

Same as Active/Standby, **PLUS:**

- Requires device to be in **Multiple Mode** (NOT Single Mode)
- Requires security contexts (thus the requirement for Multiple Mode)
- BOTH devices must be in Routed OR Transparent Mode, not mixed
- NO Dynamic Routing or Multicast IP Routing
- NO Threat Detection
- NO VPN Termination
- NO Phone Proxy support
- NO ASA 5505 or ASA 5510 Base support

### **Configuring Active/Active Failover:**

**ASDM > Wizards > High Availability and Scalability Wizard -- or --**

**ASDM > Configuration > Device Management > High Availability**

Step 1: Cable the devices  
\*Remember to pass through switch if using redundant interfaces!

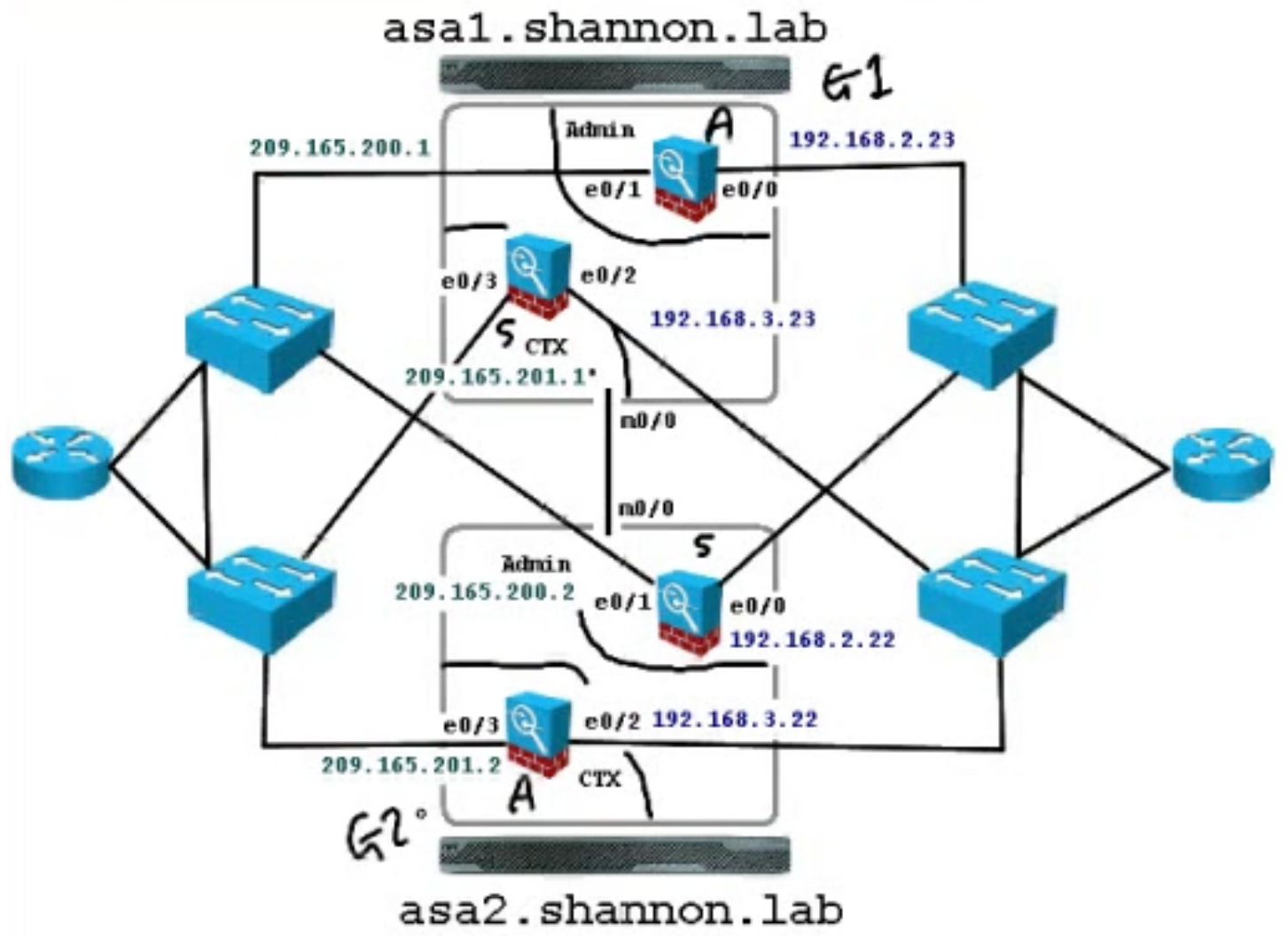
Step 2: Change device to Multiple Mode

Step 3: Create and configure security contexts on your primary ASA

- Step 4: Create 2 Failover Groups on primary ASA
- Step 5: Assign contexts to applicable groups
- Step 6: Configure A/A Failover on primary ASA  
CLI: **failover**
- Step 7: Configure A/A Failover on secondary ASA
- Step 8: Configure standby IP addresses in each context

... the wizard will walk you through each of these steps. Refer to the Cisco ASA Configuration Guide for the particular OS version you are using!

**Sample Active/Active configuration diagram from video** ... 2 contexts are used – **Admin** (present by default when switching to Multiple Mode) and **CTX** ... management interface (m0/0) is being used for Failover Link:





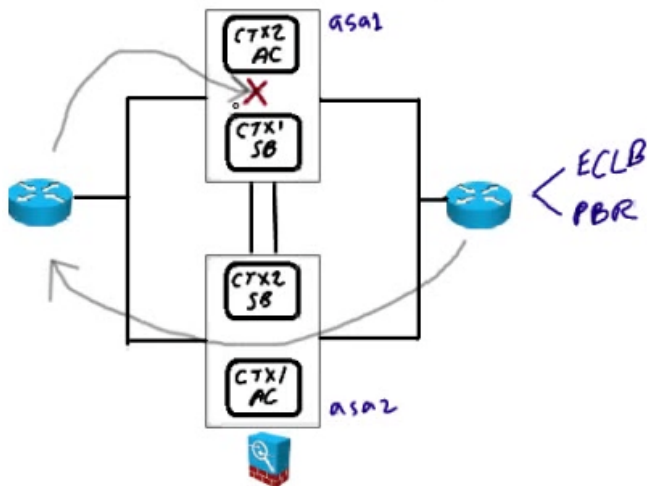
## Configuring Active/Active Failover via CLI:

```
failover group 1
  replication http
  preempt
failover group 2
  secondary
  replication http
  preempt
!
context admin
  join-failover-group 1
!
context CTX
  join-failover-group 2
!
interface Management0/0
  no shutdown
!
failover lan unit primary
failover lan interface FAILOVER Management0/0
failover key 6X9vNltTf7g6ed84bg
failover link FAILOVER Management0/0
failover interface ip FAILOVER 10.1.1.1 255.255.255.248 standby 10.1.1.3
failover
```

- By **default**, when you have **Stateful Failover** enabled, **HTTP states will NOT be transferred**. The command “**replication http**” **enables** this
- The “**preempt**” command is specified in each group. If the active device fails and later comes back, it can resume its previous role. *Think HSRP!*
- Notice the “**context admin**” and “**context CTX**” sections and the “**join-failover-group x**” commands which assign the contexts to the failover groups
- The “**failover key xxx**” assigns an optional encryption key
- The “**failover lan interface FAILOVER Management0/0**” command specifies that the management interface is to be used for the **Failover Link** (*hello packets and health information exchanged via this link*)
- The “**failover link FAILOVER Management0/0**” command specifies that the management interface is to be used for the **Stateful Link** (*state information exchanged via this link*)
- The “**failover interface ip FAILOVER x.x.x.x x.x.x.x standby x.x.x.x**” assigns active and standby IP addresses to the failover link
- The “**failover**” command is the most important – this command enables failover altogether!

## Configuring ASR Groups:

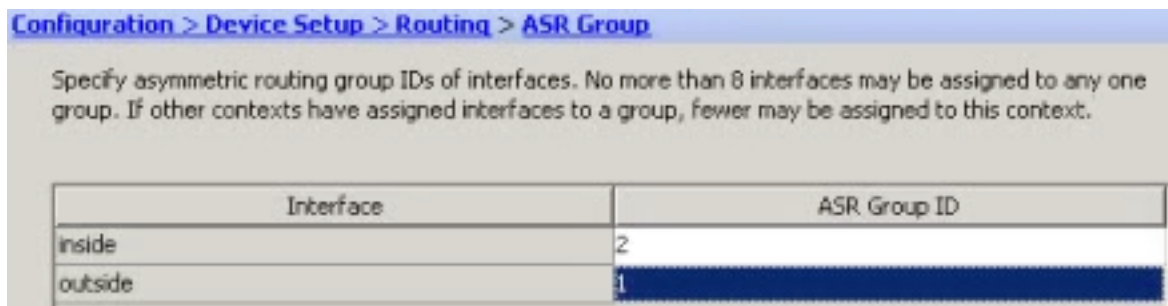
If **ECLB (Equal Cost Load Balancing)** is configured in the diagram below, it is possible that **Asymmetric Routing** could be an issue. Packets could exit across ASA2 and return to ASA1. Obviously ASA1 did not originate the traffic, and that results in Asymmetric Routing.



The ASA1 appliance doesn't have any state data for the particular packet in our example. The packet will be dropped.

To fix this, we have to create an **ASR Group**:

**ASDM > Configuration > Device Setup > Routing > ASR Group**



You can see that we have assigned ASR Group ID 2 to the inside interface, and 1 to the outside interface ... The other active context should have its interfaces in the same groups – they should match.

**Stateful Failover and HTTP Replication must be used for ASR to work correctly!**

## Configuring ASR Groups via CLI:

**changeto context admin**  
**interface e0/0**  
**asr-group x**

<< Change to admin context  
<< Change to interface  
<< Assign ASR group x to this interface

## Security Services Modules (SSMs):

### **SSM Module Types:**

*The exam primarily covers the SSC5 and the CSC-SSM.*

- **AIP → Intrusion Prevention (runs embedded Red Hat Linux)**
  - SSC5 (used in the ASA 5505)
  - SSM-10
  - SSM-20
  - SSM-40
  - Runs the same code as IOS IPS
  - Signature-based IDS/IPS
  - Anomaly-based IDS/IPS
  - Reputation-based IDS/IPS
  
- **CSC → Content Security (runs embedded Trend Micro InterScan)**
  - SSM-10
  - SSM-20
  - Base license has anti-virus, anti-spyware, and file blocking
  - Feature upgrade license adds anti-spam, content control for email, URL blocking / filtering and anti-phishing

SSMs extend the feature set of the ASA. They have their own dedicated CPU, RAM, flash memory and file system. They also have a dedicated out-of-band management interface. The SSC5 does NOT have this.

The hardware is the same between like models of the AIP-SSMs and CSC-SSMs – the difference is software. The 10, 20 and 40 modules differ only by CPU power and RAM. The SSM-40 supports 4GB of RAM and 2GB of flash memory, whereas the SSC5 supports 512MB of RAM and 512MB of flash memory.

*Note: the software can NOT be interchanged (you can't run CSC software on an AIP, or vice versa).*

*We define which traffic is sent to the SSM for further processing via policy – MPF!*

**Inline Mode** is the best way to implement **AIP-SSMs**. Even though the SSM is in the same physical hardware as the firewall, the **firewall** processes the packet **FIRST**, and then it's handed off to the SSM via an internal gigabit Ethernet connection.

**Promiscuous Mode** is also available for the **AIP-SSMs**. A **COPY** of the traffic is then sent to the **IDS (NOT IPS, because it's NOT inline)** for processing.

**Failure Management Mode** → **Fail-Open** or **Fail-Closed**? Applies to **AIP AND CSC** SSMs. If the SSM fails, should traffic still be processed? This is a policy decision.

## SSC5 (used in the ASA 5505), sample CLI configuration:

```
interface vlan 1
  no allow-ssc-mgmt
!
interface vlan 5
  allow-ssc-mgmt
  ip address 10.10.10.1 255.255.255.0
  nameif inside
!
interface Ethernet 0/5
  switchport access vlan 5
  no shutdown
```



Remember, the SSC5 does NOT have an out-of-band management interface. You have to configure a vlan on the ASA 5505 as the **SSC management vlan**, and then assign an interface to that vlan.

**Vlan 1** is enabled as the **SSC5's management vlan** by **default**. Notice that we have **DISABLED** vlan 1 as the SSC5 management vlan via the “**no allow-ssc-mgmt**” command ...

Interface Ethernet 0/5 is then assigned to vlan 5. That interface can then be used to manage the SSC5.

**hw-module 1 recover configure** << restore corrupted software

Other available options with hw-module command:

**hw-module 1 [password-reset | reload | reset | shutdown]**

## SSM CLI commands:

**show module 1 [details]**

<< display module info

**session 1**

<< open up CLI session with module\*

\*default username/password = cisco/cisco

Sample output from a CLI session on a CSC-SSM:

```
Trend Micro InterScan for Cisco CSC SSM Setup Wizard
-----

To set up the SSM, the wizard prompts for the following information:
 1. Network settings
 2. Date/time settings verification
 3. Incoming email domain name
 4. Notification settings
 5. Activation Codes

The Base License is required to activate the SSM.
Press Control-C to abort the wizard.

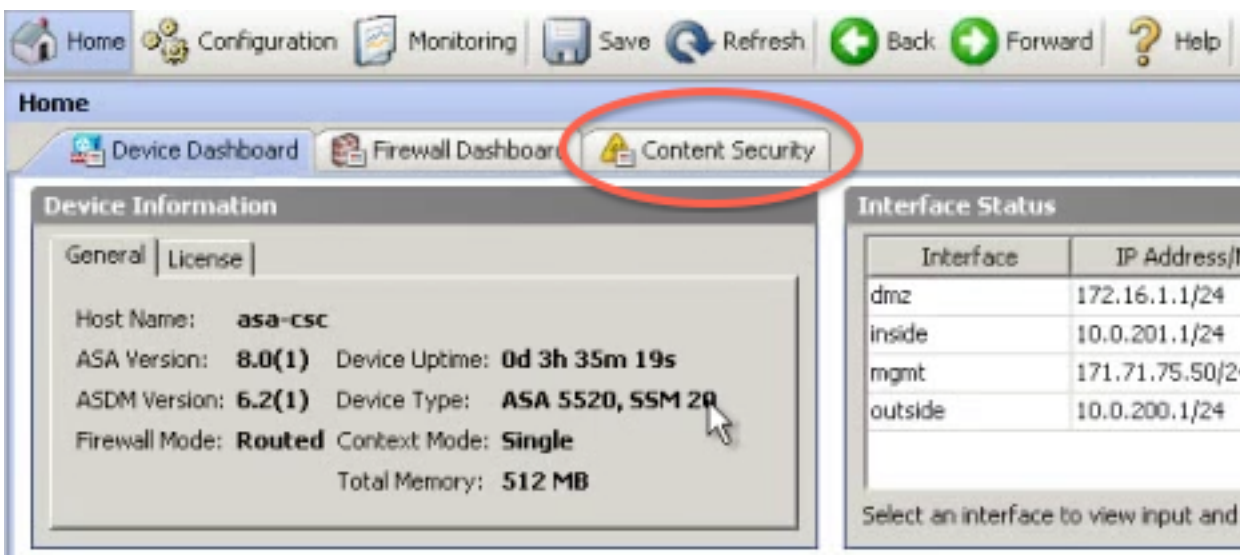
Press Enter to continue ...
```

Sample output from a web session on a CSC-SSM:



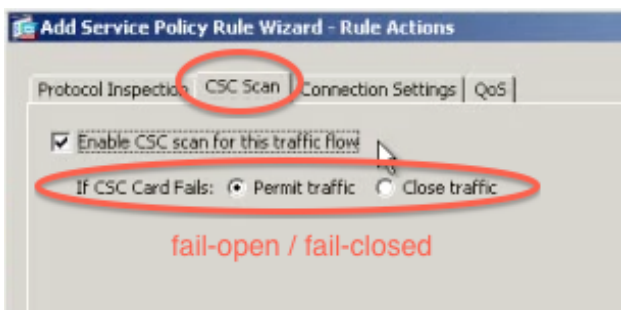
<https://192.168.2.53:8443>

ASDM CSC-SSM access:



Remember, in order for traffic to be sent to the CSC-SSM, you have to use MPF to create and apply a policy that uses CSC!

**ASDM > Configuration > Firewall > Service Policy Rules**





Configuration > Firewall > Service Policy Rules

+ Add Edit Delete Up Down Copy Paste Find Diagram Packet Trace

Traffic Classification				Rule Actions
Source	Destination	Service	Time	
any	any	pop3		csc , permit traffic
any	any	ftp		csc , permit traffic
any	any	http		Inspect HTTP Map trdy csc , permit traffic
any	any	smtp		csc , permit traffic
any	any	default-inspec...		Inspect DNS Map migrated_dn.. Inspect ESMTP (12 more inspect actions)

Cisco ASDM 6.2 for ASA - Demo mode

File View Tools Wizards Window Help Look For: Go

Home Configuration Monitoring Save Refresh Back Forward Help

Trend Micro Content Security > Mail

SMTP [POP3]

Scanning: Enabled  
[Configure Scanning](#)

Anti-spam: Disabled  
[Configure Anti-spam](#)

Content Filtering: Disabled  
[Configure Content Filtering](#)

Device Setup  
Firewall  
Remote Access VPN  
Site-to-Site VPN  
**Trend Micro Content Security**  
Device Management

<admin> 15 3/14/07 4:42:40 PM PDT



## Final Notes:

- **The ASA 5550 supports 36,000 connections/sec and 600,000 packets/sec**
- The ASA 5505 has NO security contexts (no Multiple Mode support)
- The ASA 5505 uses Internal User Licensing and the Base and Security Plus feature licenses – can also use the AnyConnect Essentials license and VPN shared license
- **Know where to go for DHCP server configuration in ASDM:**  
**ASDM > Configuration > Device Management > DHCP > DHCP Server**
- Know how the ASA algorithm works
- **The ASA 5505 has two vlan interfaces by default:**  
**Vlan 1 = Inside → Ethernet0/1 – 7**  
**Vlan 2 = Outside → Ethernet0/0**
- Review CLI Packet Tracer output
- Know logging destinations (buffer, syslog, SNMP traps)
- Know how to check for a self signed certificate:  
ASDM > Configuration > Device Management > Certificate Management
- ... > Device Management > Users/AAA > AAA Access > Authorization:  
Option 1 – Enable authorization for ASA command access  
Option 2 – Perform authorization for exec shell access
- Memorize Connection State Flags (table earlier in notes)
- **show local-host x.x.x.x [detail] shows translations AND connections**
- An **ACL deny** generates syslog message **106023** for each denied packet
- Object groups can be added for network, service, ICMP, protocol
- **uRPF = “ip verify reverse-path interface inside”**
- Packet Shunning = quickly block a particular IP address  
show shun statistics << view active shuns, get shun history
- QoS bandwidth shaping = outbound traffic ONLY
- L5-7 maps, applications supported:  
DNS, FTP, H.323, HTTP, IM, RTSP, SIP
- A L5-7 policy map is applied to traffic by NESTING inside a L3-4 policy map
- TCP Maps = tune TCP Normalization = prevent malformed TCP packets from reaching a protected host
- Applying TCP Bypass to traffic effectively disables all Stateful checks and all features that rely on them
- TCP Bypass:  
ASDM > Configuration > Firewall > Service Policy Rules > Connection Settings > Advanced Options > *checkbox*
- **Memorize default inspectors for Default Inspection Class (L5-7)**
- Know how to create an HTTP inspection policy map
- Know how to create an ESMTP inspection map with MIME type
- Know how TCP Intercept works
- Botnet Filter = additional license! Dynamic and/or Static; DNS replies for bad hostnames are cached on the ASA in a DNS reverse lookup cache

- Enable DNS Snooping:  
ASDM > Configuration > Firewall > Botnet Traffic Filter
- **Basic Threat Detection** generates syslog message **733100**
- **Advanced Threat Detection statistics for hosts = biggest performance impact to ASA!**
- CLI to enable Basic Threat Detection:  
“threat-detection basic-threat”
- **Scanning Threat Detection** generates syslog message **733101**
- Traffic Shaping vs. Traffic Policing → know the difference!  
Traffic Shaping = buffers traffic, outbound ONLY
- Priority Queueing sets size in packets (queue-limit) as well as transmission ring size (tx-ring-limit)
- **Review DNS Rewrite feature**
- Know NAT Control bypass methods → NAT Exemption is most recommended
- Instead of configuring static NAT and interface access rules separately, you can use the Public Server feature in ASDM
- Review Transparent Mode unsupported features!
- Review EtherType ACL → can't be < 0x600, NO CDP, YES BPDU, ARP permitted by default in Transparent Mode
- **If Dynamic MAC Address Learning is DISABLED, MAC addresses must be manually configured → could result in empty MAC address table!**
- Review Multiple Mode unsupported features!
- When you use shared interfaces (or sub-ifs) assign DIFFERENT MAC addresses to the shared interface in each context
- **If asterisk in “show context” output, indicates CURRENT ADMIN CONTEXT**
- Know redundant interfaces
- Know data NOT passed to standby with Stateful Failover
- Health is monitored over failover link using special hello packets
- Review output of “show failover”
- **Know the order for Zero-Downtime Failover Pair Upgrade:**
  1. Download software on both devices and specify to load new image
  2. Reload standby unit
  3. Force active unit to failover to standby
  4. Reload previously active unit
  5. Return original active unit to active state
- To show information about interfaces monitored for failover, use “show monitor-interface” command
- To use ASA to route traffic in load-sharing scenario, use ECLB / PBR

-- End --