CHAPTER 6

Configuring Dynamic Workload Scaling

This chapter describes the dynamic workload scaling (DWS) feature and how to configure it on the ACE appliance. It contains the following major sections:

• Overview of Dynamic Workload Scaling
• Configuring Dynamic Workload Scaling
• Displaying Dynamic Workload Scaling Statistics

Overview of Dynamic Workload Scaling

DWS integrates the ACE with both the Cisco Nexus 7000 series switches that are running the Cisco Overlay Transport Virtualization (OTV) Data Center Interconnect (DCI) Technology and VMware vCenter Server 4.0 or later. The OTV technology allows the extension of the Layer 2 data center connection into the virtual private cloud (VPC) space. The VMWare technology allows the ACE to retrieve virtual machine load information through the VSphere web service APIs. This combination of hardware and software provides a complete solution for DWS across data centers. When resource demands exceed the capacity of the local data center, this feature enables the dynamic allocation of resources to a remote data center in the VPC. You can configure the ACE to load balance traffic only to the local virtual machines (VMs) or to a combination of local and remote VMs.
Figure 6-1 shows how ANM and the ACE can be integrated with the Cisco Nexus 7000 running OTV software, VMware vCenter (VM controller), and VMs to allow you to create and manage server farms for application delivery that consist of a combination of physical servers and VMs. This network topology illustrates the DWS feature that permits on-demand access to remote resources that you already own, or that you rent or lease from an Internet service provider (ISP) or a cloud service provider.
DWS uses the Cisco Nexus 7000 series switch with Cisco OTV technology device to create a capacity expansion link (Layer 2 link) over an existing IP network between geographically distributed data centers. The Nexus 7000 in the local data center contains an OTV forwarding table that lists the MAC addresses of the Layer 2 extended virtual private network (VPN) and identifies the addresses as either local or remote. The ACE uses an XML query to poll the Nexus 7000 and to obtain the OTV forwarding table information to determine the locality of the VMs (local or remote).

The ACE uses a health-monitoring probe of type VM to poll the VM controller through the vSphere API to obtain the loads of the local VMs. The VM probe is similar to the ACE DNS probe except that the configurable interval between probes has a larger default value (300 seconds). The VM probe maintains a table of the IP addresses of the local VMs and uses persistent SSL connections on port 443 to connect to the VM controller. For details, see the “Configuring a VM Probe on the ACE” section.

The load of the local VMs is based on CPU usage, memory usage, or both. The ACE calculates the average aggregate load of the VMs from the load information returned by the probe. When the average CPU usage or memory usage of the local VMs is greater than or equal to the configured maximum threshold value, the ACE bursts traffic to the remote VMs. When the local VM average CPU and memory loads drop below their configured minimum threshold values, the ACE stops bursting traffic to the remote VMs and continues to load balance traffic locally.

Configuring Dynamic Workload Scaling

This section describes how to configure DWS. It contains the following subsections:

- Prerequisites
- Configuration Guidelines and Operating Considerations
- Configuring the Nexus Device
- Configuring the VM Controller on the ACE
- Configuring a VM Probe on the ACE
- Configuring Virtual Machines as Real Servers
- Configuring Server Farm Attributes for DWS
Prerequisites

DWS requires the following configuration elements:

- An ACE running in routed mode or one-arm mode with software version A4(2.0) or later and configured for DWS.
- A Nexus 7000 series switch running NX-OS System Software Release 5.1(2) or later and configured for Cisco OTV DCI technology in the local data center and in one or more remote data centers. For details about configuring a Nexus 7000 for OTV, see the Cisco Nexus 7000 NX-OS OTV Configuration Guide, Release 5.x.
- A user account on the Nexus 7000 series switch with either the network-admin or the vdc-admin role. This level of user access is required to receive the Nexus 7000 output for the VM location information in XML format.
- The IP address of the Nexus 7000 series switch that you configure on the ACE should be one of the management interfaces of either the default VDC on the Nexus 7000 or the VDC on which the OTV config is deployed.
- VMware vCenter Server 4.0 or later.
- Multiple local and remote VMs configured as real servers and associated with server farms configured on the ACE.
- ACE backend interface MTU set to 1430 bytes or less to accommodate the DCI encapsulation and the Don’t Fragment (DF) bit, which is automatically set on the DCI link. For details about setting the ACE MTU, see the Cisco 4700 Series Application Control Engine Appliance Routing and Bridging Configuration Guide.
Configuration Guidelines and Operating Considerations

Use the following configuration guidelines when you are configuring and using the DWS feature on the ACE:

- Sticky connections take precedence over DWS connections to remote VMs. Connections that are stuck to a real server continue to that same server even if a change in the DWS state of the server farm excludes that real server from the load-balancing algorithm.

- If there are open connections to remote VMs and the state of a DWS-enabled server farm changes to include only local VMs in the load-balancing algorithm, existing connections to remote VMs continue until they are closed.

- If local real servers are configured with backup servers, the ACE considers the load of only the primary servers in the calculation of the average load of the local data center.

- The ACE obtains locality and load information for all DWS-enabled server farms regardless of whether they are active or backup server farms. That way, if a failover to a backup server farm occurs, the ACE is ready to load balance traffic to the correct servers in the newly active server farm.

- If you move a server from or to the remote datacenter using vMotion, it may take up to 45 minutes for the Nexus 7000 to update the ACE with the new location information. This period of time is due to the Nexus 7000 OTV route discovery timeout. During this time, the server will be out of service because the probes will fail.

Configuring the Nexus Device

The ACE uses the local Nexus 7000 series switch to determine the locality of the VMs in the local and the remote data centers. You can configure only one Nexus 7000 per ACE. Use the `nexus-device` command in configuration mode in the Admin context to create the local Nexus device on the ACE.

Note

Connection from the ACE to a Nexus device is initiated only after you enable and configure the DWS feature for a server farm (see “Configuring Server Farm Attributes for DWS”). Ensure your load balancing infrastructure is ready for DWS/OTV before you verify the connection status to a Nexus device.
The syntax of this command is as follows:

```
nexus-device name
```

The `name` argument specifies the identifier of the local Nexus 7000 that the ACE queries for the locality information of the VMs.

For example, to create the Nexus device named NEXUS_1, enter the following command:

```
host1/Admin(config)# nexus-device NEXUS_1
host1/Admin(config-dci)#
```

The ACE enters DCI configuration mode.

To remove the Nexus device and all its attributes from the ACE configuration, enter the following command in configuration mode:

```
host1/Admin(config)# no nexus-device NEXUS_1
```

This section contains the following topics:

- Configuring the IP Address of the Nexus Device
- Configuring the Credentials of the Nexus Device

**Configuring the IP Address of the Nexus Device**

Use the `ip-address` command in DCI configuration mode to specify the IP address of one of the management interfaces of either the default VDC on the Nexus 7000 or the VDC on which the OTV configuration is deployed. This address is the one that ACE uses to connect to the Nexus 7000 to discover the locality of the VMs. The syntax of this command is as follows:

```
ip-address ip_address
```

The `ip_address` argument specifies the IP address of the Nexus 7000 management interface in the local data center.

For example, to configure the IP address of the Nexus device located at 192.168.12.15, enter the following command:

```
host1/Admin(config-dci)# ip-address 192.168.12.15
```

To remove the IP address of the Nexus device from the ACE configuration, enter the following command:
Configuring the Credentials of the Nexus Device

Use the `credentials` command in DCI configuration mode to configure the username and password of the Nexus device on the ACE. The ACE uses these credentials to log in to the Nexus 7000.

**Note** You must have either the vdc-admin or network-admin user role to receive the Nexus 7000 output for the VM location information in XML format.

The syntax of this command is as follows:

```
credentials {username} {[encrypted] password}
```

The keywords and arguments are as follows:

- **username**—Username that the ACE uses to access the Nexus device. Enter an unquoted text string with no spaces and a maximum of 64 alphanumeric characters.

- **encrypted**—(Optional) Specifies that the ACE encrypts the Nexus device password.

- **password**—Password that the ACE uses to access the local Nexus device. The password does not appear in the output of the `show running-config` command whether the password is encrypted or not. Enter an unquoted text string with no spaces and a maximum of 64 alphanumeric characters.

**Note** If you specify new credentials for the same Nexus device IP address, the ACE overwrites the previous credentials.

For example, enter the following command:

```
host1/Admin(config-dci)# credentials admin encrypted mydcipassphrase
```

To remove the credentials of the Nexus device from the ACE configuration, enter the following command:

```
host1/Admin(config-dci)# no credentials admin encrypted mydcipassphrase
```
Configuring the VM Controller on the ACE

The ACE uses the VMware vCenter Server 4.0 or later as the VM controller to obtain the aggregate load data of the VMs in the local data center. You can configure only one VM controller per ACE. Use the `vm-controller` command in configuration mode in the Admin context to configure the VM controller.

**Note**
Connection from the ACE to a VM controller (vCenter) will be active only after you configure the VM probe associated with the VM controller configuration (see “Configuring a VM Probe on the ACE”).

The syntax of this command is as follows:

```
vm-controller name
```

The `name` argument specifies the name of an existing VM controller (vCenter) that the ACE queries for VM load information. Enter an unquoted text string with no spaces and a maximum of 64 alphanumeric characters.

For example, enter the following command:

```
host1/Admin(config)# vm-controller VCENTER_1
host1/Admin(config-vm)#
```

The ACE enters VM configuration mode.

To remove the VM controller and all its attributes from the ACE configuration, enter the following command in config mode:

```
host1/Admin(config)# no vm-controller VCENTER_1
```

This section contains the following topics:

- Configuring the URL of the VM Controller
- Configuring the Credentials of the VM Controller

**Configuring the URL of the VM Controller**

Use the `url` command in VM configuration mode to configure the location of the VM controller in the network. The syntax of this command is as follows:

```
url string
```
The `string` argument specifies the host name or the IP address of the VM controller. Enter an unquoted text string with no spaces and a maximum of 255 alphanumeric characters. You must append “/sdk” at the end of the host name or IP address string.

For example, enter the following command:

```text
host1/Admin(config-vm)# url https://192.168.12.15/sdk
```

To remove the URL of the VM controller from the ACE configuration, enter the following command:

```text
host1/Admin(config-vm)# no url https://192.168.12.15/sdk
```

### Configuring the Credentials of the VM Controller

Use the `credentials` command in VM configuration mode to configure the username and password of the VM controller on the ACE. The syntax of this command is as follows:

```text
credentials {username} {encrypted} [password]
```

The keywords and arguments are as follows:

- `username`—Username that the ACE uses to access the VM controller. Enter an unquoted text string with no spaces and a maximum of 64 alphanumeric characters.

- `encrypted`—(Optional) Specifies that the ACE encrypts the VM controller password.

- `password`—Password that the ACE uses to access the VM controller. The password does not appear in the output of the `show running-config` command whether the password is encrypted or not. Enter an unquoted text string with no spaces and a maximum of 64 alphanumeric characters.

For example, enter the following command:

```text
host1/Admin(config-vm)# credentials admin encrypted myvmpassphrase
```

To remove the credentials of the VM probe from the ACE configuration, enter the following command:

```text
host1/Admin(config-vm)# no credentials admin encrypted myvmpassphrase
```
Configuring a VM Probe on the ACE

The ACE uses a probe of type **vm** to poll the local VM load information from the VM controller. The ACE calculates the average aggregate load information as a percentage of CPU usage or memory usage to determine when to burst traffic to the remote data center. If the server farm consists of both physical servers and VMs, the ACE considers load information only from the VMs. After you configure the VM probe and its attributes, you associate it with a VM controller and a server farm. Use the **probe** command in configuration mode to configure a probe of type **vm**. The syntax of this command is as follows:

```
probe probe_type probe_name
```

The arguments are as follows:

- **probe_type**—Enter the probe type as **vm**.
- **probe_name**—Unique name of the probe that the ACE uses to poll the vCenter. Enter an unquoted text string with no spaces and a maximum of 64 alphanumeric characters.

For example, enter the following command:

```
host1/Admin(config)# probe vm VM_PROBE
host1/Admin(config-probe-vm)#
```

To remove the VM probe and all its attributes from the ACE configuration, enter the following command:

```
host1/Admin(config)# no probe vm
```

This section contains the following topics:

- Configuring the VM Probe Interval
- Configuring the VM Controller for the VM Probe
- Configuring the Load Type and Bursting Threshold for the VM Probe

Configuring the VM Probe Interval

Use the **interval** command in probe VM configuration mode in the Admin or user contexts to specify the frequency with which the ACE sends probes to the VM controller. The syntax of this command is:

```
interval value
```
The *value* argument specifies the elapsed time between probes. Enter the time interval in seconds as an integer from 300 to 65535. The default is 300 seconds (5 minutes).

For example, to configure the ACE to send a probe to the VM controller every 420 seconds (7 minutes), enter the following command:

```plaintext
host1/Admin(config-probe-vm)# interval 420
```

To reset VM probe interval to the default value of 300 seconds (5 minutes), enter the following command:

```plaintext
host1/Admin(config-probe-vm)# no interval
```

### Configuring the VM Controller for the VM Probe

Use the `vm-controller` command in probe VM configuration mode in the Admin or user contexts to identify the VM controller for the probe. The syntax of this command is as follows:

```
vm-controller name
```

The *name* argument is the identifier of the VM controller that you configured in the “Configuring the VM Controller on the ACE” section. Enter an unquoted text string with no spaces and a maximum of 64 alphanumeric characters.

For example, to configure the VM controller called VCENTER_1, enter the following command:

```plaintext
host1/Admin(config-probe-vm)# vm-controller VCENTER_1
```

To remove the VM controller name from the VM probe configuration, enter the following command:

```plaintext
host1/Admin(config-probe-vm)# no vm-controller VCENTER_1
```
Configuring the Load Type and Bursting Threshold for the VM Probe

Use the `load` command in probe VM configuration mode in the Admin context or user contexts to specify the interesting load of the local VMs. You can specify CPU usage, memory usage, or both. The syntax of this command is as follows:

```
load {cpu | mem} burst-threshold {max value min value}
```

The keywords and arguments are as follows:

- **load {cpu | mem}**—Specifies the type of load information that the VM controller sends back to the ACE in response to the VM probe. You can specify that the probe poll the VM controller for load information based on CPU usage, memory usage, or both. The default behavior is for the probe to check either the CPU usage or the memory usage against the maximum threshold value. Whichever load type reaches its maximum threshold value first causes the ACE to burst traffic to the remote data center. The VM controller returns the load information of each VM in the local data center to the probe. The ACE ignores any physical servers in the server farm.

- **burst-threshold {max value min value}**—Specify the threshold values that determine when the ACE starts and stops bursting traffic through the local Nexus device over the DCI link to the remote data center. Enter a maximum and a minimum threshold value as a load percentage from 1 to 99. The default value is 99 percent for both the `max` and the `min` keywords. A maximum burst threshold value of 1 percent instructs the ACE to always burst traffic to the remote data center. A maximum burst threshold value of 99 percent instructs the ACE to always load balance traffic to the local VMs unless the load value is equal to 100 percent or the VMs are not in the OPERATIONAL state.

If the average load value returned by the VM controller is greater than or equal to the maximum threshold value, the ACE starts bursting traffic to the remote data center. When the load value returned by the VM controller is less than the minimum threshold value, the ACE stops bursting traffic to the remote data center and load balances traffic to the local VMs. Any active connections to the remote data center are allowed to complete.

For example, to instruct the ACE to start bursting traffic to the remote data center when the local average VM load exceeds 80 percent CPU usage and to stop bursting traffic when the local average CPU usage drops below 50 percent, enter the following command:

```
host1/Admin(config-probe-vm)# load cpu burst-threshold max 80 min 50
```
You can configure an additional `load` command under the same VM probe to create an OR statement between the CPU usage and the memory usage of the local VMs. Whichever load type reaches its maximum threshold first will cause the ACE to burst traffic to the remote data center. For example, enter the following commands:

```
host1/Admin(config-probe-vm)# load cpu burst-threshold max 80 min 50
host1/Admin(config-probe-vm)# load mem burst-threshold max 70 min 40
```

In this case, if the average CPU usage reaches 80 percent or the average memory usage reaches 70 percent, the ACE bursts traffic to the remote data center. The ACE does not stop bursting traffic to the remote data center until both the CPU load and the memory load drop below their respective minimum configured values.

To reset the VM probe behavior to the default of checking the average VM CPU usage and memory usage against the maximum and minimum threshold values of 99 percent each, enter the following command:

```
host1/Admin(config-probe-vm)# no load cpu burst-threshold max 80 min 50
host1/Admin(config-probe-vm)# no load mem burst-threshold max 70 min 40
```

### Configuring Virtual Machines as Real Servers

To allow the ACE to load balance traffic to the local and remote VMs, configure the VMs as real servers on the ACE. Use the `rserver` command in configuration mode and then associate the VMs with a server farm. For details about configuring real servers and server farms, see Chapter 2, Configuring Real Servers and Server Farms.

### Configuring Server Farm Attributes for DWS

Use the `serverfarm` command to configure a server farm for the DWS feature. Only server farms of type host are supported by DWS. The syntax of this command is as follows:

```
serverfarm host name
```
For example, to configure an existing server farm called DWS_SF1 for DWS, enter the following command:

```
host1/Admin(config)# serverfarm host DWS_SF1
host1/Admin(config-sfarm-host)#
```

This section includes the following topics:
- Enabling a Server Farm for Dynamic Workload Scaling
- Associating the VMs as Real Servers with the Server Farm

### Enabling a Server Farm for Dynamic Workload Scaling

Use the `dws` command in server farm host configuration mode in the Admin or a user context to enable the server farm for the DWS feature. The syntax of this command is as follows:

```
dws {local | burst probe name}
```

The keywords and arguments are as follows:
- **dws**—Enables the DWS feature on the server farm.
- **local**—Specifies that only the local pool of VMs are taken into account for load balancing decisions
- **burst**—Specifies that remote VMs are taken into account for load balancing decisions when the configured threshold for the load of the local pool of VMs is reached or exceeded.
- **probe name**—Existing VM probe associated with this server farm. For details about configuring a VM probe, see the “Configuring a VM Probe on the ACE” section.

For example, to configure a server farm for DWS, enter the following command:

```
host1/Admin(config-sfarm-host)# dws burst probe VM_PROBE
```

To disable DWS on a server farm, enter the following command:

```
host1/Admin(config-sfarm-host)# no dws burst probe VM_PROBE
```
Associating the VMs as Real Servers with the Server Farm

To complete the server farm configuration for DWS, you must associate the VMs as real servers in the server farm. Use the `rserver` command in server farm host configuration mode. For details about configuring server farms and associating real servers with them, see Chapter 2, Configuring Real Servers and Server Farms.

Displaying Dynamic Workload Scaling Statistics

This section describes the `show` commands that you can use to display DWS statistics. It contains the following subsections:

- Displaying the Nexus Device Statistics
- Displaying the VM Controller Statistics
- Displaying the DWS State of the VIP
- Displaying the DWS State of the Server Farm and the Locality of the Real Servers in the Server Farm
- Displaying the Locality of the Real Servers
- Displaying the VM Probe Statistics
- Displaying the VM Probe Details

Displaying the Nexus Device Statistics

You can display the Nexus device connection statistics by using the `show nexus-device` command in Exec mode in the Admin context. The syntax of this command is as follows:

```
show nexus-device [name][detail]
```

The argument and keyword are as follows:

- `name`—Configured identifier of the Nexus device. Enter the name of an existing Nexus device as an unquoted text string with no spaces and a maximum of 64 alphanumerics characters.
- `detail`—Displays an additional field for the IP address of the Nexus device.
For example, to display the Nexus device statistics, enter the following command:

```
host1/Admin# show nexus-device DC1 detail
```

Table 6-1 describes the fields in the `show nexus-device` command output.

**Table 6-1  Field Descriptions for the show nexus-device Command Output**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>nexus-device</td>
<td>Configured name of the Nexus device</td>
</tr>
<tr>
<td>IP</td>
<td>IP address of the Nexus device</td>
</tr>
<tr>
<td>Total Connections</td>
<td>Number of times that the ACE successfully connected to the Nexus device</td>
</tr>
<tr>
<td>Successful</td>
<td></td>
</tr>
<tr>
<td>Total Connections</td>
<td>Number of times that the ACE attempted but failed to connect to the Nexus device</td>
</tr>
<tr>
<td>Failed</td>
<td></td>
</tr>
<tr>
<td>Last successful</td>
<td>Timestamp of the last time that the ACE successfully connected to the Nexus device</td>
</tr>
<tr>
<td>Attempt</td>
<td></td>
</tr>
<tr>
<td>Last failed</td>
<td>Timestamp of the last time that the ACE failed to connect to the Nexus device</td>
</tr>
<tr>
<td>Attempt</td>
<td></td>
</tr>
<tr>
<td>Last Failure</td>
<td>Reason why the last ACE attempt to connect to the Nexus device failed</td>
</tr>
<tr>
<td>Reason</td>
<td></td>
</tr>
</tbody>
</table>

**Displaying the VM Controller Statistics**

You can display the VM controller connection statistics by using the `show vm-controller` command in Exec mode in the Admin context. The syntax of this command is as follows:

```
show vm-controller [name][detail]
```
The argument and keyword are as follows:

- **name**—Configured identifier of the VM controller. Enter the name of an existing VM controller as an unquoted text string with no spaces and a maximum of 64 alphanumeric characters.

- **detail**—Displays additional fields for the vendor and the URL location of the VM controller

For example, to display the VM controller connection statistics, enter the following command:

```
host1/Admin# show vm-controller VCENTER1 detail
```

**Table 6-2** describes the fields in the `show vm-controller detail` command output.

**Table 6-2 Field Descriptions for the show vm-controller detail Command Output**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vm-controller</td>
<td>Configured name of the VM controller.</td>
</tr>
<tr>
<td>state</td>
<td>The state of the VM controller. Possible states are as follows:</td>
</tr>
<tr>
<td></td>
<td>- ACTIVE—The VM controller is configured and associated to a VM probe.</td>
</tr>
<tr>
<td></td>
<td>- INACTIVE—The VM controller is configured but not associated to a VM probe.</td>
</tr>
<tr>
<td>vendor</td>
<td>VMware.</td>
</tr>
<tr>
<td>URL</td>
<td>URL location (hostname or IP address) of the VM controller.</td>
</tr>
<tr>
<td>Total Connections</td>
<td>Number of times that the ACE successfully connected to the VM controller.</td>
</tr>
<tr>
<td>Successful</td>
<td></td>
</tr>
<tr>
<td>Total Connections</td>
<td>Number of times that the ACE attempted but failed to connect to the VM controller.</td>
</tr>
<tr>
<td>Failed</td>
<td></td>
</tr>
<tr>
<td>Last successful</td>
<td>Timestamp of the last time that the ACE successfully connected to the VM controller.</td>
</tr>
<tr>
<td>Attempt</td>
<td></td>
</tr>
</tbody>
</table>
### Displaying Dynamic Workload Scaling Statistics

**Table 6-2**  
*Field Descriptions for the show vm-controller detail Command Output (continued)*

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last failed Attempt</td>
<td>Timestamp of the last time that the ACE failed to connect to the VM controller.</td>
</tr>
<tr>
<td>Last Failure Reason</td>
<td>Reason why the last ACE attempt to connect to the VM controller failed.</td>
</tr>
</tbody>
</table>

### Displaying the DWS State of the VIP

You can display the DWS state of a VIP by using the `show service-policy name` command in Exec mode. The syntax of this command is as follows:

```
show service-policy name
```

Table 6-3 describes the DWS-related field in the `show service-policy name` command output.

**Table 6-3**  
*DWS-Related Field Descriptions for the show service-policy name Command Output*

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIP DWS state</td>
<td>The DWS state of the VIP. Possible states are DWS_ENABLED or DWS_DISABLED.</td>
</tr>
</tbody>
</table>

For details about the other fields in the `show service-policy name` command output, see Chapter 3, Configuring Traffic Policies for Server Load Balancing.
Displaying the DWS State of the Server Farm and the Locality of the Real Servers in the Server Farm

You can display the DWS state of the server farm and the locality of the real servers in the server farm by using the `show serverfarm name` command in Exec mode. The syntax of this command is as follows:

```
show serverfarm name
```

Table 6-4 describes the DWS-related fields in the `show serverfarm name` command output.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codes</td>
<td></td>
</tr>
<tr>
<td>L - local</td>
<td>Indicates that the real server (VM) is in the local data center.</td>
</tr>
<tr>
<td>R - remote</td>
<td>Indicates that the real server (VM) is in the remote data center.</td>
</tr>
<tr>
<td>DWS state</td>
<td>DWS state of the server farm. Possible states are as follows:</td>
</tr>
<tr>
<td></td>
<td>• DISABLED—DWS is disabled on this server farm</td>
</tr>
<tr>
<td></td>
<td>• ENABLED_LOCAL_LB—The ACE is load balancing traffic to the local data center only (the <code>dws local</code> command is configured under the server farm).</td>
</tr>
<tr>
<td></td>
<td>• ENABLED_REMOTE_LB—The ACE is bursting traffic to the local VMs (the <code>dws probe name</code> command is configured under the server farm and the threshold has not been reached).</td>
</tr>
<tr>
<td></td>
<td>• ENABLED_REMOTE_LB—The ACE is bursting traffic to the remote VMs (the <code>dws probe name</code> command is configured under the server farm and the threshold has been reached).</td>
</tr>
<tr>
<td>state</td>
<td>Operational state of the real server and whether it is local or remote: [L] or [R].</td>
</tr>
</tbody>
</table>
For details about the other fields in the `show serverfarm name` command output, see Chapter 2, Configuring Real Servers and Server Farms.

### Displaying the Locality of the Real Servers

You can display the locality of the VMs by using the `show rserver name` command in Exec mode. The syntax of this command is as follows:

```
show rserver name
```

Table 6-5 describes the DCI-related fields in the `show rserver name` command output.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locality</td>
<td>Specifies whether the VM is LOCAL or REMOTE</td>
</tr>
</tbody>
</table>

For details about the other fields in the `show rserver name` command output, see Chapter 2, Configuring Real Servers and Server Farms.

### Displaying the VM Probe Statistics

You can display the VM probe statistics by using the `show stats probe type vm` command in Exec mode. The syntax of this command is as follows:

```
show stats probe type vm
```
Table 6-6 describes the fields in the `show stats probe type vm` command output.

**Table 6-6  Field Descriptions for the show stats probe type vm Command Output**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total probes sent</td>
<td>Total number of VM probes that the ACE sent to the VM controller</td>
</tr>
<tr>
<td>Total conns opened</td>
<td>Total number of connections that the ACE opened with the VM controller</td>
</tr>
<tr>
<td>Total load info received</td>
<td>Total number of times that the VM probe returned load information</td>
</tr>
<tr>
<td>Total probes failed</td>
<td>Total number of probes that the ACE sent to the VM controller that failed</td>
</tr>
<tr>
<td>Total vm-controller connect errors</td>
<td>Total number of times that a VM probe failed to connect with the VM controller</td>
</tr>
<tr>
<td>Total active conns</td>
<td>Total number of active VM probe connections with the VM controller</td>
</tr>
<tr>
<td>Total high threshold reach</td>
<td>Total number of times that the average load value of the local VMs reached the maximum burst threshold value</td>
</tr>
<tr>
<td>Total low threshold reach</td>
<td>Total number of times that the average load value of the VMs reached the minimum burst threshold value</td>
</tr>
</tbody>
</table>

**Displaying the VM Probe Details**

You can display the details of the VM probe settings and statistics by using the `show probe name` command in Exec mode. The syntax of this command is as follows:

```
show probe name
```
Table 6-7 describes the fields in the `show probe name` command output.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>probe</td>
<td>Name of the VM probe.</td>
</tr>
<tr>
<td>type</td>
<td>VM.</td>
</tr>
<tr>
<td>state</td>
<td>Operating state of the probe. Possible states are ACTIVE or INACTIVE.</td>
</tr>
<tr>
<td>interval</td>
<td>Configured time interval between probes. Default is 300 seconds.</td>
</tr>
<tr>
<td>vm-controller</td>
<td>Name of the VM controller (VMware vCenter).</td>
</tr>
<tr>
<td>cpu-load burst-threshold</td>
<td></td>
</tr>
<tr>
<td>max threshold</td>
<td>Maximum CPU load burst threshold. When the average aggregate CPU load of the local VMs is greater than or equal to this configured value, the ACE starts bursting traffic to the remote data center.</td>
</tr>
<tr>
<td>min threshold</td>
<td>Minimum CPU load burst threshold. When the average aggregate CPU load of the local VMs is less than this configured value, the ACE stops bursting traffic to the remote data center and continues to load balance traffic to the local server farm.</td>
</tr>
<tr>
<td>mem-load burst-threshold</td>
<td></td>
</tr>
<tr>
<td>max threshold</td>
<td>Maximum memory load burst threshold. When the average aggregate memory load of the local VMs is greater than or equal to this configured value, the ACE starts bursting traffic to the remote data center.</td>
</tr>
<tr>
<td>min threshold</td>
<td>Minimum memory load burst threshold. When the average aggregate memory load of the local VMs is less than this configured value, the ACE stops bursting traffic to the remote data center and continues to load balance traffic to the local server farm.</td>
</tr>
</tbody>
</table>
### Table 6-7 Field Descriptions for the show probe name Command Output (continued)

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>probe results</td>
<td></td>
</tr>
<tr>
<td>associations</td>
<td>List of server farms and real servers associated with the VM probe.</td>
</tr>
<tr>
<td>serverfarm</td>
<td>Name of the DWS-enabled server farm.</td>
</tr>
<tr>
<td>real</td>
<td>Names of the real servers (VMs) in the server farm.</td>
</tr>
<tr>
<td>ip-address</td>
<td>IP addresses of the real servers (VMs).</td>
</tr>
<tr>
<td>aggregate-stats</td>
<td>Average CPU load and average memory load of the local VMs.</td>
</tr>
<tr>
<td>cpu-load</td>
<td>Calculated CPU load of the local VMs.</td>
</tr>
<tr>
<td>mem-load</td>
<td>Calculated memory load of the local VMs.</td>
</tr>
<tr>
<td>health</td>
<td>Health status of the server farm and the VMs. Possible server farm values are as follows:</td>
</tr>
<tr>
<td></td>
<td>• BURST_REMOTE—The ACE is load balancing traffic to the local and the remote data centers.</td>
</tr>
<tr>
<td></td>
<td>• BURST_LOCAL—The ACE is load balancing traffic to the local data center only.</td>
</tr>
<tr>
<td></td>
<td>• VMCNTLR_QUERY_FAILED—The probe that the ACE sent to the VM controller failed.</td>
</tr>
<tr>
<td></td>
<td>Possible real server (VM) values are as follows:</td>
</tr>
<tr>
<td></td>
<td>• SUCCESS—The real server is available for load balancing.</td>
</tr>
<tr>
<td></td>
<td>• FAILURE—The real server is not available for load balancing.</td>
</tr>
</tbody>
</table>