PE UNI QoS

This chapter includes the following major topics:

- **PE UNI QoS Configuration, page 5-2**
- **PE UNI QoS Configuration with PWHE Access, page 5-4**

Enterprise Virtual Networks consists of traffic types that include voice, video, Critical applications traffic, and end user web traffic. All these traffic require different priorities and treatments based upon their nature and how critical to the business they are. While traffic is sent and received between PE and CE, QoS implementation on ASR9000 PE uses DSCP field in the IP header to ensure that traffic is properly treated as per its priority defined by DSCP. Two-level H-QoS is configured on the PE for both ingress and egress policies. In nV access topologies, the ingress QoS function, configured on the host for Virtual satellite access port, is offloaded to satellite so that only committed traffic enters the nV network and Fabric link oversubscription can be avoided.

The mapping shown in Table 5-1 is used for different traffic classes to DSCP.

**Table 5-1  Mapping for Different Traffic Classes to DSCP**

<table>
<thead>
<tr>
<th>Traffic Class</th>
<th>PHB</th>
<th>DSCP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Voice and Real-time</td>
<td>EF</td>
<td>46</td>
</tr>
<tr>
<td>Enterprise Video Distribution</td>
<td>AF</td>
<td>32</td>
</tr>
<tr>
<td>Enterprise Critical: In Contract</td>
<td>AF</td>
<td>16</td>
</tr>
<tr>
<td>Enterprise Critical: Out of Contract</td>
<td>AF</td>
<td>8</td>
</tr>
<tr>
<td>Enterprise Best Effort</td>
<td>BE</td>
<td>0</td>
</tr>
</tbody>
</table>

PE configuration for QoS includes configuring class-maps for respective traffic classes and mapping them to the appropriate DSCP. Two-level ingress QOS does policing of traffic in individual classes of child policy. Parent policy is configured with keyword "child-conform-aware" to prevent the parent policer from dropping any ingress traffic that conforms to the maximum rate specified in the child policer. While configuring egress policy map, real-time traffic class CMAP-RT-dscp is configured with highest priority 1 and is policed to ensure low latency expedited forwarding. Rest classes are assigned with respective required bandwidth. WRED is used as congestion avoidance mechanism for Exp 1 and 2 traffic in the Enterprise critical class CMAP-EC-EXP. Shaping is configured on the Parent egress policy to ensure overall traffic does not exceed the committed bit rate (CBR). The ingress and egress policy-maps are applied to the PE interface connecting to CE in respective directions.
**PE UNI QoS Configuration**

**Step 1** Configure class-map for business-critical traffic.
```conf
class-map match-any CMAP-BC-dscp
```

**Step 2** Match DSCP 8 and 16.
```conf
match dscp 8 16
```

**Step 3** Configure class-map for video traffic.
```conf
class-map match-any CMAP-BC-video-dscp
```

**Step 4** Match DSCP 32.
```conf
match dscp 32
```

**Step 5** Configure class-map for real-time traffic.
```conf
class-map match-any CMAP-RT-dscp
```

**Step 6** Match DSCP expedited forwarding.
```conf
match dscp ef
```

**Step 7** Configure Child Egress policy-map.
```conf
policy-map PMAP-BUS-CE-Child-E
```

**Step 8** Configure RT class-map under policy-map.
```conf
class CMAP-RT-dscp
```

**Step 9** Configure priority level 1 for RT class.
```conf
priority level 1
```

**Step 10** Police traffic in RT class.
```conf
police rate 200 mbps
```

**Step 11** Configure business-critical class under policy.
```conf
class CMAP-BC-dscp
```

**Step 12** Assign Bandwidth to the class.
```conf
bandwidth percent 5
```

**Step 13** Configure Video class under policy.
```conf
class CMAP-BC-video-dscp
```

**Step 14** Assign Bandwidth to the class.
```conf
bandwidth percent 10
```

**Step 15** Configure class-default for rest of the traffic.
```conf
class class-default
end-policy-map
```
Step 16  Configure parent egress policy-map.
        policy-map PMAP-BUS-CE-Parent-E
Step 17  Configure class-default for the policy-map.
        class class-default
Step 18  Configure child policy under class-default.
        service-policy PMAP-BUS-CE-Child-E
Step 19  Configure shaping to ensure egress traffic does not exceed CBR.
        shape average 500 mbps
Step 20  Configure bandwidth for the class.
        bandwidth 300 mbps
            -policy-map
Step 21  Configure ingress child policy-map.
        policy-map PMAP-BUS-CE-Child-I
Step 22  Configures real-time class-map under policy-map.
        class CMAP-RT-dscp
Step 23  Configure priority level 1 for real-time class.
        priority level 1
Step 24  Police traffic in real-time class.
        police rate 50 mbps
            !
Step 25  Configure video class-map under policy-map.
        class CMAP-BC-video-dscp
Step 26  Configure priority level 2 for video class.
        priority level 2
Step 27  Police traffic in video class.
        police rate 100 mbps
            !
Step 28  Configure business-critical class-map under policy-map.
        class CMAP-BC-dscp
Step 29  Police traffic in business-critical class.
        police rate 100 mbps peak-rate 200 mbps
            exceed-action transmit
            violate-action drop
            !
Step 30  Configures class-default class-map under policy-map.
        class class-default
Step 31  Police traffic in default class.
police rate 50 mbps
exceed-action transmit
end-policy-map
!
!

Step 32 Configure parent egress policy-map.

policy-map PMAP-BUS-CE-Parent-I

Step 33 Configure class-default for the policy-map.

class class-default

Step 34 Child policy under class-default.

service-policy PMAP-BUS-CE-Child-I

Step 35 Configure policing to ensure ingress traffic does not exceed CBR.

police rate 500 mbps

Step 36 Configure child-conform-aware under class.

child-conform-aware
end-policy-map

In case of PWHE access, QoS is implemented on PE based on MPLS EXP bits as the received traffic is labeled.

**PE UNI QoS Configuration with PWHE Access**

**Step 1** Configure business-critical class.

class-map match-any CMAP-BC-EXP

**Step 2** Match MPLS EXP of topmost label as 1,2.

match mpls experimental topmost 1 2
end-class-map

**Step 3** Configure real-time class.

class-map match-any CMAP-RT-EXP

**Step 4** Match MPLS EXP of topmost label as 5.

match mpls experimental topmost 5
end-class-map

**Step 5** Configures video class.

class-map match-any CMAP-BUS-video-EXP

**Step 6** Match MPLS EXP of topmost label as 3.

match mpls experimental topmost 3
end-class-map

**Step 7** Configure ingress child policy-map.
policy-map PMAP-PWHE-NNI-C-I

Step 8  Configure real-time class-map under policy-map.
       class CMAP-RT-EXP

Step 9  Configure priority level 1 for real-time class.
       priority level 1

Step 10 Police traffic in real-time class.
       police rate 50 mbps

Step 11 Configure video class-map under policy-map.
       class CMAP-BUS-video-EXP

Step 12 Configure priority level 2 for video class.
       priority level 2

Step 13 Police traffic in video class.
       police rate 100 mbps

Step 14 Configure business-critical class-map under policy-map.
       class CMAP-BC-EXP

Step 15 Configure priority level 1 for business-critical class.
       police rate 100 mbps peak-rate 200 mbps

Step 16 Police traffic in business-critical class.
       exceed-action transmit
       violate-action drop

Step 17 Configure class-default class-map under policy-map.
       class class-default

Step 18 Police traffic in default class.
       police rate 50 mbps
       exceed-action transmit
       end-policy-map

Step 19 Configure parent egress policy-map.
       policy-map PMAP-PWHE-NNI-P-I

Step 20 Configure class-default for the policy-map.
       class class-default

Step 21 Configure child policy under class-default.
       service-policy PMAP-PWHE-NNI-C-I

Step 22 Configure policing to ensure ingress traffic does not exceed CBR.
       police rate 500 mbps
Step 23 Configure child-conform-aware under class.
   child-conform-aware
   end-policy-map

Step 24 Configure child egress policy-map.
   policy-map PMAP-PWHE-NNI-C-E

Step 25 Configure real-time class-map under policy-map.
   class CMAP-RT-EXP

Step 26 Configure priority level 1 for real-time class.
   priority level 1

Step 27 Police traffic in real-time class.
   police rate 50 mbps

Step 28 Configure real-time class-map under policy-map.
   class CMAP-BUS-video-EXP

Step 29 Configure priority level 2 for video class.
   priority level 2

Step 30 Police traffic in video class.
   police rate 100 mbps

Step 31 Configure WRED to congestion avoidance.
   random-detect discard-class 3 80 ms 100 ms

Step 32 Configure business-critical class-map under policy-map.
   class CMAP-BC-EXP

Step 33 Configure bandwidth for business-critical class.
   bandwidth remaining percent 60

Step 34 Configure WRED to congestion avoidance for discard-class 2.
   random-detect discard-class 2 60 ms 70 ms

Step 35 Configure WRED to congestion avoidance for discard-class 1.
   random-detect discard-class 1 40 ms 50 ms
   !
   class class-default
   end-policy-map
   !

Step 36 Configure parent egress policy-map.
   policy-map PMAP-PWHE-NNI-P-E

Step 37 Configure class-default for the policy-map.
   class class-default
Step 38  Configure child policy under class-default.

    service-policy PMAP-PWHE-NNI-C-E

Step 39  Configure shaping to ensure egress traffic does not exceed CBR.

    shape average 500000000 bps
    end-policy-map

Step 40  Service policies applied under PW-Ether interface.

    interface PW-Ether100
    service-policy input PMAP-PWHE-NNI-P-I
    service-policy output PMAP-PWHE-NNI-P-E
    vrf BUS-VPN2