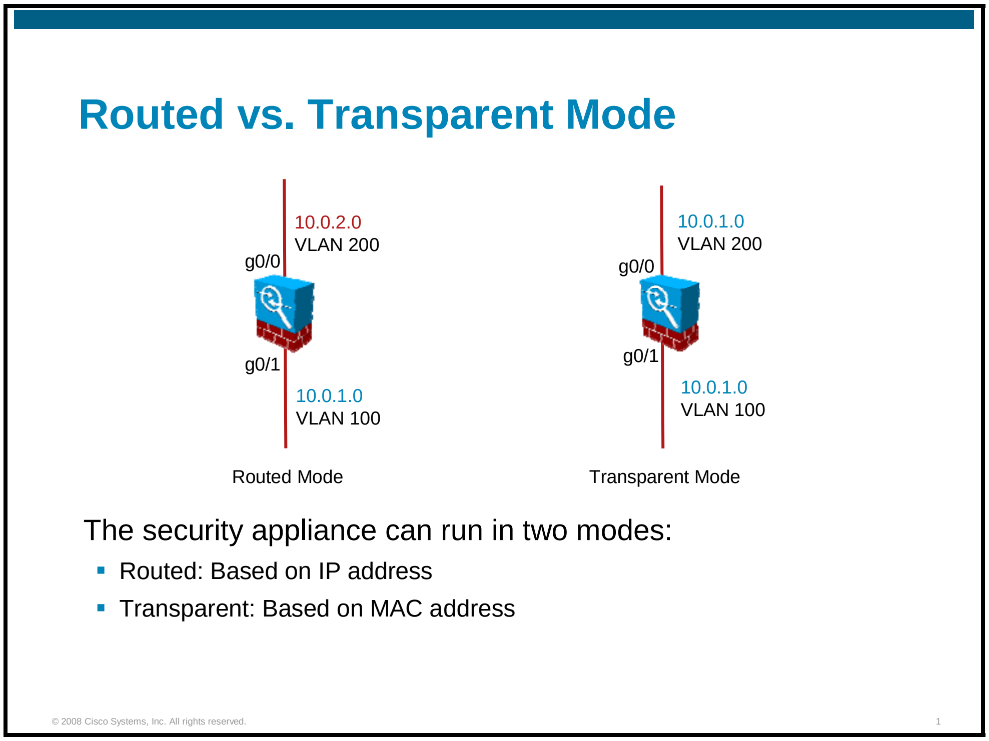
Configuring Transparent Firewall via Cisco ASDM

Created by Bob Eckhoff

This study aid provides an overview and explanation of transparent firewall mode. It also covers how to enable the transparent firewall and the monitoring and maintenance commands that are specific to the transparent firewall mode.

Transparent Firewall Mode Overview

This topic provides an overview of the transparent firewall mode.



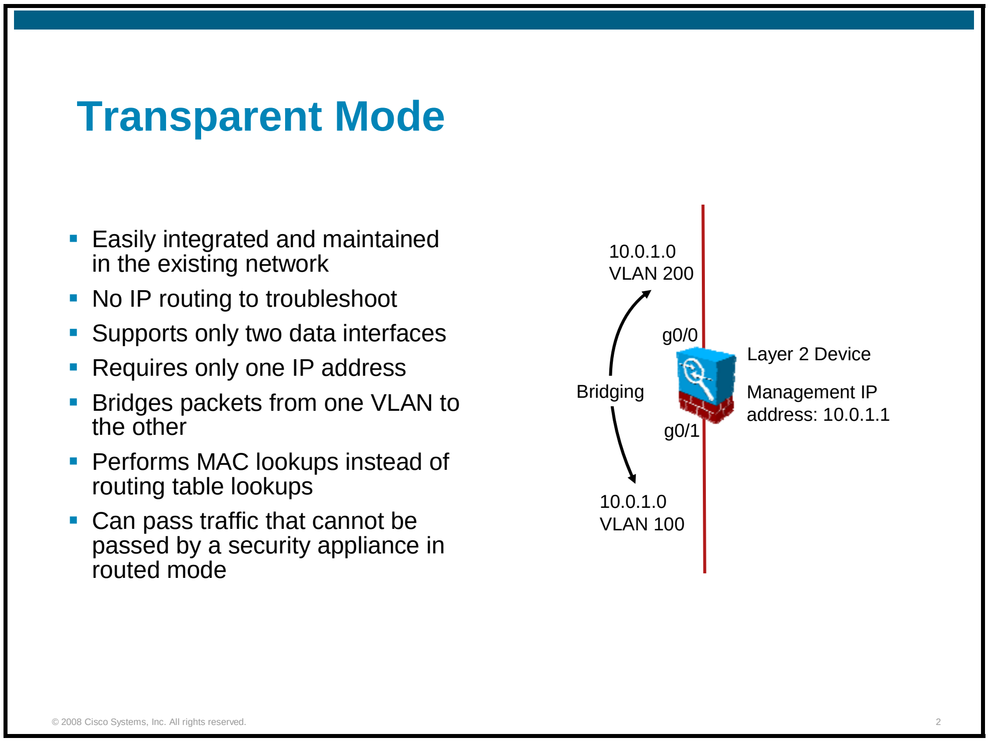
Routed vs. Transparent Mode

The security appliance can run in two modes:

- Routed: Based on IP address
- Transparent: Based on MAC address

Traditionally, a firewall is a routed hop and acts as a default gateway for hosts that connect to one of its screened subnets. A transparent firewall, on the other hand, is a Layer 2 firewall that acts like a “bump in the wire” or a “stealth firewall” and is not seen as a router hop to connected devices. The security appliance connects the same network on its inside and outside ports, but each interface resides on a different broadcast domain and the security appliance performs secured transparent bridging between the two broadcast domains.

Because the security appliance is not a routed hop, you can easily introduce a transparent firewall into an existing network. IP readdressing is unnecessary, and maintenance is facilitated because there are no complicated routing patterns to troubleshoot.



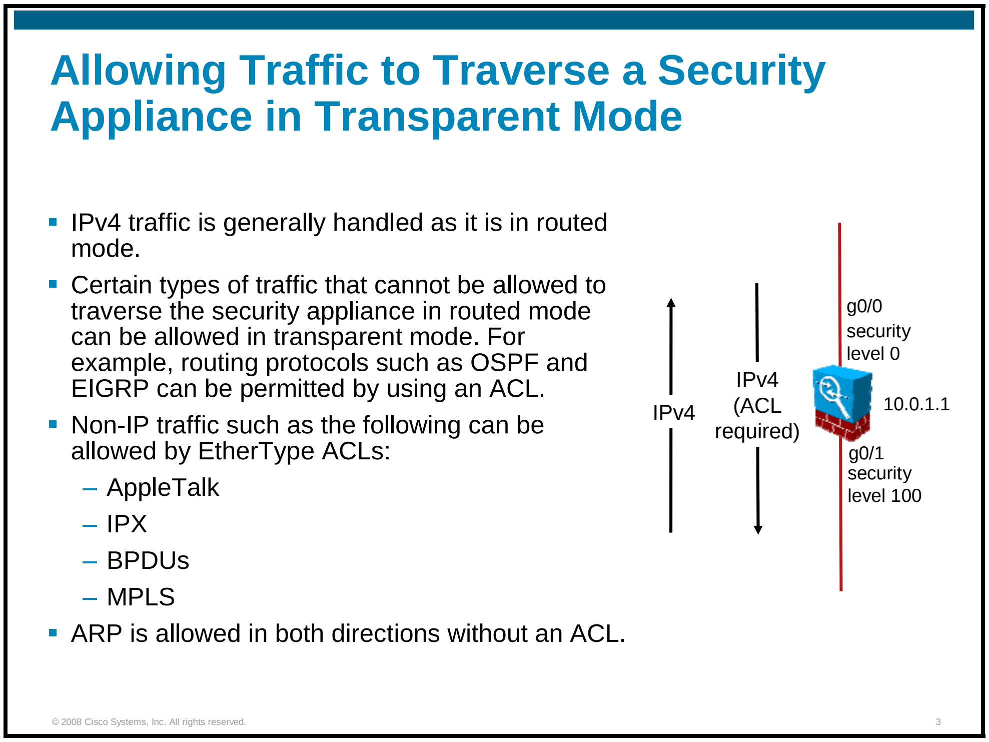
Transparent Mode

- Easily integrated and maintained in the existing network
- No IP routing to troubleshoot
- Supports only two data interfaces
- Requires only one IP address
- Bridges packets from one VLAN to the other
- Performs MAC lookups instead of routing table lookups
- Can pass traffic that cannot be passed by a security appliance in routed mode

10.0.1.0
VLAN 200
g0/0
Layer 2 Device
Bridging
Management IP
address: 10.0.1.1
g0/1
10.0.1.0
VLAN 100

A security appliance in transparent mode is easily integrated and maintained in the existing network because IP readdressing is not necessary and there is no IP routing to troubleshoot. However, before implementing transparent mode, it is important to fully understand its functionality. A security appliance running in transparent mode and a security appliance running in routed mode both support security levels on the interfaces and can run in either single or multiple context mode; however, a security appliance running in transparent mode differs from the routed mode security appliance in the following ways:

- **Supports only two data interfaces:** The transparent security appliance uses an inside interface and an outside interface only. If your platform includes a dedicated management interface, you can also configure the management interface or subinterface for management traffic only.
- **Requires only one IP address:** Unlike routed mode, which requires an IP address for each interface, a transparent firewall has an IP address assigned to the entire device.
- **Bridges packets from one interface/VLAN to the other:** Instead of routing packets from one interface/VLAN to another, the security appliance running in transparent mode bridges them.
- **Performs MAC address lookups instead of routing table lookups:** When the security appliance runs in transparent mode without Network Address Translation (NAT), the outgoing interface of a packet is determined by performing a MAC address lookup instead of a route lookup. Route statements can still be configured, but they only apply to security appliance-originated traffic. For example, if your syslog server is located on a remote network, you must use a static route so the security appliance can reach the remote network.
- **Can pass traffic that cannot be passed by a security appliance in routed mode:** Certain types of traffic that cannot be allowed to traverse the security appliance in routed mode can be allowed in transparent mode.



Allowing Traffic to Traverse a Security Appliance in Transparent Mode

- IPv4 traffic is generally handled as it is in routed mode.
- Certain types of traffic that cannot be allowed to traverse the security appliance in routed mode can be allowed in transparent mode. For example, routing protocols such as OSPF and EIGRP can be permitted by using an ACL.
- Non-IP traffic such as the following can be allowed by EtherType ACLs:
  - AppleTalk
  - IPX
  - BPDUs
  - MPLS
- ARP is allowed in both directions without an ACL.

Like routed mode, transparent mode supports security levels on the interfaces. IP version 4 (IPv4) traffic is allowed through and inspected by the transparent mode security appliance from a higher security interface to a lower security interface without an access control list (ACL); for layer 3 traffic traveling from a lower security interface to a higher security interface, an extended ACL is required.

However, certain types of traffic that cannot be allowed to traverse the security appliance in routed mode can be allowed in transparent mode. In routed mode, some types of traffic cannot pass through the security appliance even if you allow it in an ACL. The transparent firewall, on the other hand, can allow almost any traffic through using either an extended ACL or an ethertype ACL. The security appliance can inspect IP packets only; no inspection is possible for non-IP ethertypes. However, from a bridging perspective, the security appliance can bridge non-IP packets from one interface to another.

For example, you can establish routing protocol adjacencies through a transparent firewall; you can allow Open Shortest Path First (OSPF) or Enhanced Interior Gateway Routing Protocol (EIGRP) traffic through based on an extended ACL. For EIGRP and OSPF, since they have their own protocol number and don’t use TCP or User Datagram Protocol (UDP) at the transport layer, they are treated as stateless protocols like Encapsulating Security Payload (ESP) and (Generic Routing Encapsulation (GRE). Likewise, protocols like Hot Standby Router Protocol (HSRP) or Virtual Router Redundancy Protocol (VRRP) can pass through the security appliance. Ethertype ACLs enable you to allow traffic that is not IP traffic, such as AppleTalk, (Internetwork Packet Exchange) IPX, bridge protocol data units (BPDUs), and Multiprotocol Label Switching (MPLS) through the security appliance. The ACL should be applied to both inbound and outbound interfaces in the “in” direction to allow bidirectional traffic flow.

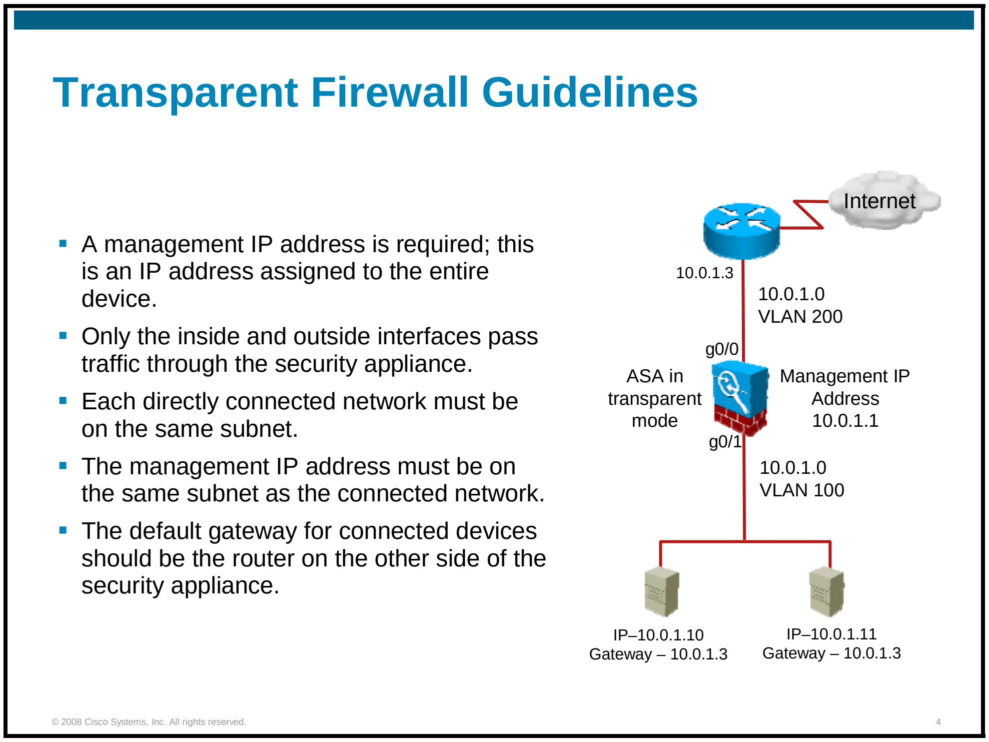
Address Resolution Protocol (ARP) packets are allowed through the transparent firewall in both directions without an access list. You can control the flow of ARP packets by optionally enabling ARP inspection.

For features that are not directly supported on the transparent firewall, you can allow traffic to pass through so that upstream and downstream routers can support the functionality. For example, by using an extended ACL, you can allow DHCP traffic (instead of the unsupported DHCP relay feature) or multicast traffic such as that created by IP/TV.

The following destination MAC addresses are allowed through the transparent firewall. Any MAC address not on this list is dropped.

- True broadcast destination MAC address equal to FFFF.FFFF.FFFF
- IPv4 multicast MAC addresses from 0100.5E00.0000 to 0100.5EFE.FFFF
- IP version 6 (IPv6) multicast MAC addresses from 3333.0000.0000 to 3333.FFFF.FFFF
- Cisco Shared Spanning Tree (SSTP) BPDU multicast MAC address 0100.0CCC.CCCD
- Appletalk multicast MAC addresses from 0900.0700.0000 to 0900.07FF.FFFF

The transparent mode security appliance does not pass Cisco Discovery Protocol packets, IPv6 packets, or any packets that do not have a valid ethertype greater than or equal to 0x600. For example, you cannot pass Intermediate System-to-Intermediate System (IS-IS) packets. An exception is made for BPDUs, which are supported.

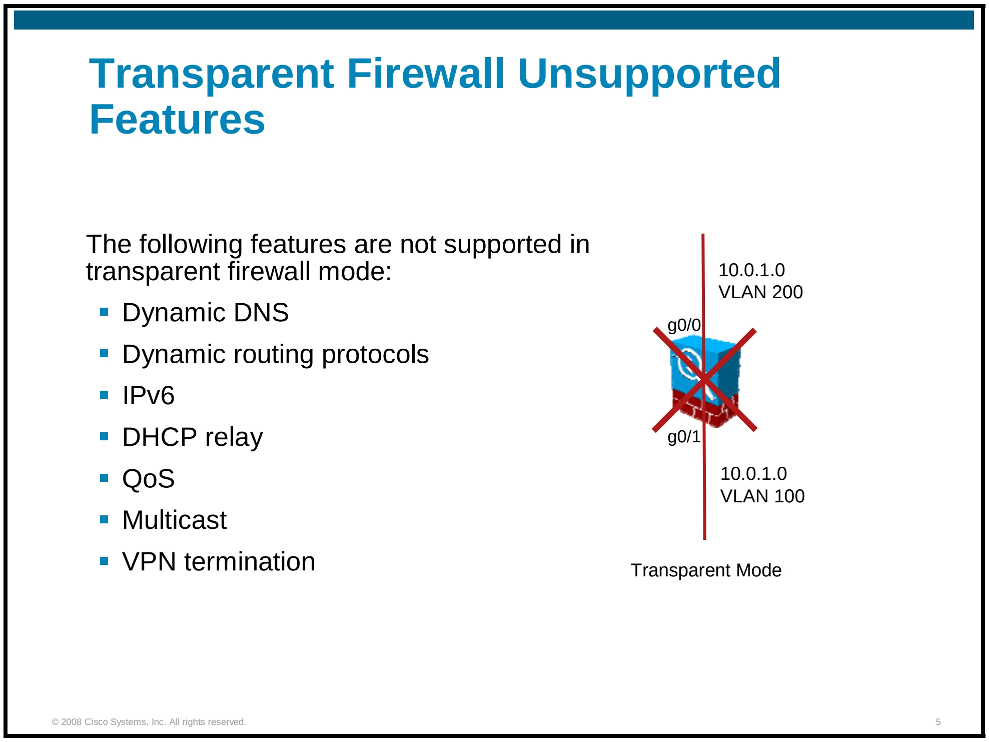


Transparent Firewall Guidelines

- A management IP address is required; this is an IP address assigned to the entire device.
- Only the inside and outside interfaces pass traffic through the security appliance.
- Each directly connected network must be on the same subnet.
- The management IP address must be on the same subnet as the connected network.
- The default gateway for connected devices should be the router on the other side of the security appliance.

Follow these guidelines when planning your transparent firewall network:

- A management IP address is required; for multiple context mode, an IP address is required for each context. Unlike routed mode, which requires an IP address for each interface, a transparent firewall has an IP address assigned to the entire device. The security appliance uses this IP address as the source address for packets originating on the security appliance, such as system messages or authentication, authorization, and accounting (AAA) communications. The management IP address must be on the same subnet as the connected network. You can configure an IP address for the Management 0/0 management-only interface. This IP address can be on a separate subnet from the main management IP address.
- The transparent security appliance uses an inside interface and an outside interface only. If your platform includes a dedicated management interface, you can also configure the management interface or subinterface for management traffic only. In single context mode, you can only use two data interfaces (and the dedicated management interface, if available) even if your security appliance includes more than two interfaces.
- Each directly connected network must be on the same subnet.
- Do not specify the security appliance management IP address as the default gateway for connected devices; devices need to specify the router on the other side of the security appliance as the default gateway.
- For multiple context mode, each context must use different interfaces; you cannot share an interface across contexts like you can in routed mode.
- For multiple context mode, each context typically uses a different subnet. You can use overlapping subnets, but your network topology requires router and NAT configuration to make it possible from a routing standpoint.



Transparent Firewall Unsupported Features

The following features are not supported in transparent firewall mode:

- Dynamic DNS
- Dynamic routing protocols
- IPv6
- DHCP relay
- QoS
- Multicast
- VPN termination

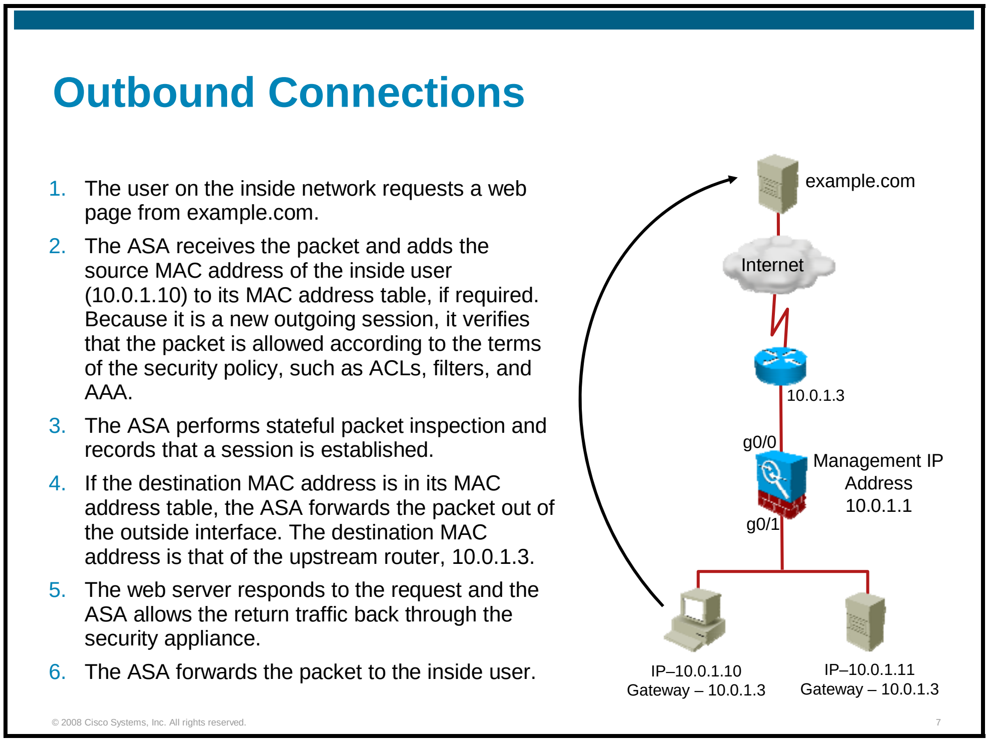
10.0.1.0
VLAN 200
g0/0
g0/1
10.0.1.0
VLAN 100
Transparent Mode

The following features are not supported in transparent mode:

- **Dynamic Domain Name System (DNS)**
- **Dynamic routing protocols:** The security appliance in transparent firewall mode will not be able to run any dynamic routing protocols. You can, however, add static routes for traffic originating on the security appliance. You can also allow dynamic routing protocols through the security appliance using an extended ACL so routers on each side of the transparent firewall can establish routing adjacency.
- **IPv6**
- **DHCP relay:** The transparent firewall can act as a DHCP server, but it does not support the DHCP relay commands. DHCP relay is not required because you can allow DHCP traffic to pass through using an extended ACL.
- **Quality of service (QoS)**
- **Multicast:** You can, however, allow multicast traffic through the security appliance by allowing it in an extended ACL.
- **Virtual private network (VPN) termination:** The transparent firewall supports site-to-site VPN tunnels for management connections only. It does not terminate VPN connections for traffic through the security appliance. You can pass VPN traffic through the security appliance using an extended ACL, but it does not terminate nonmanagement connections.

How Data Traverses a Security Appliance in Transparent Mode

This topic describes how data traverses a transparent mode security appliance in the inbound and outbound directions, with and without NAT.



Outbound Connections

1. The user on the inside network requests a web page from example.com.
2. The ASA receives the packet and adds the source MAC address of the inside user (10.0.1.10) to its MAC address table, if required. Because it is a new outgoing session, it verifies that the packet is allowed according to the terms of the security policy, such as ACLs, filters, and AAA.
3. The ASA performs stateful packet inspection and records that a session is established.
4. If the destination MAC address is in its MAC address table, the ASA forwards the packet out of the outside interface. The destination MAC address is that of the upstream router, 10.0.1.3.
5. The web server responds to the request and the ASA allows the return traffic back through the security appliance.
6. The ASA forwards the packet to the inside user.

The figure shows a typical transparent firewall implementation without NAT.

The following steps describe how data moves through the Cisco ASA security appliance when a user on the inside network visits an Internet web server:

Step 1 The user on the inside network requests a web page from example.com.

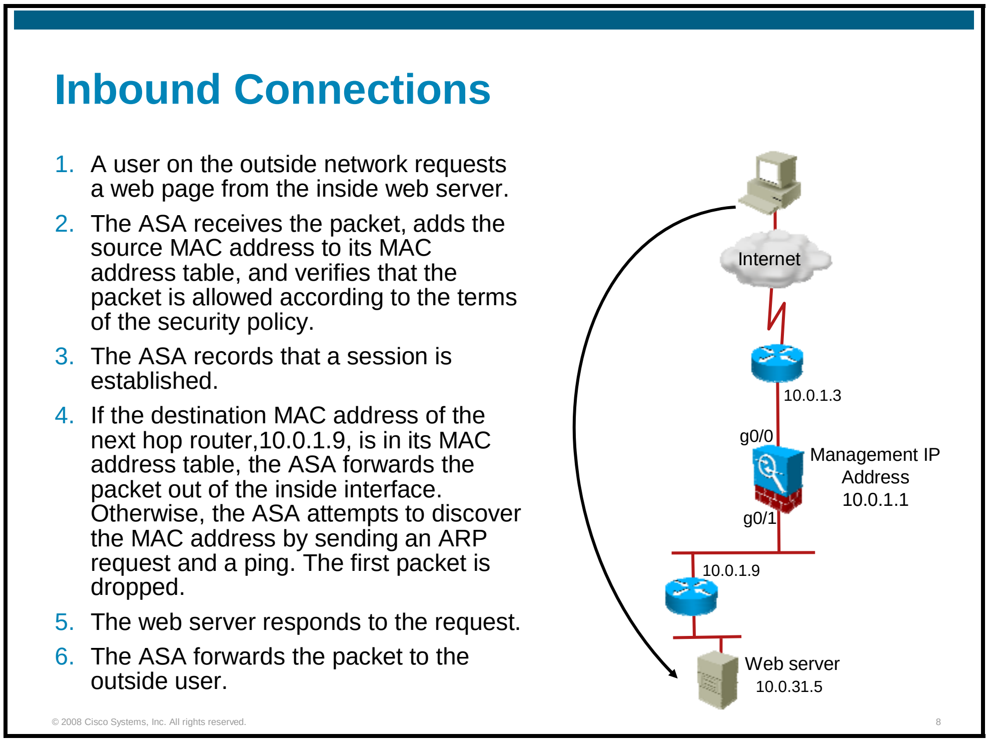
Step 2 The Cisco ASA security appliance receives the packet and adds the source MAC address of the inside user (10.0.1.10) to its MAC address table, if required. Because it is a new outgoing session, it verifies that the packet is allowed according to the terms of the security policy, such as ACLs, filters, and AAA.

Step 3 The Cisco ASA security appliance performs stateful packet inspection and records this session in its connection table.

Step 4 If the destination MAC address is in its MAC address table, the ASA forwards the packet out of the outside interface. The destination MAC address is that of the upstream router, 10.0.1.3. If the destination MAC address is not in the MAC address table, the ASA attempts to discover the MAC address by sending an ARP request.

Step 5 The web server responds to the request and the Cisco ASA security appliance allows the return traffic back through the security appliance.

Step 6 The ASA forwards the packet to the inside user.



Inbound Connections

1. A user on the outside network requests a web page from the inside web server.
2. The ASA receives the packet, adds the source MAC address to its MAC address table, and verifies that the packet is allowed according to the terms of the security policy.
3. The ASA records that a session is established.
4. If the destination MAC address of the next hop router,10.0.1.9, is in its MAC address table, the ASA forwards the packet out of the inside interface. Otherwise, the ASA attempts to discover the MAC address by sending an ARP request and a ping. The first packet is dropped.
5. The web server responds to the request.
6. The ASA forwards the packet to the outside user.

The following steps describe how data moves through the security appliance when an outside user visits the web server on the internal network:

Step 1 A user on the outside network requests a web page from the inside web server.

Step 2 The Cisco ASA security appliance receives the packet and adds the source MAC address to the MAC address table, if required. Because it is a new session, the Cisco ASA security appliance verifies that the packet is allowed according to the terms of the security policy, such as ACLs, filters, and AAA. In this example, the packet is allowed by an ACL on the outside interface. The ACL permits outside users to access only the web server on the inside network.

Step 3 The Cisco ASA security appliance performs stateful packet inspection and records this session in its connection table.

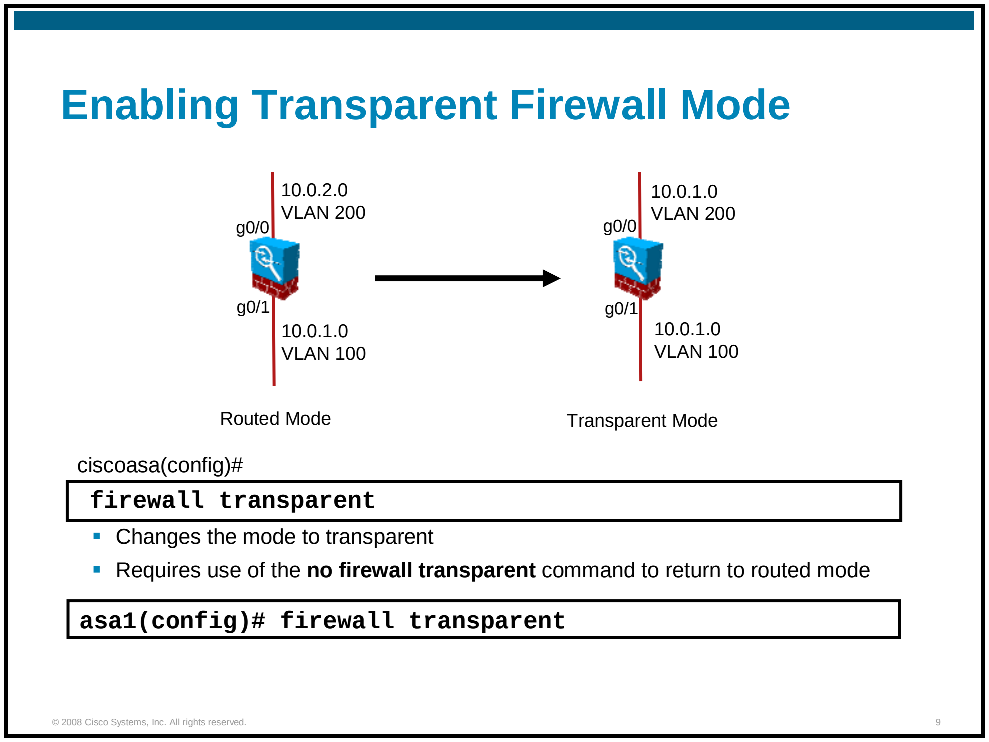
Step 4 If the destination MAC address of the next-hop router (10.0.1.9) is in its MAC address table, the Cisco ASA security appliance forwards the packet out of the inside interface. Otherwise, the Cisco ASA security appliance attempts to discover the MAC address by sending an ARP request.

Step 5 The web server responds to the request and the Cisco ASA security appliance allows the return traffic back through the security appliance.

Step 6 The Cisco ASA security appliance forwards the packet to the outside user.

Configuring Transparent Firewall Mode

This topic explains how to configure a security appliance for transparent mode.



Enabling Transparent Firewall Mode

g0/0

10.0.2.0
VLAN 200

g0/1

10.0.1.0
VLAN 100

Routed Mode

g0/0

10.0.1.0
VLAN 200

g0/1

10.0.1.0
VLAN 100

Transparent Mode

ciscoasa(config)#

```
firewall transparent
```

- Changes the mode to transparent
- Requires use of the **no firewall transparent** command to return to routed mode

```
asa1(config)# firewall transparent
```

To set the firewall mode to transparent mode, use the **firewall transparent** command in global configuration mode. To restore routed mode, use the **no** form of this command.

For multiple context mode, you can use only one firewall mode for all contexts. You must set the mode in the system configuration. This command also appears in each context configuration for informational purposes only; you cannot enter this command in a context.

When you change modes, the security appliance clears the configuration because many commands are not supported for both modes.

Note	If you already have a populated configuration, be sure to back up your configuration before changing the mode; you can use this backup for reference when creating your new configuration.

If you download a text configuration to the security appliance that changes the mode with the **firewall transparent** command, be sure to put the command at the top of the configuration; the security appliance changes the mode as soon as it reads the command, and then continues reading the configuration you downloaded. If the command is later in the configuration, the security appliance clears all the preceding lines in the configuration.

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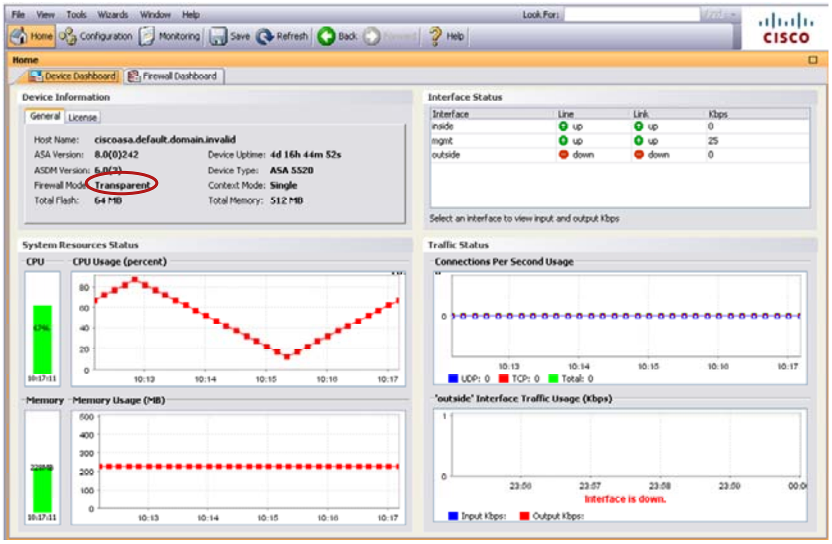
Verifying Transparent Mode



Host Name: ciscoasa.default.domain.invalid
ASA Version: 8.0(0)242
ASDM Version: 6.0(3)
Firewall Mode: Transparent
Total Flash: 64 MB
Device Uptime: 4d 16h 44m 52s
Device Type: ASA 5520
Context Mode: Single
Total Memory: 512 MB

Interface	Line	Link	Kbps
inside	● up	● up	0
mgmt	● up	● up	25
outside	● down	● down	0

Select an interface to view input and output Kbps

Interface is down.

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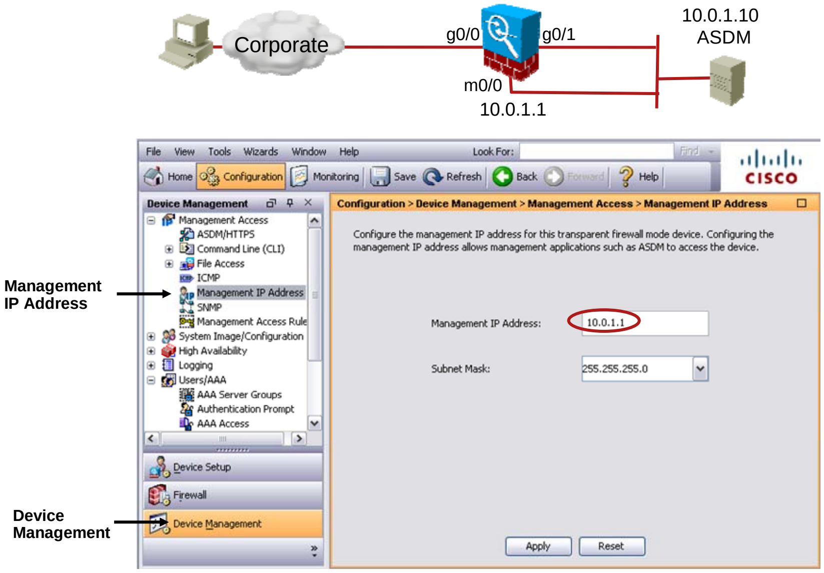
In Cisco Adaptive Security Device Manager (Cisco ASDM), you can verify the security appliance transparent mode on the General tab of the Device Dashboard. Firewall mode changes from “Routed” to “Transparent.”

Assigning the Management IP Address



Configuration > Device Management > Management Access > Management IP Address

Configure the management IP address for this transparent firewall mode device. Configuring the management IP address allows management applications such as ASDM to access the device.

Management IP Address: 10.0.1.1

Subnet Mask: 255.255.255.0

A transparent firewall does not participate in IP routing. The only IP configuration that is required for the security appliance is to set the management IP address. This address is required because the security appliance uses this address as the source address for traffic originating on the security appliance, such as system messages and communications with authentication, authorization, and accounting (AAA) servers. You can also use this address for remote management access. This address must be on the same subnet as the upstream and downstream routers and must be IPv4; the transparent firewall does not support IPv6. For multiple context mode, set the management IP address within each context.

Step 1 Click the **Configuration** button in the Cisco ASDM toolbar.

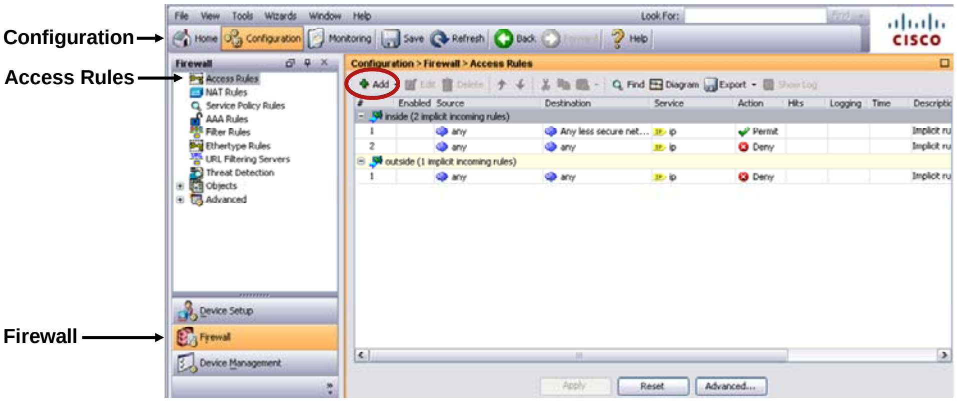
Step 2 Choose **Device Management** from the navigation pane.

Step 3 Expand the **Management Access** menu.

Step 4 Choose **Management IP Address** from the Device Management menu. The Management IP Address panel is displayed. Configure the management IP address and subnet mask.

Step 5 Click **Apply**.

Configuring ACLs in Transparent Mode



#	Enabled	Source	Destination	Service	Action	Hits	Logging	Time	Descriptic
inside (2 implicit incoming rules)									
1		any	Any less secure net...	ip	✓ Permit				Implicit ru
2		any	any	ip	Deny				Implicit ru
outside (1 implicit incoming rules)									
1		any	any	ip	Deny				Implicit ru

Security levels are supported in transparent mode; therefore, traffic from a higher security level interface to a lower security level interface will pass without an ACL, just as it does in routed mode.

Although the options available in Cisco ASDM for a security appliance running in transparent mode differ from options available in routed mode, creating an ACL in transparent mode is exactly like creating an ACL in routed mode. To create an ACL in transparent firewall mode, complete the following steps:

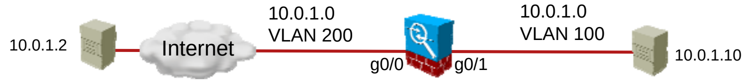
Step 6 Click the **Configuration** button in the Cisco ASDM toolbar.

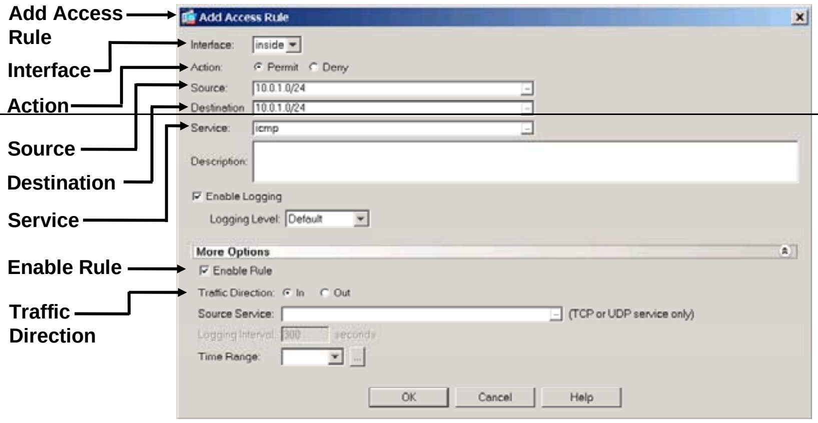
Step 7 Choose **Firewall** from the navigation pane.

Step 8 Choose **Access Rules** from the Firewall menu. The Access Rules panel is displayed.

Step 9 Click **Add**. The Add Access Rule window opens.

Configuring ACLs in Transparent Mode (Cont.)




Add Access Rule

Interface

Action

Source

Destination

Service

Enable Rule

Traffic Direction

Interface: inside

Action: ● Permit ○ Deny

Source: 10.0.1.0/24

Destination: 10.0.1.0/24

Service: icmp

Description:

☑ Enable Logging

Logging Level: Default

☑ Enable Rule

Traffic Direction: ● In ○ Out

Source Service: (TCP or UDP service only)

Logging Interval: 300 seconds

Time Range:

- The source and destination network are the same.

Step 10 Choose the interface to which you want to apply the access rule from the **Interface** drop-down list. In the figure, inside is chosen; an access rule is being created to permit ICMP on the inside interface. For ICMP to pass through the security appliance, you must create another access rule identical to this one for the outside interface. Because the security appliance allows all returning traffic for established bidirectional connections, you do not need an ACL to allow returning traffic for TCP and UDP connections in either routed or transparent mode. However, for connectionless protocols such as ICMP, the security appliance establishes unidirectional sessions, so you need to apply ACLs that allow ICMP to both the source and destination interfaces. Otherwise, you need to enable the ICMP inspection engine; the ICMP inspection engine treats ICMP sessions as bidirectional connections.

Step 11 Verify that the **Permit** radio button is selected.

Step 12 In the **Source** field, enter the IP address from which traffic is permitted or denied. You can also click the **...** button to choose an address from a predefined list. To specify a host address, you can enter /32 for the subnet mask, or you can enter the IP address without a subnet mask. To specify a network address, enter the subnet mask in slash notation after the IP address. For example, to specify the network 192.168.1.0 255.255.255.0, enter 192.168.1.0/24. In the figure, 10.0.1.0/24 is entered.

Step 13 In the **Destination** field, specify the IP address to which traffic is permitted or denied. You can also click the ... button to choose an address from a predefined list. To specify a host address, you can enter /32 for the subnet mask, or you can enter the IP address without a subnet mask. To specify a network address, enter the subnet mask in slash notation after the IP address. In this transparent firewall example, the destination network address is the same as the source address, 10.0.1.0/24.

Step 14 Specify the service or protocol for the rule in the **Service** field. You can also click the ... button to choose a service from a predefined list. In the figure, icmp is entered.

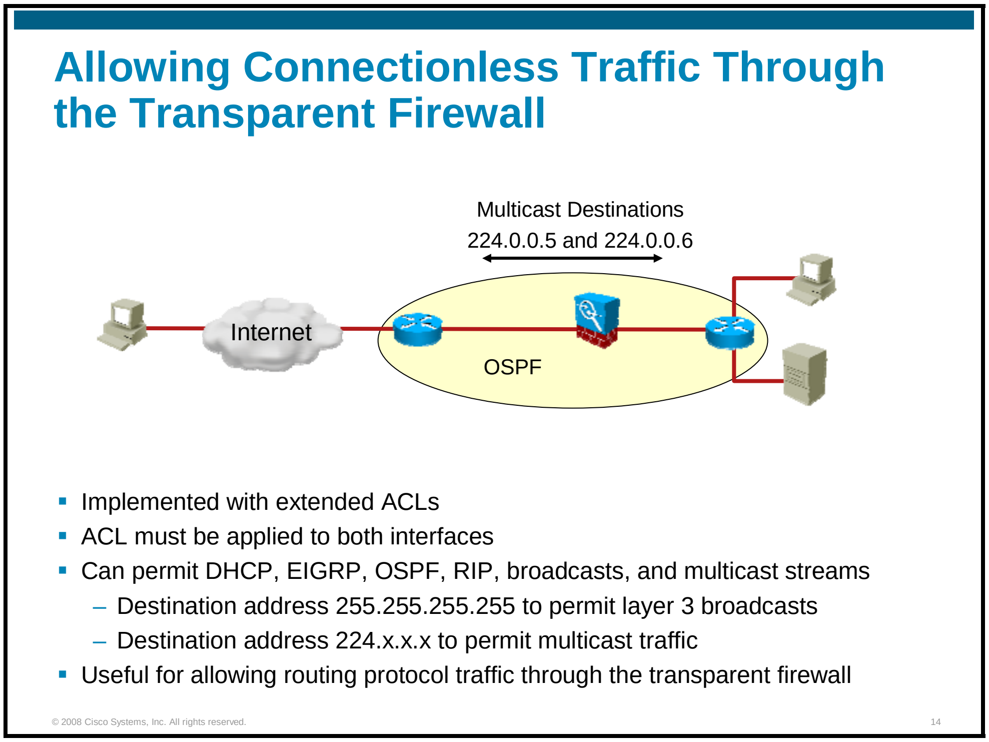
Step 15 Click the **More Options** double arrow to configure additional settings for the rule.

Step 16 Verify that the **Enable Rule** check box is checked.

Step 17 Choose the **In** or **Out** radio button from the **Traffic Direction** area to specify the direction of traffic to which the rule should be applied. The rule is applied to traffic on an interface in the direction you specify, inbound or outbound. You can apply only one access list to each direction of an interface. In the figure, the In radio button is chosen.

Step 18 Click **OK**.

Step 19 Click **Apply** in the Access Rules panel.



Allowing Connectionless Traffic Through the Transparent Firewall

- Implemented with extended ACLs
- ACL must be applied to both interfaces
- Can permit DHCP, EIGRP, OSPF, RIP, broadcasts, and multicast streams
  - Destination address 255.255.255.255 to permit layer 3 broadcasts
  - Destination address 224.x.x.x to permit multicast traffic
- Useful for allowing routing protocol traffic through the transparent firewall

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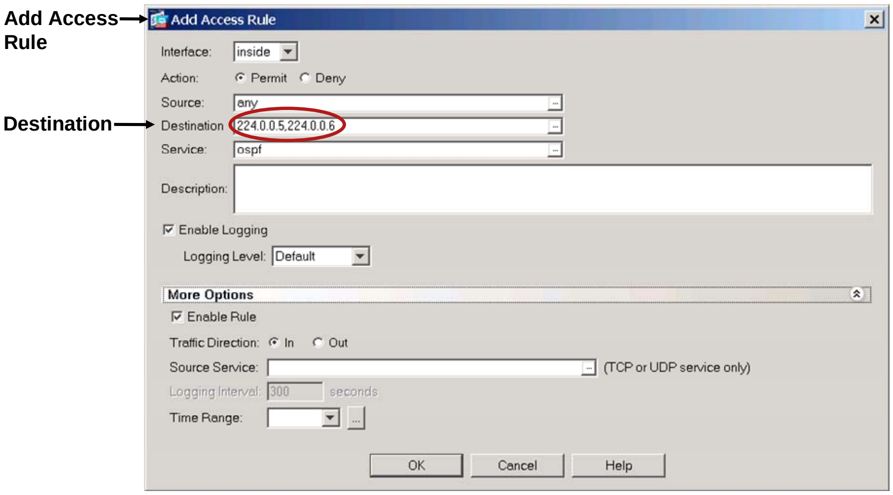
With the security appliance in transparent mode, you can allow almost any traffic to traverse the security appliance using ACL. The following table lists common traffic types that you can allow through the transparent firewall:

Traffic Type	Protocol or Port	Notes
DHCP	UDP ports 67 and 68	If you enable the DHCP server, the security appliance does not pass DHCP packets.
EIGRP	Protocol 88	—
OSPF	Protocol 89	—
Multicast streams	The UDP ports vary depending on the application.	Multicast streams are always destined to a Class D address (224.0.0.0 to 239.x.x.x).
RIP (v1 or v2)	UDP port 520	—

You can configure extended ACLs to permit these traffic types that are to be bridged (but not inspected) through the security appliance. You need to apply the extended ACL to both interfaces so traffic will be permitted in both directions.

To permit Layer 3 broadcast or multicast packets through the security appliance, configure an ACL with a Layer 3 destination address of 255.255.255.255 for broadcast or 224.x.x.x for multicast. This step is needed to allow routing protocol traffic such as OSPF and RIP to pass through the transparent firewall. For example, to allow the upstream and downstream routers to form OSPF neighbor adjacency through the Cisco ASA in transparent mode, apply an extended ACL on both the inside and outside interface to permit OSPF traffic that is destined to the multicast addresses 224.0.0.5 and 224.0.0.6.

Permitting Multicast and Broadcast Traffic


Add Access Rule

Destination

Add Access Rule

Interface: inside

Action: ● Permit ○ Deny

Source: any

Destination: 224.0.0.5,224.0.0.6

Service: ospf

Description:

☑ Enable Logging

Logging Level: Default

More Options

☑ Enable Rule

Traffic Direction: ● In ○ Out

Source Service: (TCP or UDP service only)

Logging Interval: 300 seconds

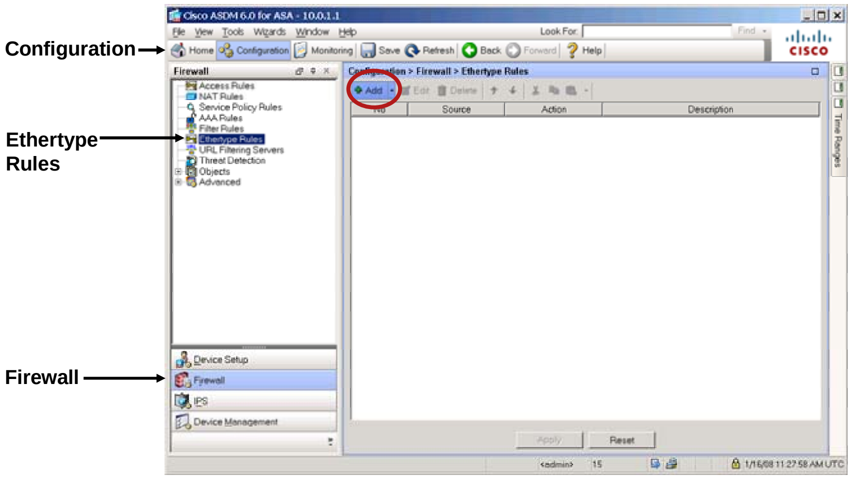
Time Range:

- Permits OSPF traffic with multicast address 224.0.0.5 or 224.0.0.6 through the transparent firewall.

The figure shows an example of allowing OSPF traffic with the multicast address 224.0.0.5 or 224.0.0.6 through the transparent firewall on the inside interface. An extended ACL (access rule in Cisco ASDM) is configured in the “in” direction for the inside interface to permit OSPF traffic from any source that is destined to the multicast destination addresses for OSPF.

A similar ACL is also needed on the outside interface.

Configuring Ethertype ACLs



- Ethertype Rules (ACLs) can allow specific non-IP packets through a transparent firewall.

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The Cisco ASA security appliance can allow traffic that is not IP traffic by using ethertype ACLs. Ethertype is identified by a 16-bit hexadecimal number or a keyword. Ethertype ACL configuration is only available when the Cisco ASA security appliance is in transparent mode.

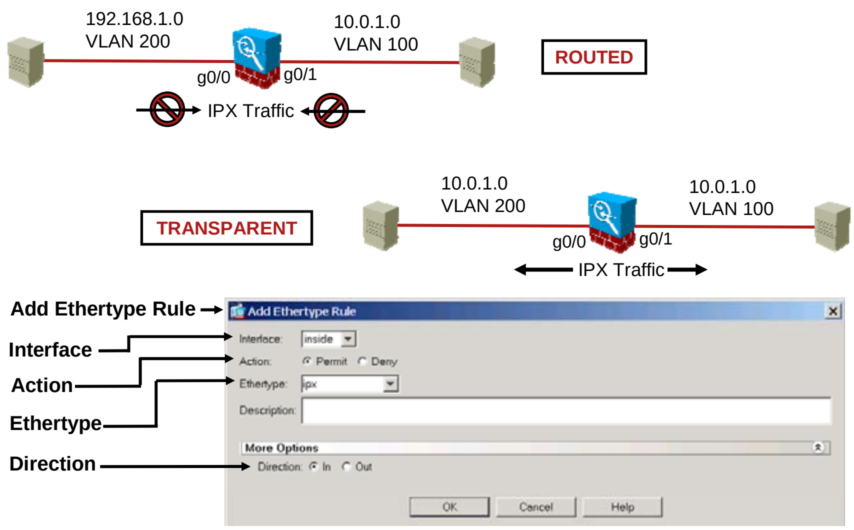
To configure an ACL that controls traffic that is based on its ethertype, complete the following steps:

Step 1 Click the **Configuration** button in the Cisco ASDM toolbar.

Step 2 Choose **Firewall** from the navigation pane.

Step 3 Choose **Ethertype Rules** from the Firewall menu. The Ethertype Rules panel is displayed.

Configuring Ethertype ACLs (Cont.)



Add Ethertype Rule

Interface: inside

Action: ● Permit ○ Deny

Ethertype: ipx

Description:

More Options

Direction: ● In ○ Out

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Step 4 From the **Interface** drop-down list, choose the interface on which you want to apply the ethertype rule. In the figure, inside is chosen; an access rule is being created to permit IPX on the inside interface.

You need to apply ethertype rules to both interfaces if you want traffic to pass in both directions. To allow IPX through the security appliance, create another access rule identical to this one for the outside interface.

Step 5 Verify that the **Permit** radio button is selected.

Step 6 Use the **Ethertype** field or drop-down list to perform one of the following actions:

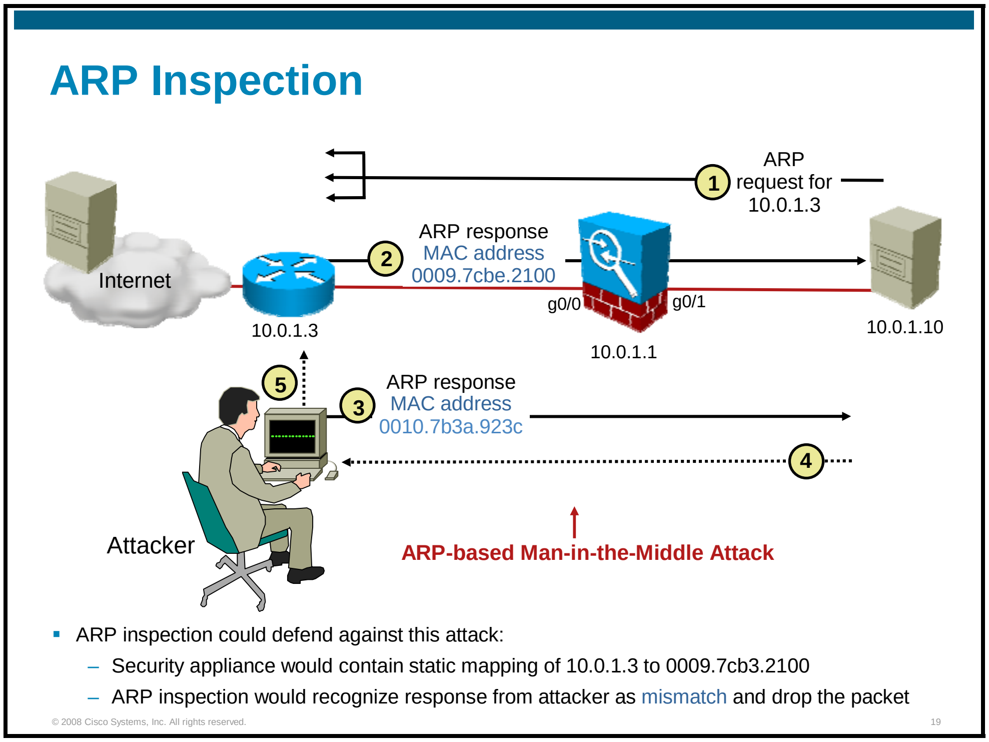
- Choose one of the following predefined ethertypes from the drop-down list: (In the figure, IPX is chosen.)
  - — BPDU
  - — IPX
  - — MPLS-multicast
  - — MPLS-unicast
- Choose **any** from the drop-down list to specify any value between 0x600 and 0xffff.
- Enter in the field a 16-bit hexadecimal number greater than or equal to 0x600, by which an ethertype can be identified.

Step 7 Optionally, enter a description for the ethertype rule in the **Description** field.

Step 8 Choose one of the Direction radio buttons, **In** or **Out**. In the figure, In is chosen.

Step 9 Click **OK**.

Step 10 Click **Apply** in the Ethertype Rules panel.



ARP Inspection

- ARP inspection could defend against this attack:
  - Security appliance would contain static mapping of 10.0.1.3 to 0009.7cb3.2100
  - ARP inspection would recognize response from attacker as mismatch and drop the packet

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ARP packets are allowed through the transparent firewall in both directions without an access list. You can control the flow of ARP packets by optionally enabling ARP inspection.

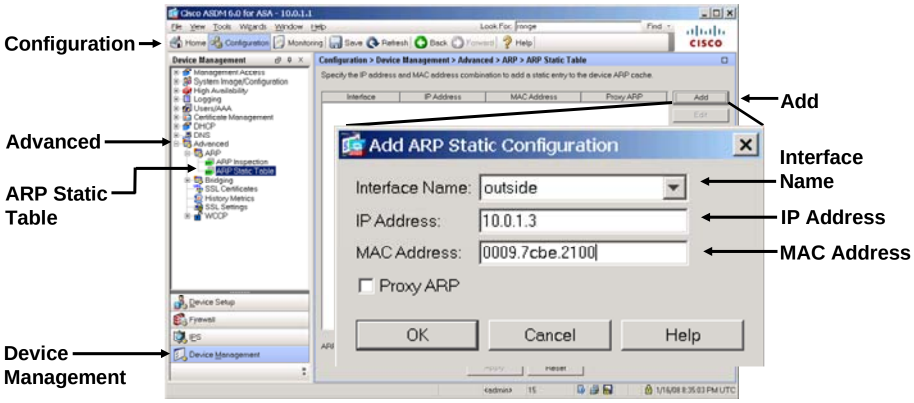
ARP inspection prevents malicious users from impersonating other hosts or routers, which is known as ARP spoofing. ARP spoofing can enable a "man-in-the-middle" attack. For example, a host sends an ARP request to the gateway router; the gateway router responds with the gateway router MAC address. The attacker, however, sends another ARP response to the host with the attacker MAC address instead of the router MAC address. The attacker can now intercept all the host traffic and copy the packets for later analysis before forwarding them on to the router. The attacker can similarly poison the ARP entry for the client PC in the default gateway ARP table, to similarly route returning traffic via itself, so that all traffic to and from the client PC can then be monitored and analyzed. This allows the attacker to easily read two-way traffic such as e-mails and file transfers. As in the other man-in-the-middle attack, this is completely transparent and unlikely to be detected by either the client or the network side.

ARP inspection ensures that an attacker cannot send an ARP response with the attacker MAC address, so long as the correct MAC address and the associated IP address are in the static ARP table of the Cisco ASA security appliance.

Configure static ARP entries before you enable ARP inspection. When you enable ARP inspection, the security appliance compares the MAC address, IP address, and source interface in all ARP packets to static entries in the ARP table, and takes the following actions:

- If the IP address, MAC address, and source interface match an ARP entry, the packet is passed through.
- If there is a mismatch between the MAC address, the IP address, or the interface, the security appliance drops the packet.
- If the ARP packet does not match any entries in the static ARP table, you can configure the security appliance to either forward the packet out all interfaces (flood), or to drop the packet.

Creating a Static Entry in the ARP Cache



Add ARP Static Configuration

Interface Name: outside

IP Address: 10.0.1.3

MAC Address: 0009.7cbe.2100

□ Proxy ARP

OK Cancel Help

To configure a static ARP entry, complete the following steps:

Step 1 Click the **Configuration** button in the Cisco ASDM toolbar.

Step 2 Choose **Device Management** from the navigation pane.

Step 3 Expand the Advanced menu.

Step 4 Choose **ARP Static Table**. The ARP Static Table panel is displayed.

Step 5 Click **Add**. The Add ARP Static Configuration window opens.

Step 6 Choose the interface that is attached to the host network from the Interface Name drop-down list. In the figure, the outside interface is chosen.

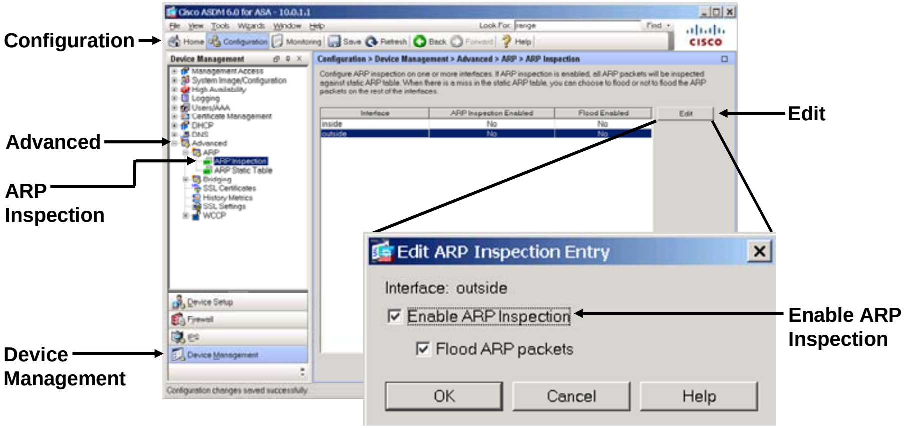
Step 7 Enter the IP address of the host in the IP Address field. In the figure, 10.0.1.3 is entered.

Step 8 Enter the MAC address of the host in the MAC Address field. In the figure, 0009.7cbe.2100 is entered.

Note The Proxy ARP check box applies only to routed mode. If you check it when your security appliance is in transparent mode, the resulting configuration is ignored. In routed mode, checking this box enables proxy ARP for the static entry. If proxy ARP is enabled and the security appliance receives an ARP request for the specified IP address, it responds with the security appliance MAC address. When the security appliance receives traffic that is destined for the host belonging to the IP address, the security appliance forwards the traffic to the host MAC address that you specify in this entry. This configuration is useful if you have devices that do not perform ARP.

Step 9 Click **OK** and then click **Apply** in the ARP Static Table panel.

Enabling ARP Inspection



Configuration

Advanced

ARP Inspection

Device Management

Edit

Enable ARP Inspection

Configuration > Device Management > Advanced > ARP > ARP Inspection

Configure ARP inspection on one or more interfaces. If ARP inspection is enabled, all ARP packets will be inspected against static ARP table. When there is a miss in the static ARP table, you can choose to flood or not to flood the ARP packets on the rest of the interfaces.

Interface	ARP Inspection Enabled	Flood Enabled
inside	No	No
outside	No	No

Edit ARP Inspection Entry

Interface: outside

☑ Enable ARP Inspection

☑ Flood ARP packets

Complete the following steps to enable ARP inspection:

Step 1 Click the **Configuration** button in the Cisco ASDM toolbar.

Step 2 Choose **Device Management** from the navigation pane.

Step 3 Expand the **Advanced** menu.

Step 4 Choose **ARP Inspection**. The ARP Inspection panel is displayed.

Step 5 Select the interface on which you want to enable ARP inspection.

Step 6 Click **Edit**. The Edit ARP Inspection Entry window opens.

Step 7 Check the **Enable ARP Inspection** check box.

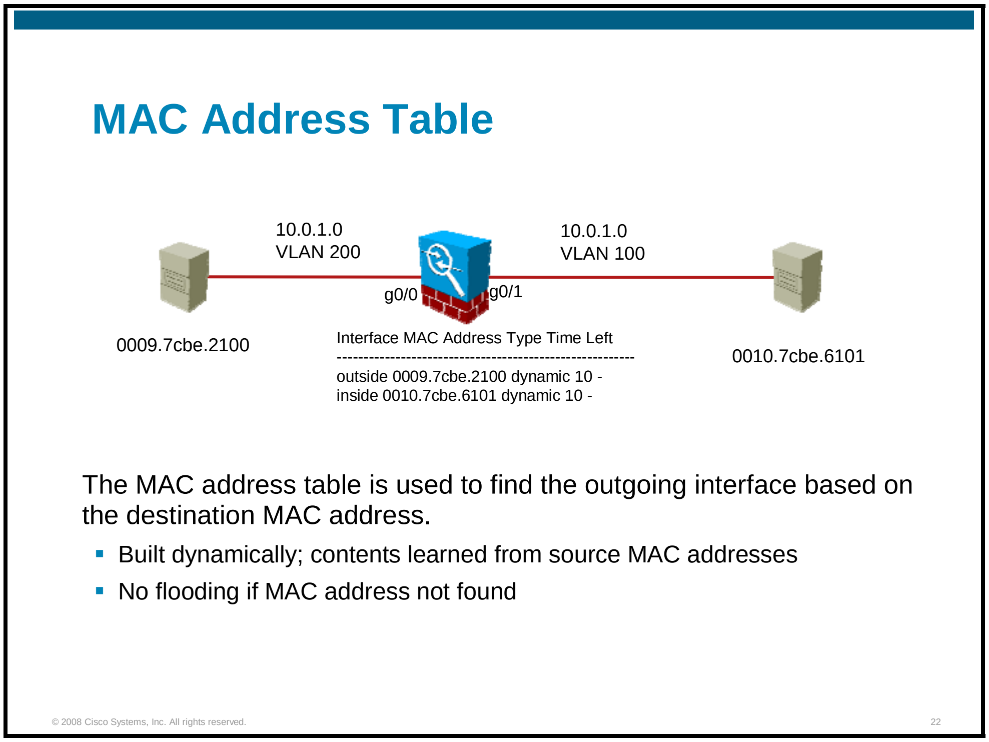
Step 8 (Optional) Check the **Flood ARP Packets** check box. Checking this box specifies that packets that do not match any element of a static ARP entry are flooded out all interfaces except the originating interface. This option is enabled by default and is enabled in the figure.

If there is a mismatch between the MAC address, the IP address, or the interface, the security appliance drops the packet.

Note The management-specific interface, if present, never floods packets even if this parameter is set to “flood.”

Step 9 Click **OK**.

Step 10 Click **Apply** in the ARP Inspection panel.



MAC Address Table

```
Interface MAC Address Type Time Left
-------------------------------------------------------
outside 0009.7cbe.2100 dynamic 10 -
inside 0010.7cbe.6101 dynamic 10 -
```

The MAC address table is used to find the outgoing interface based on the destination MAC address.

- Built dynamically; contents learned from source MAC addresses
- No flooding if MAC address not found

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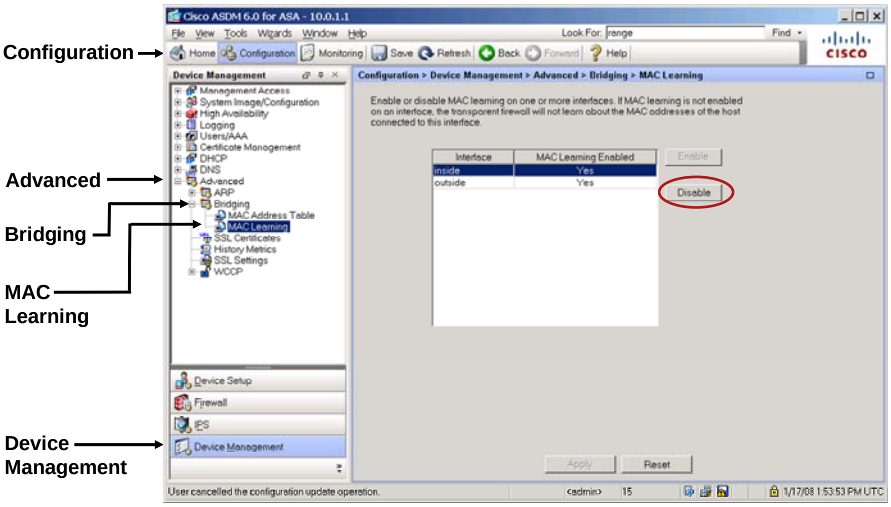
The security appliance learns and builds a MAC address table in a way that is like a normal bridge or switch: When a device sends a packet through the security appliance, the security appliance adds the MAC address to its table. The table associates the MAC address with the source interface so that the security appliance knows to send any packets that are addressed to the device out the correct interface.

Because the security appliance is a firewall, if the destination MAC address of a packet is not in the table, the security appliance does not flood the original packet on all interfaces as a normal bridge does. Instead, it generates the following:

- **Packets for directly connected devices:** The security appliance generates an ARP request for the destination IP address so that the security appliance can learn which interface receives the ARP response.
- **Packets for remote devices:** The security appliance generates a ping to the destination IP address so that the security appliance can learn which interface receives the ping reply.

Disabling MAC Address Learning



Enable or disable MAC learning on one or more interfaces. If MAC learning is not enabled on an interface, the transparent firewall will not learn about the MAC addresses of the host connected to this interface.

Interface	MAC Learning Enabled
inside	Yes
outside	Yes

User cancelled the configuration update operation.

By default, each interface automatically learns the MAC addresses of entering traffic, and the security appliance adds corresponding entries to the MAC address table. You can disable MAC address learning if desired; however, unless you statically add MAC addresses to the table, no traffic can then pass through the security appliance. One benefit to using static MAC address entries is to guard against MAC spoofing.

Complete the following steps to disable MAC address learning:

Step 1 Click the **Configuration** button in the Cisco ASDM toolbar.

Step 2 Choose **Device Management** from the navigation pane.

Step 3 Expand the **Advanced** menu.

Step 4 Expand the **Bridging** menu.

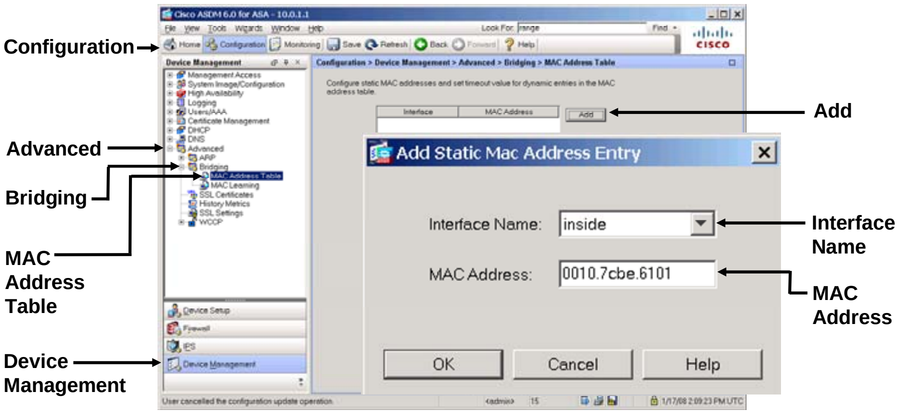
Step 5 Choose **MAC Learning.** The MAC Learning panel is displayed.

Step 6 Select the interface on which you want to disable MAC learning.

Step 7 Click **Disable**.

Step 8 Click **Apply**.

Adding a Static MAC Address



Configuration

Advanced

Bridging

MAC Address Table

Device Management

Add

Interface Name

MAC Address

Add Static Mac Address Entry

Interface Name: inside

MAC Address: 0010.7cbe.6101

Normally, MAC addresses are added to the MAC address table dynamically as traffic from a particular MAC address enters an interface. You can add static MAC addresses to the MAC address table if desired. One benefit to adding static entries is to guard against MAC spoofing. If a client with the same MAC address as a static entry attempts to send traffic to an interface that does not match the static entry, then the security appliance drops the traffic and generates a system message.

Complete the following steps to configure a static MAC address:

Step 1 Click the **Configuration** button in the Cisco ASDM toolbar.

Step 2 Choose **Device Management** from the navigation pane.

Step 3 Expand the **Advanced** menu.

Step 4 Expand the **Bridging** menu.

Step 5 Choose **MAC Address Table**. The MAC Address Table panel is displayed.

Step 6 Click **Add**. The Add Static MAC Address Entry window opens.

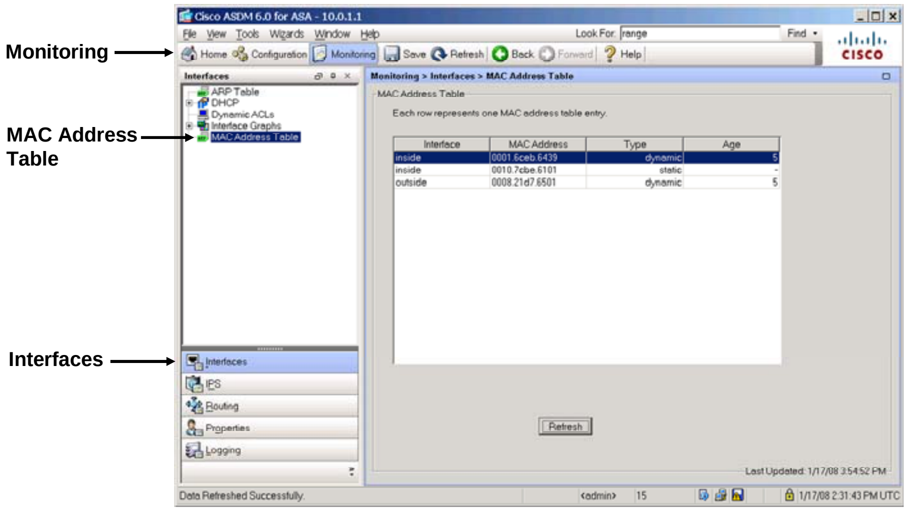
Step 7 Choose the interface for which you want to add the entry from the **Interface Name** drop-down list.

Step 8 Enter the MAC address in the MAC Address field.

Step 9 Click **OK**.

Step 10 Click **Apply** in the MAC Address Table panel.

Viewing the MAC Address Table



Monitoring > Interfaces > MAC Address Table

MAC Address Table

Each row represents one MAC address table entry.

Interface	MAC Address	Type	Age
inside	0001.6ceb.6439	dynamic	5
inside	0010.7cbe.6101	static	-
outside	0008.21d7.6501	dynamic	5

Last Updated: 1/17/08 3:54:52 PM

Data Refreshed Successfully.

Complete the following steps to view the entire MAC address table, including static and dynamic entries for both interfaces:

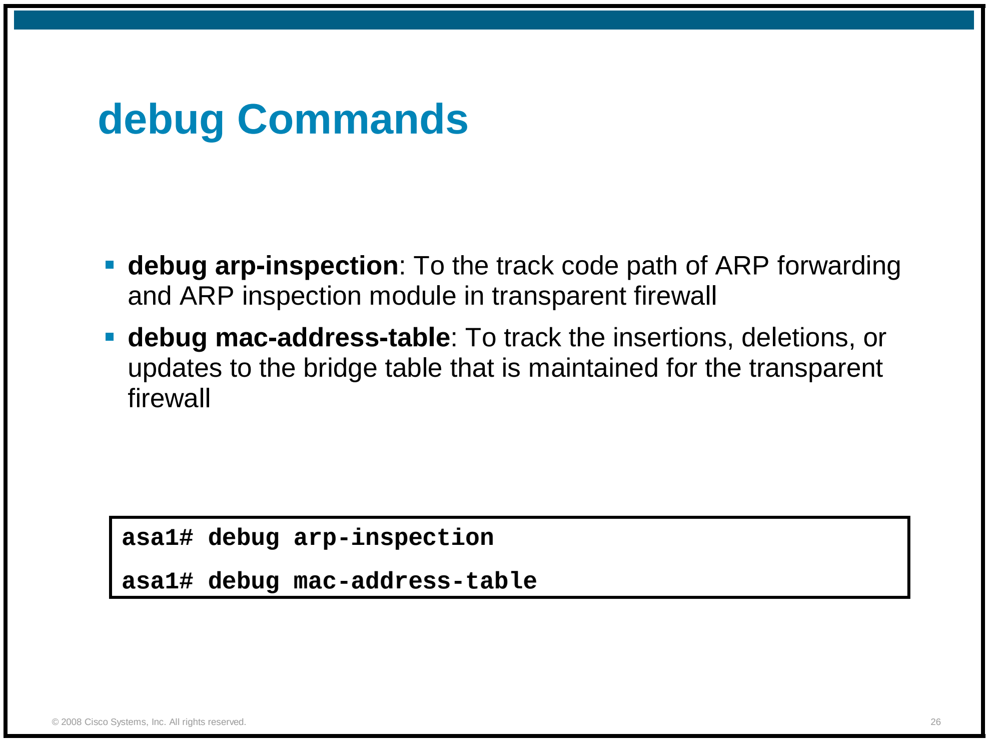
Step 1 Click the **Monitoring** button in the Cisco ASDM toolbar.

Step 2 Choose **Interfaces** from the navigation pane.

Step 3 Choose **MAC Address Table** from the Interfaces menu.

Step 4 Click **Refresh**.

The **show mac-address-table** CLI command can also be used to examine the MAC address table.



debug Commands

- **debug arp-inspection**: To the track code path of ARP forwarding and ARP inspection module in transparent firewall
- **debug mac-address-table**: To track the insertions, deletions, or updates to the bridge table that is maintained for the transparent firewall

```
asa1# debug arp-inspection
asa1# debug mac-address-table
```

The following **debug** commands can be used in transparent mode to debug ARP inspection and the MAC address table:

- **debug arp-inspection:** Shows debug messages for ARP inspection
- **debug mac-address-table:** Shows debug messages for the MAC address table