



CHAPTER 6

Configuring Class Based Weighted Fair Queueing

This chapter describes how to configure Class Based Weighted Fair Queueing policies on the Cisco Nexus 1000V to prioritize network traffic.

Information About Class Based Weighted Fair Queueing

With this feature the following goals have been addressed:

- Queueing can ensure that any traffic class does not starve other traffic types.
- Respect the bandwidth guarantees for each traffic class.
- Optimize the utilization of the uplink bandwidth.

Class-based weighted fair queueing (CBWFQ) extends the standard weighted fair queueing (WFQ) functionality to provide support for user-defined traffic classes. For CBWFQ, you define traffic classes based on match criteria including protocols, and cos values. Packets satisfying the match criteria for a class constitute the traffic for that class. A queue is reserved for each class, and traffic belonging to a class is directed to the queue for that class.

Once a class has been defined according to its match criteria, you can assign its characteristics. To characterize a class, you assign it bandwidth, and maximum queue limit. The bandwidth assigned to a class is the guaranteed bandwidth delivered to the class during congestion.

To characterize a class, you also specify the queue limit for that class, which is the maximum number of packets allowed to accumulate in the queue for the class. Packets belonging to a class are subject to the bandwidth and queue limits that characterize the class.

After a queue has reached its configured queue limit, enqueueing of additional packets to the class causes tail drop.

The traffic that does not match any of the configured classes is given best-effort treatment. Once a packet is classified, all of the standard mechanisms that can also be used to differentiate service among the classes apply.

For CBWFQ, the weight specified for the class becomes the weight of each packet that meets the match criteria of the class. Packets that arrive at the egress interface are classified according to the match criteria filters you define, then each one is assigned the appropriate weight. The weight for a packet belonging to a specific class is derived from the bandwidth you assigned to the class when you configured it; in this sense the weight for a class is user-configurable.

After the weight for a packet is assigned, the packet is enqueued in the appropriate class queue. CBWFQ uses the weights assigned to the queued packets to ensure that the class queue is serviced fairly.

Configuring a class policy—thus, configuring CBWFQ—entails these three processes:

- Defining traffic classes to specify the classification policy (class maps).
This process determines how many types of packets are to be differentiated from one another.
- Associating policies—that is, class characteristics—with each traffic class (policy maps).
This process entails configuration of policies to be applied to packets belonging to one of the classes previously defined through a class map. For this process, you configure a policy map that specifies the policy for each traffic class.
- Attaching policies to interfaces (service policies).


Note

A queueing policy map can only be applied on an uplink in the egress (outbound) direction.

This process requires that you associate an existing policy map, or service policy, with an interface to apply the particular set of policies for the map to that interface.

Policy maps prioritize network traffic by class. You create policy maps to define how to treat each class of traffic so that it is prioritized for the best quality of service.

Licensing Requirements for Class Based Weighted Fair Queueing

There are no licensing requirements for this feature.

Prerequisites for Class Based Weighted Fair Queueing

Class Based Weighted Fair Queueing has the following prerequisites:

- You are already logged in to the CLI in EXEC mode.

Guidelines and Limitations

Use the following guidelines and limitations when configuring Class Based Weighted Fair Queueing (CBWFQ).

- A queueing policy can only be applied on an uplink interface in the egress (outbound) direction.
- Queueing is only supported on ESX/ESXi 4.1.0 hosts.
- For port-channel interfaces, queueing bandwidth applies on the member ports. The overall performance will depend on how the vethernets are pinned to member ports and the traffic pattern on the individual ports.
- Cisco Nexus 1000V supports one queueing policy per module. The policy can be applied on one port or port-channel in a module. Different modules have different queueing policies.

Default Settings

Class Based Weighted Fair Queueing is disabled by default.

Configuring Class Based Weighted Fair Queueing Policies

This section describes how to create QoS queueing class policies for the Cisco Nexus 1000V:

Creating the policy consists of the following steps:

1. Create a class map
2. Create a policy map
3. Apply the policy map on an interface

Configuring Class Based Weighted Fair Queueing

This feature allows the user to differentiate traffic classes and provide appropriate bandwidth guarantees.

You can use this procedure to configure class-based weighted fair queueing as follows:

- Create a queueing class map with protocol or CoS matching criteria.
- Create a queueing policy map and assign the class map to it.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged in to the CLI in EXEC mode.
- You know whether you want the queueing class map to match protocol or CoS.
- You know whether you want to designate a minimum guaranteed bandwidth for the traffic class.
- You know whether you want to designate a maximum queue size for the traffic class.

SUMMARY STEPS

1. **configure terminal**
2. **class-map type queuing {match-all | match-any} *map-name***
3. **match {cos *id* | protocol *name*}**
4. **exit**
5. **policy-map type queuing *name***
6. **class type queuing *name***
7. **bandwidth percent *percentage***
8. **(Optional) show policy-map [[[type qos] [*pmap-name-qos*]] | {type queuing [*pmap-name-que*]]]**
9. **port-profile type ethernet *name***
10. **service-policy type queuing output *name***
11. **show policy-map interface**

12. copy running-config startup-config

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal Example: n1000v# config t n1000v(config)#	Places you into global configuration mode.
Step 2	class-map type queuing {match-any match-all} map-name Example: n1000v(config)# class-map type queuing match-all class_fin1 n1000v(config-cmap-que)	Creates a CBWFQ class map and enters class map queuing mode for configuring the new class map. match-any: Use this option to apply this class map to a packet if it matches any of the matching criteria. match-all: Use this option to apply this class map to a packet if it matches all of the matching criteria. <i>map-name:</i> up to 40 alphanumeric characters in length and can include the hyphen and underscore characters.
Step 3	match {cos id} {protocol name} Example: n1000v(config-cmap-que)# match protocol vmw_vmotion n1000v(config-cmap-que)#	Defines whether you want packets for this class map to match protocol, class of service, or both. <ul style="list-style-type: none"> CoS is specified as a number from 0 to 7. This matches traffic based on the class of service (CoS) in the IEEE 802.1Q header, defined in IEEE 802.1p. CoS is encoded in the high order 3 bits of the VLAN ID Tag field and is referred to as <i>user_priority</i>. The following are pre-defined protocol matches: <ul style="list-style-type: none"> n1k_control n1k_mgmt n1k_packet vmw_ft vmw_iscsi vmw_mgmt vmw_nfs vmw_vmotion
Step 4	exit Example: n1000v(config-cmap-que)# exit n1000v(config)#	Exits class-map queuing configuration mode and returns you to global configuration mode.

	Command	Purpose
Step 5	policy-map type queuing <i>name</i> Example: n1000v(config)# policy-map type queuing Policy-vmotion n1000v(config-pmap-que)	Creates a CBWFQ policy map and enters policy map queueing mode for configuring the new policy map.
Step 6	class type queuing <i>name</i> Example: n1000v(config-pmap-que)# class type queuing class_fin1 n1000v(config-pmap-c-que)#	Assigns a CBWFQ class to this policy map and enters policy map class queueing configuration mode.
Step 7	bandwidth percent <i>percentage</i> Example: n1000v(config-pmap-c-que)# bandwidth percent 50 n1000v(config-pmap-c-que)#	Designates the minimum guaranteed bandwidth for this traffic class as a percentage of total available bandwidth.
Step 8	(Optional) show policy-map [{ type qos] [<i>pmap-name-qos</i>] { type queuing [<i>pmap-name-que</i>]}] Example: n1000v(config-pmap-c-que)# show policy-map type queuing Policy-vmotion Type queuing policy-maps ===== policy-map type queuing Policy-vmotion class type queuing Match-vmotion bandwidth percent 50 n1000v(config-pmap-c-que)#	Displays the configuration for verification.
Step 9	exit Example: n1000v(config-pmap-c-que)# exit n1000v(config-pmap-que)#	Exits policy-map type queueing configuration mode and returns you to policy-map configuration mode.
Step 10	exit Example: n1000v(config-pmap-que)# exit n1000v(config)#	Exits policy-map configuration mode and returns you to global configuration mode.
Step 11	port-profile type ethernet <i>name</i> Example: n1000v(config)# port-profile type ethernet myppte n1000v(config-port-prof)#	Creates a port-profile and enters port-profile configuration mode.

	Command	Purpose
Step 12	service-policy type queuing output <i>name</i> Example: n1000v(config-port-prof)# service-policy type queuing output my_pmtq n1000v(config-port-prof)#	Creates a service-policy of type queuing.
Step 13	show policy-map interface Example: n1000v(config-port-prof)# show policy-map interface n1000v(config-port-prof)	Displays the status of the global statistics and the configured policy maps on all interfaces.
Step 14	copy running-config startup-config Example: n1000v(config-port-prof)# copy running-config startup-config n1000v(config-port-prof)#	(Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration.

Verifying the Class Based Weighted Fair Queueing Configuration

To verify the QoS queueing policy configuration, perform one of the following tasks:

Command	Description
show policy map type queuing <i>name</i>	Displays the queueing policy map configuration. See Example 6-1 Display Policy Map Type Queueing, page 6-6
show class-map type queuing <i>name</i>	Displays the queueing class map configuration. See Example 6-2 Display Class Map, page 6-7
show policy-map interface	Displays the policy map interface configuration. See Example 6-3 Display Policy Map on Interface, page 6-7
show running-config ipqos	Displays the QoS running configuration.

Example 6-1 Display Policy Map Type Queueing

```
n1000v# show policy-map type queuing Policy-vmotion
```

```
Type queuing policy-maps
=====
```

```
policy-map type queuing Policy-vmotion
  class type queuing Match-vmotion
    bandwidth percent 50
```

Example 6-2 Display Class Map

```
n1000v# show class-map type queuing Match-vmotion

Type queuing class-maps
=====

class-map type queuing match-any Match-vmotion
  match protocol vmw_vmotion
```

Example 6-3 Display Policy Map on Interface

```
n1000v# show policy-map interface ethernet 3/3

Global statistics status :    disabled

Ethernet3/3

Service-policy (queuing) output:  Policy-vmotion
policy statistics status:    enabled

Class-map (queuing):  Match-vmotion (match-any)
  Match: protocol vmw_vmotion
  bandwidth percent 50
```

Example 6-4 Display Class Map

```
n1000v# show class-map type queuing Match-Cos

Type queuing class-maps
=====

class-map type queuing match-all Match-Cos
  match cos 5
```

Example 6-5 Display Service Policy on Interface

```
n1000v# show policy-map interface ethernet 3/3

Global statistics status :    disabled

Ethernet3/3

Service-policy (queuing) output:  Policy-Cos
policy statistics status:    enabled

Class-map (queuing):  Match-Cos (match-all)
  Match: cos 5
  bandwidth percent 50
```

Example 6-6 Display Service Policy on Interface

```
n1000v# show policy-map interface port-channel 1
```

```

Global statistics status :   disabled

port-channel1

Service-policy (queuing) output:   Policy-vmotion
policy statistics status:   enabled

Class-map (queuing):   Match-vmotion (match-any)
  Match: protocol vmw_vmotion
  bandwidth percent 50

```

Configuration Examples for Class-Based Weighted Fair Queueing

Example 6-7 Allocating 50% of Bandwidth for vMotion Traffic

```

conf t
Enter configuration commands, one per line. End with CNTL/Z.
class-map type queuing match-any Match-vmotion
match protocol vmw_vmotion
exit
policy-map type queuing Policy-vmotion
class type queuing Match-vmotion
bandwidth percent 50
exit
exit
interface ethernet 3/3
service-policy type queuing output Policy-vmotion

```

Example 6-8 Allocating 50% of Bandwidth for Traffic with CoS Value of 5

```

conf t
Enter configuration commands, one per line. End with CNTL/Z.
class-map type queuing match-all Match-Cos
match cos 5
exit
policy-map type queuing Policy-Cos
class type queuing Match-Cos
bandwidth percent 50
exit
exit
interface ethernet 3/3
service-policy type queuing output Policy-Cos

```

Example 6-9 Policy-Map with Multiple Traffic Classes

```

conf t
Enter configuration commands, one per line. End with CNTL/Z.
class-map type queuing match-any class-vmotion
match protocol vmw_vmotion
exit
class-map type queuing match-any class-cos-2
match cos 2
exit
policy-map type queuing policy-priority-vmotion
class type queuing class-vmotion
bandwidth percent 60

```



```

class type queuing class-cos-2
bandwidth percent 40
exit
exit
int po1
service-policy type queuing output policy-priority-vmotion

sh policy-map type queuing policy-priority-vmotion

Type queuing policy-maps
=====

policy-map type queuing policy-priority-vmotion
  class type queuing class-vmotion
    bandwidth percent 60
  class type queuing class-cos-2
    bandwidth percent 40

conf t
Enter configuration commands, one per line.  End with CNTL/Z.
int po1
service-policy type queuing output policy-priority-vmotion
end

sh policy-map interface po1

Global statistics status :   disabled

port-channel1

Service-policy (queuing) output:   policy-priority-vmotion
policy statistics status:   enabled

Class-map (queuing):   class-vmotion (match-any)
  Match: protocol vmw_vmotion
  bandwidth percent 60

Class-map (queuing):   class-cos-2 (match-any)
  Match: cos 2
  bandwidth percent 40

```

Feature History for Class Based Weighted Fair Queueing

This section provides the Class Based Weighted Fair Queueing release history.

Feature Name	Releases	Feature Information
Class Based Weighted Fair Queueing	4.2(1)SV1(4)	This feature was introduced.

