



## Configuring Virtualization

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This chapter describes how to create and configure virtualization for your ACE. As the global administrator (SuperUser), you configure and manage all contexts through the Admin context, which contains the basic settings for each virtual device or context. Each context that you configure contains its own set of policies, interfaces, resources, and administrators.

This chapter contains the following sections:

- [Information About Virtualization](#)
- [Licensing Requirements for Virtualization](#)
- [Guidelines and Limitations](#)
- [Default Settings](#)
- [Configuring Virtualization](#)
- [Verifying Your Virtualization Configuration](#)
- [Monitoring Virtualization Statistics](#)
- [Configuration Examples for Virtualization](#)

### Information About Virtualization

You can operate your Cisco 4700 Series Application Control Engine (ACE) appliance in a single context or in multiple contexts. Multiple contexts use virtualization to partition your ACE into multiple virtual devices or contexts. Each context contains its own set of policies, interfaces, resources, and administrators.

This feature provides you with the tools to more closely and efficiently manage the system resources and users of the ACE, and the services you provide to your customers.

For a detailed overview on virtualization, see [Chapter 1, Overview](#).

### Licensing Requirements for Virtualization

By default, your ACE provides an Admin context and five user contexts that allows you to use multiple contexts if you choose to configure them. To increase the number of user contexts up to a maximum of 20, you must obtain a separate license from Cisco. [Table 2-1](#) shows the licensing requirements for virtualization.

**Table 2-1 ACE Virtualization Licensing Options**

Feature	License Model	Description
Virtualization	Default	1 admin/5 contexts.
	ACE-AP-VIRT-020	1 admin/20 contexts.
	ACE-AP-VIRT-020-UP	Upgrades 5 to 20 contexts.

For details about licensing, see the *Cisco 4700 Series Application Control Engine Appliance Administration Guide*.

## Guidelines and Limitations

This section includes the guidelines and limitations for virtualization:

- [Throughput and Management Traffic Bandwidth Rate Guidelines](#)
- [Resource Minimum Value Guidelines](#)
- [Changing the Resource Allocation of a Resource Class Guidelines](#)
- [Managed System Resources Guidelines](#)

### Throughput and Management Traffic Bandwidth Rate Guidelines

The maximum bandwidth rate per context is determined by your bandwidth license. By default, the entry-level ACE has a 1-Gbps through-traffic bandwidth and a 1-Gbps management-traffic bandwidth for a total maximum bandwidth of 2 Gbps. With the 2-Gbps license, the ACE has a 2-Gbps through-traffic bandwidth and a 1-Gbps management-traffic bandwidth for a total maximum bandwidth of 3 Gbps. You can upgrade the ACE with either an optional 2-Gbps or 4-Gbps bandwidth license (see the *Cisco 4700 Series Application Control Engine Appliance Administration Guide*).

When you configure a minimum bandwidth value for a resource class in the ACE by using the **limit-resource** command (see the “[Allocating Resources within a Resource Class](#)” section), the ACE subtracts that configured value from the total bandwidth maximum value of all contexts in the ACE, regardless of the resource class with which they are associated.

The total bandwidth rate of a context consists of the following two components:

- throughput—Limits through-the-ACE traffic. This is a derived value (you cannot configure it directly) and it is equal to the **bandwidth** rate minus the **mgmt-traffic** rate for the 1-Gbps, 2-Gbps, or 4-Gbps licenses.
- management traffic—Limits management (to-the-ACE) traffic in bytes per second. This parameter is independent of the **limit-resource all minimum** command. To guarantee a minimum amount of management traffic bandwidth, you must explicitly allocate a minimum percentage to management traffic using the **limit-resource rate mgmt-traffic minimum** command. When you allocate a minimum percentage of bandwidth to management traffic, the ACE subtracts that value from the maximum available management traffic bandwidth for all contexts in the ACE. By default, management traffic is guaranteed a minimum bandwidth rate of 0 and a maximum bandwidth rate of 1 Gbps, regardless of the bandwidth license that you install in the ACE.

For details about how the ACE manages bandwidth for throughput and management traffic rates, see the examples of the **show resource-usage** command output that follow. For each bandwidth license, there are examples for the default values, 25 percent minimum allocation to all resources, and both a 25 percent minimum allocation to all resources and a 10 percent minimum allocation to management traffic. The output has been modified to show only the relevant fields. All values are in bytes per second; to convert to bits per second, multiply each value by 8.

**Example 2-1 Default Show Resource Usage Command Output for 1-Gbps License**

Resource	Allocation	
	Min	Max
bandwidth	0	250000000
throughput	0	125000000
mgmt-traffic rate	0	125000000

**Example 2-2 Show Resource Usage Command Output for 1-Gbps License with 25 Percent Minimum Allocation for All Resources (continued)**

Resource	Allocation	
	Min	Max
bandwidth	31250000	218750000
throughput	31250000	93750000
mgmt-traffic rate	0	125000000

**Example 2-3 Show Resource Usage Command Output for 1-Gbps License with 25 Percent Minimum Allocation for All Resources and 10 Percent Minimum Allocation for Management Traffic**

Resource	Allocation	
	Min	Max
bandwidth	43750000	206250000
throughput	31250000	93750000
mgmt-traffic rate	12500000	112500000

**Example 2-4 Default Show Resource Usage Command Output for 2-Gbps License**

Resource	Allocation	
	Min	Max
bandwidth	0	375000000
throughput	0	250000000
mgmt-traffic rate	0	125000000

**Example 2-5 Show Resource Usage Command Output for 2-Gbps License with 25 Percent Minimum Allocation for All Resources**

Resource	Allocation	
	Min	Max
bandwidth	62500000	312500000
throughput	62500000	187500000
mgmt-traffic rate	0	125000000

**Example 2-6 Show Resource Usage Command Output for 2-Gbps License with 25 Percent Minimum Allocation for All Resources and 10 Percent Minimum Allocation for Management Traffic**

Resource	Allocation	
	Min	Max
bandwidth	75000000	300000000
throughput	62500000	187500000
mgmt-traffic rate	12500000	112500000

**Example 2-7 Default Show Resource Usage Command Output for 4-Gbps License**

Resource	Allocation	
	Min	Max
bandwidth	0	500000000
throughput	0	375000000
mgmt-traffic rate	0	125000000

**Example 2-8 Show Resource Usage Command Output for 4-Gbps License with 25 Percent Minimum Allocation for All Resources (continued)**

Resource	Allocation	
	Min	Max
bandwidth	93750000	406250000
throughput	93750000	281250000
mgmt-traffic rate	0	125000000

**Example 2-9 Show Resource Usage Command Output for 4-Gbps License with 25 Percent Minimum Allocation for All Resources and 10 Percent Minimum Allocation for Management Traffic**

Resource	Allocation	
	Min	Max
bandwidth	95000000	393750000
throughput	93750000	281250000
mgmt-traffic rate	12500000	112500000

### Resource Minimum Value Guidelines

When you configure a minimum value for a resource in a particular resource class in the ACE by using the **limit-resource** command (see the “[Allocating Resources within a Resource Class](#)” section), the ACE assigns the minimum resources only to the contexts that are members of the resource class. For all contexts, the ACE subtracts that configured minimum value from the maximum value of that resource, regardless of the resource class with which the contexts are associated. If the resource class has more than one context associated with it, the minimum value that the ACE subtracts from the maximum value is multiplied by the number of contexts in the resource class.

For example, with a 2-Gbps bandwidth license, if there are two contexts associated with the resource class and you configure a 25 percent minimum allocation for the bandwidth rate for the class, each context in the resource class would have the values that are shown in [Example 2-10](#) for the **show resource usage** command output for the bandwidth rate and throughput rate.

#### **Example 2-10 Show Resource Usage Command Output for 2-Gbps License with 25 Percent Minimum Allocation for Bandwidth**

Resource	Allocation	
	Min	Max
bandwidth	62500000	312500000
throughput	62500000	187500000
mgmt-traffic rate	0	125000000

All other contexts in the ACE would have the same maximum values as shown in [Example 2-10](#), but would have zero minimum values. Compare the values in [Example 2-10](#) with the values in [Example 2-5](#), which represents one context in a resource class.

### Changing the Resource Allocation of a Resource Class Guidelines

If you (as the global Admin) need to change the resource allocation in a resource class of which two or more user contexts are members, you may do so at any time by entering the appropriate CLI commands. For details about allocating resources, see the “[Allocating Resources within a Resource Class](#)” section.

However, the shift in resources between the contexts does not take place immediately unless the appropriate resources are available to accommodate the change. In most cases, to effect a change in resource allocation, you must inform the context administrators involved to ensure that the new resource allocation is possible.

For example, suppose that context A is using 100 percent of the available resources of the class and you want to allocate 50 percent of the resources to context A and 50 percent of the resources to context B. Although the CLI accepts your resource allocation commands, context B cannot allocate 50 percent of the resources until context A deallocates 50 percent of its resources. In this case, you must perform the following:

- Inform the Context A administrator to start deallocating resources
- Inform the Context B administrator to start allocating resources after the Context A administrator releases the resources

As resources are released from other contexts, the ACE assigns the resources to resource-starved contexts (contexts where the resource-class minimum allocations have not been met).

**Managed System Resources Guidelines**

Table 2-2 lists the managed system resources of the ACE. You can limit these resources per context or for all contexts associated with the resource class by using the **limit-resource** command. See the “Allocating Resources within a Resource Class” section.

**Table 2-2 System Resource Maximum Values**

Resource	Maximum Value
Application Acceleration Connections	10000 connections.
ACL Memory	34123184 bytes.
Buffer Memory (Syslog)	1048576 bytes.
Concurrent Connections	1,000,000 connections (Layer 4), 100,000 connections (SSL).
HTTP Compression	100 megabits per second (Mbps). You can upgrade the ACE maximum HTTP compression rate to 1 Gbps by purchasing a separate license from Cisco Systems. For more information, see the <i>Cisco 4700 Series Application Control Engine Appliance Administration Guide</i> .
Management Connections	100,000 connections.
Proxy Connections (Layer 7)	256,000 connections.
<b>Rate</b>	
Bandwidth	1 gigabits per second (Gbps). You can upgrade the ACE maximum bandwidth to 2 Gbps by purchasing a separate license from Cisco Systems. For more information, see the <i>Cisco 4700 Series Application Control Engine Appliance Administration Guide</i> .
Connections (any kind)	120,000 connections per second (Layer 4), 40,000 connections per second (Layer 7).
MAC miss	2000 packets per second.
Management traffic	125,000,000 bits per second.
SSL connections	1000 transactions per second (TPS). You can upgrade the SSL bandwidth to a maximum of 7500 TPS with a separate license. For more information, see the <i>Cisco 4700 Series Application Control Engine Appliance Administration Guide</i> .
syslog	For traffic going to the ACE (control plane), 3000 messages per second. For traffic going through the ACE (data plane), 120,000 messages per second.
Regular Expression Memory	1,048,576 bytes.
Sticky Entries	800,000 table entries.
Xlates (network and port address translation entries)	64,000 Xlates (network entries), 1,000,000 Xlates (port address translation entries).

# Default Settings

Table 2-3 lists the default settings for the virtualization function.

**Table 2-3**      **Default Virtualization Parameters**

Parameters	Default
Through-traffic Bandwidth	The entry-level ACE has a 1-Gbps through-traffic bandwidth and a 1-Gbps management-traffic bandwidth for a total maximum bandwidth of 2 Gbps. With the 2-Gbps license, the ACE has a 2-Gbps through-traffic bandwidth and a 1-Gbps management-traffic bandwidth for a total maximum bandwidth of 3 Gbps.  You can upgrade the ACE with either an optional 2-Gbps or 4-Gbps bandwidth license (see the <i>Cisco 4700 Series Application Control Engine Appliance Administration Guide</i> ).
Management-traffic Bandwidth	Management traffic is guaranteed a minimum bandwidth rate of 0 and a maximum bandwidth rate of 1 Gbps, regardless of the bandwidth license that you install in the ACE.
Resource Allocation	Minimum: 0 percent. Maximum: 100 percent.
User Default Role	Network-Monitor.
Context Domain	Default-domain.
User accounts	admin, dm, and www.
User Password	Clear text.

# Configuring Virtualization

This section includes the following topics:

- [Task Flow for Configuring Virtualization](#)
- [Managing ACE Resources](#)
- [Configuring a Context](#)
- [Configuring User Roles](#)
- [Configuring Domains](#)
- [Configuring a User](#)
- [Logging Out a User](#)

For additional information about the CLI command syntax described in this chapter, see the *Cisco 4700 Series Application Control Engine Appliance Command Reference* located at:

[http://www.cisco.com/en/US/products/ps7027/prod\\_command\\_reference\\_list.html](http://www.cisco.com/en/US/products/ps7027/prod_command_reference_list.html)

## Task Flow for Configuring Virtualization

Follows these steps to configure virtualization.

- 
- Step 1** Log in to the ACE as the global administrator using the console. By default, the console comes up with a single context called Admin.
- Step 2** Enter configuration mode.
- ```
host1/Admin# config
Enter configuration commands, one per line. End with CNTL/Z.
host1/Admin(config)#
```
- Step 3** Configure a resource class to limit resources used by user contexts. For example, to limit the resources of a context to 10 percent of the total resources available, enter the following commands:
- ```
host1/Admin(config)# resource-class RC1
host1/Admin(config-resource)# limit resource all minimum 10 maximum equal-to-min
host1/Admin(config-resource)# exit
```
- Step 4** Create a new context.
- ```
host1/Admin(config)# context C1
host1/Admin(config-context)#
```
- Step 5** Associate an existing VLAN with the context so that the context can receive traffic classified for it.
- ```
host1/Admin(config-context)# allocate-interface vlan 100
```
- Step 6** Associate the context with the resource class that you created in Step 3.
- ```
host1/Admin(config-context)# member RC1
```



**Step 7** Change to the C1 context that you created in Step 4 and enter configuration mode in that context.

```
host1/Admin(config-context)# do changeto C1
host1/C1(config-context)# exit
host1/C1(config)#
```

**Step 8** (Optional) Create a domain for the context.

```
host1/C1(config)# domain D1
host1/C1(config-domain)#
```

**Step 9** Allocate objects (for example, real servers, server farms, probes, ACLs, and so on) to the domain as needed.

```
host1/C1(config-domain)# add-object rserver SERVER1
```

**Step 10** (Optional) Create roles to define the object and resource permissions for different groups of users.

```
host1/C1(config)# role UR1
```

**Step 11** Create rules to define the role permissions.

```
host1/C1(config-role)# rule 1 permit create feature real
host1/C1(config-role)# rule 2 deny create feature acl
```

**Step 12** Configure users as required and associate roles and domains with the users.

```
host1/C1(config)# username user1 password 5 MYPASSWORD role UR1 domain D1
```

**Step 13** Verify the virtualization configuration by entering one of the following commands:

```
host1/C1# show running-config context
host1/C1# show running-config domain
host1/C1# show running-config resource-class
host1/C1# show running-config role
```

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## Managing ACE Resources

You can allocate system resources to multiple contexts by creating and defining one or more resource classes and then associating the contexts with a resource class.

The section contains the following topics:

- [Creating a Resource Class for Resource Management](#)
- [Allocating Resources within a Resource Class](#)

## Creating a Resource Class for Resource Management

You can create a resource class to allocate and manage system resources by one or more contexts by using the **resource-class** command in configuration mode.

### Restrictions

This configuration topic includes the following restrictions:

- The ACE supports a maximum of 100 resource classes.
- When you remove a resource class from the ACE, any contexts that were members of that resource class automatically become members of the default resource class. The default resource class allocates a minimum of 0.00 percent to a maximum of 100.00 percent of all ACE resources to each context. You cannot modify the default resource class.

### Detailed Steps

|        | Command                                                                                                                                       | Purpose                                                                                                                                                                                               |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | <b>config</b><br><br><b>Example:</b><br>host1/Admin# config<br>(config)#                                                                      | Enters configuration mode.                                                                                                                                                                            |
| Step 2 | <b>resource-class name</b><br><br><b>Example:</b><br>host1/Admin(config)# resource-class RC1<br>host1/Admin(config-resource)                  | Creates a resource class and accesses the resource configuration mode.<br><br>For the <i>name</i> argument, enter an unquoted text string with no spaces and a maximum of 64 alphanumeric characters. |
| Step 3 | <b>no resource-class name</b><br><br><b>Example:</b><br>host1/Admin(config)# no resource-class RC1                                            | (Optional) Removes a resource class from the configuration.                                                                                                                                           |
| Step 4 | <b>do copy running-config startup-config</b><br><br><b>Example:</b><br>host1/Admin(config-resource)# do copy<br>running-config startup-config | (Optional) Copies the running configuration to the startup configuration.                                                                                                                             |

## Allocating Resources within a Resource Class

You can allocate all resources or individual resources to all member contexts of a resource class. For example, you can allocate only concurrent connections or sticky table memory. You allocate system resources to all members (contexts) of a resource class by using the **limit-resource** command in resource-class configuration mode.

### Prerequisites

This configuration topic includes the following prerequisites:

- When you plan the initial resource allocations for the virtual contexts in your configuration, allocate only the minimum required or estimated resources. The ACE protects resources that are in use, so to decrease a context's resources, those resources must be unused. Although it is possible to decrease the resource allocations in real time, it may require additional management overhead to clear any used resources before reducing them. Therefore, it is considered a best practice to initially keep as many resources in reserve as possible and allocate the unused reserved resources as needed.
- You must configure a minimum value for sticky to allocate resources for sticky database entries, because the sticky software receives no resources under the **unlimited** setting. You can allocate resources to sticky by either configuring a minimum percentage of resources specifically for sticky (**limit-resource sticky**) or by configuring a minimum percentage of resources for all (**limit-resource all**).


### Restrictions

This configuration topic includes the following restrictions:

- To address scaling and capacity planning, we recommend that new ACE installations do not exceed 60 to 80 percent of the appliance's total capacity. To accomplish this goal, create a reserved resource class with a guarantee of 20 to 40 percent of all the ACE resources. Configure a virtual context dedicated solely to ensuring that these resources are reserved. Then, you can efficiently distribute such reserved resources to contexts as capacity demands for handling client traffic increase over time.
- The limit that you set for individual resources when you use the **limit-resource** command overrides the limit that you set for all resources when you use the **limit-resource all** command.
- If you lower the limits for one context (context A) in order to increase the limits of another context (context B), you may experience a delay in the configuration change because the ACE will not lower the limits of context A until the resources are no longer being used by the context.

## Detailed Steps

| Command                                                                                                                                                                                                                                                                       | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Step 1</b></p> <pre>limit-resource resources {minimum number} {maximum {equal-to-min   unlimited}}</pre> <p><b>Example:</b><br/> host1/Admin(config)# resource-class RC1<br/> host1/Admin(config-resource)#limit-resource<br/> all minimum 20% maximum equal-to-min</p> | <p>Specifies the system resource that you want to limit. The keywords, arguments, and options are as follows:</p> <ul style="list-style-type: none"> <li>• <i>resources</i>—Enter one of the following keywords for the system resource: <ul style="list-style-type: none"> <li>– <b>acc-connections</b>—Limits the number of application acceleration connections.</li> <li>– <b>acl-memory</b>—Limits memory space allocated for ACLs.</li> <li>– <b>all</b>—Limits all resources to the specified value for all contexts assigned to this resource class, except for management traffic bandwidth.</li> <li>– <b>buffer</b>—Limits the number of syslog buffers.</li> <li>– <b>conc-connections</b>—Limits the number of simultaneous connections.</li> <li>– <b>http-comp</b>—Limits the HTTP compression rate.</li> <li>– <b>mgmt-connections</b>—Limits the number of management (to-the-ACE) connections.</li> <li>– <b>proxy-connections</b>—Limits the number of proxy connections.</li> <li>– <b>regex</b>—Limits the amount of regular expression memory.</li> <li>– <b>sticky</b>—Limits the number of entries in the sticky table.</li> <li>– <b>xlates</b>—Limits the number of network and port address translations entries.</li> </ul> </li> <li>• <b>minimum number</b>—Specifies the lowest acceptable value for a resource. Enter an integer from 0.00 to 100.00 percent (two-decimal places of granularity). The <i>number</i> argument specifies a percentage value for all contexts that are members of the resource class.</li> </ul> <p><b>Note</b> For configuration guidelines on the <b>minimum</b> keyword, see the “<a href="#">Guidelines and Limitations</a>” section.</p> <ul style="list-style-type: none"> <li>• <b>maximum {equal-to-min   unlimited}</b>—Specifies the maximum resource value: either the same values as the minimum value or no limit.</li> </ul> |

| Command                                                                                                                                                                                                                                                                               | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Step 2</b></p> <pre>limit-resource rate rates {minimum number} {maximum {equal-to-min   unlimited}}</pre> <p><b>Example:</b></p> <pre>host1/Admin(config)# resource-class RC1 host1/Admin(config-resource)#limit-resource rate bandwidth minimum 20% maximum equal-to-min</pre> | <p>Limits the resource as a number per second for the specified connections or syslog messages.</p> <ul style="list-style-type: none"> <li><i>rates</i>—Enter one of the following keywords for the rate: <ul style="list-style-type: none"> <li><b>bandwidth</b>—Limits the total ACE throughput in bytes per second for one or more contexts. The maximum bandwidth rate per context is determined by your bandwidth license (see the <a href="#">“Licensing Requirements for Virtualization”</a> section). When you configure a minimum bandwidth value for a resource class in the ACE, the ACE subtracts that configured value from the total bandwidth maximum value of all contexts in the ACE, regardless of the resource class with which they are associated.</li> </ul> </li> </ul> <p> <b>Note</b> For configuration guidelines on bandwidth, see the <a href="#">“Guidelines and Limitations”</a> section.</p> <ul style="list-style-type: none"> <li><b>connections</b>—Limits the number of connections of any kind per second.</li> <li><b>inspect conn</b>—Limits the number of application protocol inspection connections per second for File Transfer Protocol (FTP) and Real-Time Streaming Protocol (RTSP) only.</li> <li><b>mac-miss</b>—Limits the ACE traffic sent to the control plane when the encapsulation is not correct in bytes per second.</li> <li><b>mgmt-traffic</b>—Limits management (to-the-ACE) traffic in bytes per second.</li> <li><b>ssl-connections</b>—Limits the number of SSL connections per second.</li> <li><b>syslog</b>—Limits the number of syslog messages per second.</li> </ul> <ul style="list-style-type: none"> <li><b>minimum number</b>—Specifies the lowest acceptable value for a resource. Enter an integer from 0.00 to 100.00 percent (two-decimal places of granularity). The <i>number</i> argument specifies a value per second.</li> </ul> <p><b>Note</b> For configuration guidelines on the <b>minimum</b> keyword, see the <a href="#">“Guidelines and Limitations”</a> section.</p> <ul style="list-style-type: none"> <li><b>maximum {equal-to-min   unlimited}</b>—Specifies the maximum resource value: either the same values as the minimum value or no limit.</li> </ul> |

|               | <b>Command</b>                                                                                                                                                                                                 | <b>Purpose</b>                                                                                                                 |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 3</b> | <pre>no limit-resource resources {minimum number} {maximum {equal-to-min   unlimited}}  <b>Example:</b> host1/Admin(config-resource)# no limit-resource all</pre>                                              | (Optional) Restores resource allocation to the default values of 0 percent minimum and 100 percent maximum for a resource.     |
| <b>Step 4</b> | <pre>no limit-resource rate rates {minimum number} {maximum {equal-to-min   unlimited}}  <b>Example:</b> host1/Admin(config-resource)# no limit-resource rate bandwidth minimum 20% maximum equal-to-min</pre> | (Optional) Restores the resource rate limit to the default values of 0 percent minimum and 100 percent maximum for a resource. |
| <b>Step 5</b> | <pre>do copy running-config startup-config  <b>Example:</b> host1/Admin(config-resource)# do copy running-config startup-config</pre>                                                                          | (Optional) Copies the running configuration to the startup configuration.                                                      |
| <b>Step 6</b> | <pre>exit  <b>Example:</b> host1/Admin(config-resource)# exit host1/Admin(config)#</pre>                                                                                                                       | (Optional) Exits the resource configuration mode.                                                                              |

## Configuring a Context

A context provides a user view into the ACE and determines the resources available to a user. This section contains the following topics:

- [Creating a Context](#)
- [Configuring a Context Description](#)
- [Configuring a VLAN for a Context](#)
- [Associating a Context with a Resource Class](#)
- [Moving Between Contexts](#)

### Creating a Context

A context provides a user view into the ACE and determines the resources available to a user. You create a context by using the **context** command in configuration mode.



#### Note

When you create a context, the ACE automatically creates a default domain (default-domain) for that context. You can create a maximum of 63 additional domains in each context. For information about configuring a domain, see the “[Configuring Domains](#)” section.

### Detailed Steps

|        | Command                                                                                                                                      | Purpose                                                                                                                                                                                                                                 |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | <b>config</b><br><br><b>Example:</b><br>host1/Admin# config<br>(config)#                                                                     | Enters configuration mode.                                                                                                                                                                                                              |
| Step 2 | <b>context</b> <i>name</i><br><br><b>Example:</b><br>host1/Admin(config)# context C1<br>host1/Admin(config-context)                          | Creates a context and accesses the context configuration mode.<br><br>For the <i>name</i> argument, enter a unique identifier of the context. Enter an unquoted text string with no spaces and a maximum of 64 alphanumeric characters. |
| Step 3 | <b>no context</b> <i>name</i><br><br><b>Example:</b><br>host1/Admin(config)# no context C1                                                   | (Optional) Removes a context from the configuration.                                                                                                                                                                                    |
| Step 4 | <b>do copy running-config startup-config</b><br><br><b>Example:</b><br>host1/Admin(config-context)# do copy<br>running-config startup-config | (Optional) Copies the running configuration to the startup configuration.                                                                                                                                                               |

## Configuring a Context Description

You enter a description for the context by using the **description** command in context configuration mode.

### Detailed Steps

|        | Command                                                                                                                                      | Purpose                                                                                                                                                                     |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | <b>description</b> <i>text</i><br><br><b>Example:</b><br>host1/Admin(config-context)# description<br>context for accounting users            | Enters a description for a user context.<br><br>For the <i>text</i> argument, enter a description as an unquoted text string with a maximum of 240 alphanumeric characters. |
| Step 2 | <b>no description</b><br><br><b>Example:</b><br>host1/Admin(config-context)# no<br>description                                               | (Optional) Removes the context description from the configuration.                                                                                                          |
| Step 3 | <b>do copy running-config startup-config</b><br><br><b>Example:</b><br>host1/Admin(config-context)# do copy<br>running-config startup-config | (Optional) Copies the running configuration to the startup configuration.                                                                                                   |

## Configuring a VLAN for a Context

The ACE uses class maps and policy maps to classify (filter) traffic and direct it to different interfaces (VLANs) using a service policy. A context uses VLANs to receive packets classified for that VLAN. You allocate one or more existing VLANs on which a user context can receive packets by using the **allocate-interface** command in context configuration mode in the Admin context. You can enter this command multiple times to specify multiple VLANs for a user context.

### Restrictions

This configuration topic includes the following restrictions:

- You can configure an interface directly in a user context, but the state of the interface remains Down until you enter the **allocate-interface** command for that interface in the Admin context. You can configure the interface and allocate the interface in any order.
- If you remove an interface in the Admin context and the same interface is in use in a user context, the state of the interface becomes Down. Entering the **show interface** command in the user context shows the interface as Down and the reason that the interface is no longer allocated in the Admin context.
- You cannot deallocate a VLAN from a user context if the VLAN is in use in that context.



## Detailed Steps

|        | Command                                                                                                                                                                                                                                                           | Purpose                                                                                                                                                                                                                                                    |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | <p><b>allocate-interface vlan</b> <i>number1</i></p> <p><b>Example:</b><br/> <pre>host1/Admin(config-context)# allocate-interface vlan 100</pre></p> <p><b>Example:</b><br/> <pre>host1/Admin(config-context)# allocate-interface vlan 100-200</pre></p>          | <p>Allocate one or more existing VLANs on which a user context can receive packets.</p> <p>For the <i>number</i> argument, enter the number of an existing VLAN or a range of VLANs that you want to assign to the context as integers from 2 to 4094.</p> |
| Step 2 | <p><b>no allocate-interface vlan</b> <i>number1</i></p> <p><b>Example:</b><br/> <pre>host1/Admin(config-context)# no allocate-interface vlan 100</pre></p> <p><b>Example:</b><br/> <pre>host1/Admin(config-context)# no allocate-interface vlan 100-200</pre></p> | <p>(Optional) Deallocates a VLAN or range of VLANs from a context.</p>                                                                                                                                                                                     |
| Step 3 | <p><b>do copy running-config startup-config</b></p> <p><b>Example:</b><br/> <pre>host1/Admin(config-context)# do copy running-config startup-config</pre></p>                                                                                                     | <p>(Optional) Copies the running configuration to the startup configuration.</p>                                                                                                                                                                           |

## Associating a Context with a Resource Class

Resource classes limit the resources available to one or more contexts. You associate a context with a resource class or associate the same context with a different resource class by using the **member** command in context configuration mode.

### Prerequisites

This configuration topic includes the following prerequisites:

- The default resource class allocates a minimum of 0.00 percent to a maximum of 100.00 percent of all ACE resources to each context. You can associate a context with only one resource class. For more information about resource classes, see the “[Guidelines and Limitations](#)” section.
- When you remove a context from a resource class, the ACE releases all resources associated with that context and makes the resources available to other contexts in the class.

### Restrictions

This configuration topic includes the following restrictions:

- If you do not specify a resource class, the context automatically is a member of the default resource class.
- You can associate a context with only one resource class. If you try to associate more than one resource class to the context, the ACE overwrites the existing class.

- When you add a context to a resource class, the ACE adds only those resources that can remain within their configured limits. If you want to allocate additional resources to the context, you can do so if the resources are available. Otherwise, you must first release some resources from other contexts within the resource class. For details about modifying the resource allocation among contexts, see the “[Configuring a Context](#)” section.

## Detailed Steps

|        | Command                                                                                                                                           | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | <p><b>member</b> <i>class</i></p> <p><b>Example:</b><br/>host1/Admin(config-context)# member RC1</p>                                              | <p>Associates a context with a resource class, or associates the same context with a different resource class.</p> <p>For the <i>class</i> argument, enter the name of an existing resource class as an unquoted text string with no spaces and a maximum of 64 alphanumeric characters. For information about configuring a resource class, see the “<a href="#">Creating a Resource Class for Resource Management</a>” section.</p> |
| Step 2 | <p><b>no member</b> <i>class</i></p> <p><b>Example:</b><br/>host1/Admin(config-context)# no member RC1</p>                                        | (Optional) Disassociates a context from a resource class                                                                                                                                                                                                                                                                                                                                                                              |
| Step 3 | <p><b>do copy running-config startup-config</b></p> <p><b>Example:</b><br/>host1/Admin(config-context)# do copy running-config startup-config</p> | (Optional) Copies the running configuration to the startup configuration.                                                                                                                                                                                                                                                                                                                                                             |
| Step 4 | <p><b>exit</b></p> <p><b>Example:</b><br/>host1/Admin(config-context)# exit<br/>host1/Admin(config)#</p>                                          | (Optional) Exits the context configuration mode.                                                                                                                                                                                                                                                                                                                                                                                      |

## Moving Between Contexts

You move between contexts by using the **changeto** command in Exec mode.

### Prerequisites

Context administrators, who have access to multiple contexts, must explicitly log in to the other contexts to which they have access.

### Restrictions

This configuration topic includes the following restrictions:

- You must have one of the predefined user roles in the Admin context to use the **changeto** command. For information about the predefined user roles, see the “[Role-Based Access Control](#)” section in [Chapter 1, Overview](#).
- The user role that is enforced after you enter the **changeto** command is that of the Admin context and not that of the non-Admin context.

- You cannot add, modify, or delete objects in a custom domain after you change to a non-Admin context.
  - If you originally had access to the default-domain in the Admin context prior to moving to a non-Admin context, the ACE allows you to configure any object in the non-Admin context.
  - If you originally had access to a custom domain in the Admin context prior to moving to a non-Admin context, any created objects in the new context will be added to the default-domain. However, an error message will appear when you attempt to modify existing objects in the non-Admin context.

## Detailed Steps

|        | Command                                                                                                                                   | Purpose                                                                                                                                                                                                                                                                                                                                                 |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | <p><b>changeto</b> <i>name</i></p> <p><b>Example:</b><br/>           host1/Admin# changeto C1<br/>           host1/C1#</p>                | <p>Moves from one context on the ACE to another context.</p> <p><b>Note</b> You can move between contexts in configuration mode by using the <b>do changeto</b> command.</p> <p>The <i>name</i> argument specifies the identifier of an existing context. Enter an unquoted text string with no spaces and a maximum of 64 alphanumeric characters.</p> |
| Step 2 | <p><b>do copy running-config startup-config</b></p> <p><b>Example:</b><br/>           host1/C1# do copy running-config startup-config</p> | <p>(Optional) Copies the running configuration to the startup configuration.</p>                                                                                                                                                                                                                                                                        |
| Step 3 | <p><b>exit</b></p> <p><b>Example:</b><br/>           host1/C1# exit<br/>           host1/Admin#</p>                                       | <p>(Optional) Exits the context and returns to the Admin context.</p>                                                                                                                                                                                                                                                                                   |

## Configuring User Roles

This section contains the following topics:

- [Creating a User Role](#)
- [Assigning Privileges to a User Role](#)

### Creating a User Role

User roles determine the privileges that a user has, the commands that a user can enter, and the actions that a user can perform in a particular context. For a list of the predefined roles that the ACE provides, see [Chapter 1, Overview](#).

#### Prerequisites

Only the global administrator or a context administrator can configure additional roles.

#### Restrictions

If you do not assign a role to a new user, the default role is Network-Monitor. For users that you create in the Admin context, the default scope of access is the entire device. For users that you create in other contexts, the default scope of access is the entire context. If you need to restrict a user's access, you must assign a role-domain pair using the **username** command (see the “[Configuring a User](#)” section).

#### Detailed Steps

|        | Command                                                                                                                                | Purpose                                                                                                                                                                                                                                                                                                                                     |
|--------|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | <b>config</b><br><br><b>Example:</b><br>host1/Admin# config<br>(config)#                                                               | Enters configuration mode.                                                                                                                                                                                                                                                                                                                  |
| Step 2 | <b>role name</b><br><br><b>Example:</b><br>host1/C1(config)# role TECHNICIAN<br>host1/C1(config-role)#                                 | Creates a role and accesses the role configuration mode.<br><br><b>Note</b> To display the predefined roles in the CLI, enter the <b>show role</b> command in Exec mode.<br><br>The <i>name</i> argument is an identifier associated with a role. Enter an unquoted text string with no spaces and a maximum of 64 alphanumeric characters. |
| Step 3 | <b>no role name</b><br><br><b>Example:</b><br>host1/C1(config)# no role TECHNICIAN                                                     | (Optional) Removes the role from the configuration                                                                                                                                                                                                                                                                                          |
| Step 4 | <b>do copy running-config startup-config</b><br><br><b>Example:</b><br>host1/C1(config-role)# do copy<br>running-config startup-config | (Optional) Copies the running configuration to the startup configuration.                                                                                                                                                                                                                                                                   |

## Assigning Privileges to a User Role

After you create a user role, you can limit the features that a user has access to and the commands the user can enter for that feature by configuring rules for that role. You assign privileges per feature to a role by using the **rule** command in role configuration mode.



### Note

For a user with a customized role to perform configuration and operation changes from the ACE Appliance Device Manager, you must configure the role with rules that permit the create operation for the config-copy and exec-commands features.

### Detailed Steps

|        | Command                                                                                                                                                                                                                                                                                  | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | <p><b>rule</b> <i>number</i> {<b>permit</b>   <b>deny</b>} {<b>create</b>   <b>modify</b>   <b>debug</b>   <b>monitor</b>} [<b>feature</b> {<i>features</i>}]</p> <p><b>Example:</b><br/> host1/C1(config)# role TECHNICIAN<br/> host1/C1(config-role)# rule 1 permit create rserver</p> | <p>Specifies whether to allow or disallow operations that can be performed by a user, the type of commands that can be permitted or disallowed by the role, and the ACE feature to use when configuring the rule. The keywords, arguments, and options are as follows:</p> <ul style="list-style-type: none"> <li>• <b>number</b>—Identifier of the rule and order of precedence. Enter a unique integer from 1 to 16. The rule number determines the order in which the ACE applies the rules, with a higher-numbered rule applied after a lower-numbered rule.</li> <li>• <b>permit</b>—Allows the role to perform the operations defined by the rest of the command keywords.</li> <li>• <b>deny</b>—Disallows the role to perform the operations defined by the rest of the command keywords.</li> <li>• <b>create</b>—Specifies commands for the creation of new objects or the deletion of existing objects (includes <b>modify</b>, <b>debug</b>, and <b>monitor</b> commands).</li> <li>• <b>modify</b>—Specifies commands for modifying existing configurations (includes <b>debug</b> and <b>monitor</b> commands).</li> <li>• <b>debug</b>—Specifies commands for debugging problems (includes <b>monitor</b> commands).</li> <li>• <b>monitor</b>—Specifies commands for monitoring resources and objects (<b>show</b> commands).</li> <li>• <b>feature</b>—(Optional) Specifies an ACE features for configuring this rule.</li> <li>• <i>features</i>—Enter one of the following keywords for the system resource: <ul style="list-style-type: none"> <li>– <b>AAA</b>—Specifies commands for authentication, authorization, and accounting.</li> <li>– <b>access-list</b>—Specifies commands for access control lists (ACLs). Includes ACL configuration, class maps for ACL, and policy maps that contain ACL class maps.</li> </ul> </li> </ul> |

| Command                                                                                                                                                                                                                                                                         | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>- <b>config-copy</b>—Specifies commands for copying the running-config file to the startup-config file, startup-config file to the running-config file, and copying both config files to the flash disk (disk0:) or a remote server.</li> <li>- <b>connection</b>—Specifies commands for network connections.</li> <li>- <b>dhcp</b>—Specifies commands for Dynamic Host Configuration Protocol.</li> <li>- <b>fault-tolerant</b>—Specifies commands for redundancy.</li> <li>- <b>inspect</b>—Specifies commands for packet inspection used in data-center security.</li> <li>- <b>interface</b>—Specifies all interface commands.</li> <li>- <b>loadbalance</b>—Specifies commands for load balancing (including the application acceleration and optimization functions). Allows adding a load-balancing action in a policy map.</li> <li>- <b>nat</b>—Specifies commands for Network Address Translation (NAT) associated with a class map in a policy map used in data-center security.</li> <li>- <b>pki</b>—Specifies commands for SSL public key infrastructure (PKI).</li> <li>- <b>probe</b>—Specifies commands for keepalives for real servers.</li> <li>- <b>real-inservice</b>—Specifies commands for placing a real server in service.</li> <li>- <b>routing</b>—Specifies all commands for routing, both global and per interface.</li> <li>- <b>rserver</b>—Specifies commands for physical servers.</li> <li>- <b>serverfarm</b>—Specifies commands for server farms.</li> <li>- <b>ssl</b>—Specifies commands for SSL.</li> <li>- <b>sticky</b>—Specifies commands for server persistence.</li> <li>- <b>syslog</b>—Specifies the system logging facility setup commands.</li> <li>- <b>vip</b>—Specifies commands for virtual IP addresses and virtual servers.</li> </ul> |
| <p><b>Step 2</b></p> <pre>no rule <i>number</i> {<b>permit</b>   <b>deny</b>} {<b>create</b>   <b>modify</b>   <b>debug</b>   <b>monitor</b>} [<b>feature</b> {<i>features</i>}]</pre> <p><b>Example:</b></p> <pre>host1/C1(config-role)# no rule 1 permit create rserver</pre> | (Optional) Removes the rule from a role.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|        | Command                                                                                                                                | Purpose                                                                   |
|--------|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Step 3 | <b>do copy running-config startup-config</b><br><br><b>Example:</b><br>host1/C1(config-role)# do copy<br>running-config startup-config | (Optional) Copies the running configuration to the startup configuration. |
| Step 4 | <b>exit</b><br><br><b>Example:</b><br>host1/Admin(config-role)# exit<br>host1/Admin(config)#                                           | (Optional) Exits the role configuration mode.                             |

## Configuring Domains

This section contains the following topics:

- [Creating a Domain](#)
- [Associating Objects With a Domain](#)

### Creating a Domain

A domain is the namespace in which a user operates.

#### Restrictions

This configuration topic includes the following restrictions:

- You can create a maximum of 63 additional domains in each context.
- A domain does not restrict the context configuration that you can display using the **show running-config** command. You can still display the running configuration for the entire context. However, a domain can restrict your access to the configurable objects within a context by adding only a limited subset of all the objects available to a context to the domain. You can further restrict the operations that a user can perform on those configurable objects by assigning a role to a user. For information about configuring user roles, see the “[Configuring User Roles](#)” section.

## Detailed Steps

|        | Command                                                                                                                                  | Purpose                                                                                                                                                                               |
|--------|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | <b>config</b><br><br><b>Example:</b><br>host1/Admin# config<br>(config)#                                                                 | Enters configuration mode.                                                                                                                                                            |
| Step 2 | <b>domain name</b><br><br><b>Example:</b><br>host1/C1(config)# domain D1<br>host1/C1(config-domain)#                                     | Creates a domain and access domain configuration mode.<br><br>For the <i>name</i> argument, enter an unquoted text string with no spaces and a maximum of 64 alphanumeric characters. |
| Step 3 | <b>no domain name</b><br><br><b>Example:</b><br>host1/C1(config)# no domain D1                                                           | (Optional) Removes the domain from the configuration.                                                                                                                                 |
| Step 4 | <b>do copy running-config startup-config</b><br><br><b>Example:</b><br>host1/C1(config-domain)# do copy<br>running-config startup-config | (Optional) Copies the running configuration to the startup configuration.                                                                                                             |



## Associating Objects With a Domain

After you create a domain, you can associate configurable objects with that domain (for example, a real server, server farm, interface, and so on). You associate a configurable object with a domain by using the **add-object** command in domain configuration mode.

### Detailed Steps

|        | Command                                                                                                                                                                                                                                                                                                      | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | <pre>add-object {access-list {ethertype   extended}   all   class-map   interface {bvi   vlan}   parameter-map   policy-map   probe   rserver   script   serverfarm   sticky} name</pre> <p><b>Example:</b></p> <pre>host1/C1(config)# domain D1 host1/C1(config-domain)# add-object interface vlan 10</pre> | <p>Specifies the object to be associated with a domain. The keywords, arguments, and options are as follows:</p> <ul style="list-style-type: none"> <li>• <b>access-list</b>—Specifies an existing access control list (ACL) that you want to associate with the domain.</li> <li>• <b>ethertype</b>—Specifies an existing EtherType access control list that you want to associate with the domain.</li> <li>• <b>extended</b>—Specifies an existing extended access control list that you want to associate with the domain.</li> <li>• <b>all</b>—Specifies that all existing configuration objects in the context are added to the domain.</li> <li>• <b>class-map</b>—Specifies an existing class map for flow classification that you want to associate with the domain.</li> <li>• <b>interface</b>—Specifies an existing interface that you want to associate with the domain.</li> <li>• <b>parameter-map</b>—Specifies an existing parameter map that you want to associate with the domain.</li> <li>• <b>policy-map</b>—Specifies an existing policy map that you want to associate with the domain.</li> <li>• <b>probe</b>—Specifies an existing real server probe (keepalive) that you want to associate with the domain.</li> <li>• <b>rserver</b>—Specifies an existing real server that you want to associate with the domain.</li> <li>• <b>script</b>—Specifies an existing script that you created with the ACE TCL scripting language.</li> <li>• <b>serverfarm</b>—Specifies an existing server farm that you want to associate with the domain.</li> <li>• <b>sticky</b>—Specifies an existing sticky group that you want to associate with the domain to maintain persistence with a server.</li> <li>• <b>name</b>—Identifier of the specified object. Enter an unquoted text string with no spaces and a maximum of 64 alphanumeric characters.</li> </ul> |

|        | Command                                                                                                                                                                                                                                                                               | Purpose                                                                   |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Step 2 | <pre>no add-object {access-list {ethertype   extended}   all   class-map   interface {bvi   vlan}   parameter-map   policy-map   probe   rserver   script   serverfarm   sticky} name</pre> <p><b>Example:</b><br/> host1/C1(config-domain)# no add-object<br/> interface vlan 10</p> | (Optional) Removes the object from the domain.                            |
| Step 3 | <pre>do copy running-config startup-config</pre> <p><b>Example:</b><br/> host1/C1(config-domain)# do copy<br/> running-config startup-config</p>                                                                                                                                      | (Optional) Copies the running configuration to the startup configuration. |
| Step 4 | <pre>exit</pre> <p><b>Example:</b><br/> host1/Admin(config-domain)# exit<br/> host1/Admin(config)#</p>                                                                                                                                                                                | (Optional) Exits the domain configuration mode.                           |

## Configuring a User

You create a user and define the associated role and operating domains by using the **username** command in configuration mode.

The ACE creates the following default user accounts at startup: admin, dm, and www.

- The admin user is the global administrator and cannot be deleted.
- The dm user is for accessing the Device Manager GUI and cannot be deleted. The dm user is an internal user required by the Device Manager GUI; it is hidden on the ACE CLI.



**Note** Do not modify the dm user password from the ACE CLI. If the password is changed, the Device Manager GUI will become inoperative. If this occurs, restart the Device Manager using the **dm reload** command (you must be the global administrator to access the **dm reload** command). Note that restarting the Device Manager does not impact ACE functionality; however, it may take a few minutes for the Device Manager to reinitialize as it reads the ACE CLI configuration.


- The ACE uses the www user account for the XML interface.

### Restrictions

This configuration topic includes the following restrictions:

- The global administrator (admin) assigns one user in each context as the context administrator. The context administrator can then log in to the context or contexts for which he or she is responsible and create additional users.
- If you do not assign a role to a new user, the default role is Network-Monitor. For users that you create in the Admin context, their default scope of access is the entire device. For users that you create in other contexts, their default scope of access is the entire context. If you need to restrict a user's access, you must assign a role-domain pair.

## Detailed Steps

|        | Command                                                                                                                                                                                                                                                                                                                   | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | <b>config</b><br><br><b>Example:</b><br>host1/Admin# config<br>(config)#                                                                                                                                                                                                                                                  | Enters configuration mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Step 2 | <b>username</b> <i>name1</i> [ <b>password</b> [0   5] { <i>password</i> }] [ <b>expire</b> <i>date</i> ] [ <b>role</b> <i>name2</i> { <i>domain name3 name4 . . . namen</i> }]<br><br><b>Example:</b><br>host1/C1(config)# username USER2 password<br>HERSECRET expire 2008-12-31 role Admin<br>domain default-domain D2 | <p>Creates a user or changes the default username and password. The keywords, arguments, and options are as follows:</p> <ul style="list-style-type: none"> <li>• <i>name1</i>—Identifier of the user that you are creating. Enter an unquoted text string with no spaces and a maximum of 24 alphanumeric characters.</li> <li>• <b>password</b>—(Optional) Keyword that indicates that a password follows.</li> <li>• <b>0</b>—(Optional) Specifies a clear text password.</li> <li>• <b>5</b>—(Optional) Specifies an MD5-hashed strong encryption password.</li> <li>• <i>password</i>—(Optional) Password in clear text or MD5 strong encryption, depending on the numbered option (0, 5, or 7) that you enter. If you do not enter a numbered option, the password is in clear text by default. If you enter the <b>password</b> keyword, you must enter a password. Enter a password as an unquoted text string with a maximum of 64 alphanumeric characters. The ACE supports the following special characters in a password:<br/>           , . / = + - ^ @ ! % ~ # \$ * ( )</li> </ul> <p>Note that the ACE encrypts clear text passwords in the running-config.</p> <p> <b>Note</b> If you specify an MD5-hashed strong encryption password, the ACE considers a password to be weak if it is less than eight characters in length.</p> <ul style="list-style-type: none"> <li>• <b>expire</b> <i>date</i>—(Optional) Specifies the expiration date of the user account. Enter the expiration date in the format <i>yyyy-mm-dd</i>.</li> <li>• <b>role</b> <i>name2</i>—(Optional) Specifies an existing role that you want to assign to the user.</li> <li>• <b>domain</b> <i>name3 name4 . . . namen</i>—Specifies the domains in which the user can operate. You can enter multiple domain names up to a maximum of 10, including <b>default-domain</b>.</li> </ul> |

|        | Command                                                                                                                        | Purpose                                                                   |
|--------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Step 3 | <b>no username <i>name1</i></b><br><br><b>Example:</b><br>host1/C1(config)# no username USER2                                  | (Optional) Deletes a user from the configuration.                         |
| Step 4 | <b>do copy running-config startup-config</b><br><br><b>Example:</b><br>host1/C1(config)# do copy running-config startup-config | (Optional) Copies the running configuration to the startup configuration. |

## Logging Out a User

You can force a user to log out and clear the user session by using the **clear user** command in Exec mode.

### Detailed Steps

| Command                                                                              | Purpose                                                                                                                                                                               |
|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>clear user <i>name</i></b><br><br><b>Example:</b><br>host1/Admin# clear user John | Clears a user session.<br><br>For the <i>name</i> argument, enter the name of an existing user as an unquoted text string with no spaces and a maximum of 64 alphanumeric characters. |

# Verifying Your Virtualization Configuration

This section describes the **show** commands that allow you to verify a range of configuration information for the contexts configured on your ACE.

This section contains the following topics:

- [Verifying Context Configurations](#)
- [Verifying Domain Configurations](#)
- [Verifying Resource Class Configurations](#)
- [Verifying Role Configurations](#)
- [Verifying Context Information](#)
- [Verifying Resource Allocation](#)
- [Verifying User Roles](#)
- [Verifying Domains](#)
- [Verifying User Information](#)

For additional information about the CLI command syntax described in this chapter, see the *Cisco 4700 Series Application Control Engine Appliance Command Reference* located at:

[http://www.cisco.com/en/US/products/ps7027/prod\\_command\\_reference\\_list.html](http://www.cisco.com/en/US/products/ps7027/prod_command_reference_list.html)

## Verifying Context Configurations

You display context configurations by using the **show running-config context** command in Exec mode.

| Command                            | Purpose                                                                                              |
|------------------------------------|------------------------------------------------------------------------------------------------------|
| <b>show running-config context</b> | Displays all configured user contexts and their descriptions, resource classes, and allocated VLANs. |

## Verifying Domain Configurations

You display domain configurations by using the **show running-config domain** command in Exec mode.

| Command                           | Purpose                                                                                                             |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>show running-config domain</b> | Displays all configured domains and their objects (access control lists [ACLs], class maps, interfaces, and so on). |

## Verifying Resource Class Configurations

You display resource-class configurations by using the **show running-config resource-class** command in Exec mode.

| Command                                   | Purpose                                                                            |
|-------------------------------------------|------------------------------------------------------------------------------------|
| <b>show running-config resource-class</b> | Displays all configured resource classes and their resource allocation statements. |

## Verifying Role Configurations

You display role configurations by using the **show running-config role** command in Exec mode.

| Command                         | Purpose                                                                  |
|---------------------------------|--------------------------------------------------------------------------|
| <b>show running-config role</b> | Displays all configured roles, their descriptions, and associated rules. |

## Verifying Context Information

You display a list of contexts by using the **show context** command in Exec mode.

| Command                         | Purpose                                                                                                                                                                                                                                                                     |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>show context</b> <i>name</i> | Displays a list of contexts, including the name, description, resource class, and interfaces<br><br>For the <i>name</i> argument, enter the unique identifier of an existing context as an unquoted text string with no spaces and a maximum of 64 alphanumeric characters. |

[Table 2-4](#) describes the fields in the **show context** command output.

**Table 2-4** Field Descriptions for the **show context** Command Output

| Field          | Description                                                                                                                                            |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name           | Lists identifiers of all configured contexts. If you specify the <i>name</i> argument, the ACE displays the name of the context that you specify only. |
| Config Count   | The number of lines in the running-config for the context (excluding blank lines).                                                                     |
| Description    | Previously configured text description of the context.                                                                                                 |
| Resource-class | Resource class of which the context is a member.                                                                                                       |
| VLANs          | VLANs allocated to a user context from the Admin context.                                                                                              |

## Verifying Resource Allocation

You view the allocation for each resource across all resource classes and class members by using the **show resource allocation** command in Exec mode.



### Note

The **show resource allocation** command displays the resource allocation but does not show the actual resources being used. See the “[Monitoring Virtualization Statistics](#)” section for more information about actual resource usage.

| Command                         | Purpose                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------|
| <b>show resource-allocation</b> | Displays the allocation for each resource across all resource classes and class members. |

Table 2-5 describes the fields in the **show resource allocation** command output.

**Table 2-5 Field Descriptions for the show resource allocation Command Output**

| Field     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parameter | Name of the resource that you can limit. See the “ <a href="#">Configuring Virtualization</a> ” section for information about each resource.                                                                                                                                                                                                                                                                                                                                                                                                 |
| Min       | Minimum percentage of the total system resources that is allocated for a parameter in the specified resource class. For the default resource class, the minimum value for each resource is 0.00 percent.<br><b>Note</b> For the Bandwidth Min value, this field does not display the percentage configured with the <b>limit resource all</b> command. The ACE includes the management traffic rate in addition to the throughput rate to calculate the value that appears in this field.                                                    |
| Max       | Maximum percentage of the total system resources that is allocated to a parameter in the specified resource class. For the default resource class, the Max value for each resource is equal to the total Max value of all contexts using the default resource class. For example, if you configure two user contexts and do not associate them with a resource class, the ACE automatically assigns the default resource class. If the Admin context also uses the default resource class, the Max value would equal 300% for each resource. |
| Class     | Name of the resource class.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Verifying User Roles

You display the user roles by using the **show role** command.

| Command                      | Purpose                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>show role</b> <i>name</i> | Displays the configured user roles (predefined and user-configured roles).<br>For the optional <i>name</i> argument, enter the unique identifier of the role as an unquoted text string with no spaces and a maximum of 64 alphanumeric characters. This parameter displays only the named role that you specify. To display all roles, enter the command without a name. |

Table 2-6 describes the fields in the **show role** command output.

**Table 2-6 Field Descriptions for the show role Command Output**

| Field           | Description                                                                                                                         |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Role            | Name of the role (for example, Admin).                                                                                              |
| Description     | Text that describes the role (for example, Administrator).                                                                          |
| Number of Rules | Number of rules associated with the role.                                                                                           |
| Rule            | Sequence number of the rule.                                                                                                        |
| Type            | Type of rule. Possible values are Permit or Deny.                                                                                   |
| Permission      | Permission level of the rule. The possible permission values ranked from highest to lowest, are Create, Modify, Debug, and Monitor. |
| Feature         | Software feature associated with the rule (for example, access-list).                                                               |

## Verifying Domains

You display information about the configured domains in the ACE by using the **show domain** command.

| Command                        | Purpose                                                                                                                                                                                                                                              |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>show domain</b> <i>name</i> | Displays the information about the configured domains in the ACE.<br>For the optional <i>name</i> argument, enter the unique identifier of an existing domain as an unquoted text string with no spaces and a maximum of 64 alphanumeric characters. |

Table 2-7 describes the fields in the **show domain** command output.

**Table 2-7 Field Descriptions for the show domain Command Output**

| Field       | Description                                                          |
|-------------|----------------------------------------------------------------------|
| Name        | Unique identifier of the domain.                                     |
| Object Type | List of objects associated with the domain (for example, Class-map). |
| Object Name | Configured identifier of the object.                                 |



## Verifying User Information

You display user and user account information by using the **show users** and **show user-account** commands.

| Command                                                                                                    | Purpose                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>show users</b> <i>name</i><br><br><b>Example:</b><br>host1/Admin# <b>show users admin</b>               | Displays the information for users that are currently logged in to the ACE.<br><br>For the optional <i>name</i> argument, enter the unique identifier of a user as an unquoted text string with no spaces and a maximum of 64 alphanumeric characters. |
| <b>show user-account</b> <i>name</i><br><br><b>Example:</b><br>host1/Admin# <b>show user-account admin</b> | Display user account information.<br><br>For the optional <i>name</i> argument, enter the unique identifier of a user as an unquoted text string with no spaces and a maximum of 64 alphanumeric characters.                                           |

Table 2-8 describes the fields in the **show users** command output.

**Table 2-8 Field Descriptions for the show users name Command Output**

| Field      | Description                                                                         |
|------------|-------------------------------------------------------------------------------------|
| User       | Name of user.                                                                       |
| Context    | Name of the context associated with the user.                                       |
| Line       | Port through which the user connected to the ACE (for example, pts/1).              |
| Login Time | Month, day, and time that the user logged in to the ACE (for example, Dec 7 20:11). |
| Location   | Location of the user expressed as an IP address.                                    |
| Role       | Role assigned to the user (for example, Admin).                                     |
| Domain(s)  | Domain associated with the user (for example, default-domain).                      |

Table 2-9 describes the fields in the **show user-account** command output.




**Table 2-9 Field Descriptions for the show user-account Command Output**



| Field          | Description                                                        |
|----------------|--------------------------------------------------------------------|
| User           | Name of the user.                                                  |
| Account Expiry | Date, if any, that the user account expires.                       |
| Roles          | Role assigned to the user (for example, Admin).                    |
| Domain         | Domain associated with the user (for example, default-domain).     |
| Context        | Name of the context associated with the user (for example, Admin). |

# Monitoring Virtualization Statistics

You display the resource usage statistics for each context from the Admin context by using the **show resource usage** command in Exec mode.

| Command                                                                                                                                                                       | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>show resource usage</b></p> <p><b>Example:</b><br/>host1/Admin# show resource usage</p>                                                                                 | <p>Displays the resource usage statistics for each context. This is the default setting.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <p><b>show resource usage all [counter [all   current   denied   peak [count_threshold]]]</b></p> <p><b>Example:</b><br/>host1/Admin# show resource usage all counter all</p> | <p>Displays the resource usage for each context. You can optionally specify the <b>counter</b> keyword to specify a counter name and an optional threshold.</p> <p>The <b>counter</b> keywords and arguments are as follows:</p> <ul style="list-style-type: none"> <li>• <b>all</b>—(Optional) Displays all statistics. This is the default setting.</li> <li>• <b>current</b>—(Optional) Displays the active concurrent instances or the current rate of the resource.</li> <li>• <b>denied</b>—(Optional) Displays the number of denied uses of the resource since the resource statistics were last cleared.</li> <li>• <b>peak</b>—(Optional) Displays the peak concurrent instances, or the peak rate of the resource since the statistics were last cleared, either by using the <b>clear resource usage</b> command or because the device rebooted.</li> <li>• <i>count_threshold</i>—(Optional) Number above which resources are shown. Enter an integer from 0 to 4294967295. The default is 1. If the usage of the resource is below the number that you set, then the resource is not shown. If you specify <b>all</b> for the counter name, then the <i>count_threshold</i> applies to the current usage. To show all resources, set the <i>count_threshold</i> to <b>0</b>.</li> </ul> |
| <p><b>show resource usage counter [all   current   denied   peak [count_threshold]]]</b></p> <p><b>Example:</b><br/>host1/Admin# show resource counter denied 1000</p>        | <p>Specifies a counter name and an optional threshold for the resource usage statistics.</p> <p>See above for the syntax description of the <b>counter</b> keyword and associated keywords, arguments, and options.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

| Command                                                                                                                                                                                                                                                                    | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre>show resource usage context name [resource {resources}   rate {rates}] [counter [all   current   denied   peak [count_threshold]]]</pre> <p><b>Example:</b><br/> host1/Admin# show resource usage context<br/> C1 resource conc-connections counter<br/> denied 0</p> | <p>Displays the resource usage for a specific context. The keywords, arguments, and options are as follows:</p> <ul style="list-style-type: none"> <li>• <i>name</i>—Displays the resource usage for the specified context. The <i>name</i> argument is case sensitive.</li> <li>• <b>resource</b>—Displays statistics for a specified resource.</li> <li>• <i>resources</i>—Enter one of the following keywords for the system resource: <ul style="list-style-type: none"> <li>- <b>acc-connections</b>—Displays the number of application acceleration connections.</li> <li>- <b>acl-memory</b>—Displays the ACL memory usage.</li> </ul> </li> </ul> <hr/> <p> <b>Note</b> If a context has fewer ACL memory resources than the configured Allocation Minimum, the ACE displays the Actual Minimum value that you can assign to the context.</p> <hr/> <ul style="list-style-type: none"> <li>- <b>all</b>—Displays the resource usage for all resources used by the specified context or contexts.</li> <li>- <b>conc-connections</b>—Displays the resource usage for the number of simultaneous connections.</li> <li>- <b>mgmt-connections</b>—Displays the resource usage for the number of management connections.</li> <li>- <b>probes</b>—Displays the resource usage for the probes.</li> <li>- <b>proxy-connections</b>—Displays the resource usage for the proxy connections.</li> <li>- <b>regexp</b>—Displays the resource usage for the regular expressions.</li> </ul> <hr/> <p> <b>Note</b> If a context has fewer regexp resources than the configured Allocation Minimum, the ACE displays the Actual Minimum value that you can assign to the context.</p> <hr/> <ul style="list-style-type: none"> <li>- <b>sticky</b>—Displays the resource usage for the sticky entries.</li> </ul> <hr/> <p> <b>Note</b> If a context has fewer sticky resources than the configured Allocation Minimum, the ACE displays the Actual Minimum value that you can assign to the context.</p> |

| Command                                                                                                                                                                                                                                                                            | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>- <b>syslogbuffer</b>—Displays the resource usage for the syslog buffer.</li> </ul> <hr/> <p> <b>Note</b> The ACE assigns syslog buffers in increments of 1024. If the resource-class Allocation Minimum value was satisfied, then the Current field of the <b>show resource usage syslogbuffer</b> command would display the highest multiple of 1024 that is less than the Allocation Min value.</p> <hr/> <ul style="list-style-type: none"> <li>- <b>xlates</b>—Displays the resource usage by Network Address Translation (NAT) and Port Address Translation (PAT) entries.</li> <li>• <b>rate</b>—Displays the rate per second for the specified connections or syslog messages.</li> <li>• <b>rates</b>—Enter one of the following keywords for the rate: <ul style="list-style-type: none"> <li>- <b>bandwidth</b>—Displays the bandwidth in bytes per second. To convert to bits per second, multiply the displayed value by 8.</li> <li>- <b>connections</b>—Displays connections per second.</li> <li>- <b>http-comp</b>—Displays the HTTP compression rate in bytes per second. To convert to bits per second, multiply the displayed value by 8.</li> <li>- <b>inspect-conn</b>—Displays RTSP/FTP inspection connections per second.</li> <li>- <b>mac-miss</b>—Displays MAC miss traffic that was punted to the CP packets per second.</li> <li>- <b>mgmt-traffic</b>—Displays management traffic bytes per second. To convert to bits per second, multiply the displayed value by 8.</li> <li>- <b>ssl-connections</b>—Displays Secure Sockets Layer (SSL) connections.</li> <li>- <b>syslog</b>—Displays the syslog message buffer usage.</li> </ul> </li> </ul> <hr/> <p> <b>Note</b> The syslog message statistics do not include the syslogs generated from the dataplane when you enable the logging of connection setup and teardown syslog messages through the <b>logging fastpath</b> command.</p> <hr/> <p>See above for the syntax description of the optional <b>counter</b> keyword and associated arguments and options.</p> |
| <pre>show resource usage resource {resources}   rate {rates}} [counter [all   current   denied   peak [count_threshold]]] [counter [all   current   denied   peak [count_threshold]]]</pre> <p><b>Example:</b><br/> host1/Admin# show resource usage resource conc-connections</p> | <p>Displays usage statistics for a specific resource.</p> <p>See above for the syntax description of the optional <b>resource</b>, <b>rate</b>, and <b>counter</b> keywords and their associated keywords, arguments, and options.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Command                                                                                                                                                                                                                                                           | Purpose                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre>show resource usage summary [resource {resources}   rate {rates}] [counter [all   current   denied   peak [count_threshold]]]</pre> <p><b>Example:</b><br/> host1/Admin# show resource usage summary<br/> resource mgmt-connections counter all</p>          | <p>Displays the total resource usage for all contexts. For example, the denied column shows the items that have been denied for each context limit.</p> <p>See above for the syntax description of the optional <b>resource</b>, <b>rate</b>, and <b>counter</b> keyword and associated keywords, arguments, and options.</p> |
| <pre>show resource usage top [resource {resources}   rate {rates}] [counter [all   current   denied   peak [count_threshold]]]</pre> <p><b>Example:</b><br/> host1/Admin# show resource usage context<br/> C1 resource conc-connections counter<br/> denied 0</p> | <p>Displays the greatest <i>n</i> users of a single resource arranged from the highest to the lowest percentage of resources used. You must specify a single resource type.</p> <p>You cannot use the <b>resource all</b> keywords with this option.</p>                                                                      |

Table 2-10 describes the fields in the **show resource usage** command output.

**Table 2-10 Field Descriptions for the show resource usage Command Output**

| Field                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resource             | The name of the limited resource in each context. See the “ <a href="#">Configuring Virtualization</a> ” section for more information about each resource name.                                                                                                                                                                                                                                                                                                                                                                          |
| Current              | Active concurrent instances or the current rate of the resource.                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Peak                 | Highest value of resource usage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Allocation (Min/Max) | Allocation minimum value that indicates the resource units that are guaranteed to be available to each context. The allocation maximum value indicates the resource units that may be available to each context and are shared among all contexts from the oversubscription pool. When you configure the maximum value as <b>equal-to-minimum</b> , the maximum value is automatically set to 0. When the allocation maximum value is 0, no additional resource units are available beyond the allocation minimum value to each context. |
| Denied               | Number of denied resources because of oversubscription or resource depletion.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Actual Min           | Minimum ACL, regexp, sticky, or syslog buffer resources that you can allocate to the context if the resource-class minimum cannot be met.                                                                                                                                                                                                                                                                                                                                                                                                |

## Clearing Resource Usage Statistics

You clear resource usage statistics by using the following commands.

| Command                                 | Purpose                                                                                |
|-----------------------------------------|----------------------------------------------------------------------------------------|
| <code>clear stats resource usage</code> | Resets the resource usage statistics to zero for each context from the Admin context.  |
| <code>clear stats all</code>            | Clear all statistical information in a context along with the resource usage counters. |

# Configuration Examples for Virtualization

The following running-configuration example shows a basic virtualization configuration with one user-defined context, one resource class, one domain, and one user.

```
resource-class RC1
  limit-resource rate syslog minimum 10.00 maximum equal-to-min
  limit-resource acl-memory minimum 10.00 maximum unlimited

access-list ACL1 line 10 extended permit ip any any

rserver host RS1
  ip address 192.168.2.251
  inservice
rserver host RS2
  ip address 192.168.2.252
  inservice
serverfarm host SF1
  rserver RS1
    inservice
  rserver RS2
    inservice

domain D1
  add-object access-list extended ACL1
  add-object rserver RS1
  add-object rserver RS2
  add-object serverfarm SF1

role SLB-Admin

context C1
  allocate-interface vlan 100-200
  description accounting department
  member RC1

username JANE password 5 adropgijaeprgja9erjg2uWgtce1 role SLB-Admin domain D1
```