CHAPTER 5

Managing Multiple Context Mode

This chapter describes how to configure multiple security contexts on the ASA, and includes the following sections:

Information About Security Contexts

You can partition a single ASA into multiple virtual devices, known as security contexts. Each context is an independent device, with its own security policy, interfaces, and administrators. Multiple contexts are similar to having multiple standalone devices. Many features are supported in multiple context mode, including routing tables, firewall features, IPS, and management. Some features are not supported, including VPN and dynamic routing protocols.

Note When the ASA is configured for security contexts (also called firewall multmode) or Active/Active stateful failover, IPSec or SSL VPN cannot be enabled. Therefore, these features are unavailable.

This section provides an overview of security contexts, and includes the following topics:

Common Uses for Security Contexts

You might want to use multiple security contexts in the following situations:

- You are a service provider and want to sell security services to many customers. By enabling multiple security contexts on the ASA, you can implement a cost-effective, space-saving solution that keeps all customer traffic separate and secure, and also eases configuration.
- You are a large enterprise or a college campus and want to keep departments completely separate.
- You are an enterprise that wants to provide distinct security policies to different departments.
- You have any network that requires more than one ASA.

Unsupported Features

Multiple context mode does not support the following features:

- Dynamic routing protocols

  Security contexts support only static routes. You cannot enable OSPF, RIP, or EIGRP in multiple context mode.
- VPN
- Multicast routing. Multicast bridging is supported.
- Threat Detection
- Phone Proxy
- QoS

Context Configuration Files

This section describes how the ASA implements multiple context mode configurations and includes the following sections:

Context Configurations

The ASA includes a configuration for each context that identifies the security policy, interfaces, and almost all the options you can configure on a standalone device. You can store context configurations on the internal Flash memory or the external Flash memory card, or you can download them from a TFTP, FTP, or HTTP(S) server.

System Configuration

The system administrator adds and manages contexts by configuring each context configuration location, allocated interfaces, and other context operating parameters in the system configuration, which, like a single mode configuration, is the startup configuration. The system configuration identifies basic settings for the ASA. The system configuration does not include any network interfaces or network settings for itself; rather, when the system needs to access network resources (such as downloading the contexts from the server), it uses one of the contexts that is designated as the *admin context*. The system configuration does include a specialized failover interface for failover traffic only.

Admin Context Configuration

The admin context is just like any other context, except that when a user logs in to the admin context, then that user has system administrator rights and can access the system and all other contexts. The admin context is not restricted in any way, and can be used as a regular context. However, because logging into the admin context grants you administrator privileges over all contexts, you might need to restrict access to the admin context to appropriate users. The admin context must reside on Flash memory, and not remotely.

If your system is already in multiple context mode, or if you convert from single mode, the admin context is created automatically as a file on the internal Flash memory called admin.cfg. This context is named "admin." If you do not want to use admin.cfg as the admin context, you can change the admin context.

How the Security Appliance Classifies Packets

Each packet that enters the ASA must be classified, so that the ASA can determine to which context to send a packet. This section includes the following topics:

- Valid Classifier Criteria, page 5-3
- Invalid Classifier Criteria, page 5-4
- Classification Examples, page 5-5

Note If the destination MAC address is a multicast or broadcast MAC address, the packet is duplicated and delivered to each context.

Valid Classifier Criteria

This section describes the criteria used by the classifier, and includes the following topics:

- Unique Interfaces, page 5-3
- Unique MAC Addresses, page 5-3
- NAT Configuration, page 5-4

Unique Interfaces

If only one context is associated with the ingress interface, the ASA classifies the packet into that context. In transparent firewall mode, unique interfaces for contexts are required, so this method is used to classify packets at all times.

Unique MAC Addresses

If multiple contexts share an interface, then the classifier uses the interface MAC address. The ASA lets you assign a different MAC address in each context to the same shared interface, whether it is a shared physical interface or a shared subinterface. By default, shared interfaces do not have unique MAC addresses; the interface uses the physical interface burned-in MAC address in every context. An upstream router cannot route directly to a context without unique MAC addresses. You can set the MAC addresses manually when you configure each interface (see the "Configuring the MAC Address" section on page 6-26), or you can automatically generate MAC addresses (see the "Automatically Assigning MAC Addresses to Context Interfaces" section on page 5-20).

NAT Configuration

If you do not have unique MAC addresses, then the classifier intercepts the packet and performs a destination IP address lookup. All other fields are ignored; only the destination IP address is used. To use the destination address for classification, the classifier must have knowledge about the subnets located behind each security context. The classifier relies on the NAT configuration to determine the subnets in each context. The classifier matches the destination IP address to either a **static** command or a **global** command. In the case of the **global** command, the classifier does not need a matching **nat** command or an active NAT session to classify the packet. Whether the packet can communicate with the destination IP address after classification depends on how you configure NAT and NAT control.

For example, the classifier gains knowledge about subnets 10.10.10.0, 10.20.10.0 and 10.30.10.0 when the context administrators configure **static** commands in each context:

- Context A:

  ```
  static (inside,shared) 10.10.10.0 10.10.10.0 netmask 255.255.255.0
  ```

- Context B:

  ```
  static (inside,shared) 10.20.10.0 10.20.10.0 netmask 255.255.255.0
  ```

- Context C:

  ```
  static (inside,shared) 10.30.10.0 10.30.10.0 netmask 255.255.255.0
  ```

Note For management traffic destined for an interface, the interface IP address is used for classification.

Invalid Classifier Criteria

The following configurations are not used for packet classification:

- NAT exemption—The classifier does not use a NAT exemption configuration for classification purposes because NAT exemption does not identify a mapped interface.
- Routing table—If a context includes a static route that points to an external router as the next-hop to a subnet, and a different context includes a **static** command for the same subnet, then the classifier uses the **static** command to classify packets destined for that subnet and ignores the static route.

Classification Examples

Figure 5-1 shows multiple contexts sharing an outside interface. The classifier assigns the packet to Context B because Context B includes the MAC address to which the router sends the packet.

Figure 5-1 Packet Classification with a Shared Interface using MAC Addresses

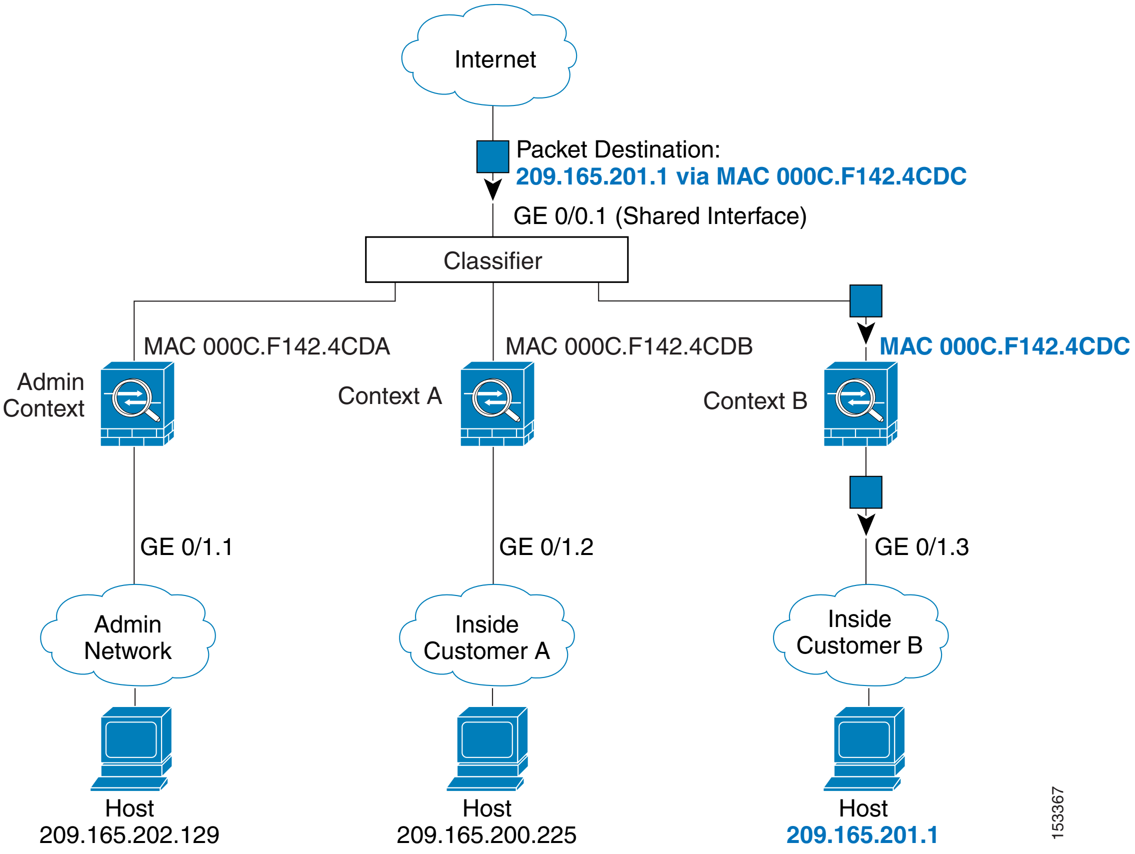
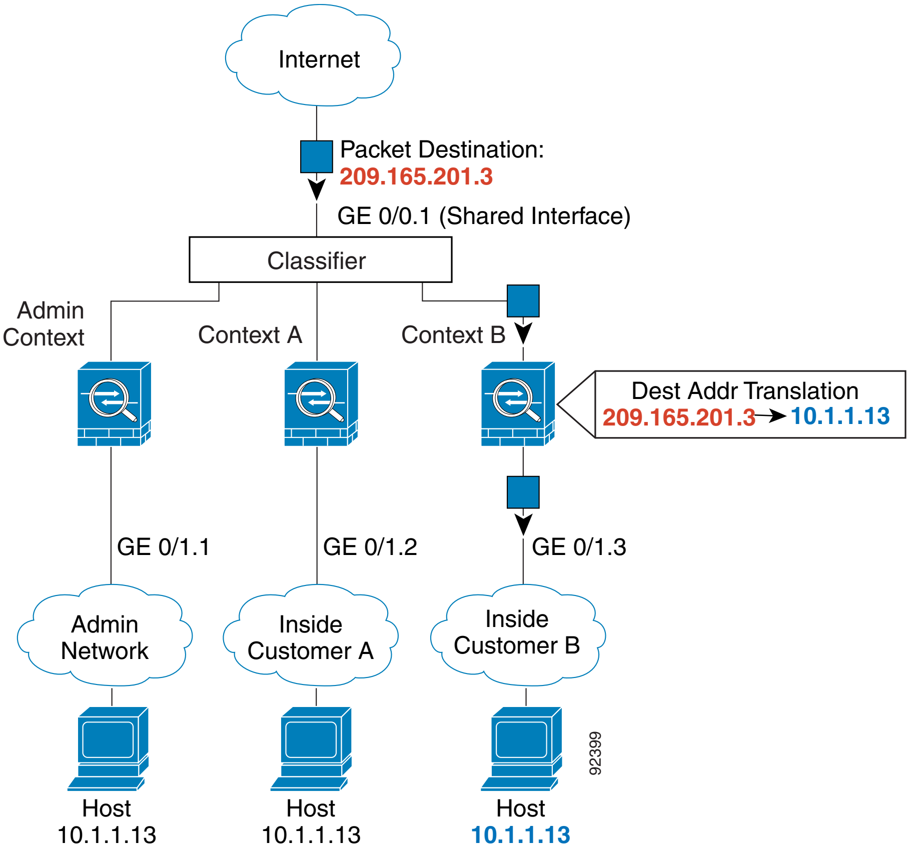


Figure 5-2 shows multiple contexts sharing an outside interface without MAC addresses assigned. The classifier assigns the packet to Context B because Context B includes the address translation that matches the destination address.

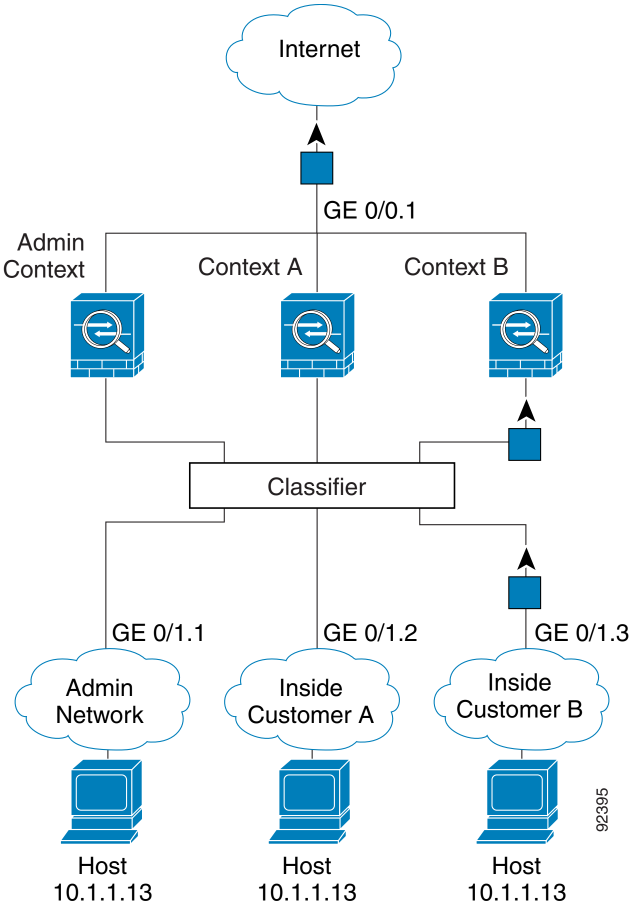
Figure 5-2 Packet Classification with a Shared Interface using NAT



Note that all new incoming traffic must be classified, even from inside networks. Figure 5-3 shows a host on the Context B inside network accessing the Internet. The classifier assigns the packet to Context B because the ingress interface is Gigabit Ethernet 0/1.3, which is assigned to Context B.

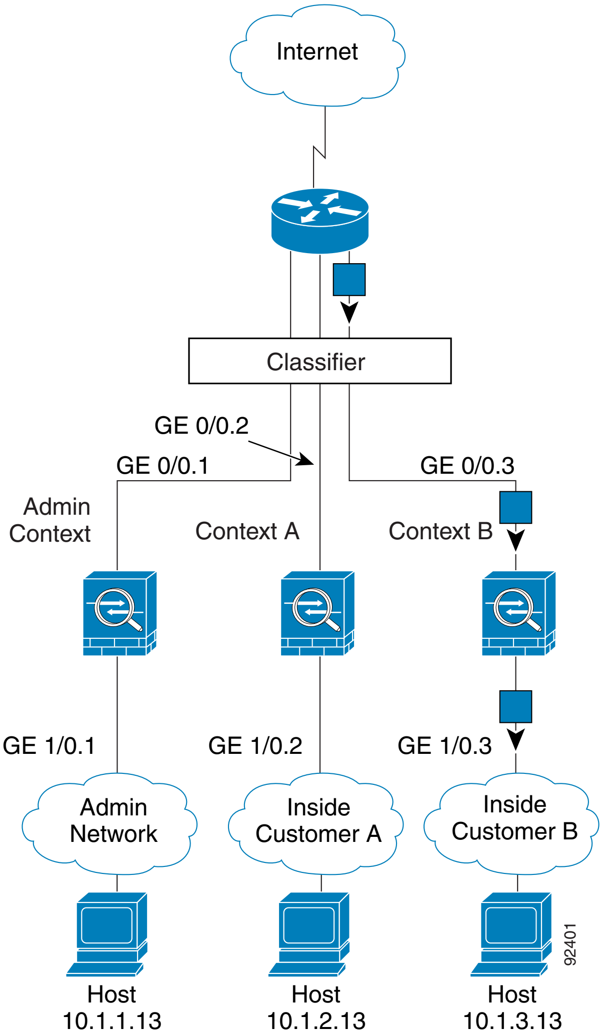
Note If you share an *inside* interface and do not use unique MAC addresses, the classifier imposes some major restrictions. The classifier relies on the address translation configuration to classify the packet within a context, and you must translate the *destination* addresses of the traffic. Because you do not usually perform NAT on outside addresses, sending packets from inside to outside on a shared interface is not always possible; the outside network is large, (the Web, for example), and addresses are not predictable for an outside NAT configuration. If you share an inside interface, we suggest you use unique MAC addresses.

Figure 5-3 Incoming Traffic from Inside Networks



For transparent firewalls, you must use unique interfaces. Figure 5-4 shows a host on the Context B inside network accessing the Internet. The classifier assigns the packet to Context B because the ingress interface is Gigabit Ethernet 1/0.3, which is assigned to Context B.

Figure 5-4 Transparent Firewall Contexts



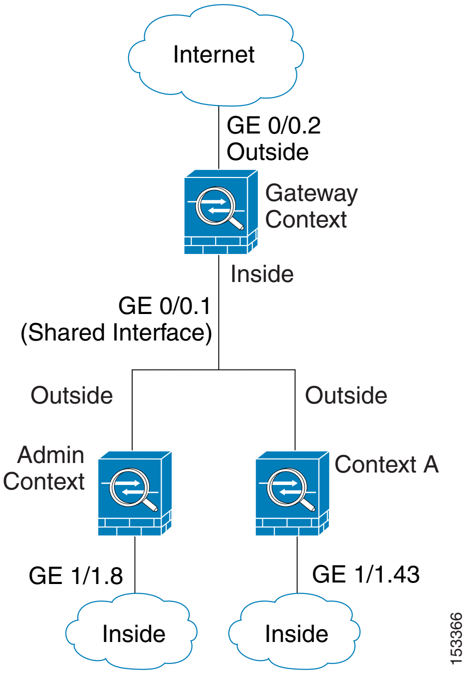
Cascading Security Contexts

Placing a context directly in front of another context is called cascading contexts; the outside interface of one context is the same interface as the inside interface of another context. You might want to cascade contexts if you want to simplify the configuration of some contexts by configuring shared parameters in the top context.

Note Cascading contexts requires that you configure unique MAC addresses for each context interface. Because of the limitations of classifying packets on shared interfaces without MAC addresses, we do not recommend using cascading contexts without unique MAC addresses.

Figure 5-5 shows a gateway context with two contexts behind the gateway.

Figure 5-5 Cascading Contexts



Management Access to Security Contexts

The ASA provides system administrator access in multiple context mode as well as access for individual context administrators. The following sections describe logging in as a system administrator or as a a context administrator:

- System Administrator Access, page 5-9
- Context Administrator Access, page 5-10

System Administrator Access

You can access the ASA as a system administrator in two ways:

- Access the ASA console.

  From the console, you access the *system execution space*, which means that any commands you enter affect only the system configuration or the running of the system (for run-time commands).

- Access the admin context using Telnet, SSH, or ASDM.

  See Chapter 37, "Configuring Management Access," to enable Telnet, SSH, and SDM access.

As the system administrator, you can access all contexts.

When you change to a context from admin or the system, your username changes to the default "enable_15" username. If you configured command authorization in that context, you need to either configure authorization privileges for the "enable_15" user, or you can log in as a different name for which you provide sufficient privileges in the command authorization configuration for the context. To log in with a username, enter the **login** command. For example, you log in to the admin context with the username "admin." The admin context does not have any command authorization configuration, but all other contexts include command authorization. For convenience, each context configuration includes a user "admin" with maximum privileges. When you change from the admin context to context A, your username is altered, so you must log in again as "admin" by entering the **login** command. When you change to context B, you must again enter the **login** command to log in as "admin."

The system execution space does not support any AAA commands, but you can configure its own enable password, as well as usernames in the local database to provide individual logins.

Context Administrator Access

You can access a context using Telnet, SSH, or ASDM. If you log in to a non-admin context, you can only access the configuration for that context. You can provide individual logins to the context. See See Chapter 37, "Configuring Management Access," to enable Telnet, SSH, and SDM access and to configure management authentication.

Enabling or Disabling Multiple Context Mode

Your ASA might already be configured for multiple security contexts depending on how you ordered it from Cisco. If you are upgrading, however, you might need to convert from single mode to multiple mode by following the procedures in this section.

This section includes the following topics:

- Backing Up the Single Mode Configuration, page 5-10
- Enabling Multiple Context Mode, page 5-10
- Restoring Single Context Mode, page 5-11

Backing Up the Single Mode Configuration

When you convert from single mode to multiple mode, the ASA converts the running configuration into two files. The original startup configuration is not saved, so if it differs from the running configuration, you should back it up before proceeding.

Enabling Multiple Context Mode

The context mode (single or multiple) is not stored in the configuration file, even though it does endure reboots. If you need to copy your configuration to another device, set the mode on the new device to match using the **mode** command.

When you convert from single mode to multiple mode, the ASA converts the running configuration into two files: a new startup configuration that comprises the system configuration, and admin.cfg that comprises the admin context (in the root directory of the internal Flash memory). The original running configuration is saved as old_running.cfg (in the root directory of the internal Flash memory). The original startup configuration is not saved. The ASA automatically adds an entry for the admin context to the system configuration with the name "admin."

To enable multiple mode, enter the following command:

```
hostname(config)# mode multiple
```

You are prompted to reboot the ASA.

Restoring Single Context Mode

If you convert from multiple mode to single mode, you might want to first copy a full startup configuration (if available) to the ASA; the system configuration inherited from multiple mode is not a complete functioning configuration for a single mode device. Because the system configuration does not have any network interfaces as part of its configuration, you must access the ASA from the console to perform the copy.

To copy the old running configuration to the startup configuration and to change the mode to single mode, perform the following steps in the system execution space:

Step 1 To copy the backup version of your original running configuration to the current startup configuration, enter the following command in the system execution space:

```
hostname(config)# copy flash:old_running.cfg startup-config
```

Step 2 To set the mode to single mode, enter the following command in the system execution space:

```
hostname(config)# mode single
```

The ASA reboots.

Configuring Resource Management

By default, all security contexts have unlimited access to the resources of the ASA, except where maximum limits per context are enforced. However, if you find that one or more contexts use too many resources, and they cause other contexts to be denied connections, for example, then you can configure resource management to limit the use of resources per context.

This section includes the following topics:

- Classes and Class Members Overview, page 5-11
- Configuring a Class, page 5-14

Classes and Class Members Overview

The ASA manages resources by assigning contexts to resource classes. Each context uses the resource limits set by the class. This section includes the following topics:

- Resource Limits, page 5-12
- Default Class, page 5-13
- Class Members, page 5-14

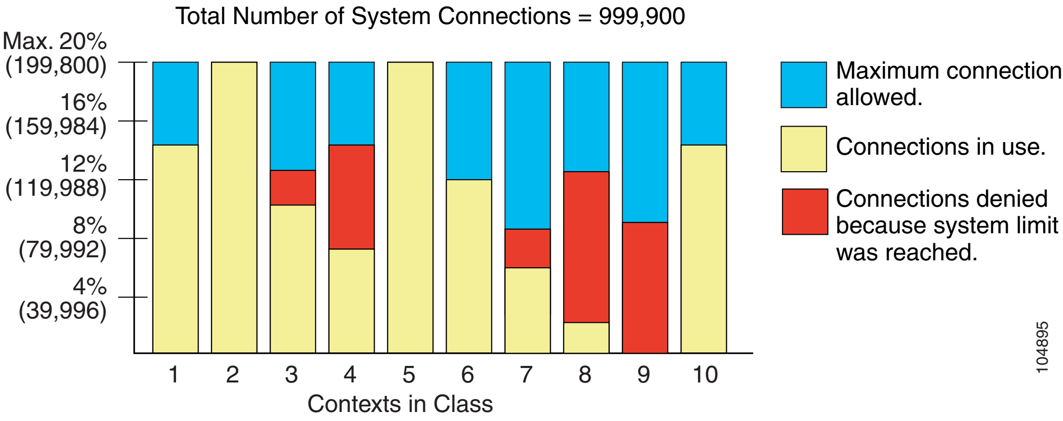
Resource Limits

When you create a class, the ASA does not set aside a portion of the resources for each context assigned to the class; rather, the ASA sets the maximum limit for a context. If you oversubscribe resources, or allow some resources to be unlimited, a few contexts can "use up" those resources, potentially affecting service to other contexts.

You can set the limit for individual resources, as a percentage (if there is a hard system limit) or as an absolute value.

You can oversubscribe the ASA by assigning more than 100 percent of a resource across all contexts. For example, you can set the Bronze class to limit connections to 20 percent per context, and then assign 10 contexts to the class for a total of 200 percent. If contexts concurrently use more than the system limit, then each context gets less than the 20 percent you intended. (See Figure 5-6.)

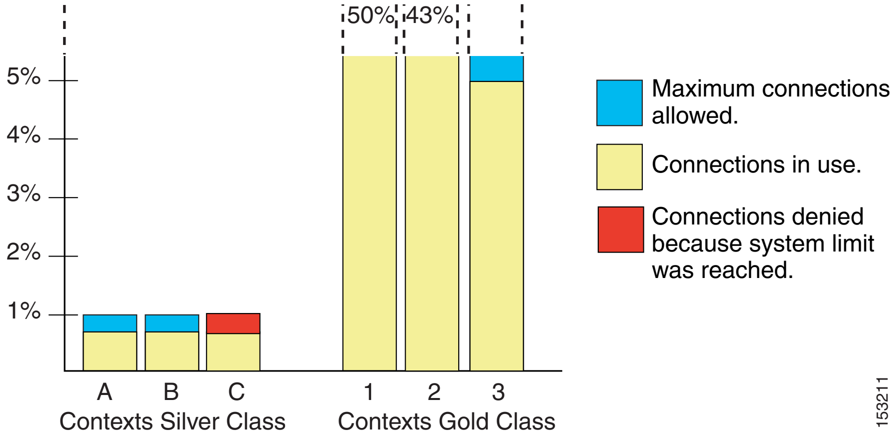
Figure 5-6 Resource Oversubscription



If you assign an absolute value to a resource across all contexts that exceeds the practical limit of the ASA, then the performance of the ASA might be impaired.

The ASA lets you assign unlimited access to one or more resources in a class, instead of a percentage or absolute number. When a resource is unlimited, contexts can use as much of the resource as the system has available or that is practically available. For example, Context A, B, and C are in the Silver Class, which limits each class member to 1 percent of the connections, for a total of 3 percent; but the three contexts are currently only using 2 percent combined. Gold Class has unlimited access to connections. The contexts in the Gold Class can use more than the 97 percent of "unassigned" connections; they can also use the 1 percent of connections not currently in use by Context A, B, and C, even if that means that Context A, B, and C are unable to reach their 3 percent combined limit. (See Figure 5-7.) Setting unlimited access is similar to oversubscribing the ASA, except that you have less control over how much you oversubscribe the system.

Figure 5-7 *Unlimited Resources*



Default Class

All contexts belong to the default class if they are not assigned to another class; you do not have to actively assign a context to the default class.

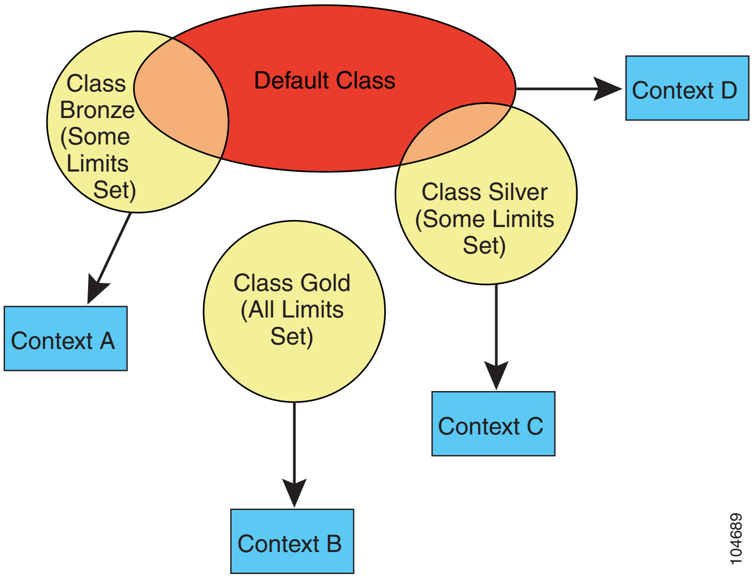
If a context belongs to a class other than the default class, those class settings always override the default class settings. However, if the other class has any settings that are not defined, then the member context uses the default class for those limits. For example, if you create a class with a 2 percent limit for all concurrent connections, but no other limits, then all other limits are inherited from the default class. Conversely, if you create a class with a limit for all resources, the class uses no settings from the default class.

By default, the default class provides unlimited access to resources for all contexts, except for the following limits, which are by default set to the maximum allowed per context:

- Telnet sessions—5 sessions.
- SSH sessions—5 sessions.
- IPSec sessions—5 sessions.
- MAC addresses—65,535 entries.

Figure 5-8 shows the relationship between the default class and other classes. Contexts A and C belong to classes with some limits set; other limits are inherited from the default class. Context B inherits no limits from default because all limits are set in its class, the Gold class. Context D was not assigned to a class, and is by default a member of the default class.

Figure 5-8 Resource Classes


Class Bronze (Some Limits Set)
Default Class
Context D
Class Silver (Some Limits Set)
Class Gold (All Limits Set)
Context A
Context C
Context B
104689

Class Members

To use the settings of a class, assign the context to the class when you define the context. All contexts belong to the default class if they are not assigned to another class; you do not have to actively assign a context to default. You can only assign a context to one resource class. The exception to this rule is that limits that are undefined in the member class are inherited from the default class; so in effect, a context could be a member of default plus another class.

Configuring a Class

To configure a class in the system configuration, perform the following steps. You can change the value of a particular resource limit by reentering the command with a new value.

Guidelines

Table 5-1 lists the resource types and the limits. See also the **show resource types** command.

Table 5-1 Resource Names and Limits

Resource Name	Rate or Concurrent	Minimum and Maximum Number per Context	System Limit[1]	Description
mac-addresses	Concurrent	N/A	65,535	For transparent firewall mode, the number of MAC addresses allowed in the MAC address table.
conns	Concurrent or Rate	N/A	Concurrent connections: See the "Supported Feature Licenses Per Model" section on page 3-1 for the connection limit for your platform. Rate: N/A	TCP or UDP connections between any two hosts, including connections between one host and multiple other hosts.
inspects	Rate	N/A	N/A	Application inspections.
hosts	Concurrent	N/A	N/A	Hosts that can connect through the ASA.
asdm	Concurrent	1 minimum 5 maximum	200	ASDM management sessions. **Note** ASDM sessions use two HTTPS connections: one for monitoring that is always present, and one for making configuration changes that is present only when you make changes. For example, the system limit of 32 ASDM sessions represents a limit of 64 HTTPS sessions.
ssh	Concurrent	1 minimum 5 maximum	100	SSH sessions.
syslogs	Rate	N/A	N/A	Syslog messages.
telnet	Concurrent	1 minimum 5 maximum	100	Telnet sessions.
xlates	Concurrent	N/A	N/A	Address translations.

[1] If this column value is N/A, then you cannot set a percentage of the resource because there is no hard system limit for the resource.

Detailed Steps

Step 1 To specify the class name and enter the class configuration mode, enter the following command in the system execution space:

```
hostname(config)# class name
```

The *name* is a string up to 20 characters long. To set the limits for the default class, enter **default** for the name.

Step 2 To set the resource limits, see the following options:

- To set all resource limits (shown in Table 5-1) to be unlimited, enter the following command:

```
hostname(config-resmgmt)# limit-resource all 0
```

For example, you might want to create a class that includes the admin context that has no limitations. The default class has all resources set to unlimited by default.

- To set a particular resource limit, enter the following command:

  ```
  hostname(config-resmgmt)# limit-resource [rate] resource_name number[%]
  ```

  For this particular resource, the limit overrides the limit set for **all**. Enter the **rate** argument to **s**et the rate per second for certain resources. For resources that do not have a system limit, you cannot set the percentage (%) between 1 and 100; you can only set an absolute value. See Table 5-1 for resources for which you can set the rate per second and which to not have a system limit.

Examples

For example, to set the default class limit for conns to 10 percent instead of unlimited, enter the following commands:

```
hostname(config)# class default
hostname(config-class)# limit-resource conns 10%
```

All other resources remain at unlimited.

To add a class called gold, enter the following commands:

```
hostname(config)# class gold
hostname(config-class)# limit-resource mac-addresses 10000
hostname(config-class)# limit-resource conns 15%
hostname(config-class)# limit-resource rate conns 1000
hostname(config-class)# limit-resource rate inspects 500
hostname(config-class)# limit-resource hosts 9000
hostname(config-class)# limit-resource asdm 5
hostname(config-class)# limit-resource ssh 5
hostname(config-class)# limit-resource rate syslogs 5000
hostname(config-class)# limit-resource telnet 5
hostname(config-class)# limit-resource xlates 36000
```

Configuring a Security Context

The security context definition in the system configuration identifies the context name, configuration file URL, and interfaces that a context can use.

Prerequisites

- Configure physical interface parameters, VLAN subinterfaces, and redundant interfaces according to the "Starting Interface Configuration (ASA 5510 and Higher)" section on page 6-8.
- If you do not have an admin context (for example, if you clear the configuration) then you must first specify the admin context name by entering the following command:

  ```
  hostname(config)# admin-context name
  ```

  Although this context name does not exist yet in your configuration, you can subsequently enter the **context** *name* command to match the specified name to continue the admin context configuration.

Detailed Steps

Step 1 To add or modify a context, enter the following command in the system execution space:

```
hostname(config)# context name
```

The *name* is a string up to 32 characters long. This name is case sensitive, so you can have two contexts named "customerA" and "CustomerA," for example. You can use letters, digits, or hyphens, but you cannot start or end the name with a hyphen.

"System" or "Null" (in upper or lower case letters) are reserved names, and cannot be used.

Step 2 (Optional) To add a description for this context, enter the following command:

```
hostname(config-ctx)# description text
```

Step 3 To specify the interfaces you can use in the context, enter the command appropriate for a physical interface or for one or more subinterfaces.

- To allocate a physical interface, enter the following command:

```
hostname(config-ctx)# allocate-interface physical_interface [mapped_name]
[visible | invisible]
```

- To allocate one or more subinterfaces, enter the following command:

```
hostname(config-ctx)# allocate-interface
physical_interface.subinterface[-physical_interface.subinterface]
[mapped_name[-mapped_name]] [visible | invisible]
```

Note Do not include a space between the interface type and the port number.

You can enter these commands multiple times to specify different ranges. If you remove an allocation with the **no** form of this command, then any context commands that include this interface are removed from the running configuration.

Transparent firewall mode allows only two interfaces to pass through traffic; however, on the ASA adaptive security appliance, you can use the dedicated management interface, Management 0/0, (either the physical interface or a subinterface) as a third interface for management traffic.

Note The management interface for transparent mode does not flood a packet out the interface when that packet is not in the MAC address table.

You can assign the same interfaces to multiple contexts in routed mode, if desired. Transparent mode does not allow shared interfaces.

The *mapped_name* is an alphanumeric alias for the interface that can be used within the context instead of the interface ID. If you do not specify a mapped name, the interface ID is used within the context. For security purposes, you might not want the context administrator to know which interfaces are being used by the context.

A mapped name must start with a letter, end with a letter or digit, and have as interior characters only letters, digits, or an underscore. For example, you can use the following names:

```
int0

inta

int_0
```

For subinterfaces, you can specify a range of mapped names.

If you specify a range of subinterfaces, you can specify a matching range of mapped names. Follow these guidelines for ranges:

- The mapped name must consist of an alphabetic portion followed by a numeric portion. The alphabetic portion of the mapped name must match for both ends of the range. For example, enter the following range:

  ```
  int0-int10
  ```

  If you enter **gigabitethernet0/1.1-gigabitethernet0/1.5 happy1-sad5**, for example, the command fails.

- The numeric portion of the mapped name must include the same quantity of numbers as the subinterface range. For example, both ranges include 100 interfaces:

  ```
  gigabitethernet0/0.100-gigabitethernet0/0.199 int1-int100
  ```

  If you enter **gigabitethernet0/0.100-gigabitethernet0/0.199 int1-int15**, for example, the command fails.

Specify **visible** to see physical interface properties in the **show interface** command even if you set a mapped name. The default **invisible** keyword specifies to only show the mapped name.

The following example shows gigabitethernet0/1.100, gigabitethernet0/1.200, and gigabitethernet0/2.300 through gigabitethernet0/1.305 assigned to the context. The mapped names are int1 through int8.

```
hostname(config-ctx)# allocate-interface gigabitethernet0/1.100 int1
hostname(config-ctx)# allocate-interface gigabitethernet0/1.200 int2
hostname(config-ctx)# allocate-interface gigabitethernet0/2.300-gigabitethernet0/2.305
int3-int8
```

Step 4 To identify the URL from which the system downloads the context configuration, enter the following command:

```
hostname(config-ctx)# config-url url
```

When you add a context URL, the system immediately loads the context so that it is running, if the configuration is available.

Note Enter the **allocate-interface** command(s) before you enter the **config-url** command. The ASA must assign interfaces to the context before it loads the context configuration; the context configuration might include commands that refer to interfaces (**interface**, **nat**, **global**...). If you enter the **config-url** command first, the ASA loads the context configuration immediately. If the context contains any commands that refer to interfaces, those commands fail.

See the following URL syntax:

- **disk:/**[*path*/]*filename*

  This URL indicates the internal Flash memory. The filename does not require a file extension, although we recommend using ".cfg". If the configuration file is not available, you see the following message:

  ```
  WARNING: Could not fetch the URL disk:/url
  INFO: Creating context with default config
  ```

You can then change to the context, configure it at the CLI, and enter the **write memory** command to write the file to Flash memory.

Note The admin context file must be stored on the internal Flash memory.

- **ftp://**[*user*[**:***password*]@]*server*[:*port*]**/**[*path***/**]*filename*[**;type=***xx*]

  The **type** can be one of the following keywords:

  - **ap**—ASCII passive mode
  - **an**—ASCII normal mode
  - **ip**—(Default) Binary passive mode
  - **in**—Binary normal mode

  The server must be accessible from the admin context. The filename does not require a file extension, although we recommend using “.cfg”. If the configuration file is not available, you see the following message:

  ```
  WARNING: Could not fetch the URL ftp://url
  INFO: Creating context with default config
  ```

  You can then change to the context, configure it at the CLI, and enter the **write memory** command to write the file to the FTP server.

- **http**[**s**]**://**[*user*[**:***password*]@]*server*[:*port*]**/**[*path***/**]*filename*

  The server must be accessible from the admin context. The filename does not require a file extension, although we recommend using “.cfg”. If the configuration file is not available, you see the following message:

  ```
  WARNING: Could not fetch the URL http://url
  INFO: Creating context with default config
  ```

  If you change to the context and configure the context at the CLI, you cannot save changes back to HTTP or HTTPS servers using the **write memory** command. You can, however, use the **copy tftp** command to copy the running configuration to a TFTP server.

- **tftp://**[*user*[**:***password*]@]*server*[:*port*]**/**[*path***/**]*filename*[**;int=***interface_name*]

  The server must be accessible from the admin context. Specify the interface name if you want to override the route to the server address. The filename does not require a file extension, although we recommend using “.cfg”. If the configuration file is not available, you see the following message:

  ```
  WARNING: Could not fetch the URL tftp://url
  INFO: Creating context with default config
  ```

  You can then change to the context, configure it at the CLI, and enter the **write memory** command to write the file to the TFTP server.

To change the URL, reenter the **config-url** command with a new URL.

See the “Changing the Security Context URL” section on page 5-26 for more information about changing the URL.

For example, enter the following command:

```
hostname(config-ctx)# config-url ftp://joe:passw0rd1@10.1.1.1/configlets/test.cfg
```

Step 5 (Optional) To assign the context to a resource class, enter the following command:

```
hostname(config-ctx)# member class_name
```

If you do not specify a class, the context belongs to the default class. You can only assign a context to one resource class.

For example, to assign the context to the gold class, enter the following command:

```
hostname(config-ctx)# member gold
```

Step 6 (Optional) To assign an IPS virtual sensor to this context if you have the AIP SSM installed, use the **allocate-ips** command. See the "Assigning Virtual Sensors to a Security Context (ASA 5510 and Higher)" section on page 59-6 for detailed information about virtual sensors

Examples

The following example sets the admin context to be "administrator," creates a context called "administrator" on the internal Flash memory, and then adds two contexts from an FTP server:

```
hostname(config)# admin-context administrator
hostname(config)# context administrator
hostname(config-ctx)# allocate-interface gigabitethernet0/0.1
hostname(config-ctx)# allocate-interface gigabitethernet0/1.1
hostname(config-ctx)# config-url flash:/admin.cfg

hostname(config-ctx)# context test
hostname(config-ctx)# allocate-interface gigabitethernet0/0.100 int1
hostname(config-ctx)# allocate-interface gigabitethernet0/0.102 int2
hostname(config-ctx)# allocate-interface gigabitethernet0/0.110-gigabitethernet0/0.115
int3-int8
hostname(config-ctx)# config-url ftp://user1:passw0rd@10.1.1.1/configlets/test.cfg
hostname(config-ctx)# member gold


hostname(config-ctx)# context sample
hostname(config-ctx)# allocate-interface gigabitethernet0/1.200 int1
hostname(config-ctx)# allocate-interface gigabitethernet0/1.212 int2
hostname(config-ctx)# allocate-interface gigabitethernet0/1.230-gigabitethernet0/1.235
int3-int8
hostname(config-ctx)# config-url ftp://user1:passw0rd@10.1.1.1/configlets/sample.cfg
hostname(config-ctx)# member silver
```

Automatically Assigning MAC Addresses to Context Interfaces

This section tells how to configure auto-generation of MAC addresses, and includes the following sections:

- Information About MAC Addresses, page 5-21
- Default MAC Address, page 5-21
- Failover MAC Addresses, page 5-21
- MAC Address Format, page 5-21
- Enabling Auto-Generation of MAC Addresses, page 5-22
- Viewing Assigned MAC Addresses, page 5-22

Information About MAC Addresses

To allow contexts to share interfaces, we suggest that you assign unique MAC addresses to each shared context interface. The MAC address is used to classify packets within a context. If you share an interface, but do not have unique MAC addresses for the interface in each context, then the destination IP address is used to classify packets. The destination address is matched with the context NAT configuration, and this method has some limitations compared to the MAC address method. See the "How the Security Appliance Classifies Packets" section on page 5-3 for information about classifying packets.

In the rare circumstance that the generated MAC address conflicts with another private MAC address in your network, you can manually set the MAC address for the interface within the context. See the "Configuring the MAC Address" section on page 6-26 to manually set the MAC address.

Default MAC Address

By default, the physical interface uses the burned-in MAC address, and all subinterfaces of a physical interface use the same burned-in MAC address.

All auto-generated MAC addresses start with A2. The auto-generated MAC addresses are persistent across reloads.

Interaction with Manual MAC Addresses

If you manually assign a MAC address and also enable auto-generation, then the manually assigned MAC address is used. If you later remove the manual MAC address, the auto-generated address is used.

Because auto-generated addresses start with A2, you cannot start manual MAC addresses with A2 if you also want to use auto-generation.

Failover MAC Addresses

For use with failover, the ASA generates both an active and standby MAC address for each interface. If the active unit fails over and the standby unit becomes active, the new active unit starts using the active MAC addresses to minimize network disruption. See the "MAC Address Format" section for more information.

For upgrading failover units with the legacy version of the **mac-address auto** command before the **prefix** keyword was introduced, see the **mac-address auto** command in the *Cisco ASA 5500 Series Command Reference*.

MAC Address Format

The ASA generates the MAC address using the following format:

A2xx.yyzz.zzzz

Where xx.yy is a user-defined prefix, and zz.zzzz is an internal counter generated by the ASA. For the standby MAC address, the address is identical except that the internal counter is increased by 1.

For an example of how the prefix is used, if you set a prefix of 77, then the ASA converts 77 into the hexadecimal value 004D (yyxx). When used in the MAC address, the prefix is reversed (xxyy) to match the ASA native form:

A2**4D.00**zz.zzzz

For a prefix of 1009 (03F1), the MAC address is:

A2**F1.03**zz.zzzz

Enabling Auto-Generation of MAC Addresses

You can automatically assign private MAC addresses to each context interface.

Guidelines

When you configure a **nameif** command for the interface in a context, the new MAC address is generated immediately. If you enable this command after you configure context interfaces, then MAC addresses are generated for all interfaces immediately after you enter the command. If you use the **no mac-address auto** command, the MAC address for each interface reverts to the default MAC address. For example, subinterfaces of GigabitEthernet 0/1 revert to using the MAC address of GigabitEthernet 0/1.

Note For the MAC address generation method when not using a prefix (not recommended), see the **mac-address auto** command in the *Cisco ASA 5500 Series Command Reference*.

Detailed Steps

Command	Purpose

`mac-address auto prefix` *`prefix`*
Example:
`hostname(config)# mac-address auto prefix 19`
	Automatically assign private MAC addresses to each context interface.
	The *prefix* is a decimal value between 0 and 65535. This prefix is converted to a 4-digit hexadecimal number, and used as part of the MAC address. The prefix ensures that each ASA uses unique MAC addresses, so you can have multiple ASAs on a network segment, for example. See the "MAC Address Format" section for more information about how the prefix is used.

Viewing Assigned MAC Addresses

You can view auto-generated MAC addresses within the system configuration or within the context. This section includes the following topics:

- Viewing MAC Addresses in the System Configuration, page 5-22
- Viewing MAC Addresses Within a Context, page 5-24

Viewing MAC Addresses in the System Configuration

This section describes how to view MAC addresses in the system configuration.

Guidelines

If you manually assign a MAC address to an interface, but also have auto-generation enabled, the auto-generated address continues to show in the configuration even though the manual MAC address is the one that is in use. If you later remove the manual MAC address, the auto-generated one shown will be used.

Detailed Steps

Command	Purpose
show running-config all context [*name*]	Shows the assigned MAC addresses from the system execution space. The **all** option is required to view the assigned MAC addresses. Although this command is user-configurable in global configuration mode only, the **mac-address auto** command appears as a read-only entry in the configuration for each context along with the assigned MAC address. Only allocated interfaces that are configured with a **nameif** command within the context have a MAC address assigned.

Examples

The following output from the **show running-config all context admin** command shows the primary and standby MAC address assigned to the Management0/0 interface:

```
hostname# show running-config all context admin

context admin
  allocate-interface Management0/0
  mac-address auto Management0/0 a24d.0000.1440 a24d.0000.1441
  config-url disk0:/admin.cfg
```

The following output from the **show running-config all context** command shows all the MAC addresses (primary and standby) for all context interfaces. Note that because the GigabitEthernet0/0 and GigabitEthernet0/1 main interfaces are not configured with a **nameif** command inside the contexts, no MAC addresses have been generated for them.

```
hostname# show running-config all context

admin-context admin
context admin
  allocate-interface Management0/0
  mac-address auto Management0/0 a2d2.0400.125a a2d2.0400.125b
  config-url disk0:/admin.cfg
!

context CTX1
  allocate-interface GigabitEthernet0/0
  allocate-interface GigabitEthernet0/0.1-GigabitEthernet0/0.5
  mac-address auto GigabitEthernet0/0.1 a2d2.0400.11bc a2d2.0400.11bd
  mac-address auto GigabitEthernet0/0.2 a2d2.0400.11c0 a2d2.0400.11c1
  mac-address auto GigabitEthernet0/0.3 a2d2.0400.11c4 a2d2.0400.11c5
  mac-address auto GigabitEthernet0/0.4 a2d2.0400.11c8 a2d2.0400.11c9
  mac-address auto GigabitEthernet0/0.5 a2d2.0400.11cc a2d2.0400.11cd
  allocate-interface GigabitEthernet0/1
  allocate-interface GigabitEthernet0/1.1-GigabitEthernet0/1.3
  mac-address auto GigabitEthernet0/1.1 a2d2.0400.120c a2d2.0400.120d
  mac-address auto GigabitEthernet0/1.2 a2d2.0400.1210 a2d2.0400.1211
  mac-address auto GigabitEthernet0/1.3 a2d2.0400.1214 a2d2.0400.1215
  config-url disk0:/CTX1.cfg
!

context CTX2
  allocate-interface GigabitEthernet0/0
  allocate-interface GigabitEthernet0/0.1-GigabitEthernet0/0.5
  mac-address auto GigabitEthernet0/0.1 a2d2.0400.11ba a2d2.0400.11bb
  mac-address auto GigabitEthernet0/0.2 a2d2.0400.11be a2d2.0400.11bf
  mac-address auto GigabitEthernet0/0.3 a2d2.0400.11c2 a2d2.0400.11c3
  mac-address auto GigabitEthernet0/0.4 a2d2.0400.11c6 a2d2.0400.11c7
  mac-address auto GigabitEthernet0/0.5 a2d2.0400.11ca a2d2.0400.11cb
  allocate-interface GigabitEthernet0/1
  allocate-interface GigabitEthernet0/1.1-GigabitEthernet0/1.3
  mac-address auto GigabitEthernet0/1.1 a2d2.0400.120a a2d2.0400.120b
  mac-address auto GigabitEthernet0/1.2 a2d2.0400.120e a2d2.0400.120f
  mac-address auto GigabitEthernet0/1.3 a2d2.0400.1212 a2d2.0400.1213
  config-url disk0:/CTX2.cfg
!
```

Viewing MAC Addresses Within a Context

This section describes how to view MAC addresses within a context.

Detailed Steps

Command	Purpose
show interface | include (Interface)|(MAC)	Shows the MAC address in use by each interface within the context.

Examples

For example:

```
hostname/context# show interface | include (Interface)|(MAC)

Interface GigabitEthernet1/1.1 "g1/1.1", is down, line protocol is down
        MAC address a201.0101.0600, MTU 1500
Interface GigabitEthernet1/1.2 "g1/1.2", is down, line protocol is down
        MAC address a201.0102.0600, MTU 1500
Interface GigabitEthernet1/1.3 "g1/1.3", is down, line protocol is down
        MAC address a201.0103.0600, MTU 1500
...
```

Note The **show interface** command shows the MAC address in use; if you manually assign a MAC address and also have auto-generation enabled, then you can only view the unused auto-generated address from within the system configuration.

Changing Between Contexts and the System Execution Space

If you log in to the system execution space (or the admin context using Telnet or SSH), you can change between contexts and perform configuration and monitoring tasks within each context. The running configuration that you edit in a configuration mode, or that is used in the **copy** or **write** commands, depends on your location. When you are in the system execution space, the running configuration consists only of the system configuration; when you are in a context, the running configuration consists only of that context. For example, you cannot view all running configurations (system plus all contexts) by entering the **show running-config** command. Only the current configuration displays.

To change between the system execution space and a context, or between contexts, see the following commands:

- To change to a context, enter the following command:

  ```
  hostname# changeto context name
  ```

  The prompt changes to the following:

  ```
  hostname/name#
  ```

- To change to the system execution space, enter the following command:

  ```
  hostname/admin# changeto system
  ```

  The prompt changes to the following:

  ```
  hostname#
  ```

Managing Security Contexts

This section describes how to manage security contexts, and includes the following topics:

- Removing a Security Context, page 5-25
- Changing the Admin Context, page 5-26
- Changing the Security Context URL, page 5-26
- Reloading a Security Context, page 5-27

Removing a Security Context

You can only remove a context by editing the system configuration. You cannot remove the current admin context, unless you remove all contexts using the **clear context** command.

Note If you use failover, there is a delay between when you remove the context on the active unit and when the context is removed on the standby unit. You might see an error message indicating that the number of interfaces on the active and standby units are not consistent; this error is temporary and can be ignored.

Use the following commands for removing contexts:

- To remove a single context, enter the following command in the system execution space:

  ```
  hostname(config)# no context name
  ```

All context commands are also removed.

- To remove all contexts (including the admin context), enter the following command in the system execution space:

```
hostname(config)# clear context
```

Changing the Admin Context

The system configuration does not include any network interfaces or network settings for itself; rather, when the system needs to access network resources (such as downloading the contexts from the server), it uses one of the contexts that is designated as the admin context.

The admin context is just like any other context, except that when a user logs in to the admin context, then that user has system administrator rights and can access the system and all other contexts. The admin context is not restricted in any way, and can be used as a regular context. However, because logging into the admin context grants you administrator privileges over all contexts, you might need to restrict access to the admin context to appropriate users.

You can set any context to be the admin context, as long as the configuration file is stored in the internal Flash memory. To set the admin context, enter the following command in the system execution space:

```
hostname(config)# admin-context context_name
```

Any remote management sessions, such as Telnet, SSH, or HTTPS, that are connected to the admin context are terminated. You must reconnect to the new admin context.

Note A few system commands, including **ntp server**, identify an interface name that belongs to the admin context. If you change the admin context, and that interface name does not exist in the new admin context, be sure to update any system commands that refer to the interface.

Changing the Security Context URL

You cannot change the security context URL without reloading the configuration from the new URL.

The ASA merges the new configuration with the current running configuration. Reentering the same URL also merges the saved configuration with the running configuration. A merge adds any new commands from the new configuration to the running configuration. If the configurations are the same, no changes occur. If commands conflict or if commands affect the running of the context, then the effect of the merge depends on the command. You might get errors, or you might have unexpected results. If the running configuration is blank (for example, if the server was unavailable and the configuration was never downloaded), then the new configuration is used. If you do not want to merge the configurations, you can clear the running configuration, which disrupts any communications through the context, and then reload the configuration from the new URL.

To change the URL for a context, perform the following steps:

Step 1 If you do not want to merge the configuration, change to the context and clear its configuration by entering the following commands. If you want to perform a merge, skip to Step 2.

```
hostname# changeto context name
hostname/name# configure terminal
hostname/name(config)# clear configure all
```

Step 2 If required, change to the system execution space by entering the following command:

```
hostname/name(config)# changeto system
```

Step 3 To enter the context configuration mode for the context you want to change, enter the following command:

```
hostname(config)# context name
```

Step 4 To enter the new URL, enter the following command:

```
hostname(config)# config-url new_url
```

The system immediately loads the context so that it is running.

Reloading a Security Context

You can reload the context in two ways:

- Clear the running configuration and then import the startup configuration.

  This action clears most attributes associated with the context, such as connections and NAT tables.

- Remove the context from the system configuration.

  This action clears additional attributes, such as memory allocation, which might be useful for troubleshooting. However, to add the context back to the system requires you to respecify the URL and interfaces.

This section includes the following topics:

- Reloading by Clearing the Configuration, page 5-27
- Reloading by Removing and Re-adding the Context, page 5-28

Reloading by Clearing the Configuration

To reload the context by clearing the context configuration, and reloading the configuration from the URL, perform the following steps:

Step 1 To change to the context that you want to reload, enter the following command:

```
hostname# changeto context name
```

Step 2 To access configuration mode, enter the following command:

```
hostname/name# configure terminal
```

Step 3 To clear the running configuration, enter the following command:

```
hostname/name(config)# clear configure all
```

This command clears all connections.

Step 4 To reload the configuration, enter the following command:

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

The ASA copies the configuration from the URL specified in the system configuration. You cannot change the URL from within a context.

Reloading by Removing and Re-adding the Context

To reload the context by removing the context and then re-adding it, perform the steps in the following sections:

1. "Automatically Assigning MAC Addresses to Context Interfaces" section on page 5-20
2. "Configuring a Security Context" section on page 5-16

Monitoring Security Contexts

This section describes how to view and monitor context information, and includes the following topics:

- Viewing Context Information, page 5-28
- Viewing Context Information, page 5-28
- Viewing Resource Allocation, page 5-29
- Viewing Resource Usage, page 5-32
- Monitoring SYN Attacks in Contexts, page 5-33

Viewing Context Information

From the system execution space, you can view a list of contexts including the name, allocated interfaces, and configuration file URL.

From the system execution space, view all contexts by entering the following command:

```
hostname# show context [name | detail| count]
```

The **detail** option shows additional information. See the following sample displays below for more information.

If you want to show information for a particular context, specify the *name*.

The **count** option shows the total number of contexts.

The following is sample output from the **show context** command. The following sample display shows three contexts:

```
hostname# show context

Context Name      Interfaces                    URL
*admin            GigabitEthernet0/1.100        disk0:/admin.cfg
                  GigabitEthernet0/1.101
contexta          GigabitEthernet0/1.200        disk0:/contexta.cfg
                  GigabitEthernet0/1.201
contextb          GigabitEthernet0/1.300        disk0:/contextb.cfg
                  GigabitEthernet0/1.301
Total active Security Contexts: 3
```

Table 5-2 shows each field description.

Table 5-2 show context Fields

Field	Description
Context Name	Lists all context names. The context name with the asterisk (*) is the admin context.
Interfaces	The interfaces assigned to the context.
URL	The URL from which the ASA loads the context configuration.

The following is sample output from the **show context detail** command:

```
hostname# show context detail

Context "admin", has been created, but initial ACL rules not complete
  Config URL: disk0:/admin.cfg
  Real Interfaces: Management0/0
  Mapped Interfaces: Management0/0
  Flags: 0x00000013, ID: 1

Context "ctx", has been created, but initial ACL rules not complete
  Config URL: ctx.cfg
  Real Interfaces: GigabitEthernet0/0.10, GigabitEthernet0/1.20,
     GigabitEthernet0/2.30
  Mapped Interfaces: int1, int2, int3
  Flags: 0x00000011, ID: 2

Context "system", is a system resource
  Config URL: startup-config
  Real Interfaces:
  Mapped Interfaces: Control0/0, GigabitEthernet0/0,
     GigabitEthernet0/0.10, GigabitEthernet0/1, GigabitEthernet0/1.10,
     GigabitEthernet0/1.20, GigabitEthernet0/2, GigabitEthernet0/2.30,
     GigabitEthernet0/3, Management0/0, Management0/0.1
  Flags: 0x00000019, ID: 257

Context "null", is a system resource
  Config URL: ... null ...
  Real Interfaces:
  Mapped Interfaces:
  Flags: 0x00000009, ID: 258
```

See the *Cisco ASA 5500 Series Command Reference* for more information about the **detail** output.

The following is sample output from the **show context count** command:

```
hostname# show context count
Total active contexts: 2
```

Viewing Resource Allocation

From the system execution space, you can view the allocation for each resource across all classes and class members.

To view the resource allocation, enter the following command:

```
hostname# show resource allocation [detail]
```

This command shows the resource allocation, but does not show the actual resources being used. See the "Viewing Resource Usage" section on page 5-32 for more information about actual resource usage.

The **detail** argument shows additional information. See the following sample displays for more information.

The following sample display shows the total allocation of each resource as an absolute value and as a percentage of the available system resources:

```
hostname# show resource allocation
Resource                    Total       % of Avail
 Conns [rate]               35000           N/A
 Inspects [rate]              35000           N/A
 Syslogs [rate]             10500           N/A
 Conns                     305000           30.50%
 Hosts                      78842           N/A
 SSH                           35           35.00%
 Telnet                        35           35.00%
 Xlates                     91749           N/A
 All                    unlimited
```

Table 5-3 shows each field description.

Table 5-3 show resource allocation Fields

Field	Description
Resource	The name of the resource that you can limit.
Total	The total amount of the resource that is allocated across all contexts. The amount is an absolute number of concurrent instances or instances per second. If you specified a percentage in the class definition, the ASA converts the percentage to an absolute number for this display.
% of Avail	The percentage of the total system resources that is allocated across all contexts, if the resource has a hard system limit. If a resource does not have a system limit, this column shows N/A.

The following is sample output from the **show resource allocation detail** command:

```
hostname# show resource allocation detail
Resource Origin:
    A    Value was derived from the resource 'all'
    C    Value set in the definition of this class
    D    Value set in default class
Resource         Class          Mmbrs  Origin      Limit      Total    Total %
Conns [rate]     default          all      CA  unlimited
                 gold               1       C      34000      34000     N/A
                 silver             1      CA      17000      17000     N/A
                 bronze             0      CA       8500
                 All Contexts:      3                         51000     N/A

Inspects [rate]  default          all      CA  unlimited
                 gold               1      DA  unlimited
                 silver             1      CA      10000      10000     N/A
                 bronze             0      CA       5000
                 All Contexts:      3                         10000     N/A

Syslogs [rate]   default          all      CA  unlimited
                 gold               1       C       6000       6000     N/A
                 silver             1      CA       3000       3000     N/A
                 bronze             0      CA       1500
                 All Contexts:      3                          9000     N/A

Conns            default          all      CA  unlimited
```

```
                 gold               1       C     200000     200000     20.00%
                 silver             1      CA     100000     100000     10.00%
                 bronze             0      CA      50000
                 All Contexts:      3                        300000     30.00%

Hosts            default          all      CA  unlimited
                 gold               1      DA  unlimited
                 silver             1      CA      26214      26214      N/A
                 bronze             0      CA      13107
                 All Contexts:      3                         26214      N/A

SSH              default          all       C          5
                 gold               1       D          5          5      5.00%
                 silver             1      CA         10         10     10.00%
                 bronze             0      CA          5
                 All Contexts:      3                            20     20.00%

Telnet           default          all       C          5
                 gold               1       D          5          5      5.00%
                 silver             1      CA         10         10     10.00%
                 bronze             0      CA          5
                 All Contexts:      3                            20     20.00%

Xlates           default          all      CA  unlimited
                 gold               1      DA  unlimited
                 silver             1      CA      23040      23040     N/A
                 bronze             0      CA      11520
                 All Contexts:      3                         23040     N/A

mac-addresses    default          all       C      65535
                 gold               1       D      65535      65535    100.00%
                 silver             1      CA       6553       6553      9.99%
                 bronze             0      CA       3276
                 All Contexts:      3                        137623    209.99%
```

Table 5-4 shows each field description.

Table 5-4 show resource allocation detail Fields

Field	Description
Resource	The name of the resource that you can limit.
Class	The name of each class, including the default class. The All contexts field shows the total values across all classes.
Mmbrs	The number of contexts assigned to each class.
Origin	The origin of the resource limit, as follows: • A—You set this limit with the **all** option, instead of as an individual resource. • C—This limit is derived from the member class. • D—This limit was not defined in the member class, but was derived from the default class. For a context assigned to the default class, the value will be “C” instead of “D.” The ASA can combine “A” with “C” or “D.”
Limit	The limit of the resource per context, as an absolute number. If you specified a percentage in the class definition, the ASA converts the percentage to an absolute number for this display.

Table 5-4 show resource allocation detail Fields

Field	Description
Total	The total amount of the resource that is allocated across all contexts in the class. The amount is an absolute number of concurrent instances or instances per second. If the resource is unlimited, this display is blank.
% of Avail	The percentage of the total system resources that is allocated across all contexts in the class. If the resource is unlimited, this display is blank. If the resource does not have a system limit, then this column shows N/A.

Viewing Resource Usage

From the system execution space, you can view the resource usage for each context and display the system resource usage.

From the system execution space, view the resource usage for each context by entering the following command:

```
hostname# show resource usage [context context_name | top n | all | summary | system]
[resource {resource_name | all} | detail] [counter counter_name [count_threshold]]
```

By default, **all** context usage is displayed; each context is listed separately.

Enter the **top** *n* keyword to show the contexts that are the top *n* users of the specified resource. You must specify a single resource type, and not **resource all**, with this option.

The **summary** option shows all context usage combined.

The **system** option shows all context usage combined, but shows the system limits for resources instead of the combined context limits.

For the **resource** *resource_name*, see Table 5-1 for available resource names. See also the **show resource type** command. Specify **all** (the default) for all types.

The **detail** option shows the resource usage of all resources, including those you cannot manage. For example, you can view the number of TCP intercepts.

The **counter** *counter_name* is one of the following keywords:

- **current**—Shows the active concurrent instances or the current rate of the resource.
- **denied**—Shows the number of instances that were denied because they exceeded the resource limit shown in the Limit column.
- **peak**—Shows the peak concurrent instances, or the peak rate of the resource since the statistics were last cleared, either using the **clear resource usage** command or because the device rebooted.
- **all**—(Default) Shows all statistics.

The *count_threshold* sets the number above which resources are shown. The default is 1. If the usage of the resource is below the number you set, then the resource is not shown. If you specify **all** for the counter name, then the *count_threshold* applies to the current usage.

Note To show all resources, set the *count_threshold* to **0**.

The following is sample output from the **show resource usage context** command, which shows the resource usage for the admin context:

```
hostname# show resource usage context admin
```

```
Resource              Current         Peak      Limit    Denied  Context
Telnet                      1            1          5         0  admin
Conns                      44           55        N/A         0  admin
Hosts                      45           56        N/A         0  admin
```

The following is sample output from the **show resource usage summary** command, which shows the resource usage for all contexts and all resources. This sample shows the limits for 6 contexts.

```
hostname# show resource usage summary

Resource              Current         Peak      Limit     Denied Context
Syslogs [rate]           1743         2132      N/A            0 Summary
Conns                     584          763      280000(S)      0 Summary
Xlates                   8526         8966      N/A            0 Summary
Hosts                     254          254      N/A            0 Summary
Conns [rate]              270          535      N/A         1704 Summary
Inspects [rate]           270          535      N/A            0 Summary
S = System: Combined context limits exceed the system limit; the system limit is shown.
```

The following is sample output from the **show resource usage summary** command, which shows the limits for 25 contexts. Because the context limit for Telnet and SSH connections is 5 per context, then the combined limit is 125. The system limit is only 100, so the system limit is shown.

```
hostname# show resource usage summary

Resource              Current         Peak      Limit    Denied   Context
Telnet                      1            1        100[S]      0   Summary
SSH                         2            2        100[S]      0   Summary
Conns                      56           90        N/A         0   Summary
Hosts                      89          102        N/A         0   Summary
S = System: Combined context limits exceed the system limit; the system limit is shown.
```

The following is sample output from the **show resource usage system** command, which shows the resource usage for all contexts, but it shows the system limit instead of the combined context limits. The **counter all 0** option is used to show resources that are not currently in use. The Denied statistics indicate how many times the resource was denied due to the system limit, if available.

```
hostname# show resource usage system counter all 0

Resource              Current         Peak      Limit        Denied    Context
Telnet                      0            0        100             0    System
SSH                         0            0        100             0    System
ASDM                        0            0         32             0    System
Syslogs [rate]              1           18        N/A             0    System
Conns                       0            1     280000             0    System
Xlates                      0            0        N/A             0    System
Hosts                       0            2        N/A             0    System
Conns [rate]                1            1        N/A             0    System
Inspects [rate]             0            0        N/A             0    System
```

Monitoring SYN Attacks in Contexts

The ASA prevents SYN attacks using TCP Intercept. TCP Intercept uses the SYN cookies algorithm to prevent TCP SYN-flooding attacks. A SYN-flooding attack consists of a series of SYN packets usually originating from spoofed IP addresses. The constant flood of SYN packets keeps the server SYN queue full, which prevents it from servicing connection requests. When the embryonic connection threshold of a connection is crossed, the ASA acts as a proxy for the server and generates a SYN-ACK response to the client SYN request. When the ASA receives an ACK back from the client, it can then authenticate the client and allow the connection to the server.

You can monitor the rate of attacks for individual contexts using the **show perfmon** command; you can monitor the amount of resources being used by TCP intercept for individual contexts using the **show resource usage detail** command; you can monitor the resources being used by TCP intercept for the entire system using the **show resource usage summary detail** command.

The following is sample output from the **show perfmon** command that shows the rate of TCP intercepts for a context called admin.

```
hostname/admin# show perfmon

Context:admin
PERFMON STATS:   Current      Average
Xlates               0/s          0/s
Connections          0/s          0/s
TCP Conns            0/s          0/s
UDP Conns            0/s          0/s
URL Access           0/s          0/s
URL Server Req       0/s          0/s
WebSns Req           0/s          0/s
TCP Fixup            0/s          0/s
HTTP Fixup           0/s          0/s
FTP Fixup            0/s          0/s
AAA Authen           0/s          0/s
AAA Author           0/s          0/s
AAA Account          0/s          0/s
TCP Intercept    322779/s      322779/s
```

The following is sample output from the **show resource usage detail** command that shows the amount of resources being used by TCP Intercept for individual contexts. (Sample text in italics shows the TCP intercept information.)

```
hostname(config)# show resource usage detail
Resource              Current         Peak      Limit        Denied Context
memory                 843732       847288  unlimited             0 admin
chunk:channels             14           15  unlimited             0 admin
chunk:fixup                15           15  unlimited             0 admin
chunk:hole                  1            1  unlimited             0 admin
chunk:ip-users             10           10  unlimited             0 admin
chunk:list-elem            21           21  unlimited             0 admin
chunk:list-hdr              3            4  unlimited             0 admin
chunk:route                 2            2  unlimited             0 admin
chunk:static                1            1  unlimited             0 admin
tcp-intercepts         328787       803610  unlimited             0 admin
np-statics                  3            3  unlimited             0 admin
statics                     1            1  unlimited             0 admin
ace-rules                   1            1  unlimited             0 admin
console-access-rul          2            2  unlimited             0 admin
fixup-rules                14           15  unlimited             0 admin
memory                 959872       960000  unlimited             0 c1
chunk:channels             15           16  unlimited             0 c1
chunk:dbgtrace              1            1  unlimited             0 c1
chunk:fixup                15           15  unlimited             0 c1
chunk:global                1            1  unlimited             0 c1
chunk:hole                  2            2  unlimited             0 c1
chunk:ip-users             10           10  unlimited             0 c1
chunk:udp-ctrl-blk          1            1  unlimited             0 c1
chunk:list-elem            24           24  unlimited             0 c1
chunk:list-hdr              5            6  unlimited             0 c1
chunk:nat                   1            1  unlimited             0 c1
```

```
chunk:route                 2            2  unlimited             0 c1
chunk:static                1            1  unlimited             0 c1
tcp-intercept-rate      16056        16254  unlimited             0 c1
globals                     1            1  unlimited             0 c1
np-statics                  3            3  unlimited             0 c1
statics                     1            1  unlimited             0 c1
nats                        1            1  unlimited             0 c1
ace-rules                   2            2  unlimited             0 c1
console-access-rul          2            2  unlimited             0 c1
fixup-rules                14           15  unlimited             0 c1
memory              232695716    232020648  unlimited             0 system
chunk:channels             17           20  unlimited             0 system
chunk:dbgtrace              3            3  unlimited             0 system
chunk:fixup                15           15  unlimited             0 system
chunk:ip-users              4            4  unlimited             0 system
chunk:list-elem          1014         1014  unlimited             0 system
chunk:list-hdr              1            1  unlimited             0 system
chunk:route                 1            1  unlimited             0 system
block:16384               510          885  unlimited             0 system
block:2048                 32           34  unlimited             0 system
```

The following sample output shows the resources being used by TCP intercept for the entire system. (Sample text in italics shows the TCP intercept information.)

```
hostname(config)# show resource usage summary detail
Resource              Current         Peak      Limit        Denied Context
memory              238421312    238434336  unlimited             0 Summary
chunk:channels             46           48  unlimited             0 Summary
chunk:dbgtrace              4            4  unlimited             0 Summary
chunk:fixup                45           45  unlimited             0 Summary
chunk:global                1            1  unlimited             0 Summary
chunk:hole                  3            3  unlimited             0 Summary
chunk:ip-users             24           24  unlimited             0 Summary
chunk:udp-ctrl-blk          1            1  unlimited             0 Summary
chunk:list-elem          1059         1059  unlimited             0 Summary
chunk:list-hdr             10           11  unlimited             0 Summary
chunk:nat                   1            1  unlimited             0 Summary
chunk:route                 5            5  unlimited             0 Summary
chunk:static                2            2  unlimited             0 Summary
block:16384               510          885  unlimited             0 Summary
block:2048                 32           35  unlimited             0 Summary
tcp-intercept-rate     341306       811579  unlimited             0 Summary
globals                     1            1  unlimited             0 Summary
np-statics                  6            6  unlimited             0 Summary
statics                     2            2        N/A             0 Summary
nats                        1            1        N/A             0 Summary
ace-rules                   3            3        N/A             0 Summary
console-access-rul          4            4        N/A             0 Summary
fixup-rules                43           44        N/A             0 Summary
```