Configuring Quality of Service

This chapter includes the following sections:

- Quality of Service, page 1
- Configuring System Classes, page 1
- Configuring Quality of Service Policies, page 5
- Configuring Flow Control Policies, page 6

Quality of Service

Cisco UCS provides the following methods to implement quality of service:

- System classes that specify the global configuration for certain types of traffic across the entire system
- QoS policies that assign system classes for individual vNICs
- Flow control policies that determine how uplink Ethernet ports handle pause frames

Configuring System Classes

System Classes

Cisco UCS uses Data Center Ethernet (DCE) to handle all traffic inside a Cisco UCS domain. This industry standard enhancement to Ethernet divides the bandwidth of the Ethernet pipe into eight virtual lanes. Two virtual lanes are reserved for internal system and management traffic. You can configure quality of service (QoS) for the other six virtual lanes. System classes determine how the DCE bandwidth in these six virtual lanes is allocated across the entire Cisco UCS domain.

Each system class reserves a specific segment of the bandwidth for a specific type of traffic, which provides a level of traffic management, even in an oversubscribed system. For example, you can configure the Fibre Channel Priority system class to determine the percentage of DCE bandwidth allocated to FCoE traffic.

The following table describes the system classes that you can configure.
**Table 1: System Classes**

<table>
<thead>
<tr>
<th>System Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platinum</td>
<td>A configurable set of system classes that you can include in the QoS policy for a service profile. Each system class manages one lane of traffic. All properties of these system classes are available for you to assign custom settings and policies.</td>
</tr>
<tr>
<td>Gold</td>
<td>A system class that sets the quality of service for the lane reserved for basic Ethernet traffic. Some properties of this system class are preset and cannot be modified. For example, this class has a drop policy that allows it to drop data packets if required. You cannot disable this system class.</td>
</tr>
<tr>
<td>Silver</td>
<td>A system class that sets the quality of service for the lane reserved for Fibre Channel over Ethernet traffic. Some properties of this system class are preset and cannot be modified. For example, this class has a no-drop policy that ensures it never drops data packets. You cannot disable this system class.</td>
</tr>
<tr>
<td>Bronze</td>
<td>FCoE traffic has a reserved QoS system class that should not be used by any other type of traffic. If any other type of traffic has a CoS value that is used by FCoE, the value is remarked to 0.</td>
</tr>
<tr>
<td>Best Effort</td>
<td>A system class that sets the quality of service for the lane reserved for Fibre Channel over Ethernet traffic. Some properties of this system class are preset and cannot be modified. For example, this class has a no-drop policy that ensures it never drops data packets. You cannot disable this system class.</td>
</tr>
</tbody>
</table>

**Configuring QoS System Classes**

The type of adapter in a server may limit the maximum MTU supported. For example, network MTU above the maximums may cause the packet to be dropped for the following adapters:

- The Cisco UCS M71KR CNA adapter, which supports a maximum MTU of 9216.
- The Cisco UCS 82598KR-CI adapter, which supports a maximum MTU of 14000.

**Important**

Use the same CoS values on UCS and N5K for all the no-drop policies. To insure that end-to-end PFC works correctly, have the same QoS policy configured on all intermediate switches.
**Procedure**

**Step 1** In the **Navigation** pane, click the **LAN** tab.

**Step 2** In the **LAN** tab, expand **LAN > LAN Cloud**.

**Step 3** Select the **QoS System Class** node.

**Step 4** In the **Work** pane, click the **General** tab.

**Step 5** Update the following properties for the system class you want to configure to meet the traffic management needs of the system:

**Note** Some properties may not be configurable for all system classes.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enabled</strong></td>
<td>If checked, the associated QoS class is configured on the fabric interconnect and can be assigned to a QoS policy. If unchecked, the class is not configured on the fabric interconnect and any QoS policies associated with this class default to <strong>Best Effort</strong> or, if a system class is configured with a CoS of 0, to the CoS 0 system class. <strong>Note</strong> This field is always checked for <strong>Best Effort</strong> and <strong>Fibre Channel</strong>.</td>
</tr>
<tr>
<td><strong>CoS field</strong></td>
<td>The class of service. You can enter an integer value between 0 and 6, with 0 being the lowest priority and 6 being the highest priority. We recommend that you do not set the value to 0, unless you want that system class to be the default system class for traffic if the QoS policy is deleted or the assigned system class is disabled. <strong>Note</strong> This field is set to 7 for internal traffic and to any for <strong>Best Effort</strong>. Both of these values are reserved and cannot be assigned to any other priority.</td>
</tr>
<tr>
<td><strong>Packet Drop</strong> check box</td>
<td>If checked, packet drop is allowed for this class. If unchecked, packets cannot be dropped during transmission. This field is always unchecked for the <strong>Fibre Channel</strong> class, which never allows dropped packets, and always checked for <strong>Best Effort</strong>, which always allows dropped packets.</td>
</tr>
</tbody>
</table>
| **Weight** drop-down list | This can be one of the following:  
  - An integer between 1 and 10. If you enter an integer, Cisco UCS determines the percentage of network bandwidth assigned to the priority level as described in the **Weight (%)** field.  
  - **best-effort**.  
  - **none**. |
To determine the bandwidth allocated to a channel, Cisco UCS:
1. Adds the weights for all the channels
2. Divides the channel weight by the sum of all weights to get a percentage
3. Allocates that percentage of the bandwidth to the channel

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Weight (%) field          | To determine the bandwidth allocated to a channel, Cisco UCS:  
  1. Adds the weights for all the channels  
  2. Divides the channel weight by the sum of all weights to get a percentage  
  3. Allocates that percentage of the bandwidth to the channel |
| MTU drop-down list        | The maximum transmission unit for the channel. This can be one of the following:  
  • An integer between 1500 and 9216. This value corresponds to the maximum packet size.  
  • fc—A predefined packet size of 2240.  
  • normal—A predefined packet size of 1500.  
  Note: This field is always set to fc for Fibre Channel. |
| Multicast Optimized check box | If checked, the class is optimized to send packets to multiple destinations simultaneously.  
  Note: This option is not applicable to the Fibre Channel. |

**Step 6** Click Save Changes.

---

**Enabling a QoS System Class**

The Best Effort or Fibre Channel system classes are enabled by default.

**Procedure**

**Step 1** In the Navigation pane, click the LAN tab.

**Step 2** In the LAN tab, expand LAN > LAN Cloud.

**Step 3** Select the QoS System Class node.

**Step 4** In the Work pane, click the General tab.

**Step 5** Check the Enabled check box for the QoS system that you want to enable.

**Step 6** Click Save Changes.
Disabling a QoS System Class

You cannot disable the Best Effort or Fibre Channel system classes. All QoS policies that are associated with a disabled system class default to Best Effort or, if the disabled system class is configured with a Cos of 0, to the Cos 0 system class.

Procedure

Step 1 In the Navigation pane, click the LAN tab.
Step 2 In the LAN tab, expand LAN > LAN Cloud.
Step 3 Select the QoS System Class node.
Step 4 In the Work pane, click the General tab.
Step 5 Uncheck the Enabled check box for the QoS system that you want to disable.
Step 6 Click Save Changes.

Configuring Quality of Service Policies

Quality of Service Policy

A quality of service (QoS) policy assigns a system class to the outgoing traffic for a vNIC or vHBA. This system class determines the quality of service for that traffic. For certain adapters, you can also specify additional controls on the outgoing traffic, such as burst and rate.

You must include a QoS policy in a vNIC policy or vHBA policy and then include that policy in a service profile to configure the vNIC or vHBA.

Creating a QoS Policy

Procedure

Step 1 In the Navigation pane, click the LAN tab.
Step 2 In the LAN tab, expand LAN > Policies.
Step 3 Expand the node for the organization where you want to create the pool. If the system does not include multitenancy, expand the root node.
Step 4 Right-click QoS Policy and select Create QoS Policy.
Step 5 In the Create QoS Policy dialog box, complete the required fields.
Step 6 Click OK.
What to Do Next
Include the QoS policy in a vNIC or vHBA template.

Deleting a QoS Policy

If you delete a QoS policy that is in use or you disable a system class that is used in a QoS policy, any vNIC or vHBA that uses that QoS policy is assigned to the Best Effort system class or to the system class with a CoS of 0. In a system that implements multi-tenancy, Cisco UCS Manager first attempts to find a matching QoS policy in the organization hierarchy.

Procedure

**Step 1** In the **Navigation** pane, click the **LAN** tab.
**Step 2** On the **Servers** tab, expand **Servers > Policies > Organization_Name**.
**Step 3** Expand the **QoS Policies** node.
**Step 4** Right-click the QoS policy you want to delete and select **Delete**.
**Step 5** If the Cisco UCS Manager GUI displays a confirmation dialog box, click **Yes**.

Configuring Flow Control Policies

Flow Control Policy

Flow control policies determine whether the uplink Ethernet ports in a Cisco UCS domain send and receive IEEE 802.3x pause frames when the receive buffer for a port fills. These pause frames request that the transmitting port stop sending data for a few milliseconds until the buffer clears.

For flow control to work between a LAN port and an uplink Ethernet port, you must enable the corresponding receive and send flow control parameters for both ports. For Cisco UCS, the flow control policies configure these parameters.

When you enable the send function, the uplink Ethernet port sends a pause request to the network port if the incoming packet rate becomes too high. The pause remains in effect for a few milliseconds before traffic is reset to normal levels. If you enable the receive function, the uplink Ethernet port honors all pause requests from the network port. All traffic is halted on that uplink port until the network port cancels the pause request.

Because you assign the flow control policy to the port, changes to the policy have an immediate effect on how the port reacts to a pause frame or a full receive buffer.
Creating a Flow Control Policy

Before You Begin
Configure the network port with the corresponding setting for the flow control that you need. For example, if you enable the send setting for flow-control pause frames in the policy, make sure that the receive parameter in the network port is set to on or desired. If you want the Cisco UCS port to receive flow-control frames, make sure that the network port has a send parameter set to on or desired. If you do not want to use flow control, you can set the send and receive parameters on the network port to off.

Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>In the Navigation pane, click the LAN tab.</td>
</tr>
<tr>
<td>Step 2</td>
<td>On the LAN tab, expand LAN &gt; Policies.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Expand the root node. You can only create a flow control policy in the root organization. You cannot create a flow control policy in a sub-organization.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Right-click the Flow Control Policies node and select Create Flow Control Policy.</td>
</tr>
<tr>
<td>Step 5</td>
<td>In the Create Flow Control Policy wizard, complete the following fields:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name field</td>
<td>The name of the policy. This name can be between 1 and 16 alphanumeric characters. You cannot use spaces or any special characters other than - (hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object has been saved.</td>
</tr>
</tbody>
</table>
| Priority field | This can be one of the following:  
  * Auto—Cisco UCS and the network negotiate whether PPP is used on this fabric interconnect  
  * On—PPP is enabled on this fabric interconnect |
| Receive field | This can be one of the following:  
  * Off—Pause requests from the network are ignored and traffic flow continues as normal  
  * On—Pause requests are honored and all traffic is halted on that uplink port until the network cancels the pause request |
### Deleting a Flow Control Policy

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Send field</td>
<td>This can be one of the following:</td>
</tr>
<tr>
<td></td>
<td>• <strong>Off</strong>—Traffic on the port flows normally regardless of the packet load.</td>
</tr>
<tr>
<td></td>
<td>• <strong>On</strong>—Cisco UCS sends a pause request to the network if the incoming packet rate becomes too high. The pause remains in effect for a few milliseconds before traffic is reset to normal levels.</td>
</tr>
</tbody>
</table>

**Step 6**  
Click **OK**.

**What to Do Next**  
Associate the flow control policy with an uplink Ethernet port or port channel.

#### Deleting a Flow Control Policy

**Procedure**

**Step 1**  
In the **Navigation** pane, click the **LAN** tab.

**Step 2**  
On the **LAN** tab, expand **LAN > Policies > Organization_Name**.

**Step 3**  
Expand the **Flow Control Policies** node.

**Step 4**  
Right-click the policy you want to delete and select **Delete**.

**Step 5**  
If the Cisco UCS Manager GUI displays a confirmation dialog box, click **Yes**.