Catalyst Switch Roles

operations in hardware

Cisco has done extensive testing and has found that a significant decrease in non-real-time application response times occurs when real-time traffic exceeds one-third of link bandwidth capacity. In fact, both testing and customer deployments have shown that a general best queuing practice is to limit the amount of

APIC-EM and the EasyQoS Application

The Application Policy Infrastructure Controller–Enterprise Module (APIC-EM) is Cisco's enterprise SDN controller. EasyQoS is one of several applications which run on APIC-EM. The following sections discuss how to access APIC-EM, declaratively express QoS policies within the EasyQoS application, and then deploy those QoS policies to groups of network infrastructure devices.

Logging Into APIC-EM

APIC-EM provides a web-based GUI for configuring and monitoring the base APIC-EM functionality as well as the applications that reside upon it.

21

If the Device Controllability feature is disabled (wT 0 85 0r   3

- Cisco video s

Figure 21 **APIC-EM EasyQoS**

Figure 38   **Adding a Wireless Policy to a Policy Scope**

Clicking on the

Figure 40 **Enabling Dynamic QoS**

For APIC-EM 1.3 Dynamic QoS is a feature that is enabled globally—meaning across all policy scopes—

- Transactional Data

-

```
 match protocol attribute traffic-class broadcast-video
 match protocol attribute business-relevance business-relevant
class-map match-all prm-MARKING_IN#REALTIME
 match protocol attribute traffic-class real-time-interactive
 match protocol attribute business-relevance business-relevant
class-map match-all prm-MARKING_IN#CONTROL
 match protocol attribute tra4f4ic71alsso helt0wo rk-290nt42l593.02 Tm -392Tc[(4.4 714.1 o TJE
 match protocol attribute business-relevance business-relevant
class-map match-all prm-
```

```
 match protocol adobe-connect

 match protocol cisco-jabber-im

 match protocol cisco-jabber-video

 match protocol ms-lync

 match protocol ms-lync-video
ô
class-map match-any prm-MARKING_IN#MM_STREAM-NBAR

 match protocol apple-remote-desktop

 match protocol citrix

 match protocol citrix-static




ô
class-map match-any prm-MARKING_IN#CONTROL
```

```
!
ip nbar attribute-map APIC-A_M-RELEVANT
 attribute business-relevance business-relevant


ip nbar attribute-map APIC-A_M-DEFAULT
 attribute business-relevance default


ip nbar attribute-map APIC-A_M-SCAVENGER
 attribute business-relevance business-irrelevant
!
```

Under each of these attribute-map dof TJETBT1 0 0 1 204.44 51ini 0 04.ns, EasyQoS s4 5e1 02(s)9(J1 3144 512 T

0E4518 7 TJE 0 0 1 242.42 572.68 Tm399.4E4518 7 TJE1 BT1 1 284 5 BT4.5 0 0 1 209.5 51 0 209.sTcБ-

high priority or low priority. High-priority packets are sent on separate channels to the embedded services processor (ESP) than low-priority packets. QoS is then performed within the ESP. The SPA queues packets

Service Provider Managed-

SPP4/SPP

SPP4/SPP

```
 set DSCP af41
class prm-EZQOS_12C#MM_CONF
 bandwidth remaining percent 16
 fair-queue
 set DSCP af41
 random-detect DSCP-
```

```
  set DSCP cs1
 class class-default
  bandwidth remaining percent 25
  fair-queue
  set DSCP default
  random-detect DSCP-based
  random-detect DSCP 0 50 64        ! ISR G2 Series platforms only.
 !
```

As with the previous service provider profile models, the names of the parent and child policy-

have a default setting for the traffic-class attribute—meaning the traffic-class to which the application belongs. This attribute cannot be modified currently within the EasyQoS web-based

distribution

DSCP

```
mls qos srr-queue output DSCP-map queue 3 threshold 3 0 1 2 3 4 5 6 7
! Maps BE + non-standard DSCPs to Q3 (tail)
mls qos srr-queue output DSCP-map queue 3 threshold 3 9 11 13 15
mls qos srr-queue output DSCP-map queue 3 threshold 3 17 19 21 23
mls qos srr-queue output DSCP-map queue 3 threshold 3 25 27518(a31] TJETBT1 0 0 1 476.44
```

```
! CoS value 3 is mapped to ingress Q1T2
mls qos srr-!
```

10 Mbps of bandwidth. Likewise, 1% of a 10 Gbps interface is 100 Mbps of bandwidth. Individual voice calls average under 100 Kbps, even with the overhead of Layer 2-4 headers. Hence, 1% of the bandwidth is sufficient for approximately 100 voice calls on a 1 Gbps interface and 1,000 voice calls on a 10 Gbps

The following configuration, provisioned by APIC-

The following configuration, provisioned by APIC-EM   -map for the 1P7Q1T

!

–

```
!

interface GigabitEthernetx/x
```

The status of whether the

2Q4T Ingress Queuing Models

```
policy-map type lan-queuing prm-DSCP#EZQOS_1P3Q8T-OUT

  class prm-EZQOS_1P3Q8T#PQ

    priority

  class prm-EZQOS_1P3Q8T#Q2

    bandwidth remaining percent 45

    random-
```

```
        bandwidth remaining percent 5

        random-detect cos-based

        random-detect cos 1 percent 80 100

     class class-default

        random-detect cos-based

        random-detect cos 0 percent 80 100

   !
```

Functionally, both variations of the policy-

Figure 64   **1P3Q4T Egress Queuing Model—CoS-to-Queue Mapping with CoS-based WRED**

The following configuration, provisioned by APIC-EM EM

```
   match DSCP af32

   match DSCP af33

class-map type lan-queuing match-any prm-EZQOS_1P7Q4T#CONTROL

   match DSCP cs2

   match DSCP cs3

   match DSCP cs6

   match DSCP cs7

class-map type lan-queuing match-any prm-EZQOS_1P7Q4T#TRANS_DATA

   match DSCP af21

   match DSCP af22

   match DSCP af23

class-map type lan-queuing match-any prm-EZQOS_1P7Q4T#BULK_DATA

   match DSCP af11

   match DSCP af12

   match DS
```

1P7Q8T Egress Queuing

1P7Q8T egress queuing is supported by the following line cards:

- WS-X6704-10GE with CFC

- WS-X6704-10GE with a DFC4 or DFC4XL upgrade (WS-F6k-DFC4-A, WS-F6k-DFC4-AXL)

1P7Q8T egress queueing for these line cards implements CoS-to-queue mapping, with CoS-based tail-drop for congestion avoidance. Note that due to the combination of 8 queues and only 8 CoS values, tail

```
 match cos 4

class-map
```

Figure 67   When is Ingress Queuing Applied?

!

APIC-EM Eas

It should be noted that QoS

The following figure shows the ingress queueing model implemented by APIC-EM EasyQoS solution for the WS-X6724-SFP, WS-X6748-SFP, and WS-X6748-

```
rcv-queue random-detect 3

rcv-queue random-detect 4

rcv-queue random-detect 5

rcv-queue random-detect 6

no rcv-queue random-detect 7

no rcv-queue random-detect 8

rcv-queue random-detect max-threshold 1 100 100 100 100

rcv-queue random-detect min-threshold 1 80 100 100 100

rcv-queue random-detect max-threshold 3 100 100 100 100

rcv-queue random-detect min-threshold 3 60 70 80 100-
```

```
wrr-queue bandwidth 50 5 45

wrr-queue random-detect 1

wrr-queue random-detect 2

wrr-queue random-detect 3

wrr-queue random-detect max0 5 45
```

1P3Q4T Egress Queuing Models

```
 priority-queue cos-map 1 4 5
!
interface TenGigabitEthernet x/x/x
 wrr-queue queue-limit 40 15 40
 priority-queue queue
```

1P7Q8T egress queueing for these line cards implements CoS-to-queue mapping, with CoS-

```
     wrr-queue random-detect max-threshold 2 100 100 100 100 100 100 100 100
     wrr-queue random-detect min-threshold 2 80 100 100 100 100 100 100 100
     wrr-queue random-detect max-threshold 3 100 100 100 100 100 100 100 100
     wrr-queue random-detect min-threshold 3 80 100 100 100 100 100 100 100
     wrr-queue random-detect max-threshold 4 100 100 100 100 100 100 100 100
     wrr-queue random-detect min-threshold 4 80 100 100 100 100 100 100 100
     wrr-queue random-detect max-threshold 5 100 100 100 100 100 100 100 100
     wrr-queue random-detect min-threshold 5 80 100 100 100 100 100 100 100
     wrr-queue cos-map 1 1 0
     wrr-queue cos-map 2 1 1
     wrr-queue cos-map 3 1 2
     wrr-queue cos-map 4 1 3
     wrr-queue cos-map 5 1 4
     wrr-queue cos-map 6 1 6
     wrr-queue cos-map 7 1 7
     priority-queue cos-map 1 5
 !
```

Cisco Nexus 7000/7700 Q 0 1iexus 7000

Ingress Queuing Model25(o)8 8Q2T)

```
    random-detect DSCP 0 minimum-threshold percent 80 maximum-threshold percent
100

!
```

The policy-map with the 8Q2T ingress queuing s

-

-

Note that because there are no DSCP values within egress class-maps, there are no issues w

```
        class type queuing 4q1t-8e-4q4q-in-q1

          queue-limit percent 10

          bandwidth percent 25

        class type queuing 4q1t-8e-4q4q-in-q-default

          queue-limit percent 30

          bandwidth percent 25

        class type queuing 4q1t-8e-4q4q-in-q3

          queue-limit percent 30

          bandwidth percent 25

        class type queuing 4q1t-8e-4q4q-in-q4

          queue-limit percent 30

          bandwidth percent 25
```

For F2, F2e, ands modules, tnd ingress qne nde0 0 1 152.42 511.66 Tm 424.722, F2e, 0 1 158.42 511.66 Tm 430.1

=======================s modules, tnd

```
class-map type queuing match-any 4q1t-8e-4q4q-in-q-default
  Description: Classifier for Ingress queue 2 of type 4q1t-
```

```
      bandwidth remaining percent 35
  !
```

The policy-map with the 1P3Q1T egress queuing structure is then applied to Ethernet interfaces that

The network-qos default-nq-8e-4q8q-policy template also provides default settings for the system-defined class-maps that can be displayed via the exec-

the system-defined class-map names. An example of the output for each of the system-defined class-maps is shown below.

```
N7700# show class-map type queuing 8e-4q8q-in-q1


    Type queuing JETBT1 0 0 1 218.12 713.46 Tm 0 T8.42 690.012 Tc[(  )] BT1 0 0 1 223.52 7
```

After the DSCP and CoS values have been moved into the appropriate cla

```
class-map type queuing match-any 8e-
```

```
!
```

The policy-map with the 1P7Q1T egress queuing structure is then applied to Ethernet interfaces that connect to either other core

```
config qos qosmap up-to-DSCP-map 3 24 24 31

config qos qosmap up-to-DSCP-map 4 32 32 39

config qos qosmap up-to-DSCP-map 5 34 40 47

config qos qosmap up-to-DSCP-map 6 46 48 62

config qos qosmap up-to-DSCP-map 7 56 56 63


config qos qosmap clear-all

config qos qosmap DSCP-to-up-exception 16 0

config qos qosmap DSCP
```

CS0 (DSCP 0)

DSCP 1–

APIC-EM EasyQoS Pre-Configuration for Access-Layer Switches

When Dynamic QoS is first enabled within EasyQoS–

This command