Monitoring Load-Balancing Services

Load-balancing is a technology that enables network traffic to follow multiple paths to a specific destination. It distributes incoming service requests evenly among multiple servers in such a way that the load distribution is transparent to users.

Content switching is a type of server load-balancing. It balances the load of traffic across web servers based on server load and content availability.

Performance Monitor supports the monitoring of validated content-switching service modules (CSM) that are installed in Cisco Catalyst 6500 Series switches.

**Note**
Performance Monitor does not monitor the cluster load balancing capabilities or cluster load balancing performance of Cisco VPN 3000 concentrators.

The following topics describe the features with which you monitor web server load balancing services in your network:

- Content Switching Concepts, page 8-1
- Monitoring Modules Collectively, page 8-2
- Monitoring Modules Individually, page 8-5

**Tip**
To troubleshoot common problems with load-balancing services, see the Troubleshooting appendix.

Content Switching Concepts

A content switch analyzes the availability of web content and the load on web servers. Using the results of this analysis, the content switch balances the load of traffic across servers and accelerates the delivery of web content in a way that is transparent to the website end-user.

Properly-configured content switches:

- Improve the responsiveness of websites.
- Help guarantee efficient delivery of high-bandwidth files.
- Decrease network congestion.
- Optimize resource utilization in networks and servers.
- Improve the performance and scalability of web application platforms.
Monitoring Modules Collectively

**Purpose of Content-Switching Service Modules**

A content-switching service module (CSM) provides high-performance connections between network devices and server farms based on Layer 4 through Layer 7 packet information. Clients connect to the CSM by supplying the virtual IP address (VIP) associated with the virtual server. When a client initiates a connection to the virtual server, the CSM selects a real server for the connection based on configured load-balancing algorithms and policies.

<table>
<thead>
<tr>
<th>Virtual Servers</th>
<th>Virtual servers use real server farms through policies you configure on the CSM.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Servers</td>
<td>Real servers are physical or virtual devices assigned to a server farm. Real servers provide the services that are load balanced. When the server receives a client request, it pulls matching information from a disk and sends it to the CSM for forwarding to the client.</td>
</tr>
<tr>
<td>Server Farms</td>
<td>A server farm or server pool is a collection of real servers that contain the same content. You specify the server farm name when you configure the server farm and add servers to it, and when you bind the server farm to a virtual server.</td>
</tr>
</tbody>
</table>

Performance Monitor enables you to monitor the CSM as it tracks network sessions and server load conditions in real time and directs sessions to the most appropriate servers.

**Monitoring Modules Collectively**

The following topics explain how you can monitor CSM modules collectively:

- Displaying CSM Usage and Activity Statistics, page 8-2
- Displaying Load Balancing Failure Statistics, page 8-3
- Displaying Server and Policy Reject Statistics, page 8-4

**Displaying CSM Usage and Activity Statistics**

You can display usage and activity statistics for all of the validated CSM modules in your network.

**Procedure**

**Step 1**
Select **Monitor > Load Balancing > Modules**. For an explanation of the columns in the table, see Table 8-1.

All measured values on the Load Balancing Modules page are computed as *deltas* (meaning they indicate the scope of difference from one polling cycle to the next)—except for the whole number count of current connections.

**Step 2**
To display detail graphs for one CSM module, click the relevant entry in the Chassis:Module column.
Displaying Load Balancing Failure Statistics

You can display and work from a table that describes the operational failures of your validated CSM modules.

Procedure

**Step 1** Select **Monitor > Load Balancing > Failures**. For an explanation of the columns in the table, see Table 8-2.

All measured values on the Load Balancing Failures page are computed as deltas.

**Step 2** To display summary graphs for one CSM module, click the relevant entry in the Chassis:Module column.
Displaying Server and Policy Reject Statistics

You can display and work from a table of rejection statistics for your validated CSM modules.

Procedure

**Step 1** Select Monitor > Load Balancing > Rejects. For an explanation of the columns in the table, see Table 8-3.

All measured values on the Load Balancing Rejects page are computed as deltas.

**Step 2** To display summary graphs for one CSM module, click the relevant entry in the Chassis:Module column.

Reference

### Table 8-2 Load Balancing Failures Page

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alert column</td>
<td>Displays an alert icon in cases of high-severity problems or failures. Click the icon to open an event browser and view a filtered display of severe CSM errors only. See Understanding Interface Icons, page 3-5. For reference information on the Event Browser elements, see Event Browser Windows, page 3-14.</td>
</tr>
<tr>
<td>Chassis:Module column</td>
<td>Displays the IP address of the relevant Catalyst 6500 switch and the numbered slot in which the CSM module is installed.</td>
</tr>
<tr>
<td>No. Failed Connections column</td>
<td>Displays the total number of failed connections.</td>
</tr>
<tr>
<td>Failed Connections % column</td>
<td>Displays the percentage of connections that resulted in failure.</td>
</tr>
<tr>
<td>No. Dropped Connections column</td>
<td>Displays the total number of dropped connections.</td>
</tr>
<tr>
<td>Dropped Connections % column</td>
<td>Displays the percentage of all connections that were dropped.</td>
</tr>
</tbody>
</table>

**Related Topics**

- Optional Tasks in Performance Monitor Tables, page 3-9
- Common Elements in Tables, page 3-8
Chapter 8 Monitoring Load-Balancing Services

Monitoring Modules Individually

The following topics explain how you can monitor CSM modules individually:

- Displaying and Interpreting Module Detail Graphs, page 8-5
- Displaying the Virtual Servers Table, page 8-6
- Displaying the Real Servers Table, page 8-7
- Displaying the Interfaces Table, page 8-8

Displaying and Interpreting Module Detail Graphs

You can display and work from a page of detail graphs for one validated CSM module.

Procedure

Step 1  Select Monitor > Load Balancing > Module Details.

By default, Performance Monitor displays graphs that describe the health and performance of whichever module uses the lowest number as its IP address. For a description of the graphs, see Table 8-4.

Step 2  Select the IP address and slot number of the CSM module you want to view from the Select Chassis:Module list.

| Table 8-3  Load Balancing Rejects Page (continued) |
| Element                                                                 | Description                                                                 |
| Chassis:Module column                                                 | Displays the IP address of the relevant Catalyst 6500 switch and the numbered slot in which the CSM module is installed. |
| No. of No Active Server Rejects column                                | Displays the number of connections that were rejected because the relevant server farm had no active servers. |
| No. of No Match Policy Rejects column                                 | Displays the number of connections that were rejected because they failed to match any configured policy. |
| No. of No Config Policy Rejects column                                | Displays the number of connections that were rejected because the matching virtual server was not configured with any policy. |

Related Topics

- Optional Tasks in Performance Monitor Tables, page 3-9
- Common Elements in Tables, page 3-8
### Types of Load Balancing Graphs

**Table 8-4     Interpreting Load Balancing Module Graphs**

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
</table>
| Connection Failures | Illustrates the trend of module connection failures over time:  
                     - The vertical axis shows the percentage of failures in a specific polling cycle.  
                     - The horizontal axis shows the time of day for the polling cycle. |
| Dropped Connection | Illustrates the trend of dropped connections over time:  
                     - The vertical axis shows the average number of dropped connections in a specific polling cycle.  
                     - The horizontal axis shows the time of day for the polling cycle. |
| Current Connections | Illustrates the trend of successful connections over time:  
                     - The vertical axis shows the average number of successful connections in a specific polling cycle.  
                     - The horizontal axis shows the time of day for the polling cycle. |
| Total Rejects     | Illustrates the trend of rejected connections over time:  
                     - The vertical axis shows the average sum of these values over time:  
                       - The number of connections that were rejected because the relevant server farm had no active servers.  
                       - The number of connections that were rejected because they failed to match any configured policy.  
                       - The number of connections that were rejected because the matching virtual server was not configured with any policy.  
                     - The horizontal axis shows the time of day for the polling cycle. |

### Displaying the Virtual Servers Table

You can display and work from a table of virtual server statistics for one validated CSM module.

**Procedure**

**Step 1** Select **Monitor > Load Balancing > Virtual Servers**. For an explanation of the columns in the table, see **Table 8-5**.

The Load Balancing Virtual Servers page displays information about all of the virtual servers associated with a specific CSM module.

**Step 2** Select the IP address and slot number of the CSM module you want to view from the **Select Chassis:Module** list.

**Reference**

**Table 8-5     Load Balancing Virtual Servers Page**

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name column</td>
<td>Displays the name of the virtual server that is configured on the CSM.</td>
</tr>
</tbody>
</table>
Displaying the Real Servers Table

You can display and work from a table of real server statistics for one validated CSM service module.

**Procedure**

1. Select Monitor > Load Balancing > Real Servers. For an explanation of the columns in the table, see Table 8-6.

   The Load Balancing Real Servers page displays information about all of the real servers associated with a specific CSM module.

2. Select the IP address and slot number of the CSM module you want to view from the Select Chassis:Module list.

**Reference**

### Table 8-6 Load Balancing Real Servers

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server Farm column</td>
<td>Displays the name of the server farm.</td>
</tr>
<tr>
<td>Address column</td>
<td>Displays the IP address of the real server.</td>
</tr>
<tr>
<td>Port column</td>
<td>Displays the port number of the real server.</td>
</tr>
<tr>
<td>State column</td>
<td>Displays the state of the real server.</td>
</tr>
<tr>
<td>No. Current Connections column</td>
<td>Displays the number of active connections.</td>
</tr>
<tr>
<td>No. Total Connections column</td>
<td>Displays the total number of connections since the previous polling cycle.</td>
</tr>
<tr>
<td>No. Total Failed Connections column</td>
<td>Displays the total number of connections that failed since the previous polling cycle.</td>
</tr>
<tr>
<td>Connection Failed % column</td>
<td>Displays the percentage of connections that failed since the previous polling cycle.</td>
</tr>
</tbody>
</table>
Related Topics

- Optional Tasks in Performance Monitor Tables, page 3-9
- Common Elements in Tables, page 3-8

Displaying the Interfaces Table

You can display and work from a table of interface statistics for one validated CSM module.

Procedure

**Step 1** Select Monitor > Load Balancing > Interfaces. For an explanation of the columns in the table, see Table 8-7.

Statistics on the Load Balancing Interfaces page describe routed VLANs that are associated with a CSM module interface.

All measured values on the Load Balancing Interfaces page are computed as deltas.

**Step 2** Select the IP address and slot number of the CSM module you want to view from the Select Chassis:Module list.

Reference

Table 8-7 Load Balancing Interfaces

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descr column</td>
<td>Provides a specific description of the physical interface. For example, DEC 21143A PCI Fast Ethernet.</td>
</tr>
<tr>
<td>Address column</td>
<td>Displays the interface MAC address.</td>
</tr>
<tr>
<td>Admin Status column</td>
<td>Displays the administrative status.</td>
</tr>
<tr>
<td>Operation Status column</td>
<td>Displays the operational status.</td>
</tr>
<tr>
<td>Type column</td>
<td>Displays the frame type to which TCP/IP is bound. For example, a displayed type of iso88023-csmacd indicates a frame type of 100 MBits/s FastEthernet that applies CSMACD (carrier sense multiple access/collision detection).</td>
</tr>
<tr>
<td>Speed (Kbps) column</td>
<td>Displays the interface speed in Kbps.</td>
</tr>
<tr>
<td>Packets In column</td>
<td>Displays the total number of inbound packets on the interface since the previous polling cycle.</td>
</tr>
<tr>
<td>Packets Out column</td>
<td>Displays the total number of outbound packets on the interface since the previous polling cycle.</td>
</tr>
<tr>
<td>Packet Drop % column</td>
<td>Displays the total number of packets dropped since the previous polling cycle.</td>
</tr>
<tr>
<td>Throughput (Kbps) column</td>
<td>Displays the sum of inbound and outbound octets through the interface since the previous polling cycle in Kbps.</td>
</tr>
</tbody>
</table>

Related Topics

- Optional Tasks in Performance Monitor Tables, page 3-9
- Common Elements in Tables, page 3-8