



# Configuring Quality of Service

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## 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**

| System Class                         | Description   |
|--------------------------------------|---|
| Platinum<br>Gold<br>Silver<br>Bronze | 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.<br><br>All properties of these system classes are available for you to assign custom settings and policies.   |
| Best Effort                          | A system class that sets the quality of service for the lane reserved for basic Ethernet traffic.<br><br>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.   |
| Fibre Channel                        | A system class that sets the quality of service for the lane reserved for Fibre Channel over Ethernet traffic.<br><br>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.<br><br><b>Note</b> 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. |

## Configuring a System Class

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.

### Procedure

|               | Command or Action   | Purpose   |
|---------------|---|---|
| <b>Step 1</b> | UCS-A# <b>scope eth-server</b>  | Enters Ethernet server mode.  |
| <b>Step 2</b> | UCS-A /eth-server # <b>scope qos</b>  | Enters Ethernet server QoS mode.  |
| <b>Step 3</b> | UCS-A /eth-server/qos # <b>scope eth-classified {bronze   gold   platinum silver}</b> | Enters Ethernet server QoS Ethernet classified mode for the specified system class. |
| <b>Step 4</b> | UCS-A /eth-server/qos/eth-classified # <b>enable</b>                                  | Enables the specified system class.   |

|                | Command or Action  | Purpose   |
|----------------|--|---|
| <b>Step 5</b>  | UCS-A /eth-server/qos/eth-classified #<br><b>set cos</b> <i>cos-value</i>  | Specifies the class of service for the specified system class. Valid class of service values are 0 to 6; higher values indicate more important traffic.   |
| <b>Step 6</b>  | UCS-A /eth-server/qos/eth-classified #<br><b>set drop</b> { <b>drop</b>   <b>no-drop</b> }                             | Specifies whether the channel can drop packets or not.<br><b>Note</b> Only one system class can use the no-drop option.   |
| <b>Step 7</b>  | UCS-A /eth-server/qos/eth-classified #<br><b>set mtu</b> { <i>mtu-value</i>   <b>fc</b>   <b>normal</b> }              | The maximum transmission unit, or packet size, that this vNIC accepts.<br><b>Note</b> If the vNIC has an associated QoS policy, the MTU specified here must be equal to or less than the MTU specified in the associated QoS system class. If this MTU value exceeds the MTU value in the QoS system class, packets might get dropped during data transmission. |
| <b>Step 8</b>  | UCS-A /eth-server/qos/eth-classified #<br><b>set multicast-optimize</b> { <b>no</b>   <b>yes</b> }                     | Specifies whether the class is optimized to for sending multicast packets.  |
| <b>Step 9</b>  | UCS-A /eth-server/qos/eth-classified #<br><b>set weight</b> { <i>weight-value</i>   <b>best-effort</b>   <b>none</b> } | Specifies the relative weight for the specified system class. Valid weight values are 0 to 10.  |
| <b>Step 10</b> | UCS-A /eth-server/qos/eth-classified #<br><b>commit-buffer</b>   | Commits the transaction to the system configuration.  |

The following example enables the platinum system class, allows the channel to drop packets, sets the class of service to 6, sets the MTU to normal, optimizes the class for sending multicast packets, sets the relative weight to 5, and commits the transaction:

```
UCS-A# scope eth-server
UCS-A /eth-server # scope qos
UCS-A /eth-server/qos # scope eth-classified platinum
UCS-A /eth-server/qos/eth-classified # enable
UCS-A /eth-server/qos/eth-classified* # set drop drop
UCS-A /eth-server/qos/eth-classified* # set cos 6
UCS-A /eth-server/qos/eth-classified* # set mtu normal
UCS-A /eth-server/qos/eth-classified* # set multicast-optimize yes
UCS-A /eth-server/qos/eth-classified* # set weight 5
UCS-A /eth-server/qos/eth-classified* # commit-buffer
UCS-A /eth-server/qos/eth-classified #
```

## Disabling a System Class

If you disable a system class that is used in a QoS policy, Cisco UCS Manager uses the system class configured with CoS 0 for traffic on servers that are configured with the QoS policy. If no system class is configured as CoS 0, the Best Effort system class is used. You cannot disable the Best Effort or Fibre Channel system classes.

**Procedure**

|               | Command or Action   | Purpose   |
|---------------|---|---|
| <b>Step 1</b> | UCS-A# <b>scope eth-server</b>  | Enters Ethernet server mode.  |
| <b>Step 2</b> | UCS-A /eth-server # <b>scope qos</b>  | Enters Ethernet server QoS mode.  |
| <b>Step 3</b> | UCS-A /eth-server/qos # <b>scope eth-classified {bronze   gold   platinum silver}</b> | Enters Ethernet server QoS Ethernet classified mode for the specified system class. |
| <b>Step 4</b> | UCS-A /eth-server/qos/eth-classified # <b>disable</b>                                 | Disables the specified system class.  |
| <b>Step 5</b> | UCS-A /eth-server/qos/eth-classified # <b>commit-buffer</b>                           | Commits the transaction to the system configuration.                                |

The following example disables the platinum system class and commits the transaction:

```
UCS-A# scope eth-server
UCS-A /eth-server # scope qos
UCS-A /eth-server/qos # scope eth-classified platinum
UCS-A /eth-server/qos/eth-classified # disable
UCS-A /eth-server/qos/eth-classified* # commit-buffer
UCS-A /eth-server/qos/eth-classified #
```

# 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.

## Configuring a QoS Policy

**Procedure**

|               | Command or Action   | Purpose  |
|---------------|---|--|
| <b>Step 1</b> | Switch-A# <b>scope org</b><br><i>org-name</i>               | Enters org mode for the specified organization. To enter the default org mode, type / as the <i>org-name</i> . |
| <b>Step 2</b> | Switch-A /org # <b>create qos-policy</b> <i>policy-name</i> | Creates the specified QoS policy, and enters org QoS policy mode.  |

|               | Command or Action   | Purpose   |
|---------------|---|---|
| <b>Step 3</b> | Switch-A /org/qos-policy #<br><b>create egress-policy</b>                                     | Creates the egress policy (for both vNICs and vHBAs) to be used by the QoS policy, and enters org QoS policy egress policy mode.  |
| <b>Step 4</b> | Switch-A<br>/org/qos-policy/egress-policy<br># <b>set host-cos-control {full   none}</b>      | (Optional) Specifies whether the host or Cisco UCS Manager controls the class of service (CoS) for a vNIC. This setting has no effect on a vHBA.<br><br>Use the <b>full</b> keyword to have the host control the CoS. If the packet has a valid CoS value, the host uses that value. Otherwise, it uses the CoS value associated with the specified class priority. Use the <b>none</b> keyword to have Cisco UCS Manager use the CoS value associated with the specified priority.   |
| <b>Step 5</b> | Switch-A<br>/org/qos-policy/egress-policy<br># <b>set prio sys-class-name</b>                 | Specifies the system class to be used for the egress policy. The <i>sys-class-name</i> argument can be one of the following class keywords: <ul style="list-style-type: none"> <li>• <b>Fc</b>—Use this priority for QoS policies that control vHBA traffic only.</li> <li>• <b>Platinum</b>—Use this priority for QoS policies that control vNIC traffic only.</li> <li>• <b>Gold</b>—Use this priority for QoS policies that control vNIC traffic only.</li> <li>• <b>Silver</b>—Use this priority for QoS policies that control vNIC traffic only.</li> <li>• <b>Bronze</b>—Use this priority for QoS policies that control vNIC traffic only.</li> <li>• <b>Best Effort</b>—Do not use this priority. It is reserved for the Basic Ethernet traffic lane. If you assign this priority to a QoS policy and configure another system class as CoS 0, Cisco UCS Manager does not default to this system class. It defaults to the priority with CoS 0 for that traffic.</li> </ul> |
| <b>Step 6</b> | Switch-A<br>/org/qos-policy/egress-policy<br># <b>set rate {line-rate   kbps} burst bytes</b> | Specifies the rate limit for egress traffic by defining the average traffic rate and burst size. The <b>line-rate</b> keyword sets the rate limit to the physical line rate.<br><br>Rate limiting is supported only on vNICs on the Cisco UCS VIC-1240 Virtual Interface Card and Cisco UCS VIC-1280 Virtual Interface Card. The Cisco UCS M81KR Virtual Interface Card supports rate limiting on both vNICs and vHBAs.   |
| <b>Step 7</b> | Switch-A<br>/org/qos-policy/egress-policy<br># <b>commit-buffer</b>                           | Commits the transaction to the system configuration.  |

The following example creates a QoS policy for vNIC traffic, assigns the platinum system class and sets the rate limit (traffic rate and burst size) for the egress policy, and commits the transaction:

```
Switch-A# scope org /
Switch-A /org # create qos-policy VnicPolicy34
Switch-A /org/qos-policy* # create egress-policy
Switch-A /org/qos-policy/egress-policy* # set prio platinum
Switch-A /org/qos-policy/egress-policy* # set rate 5000000 burst 65000
Switch-A /org/qos-policy/egress-policy* # commit-buffer
Switch-A /org/qos-policy/egress-policy #
```

The following example creates a QoS policy for vHBA traffic, assigns the fc (Fibre Channel) system class and sets the rate limit (traffic rate and burst size) for the egress policy, and commits the transaction:

```
Switch-A# scope org /
Switch-A /org # create qos-policy VhbaPolicy12
Switch-A /org/qos-policy* # create egress-policy
Switch-A /org/qos-policy/egress-policy* # set prio fc
Switch-A /org/qos-policy/egress-policy* # set rate 5000000 burst 65000
Switch-A /org/qos-policy/egress-policy* # commit-buffer
Switch-A /org/qos-policy/egress-policy #
```

### 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

|               | Command or Action  | Purpose   |
|---------------|--|---|
| <b>Step 1</b> | UCS-A# <b>scope org</b> <i>org-name</i>                  | Enters organization mode for the specified organization. To enter the root organization mode, type / as the <i>org-name</i> . |
| <b>Step 2</b> | UCS-A /org # <b>delete qos-policy</b> <i>policy-name</i> | Deletes the specified QoS policy.   |
| <b>Step 3</b> | UCS-A /org # <b>commit-buffer</b>                        | Commits the transaction to the system configuration.  |

The following deletes the QoS policy named QosPolicy34 and commits the transaction:

```
UCS-A# scope org /
UCS-A /org # delete qos-policy QosPolicy34
UCS-A /org* # commit-buffer
UCS-A /org #
```

# 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.

## Configuring 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

|               | Command or Action  | Purpose   |
|---------------|--|---|
| <b>Step 1</b> | UCS-A# <b>scope eth-uplink</b>   | Enters Ethernet uplink mode.  |
| <b>Step 2</b> | UCS-A /eth-uplink # <b>scope flow-control</b>                          | Enters Ethernet uplink flow control mode.   |
| <b>Step 3</b> | UCS-A /eth-uplink/flow-control # <b>create policy policy-name</b>      | Creates the specified flow control policy.  |
| <b>Step 4</b> | UCS-A<br>/eth-uplink/flow-control/policy # <b>set prio prio-option</b> | Specifies one of the following flow control priority options: <ul style="list-style-type: none"> <li>• <b>auto</b> —The Cisco UCS system and the network negotiate whether PPP will be used on this fabric interconnect.</li> <li>• <b>on</b> —PPP is enabled on this fabric interconnect.</li> </ul> |

|               | Command or Action   | Purpose  |
|---------------|---|--|
| <b>Step 5</b> | UCS-A<br>/eth-uplink/flow-control/policy # <b>set receive</b> <i>receive-option</i> | Specifies one of the following flow control receive options: <ul style="list-style-type: none"> <li>• <b>off</b> —Pause requests from the network are ignored and traffic flow continues as normal.</li> <li>• <b>on</b> —Pause requests are honored and all traffic is halted on that uplink port until the network cancels the pause request.</li> </ul>   |
| <b>Step 6</b> | UCS-A<br>/eth-uplink/flow-control/policy # <b>set send</b> <i>send-option</i>       | Specifies one of the following flow control send options: <ul style="list-style-type: none"> <li>• <b>off</b> —Traffic on the port flows normally regardless of the packet load.</li> <li>• <b>on</b> —The Cisco UCS system 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.</li> </ul> |
| <b>Step 7</b> | UCS-A<br>/eth-uplink/flow-control/policy # <b>commit-buffer</b>                     | Commits the transaction to the system configuration.   |

The following configures a flow control policy and commits the transaction:

```
UCS-A# scope eth-uplink
UCS-A /eth-uplink # scope flow-control
UCS-A /eth-uplink/flow-control # create policy FlowControlPolicy23
UCS-A /eth-uplink/flow-control/policy* # set prio auto
UCS-A /eth-uplink/flow-control/policy* # set receive on
UCS-A /eth-uplink/flow-control/policy* # set send on
UCS-A /eth-uplink/flow-control/policy* # commit-buffer
UCS-A /eth-uplink/flow-control/policy #
```

### What to Do Next

Associate the flow control policy with an uplink Ethernet port or port channel.

## Deleting a Flow Control Policy

### Procedure

|               | Command or Action  | Purpose                                    |
|---------------|--|--|
| <b>Step 1</b> | UCS-A# <b>scope eth-uplink</b>   | Enters Ethernet uplink mode.               |
| <b>Step 2</b> | UCS-A /eth-uplink # <b>scope flow-control</b>                            | Enters Ethernet uplink flow control mode.  |
| <b>Step 3</b> | UCS-A /eth-uplink/flow-control # <b>delete policy</b> <i>policy-name</i> | Deletes the specified flow control policy. |



|               | Command or Action  | Purpose  |
|---------------|--|--|
| <b>Step 4</b> | UCS-A /eth-uplink/flow-control #<br><b>commit-buffer</b> | Commits the transaction to the system configuration. |

The following example deletes the flow control policy named FlowControlPolicy23 and commits the transaction:

```
UCS-A# scope eth-uplink
UCS-A /eth-uplink # scope flow-control
UCS-A /eth-uplink/flow-control # delete policy FlowControlPolicy23
UCS-A /eth-uplink/flow-control* # commit-buffer
UCS-A /eth-uplink/flow-control #
```

