



QoS on Layer 3 Terminated MLPPP Interfaces

Table 1: Feature History

| Feature Name | Release Information | Description |
|---|-----------------------------|--|
| QoS on Layer 3-terminated MLPPP Interface | Cisco IOS XE Dublin 17.10.1 | <p>You can configure QoS features such as classification, shaping, queuing, bandwidth, and weighted random early detection on the layer 3-terminated MLPPP interfaces at the egress direction for the following interface modules:</p> <ul style="list-style-type: none"> • 1 port OC-48/STM-16 or 4 port OC-12/OC-3 / STM-1/STM-4 + 12 port T1/E1 + 4 port T3/E3 CEM Interface Module (A900-IMA3G-IMSG) • 1-Port OC-192 or 8-Port Low Rate CEM 20G Bandwidth Interface Module (A900-IMA1Z8S-CXMS) |

Starting with the Cisco IOS XE Dublin 17.10.1 release, you can configure the following QoS features on the Layer 3-terminated MLPPP interface on the SONET or SDH controller for the Cisco RSP3 module.

- **Egress Classification**—Classification based on the QoS group.
- **Egress Shaping**—Shaping at the egress direction only based on the class QoS group. The shaping average range is from 384 Kbps to 100 Gbps.
- **Egress Queuing**—Supports egress class-based weighted fair queuing (CBWFQ) and egress Low-Latency queuing (LLQ) with two-level priority and shaping.
- **Egress Bandwidth**—Supports bandwidth (in kbps), bandwidth remaining ratio (BRR), and bandwidth remaining percent (BRP).
 - You can configure bandwidth committed information rate (CIR) from 100 Kbps to 10 Gbps.

- If the **priority** command is configured, then you can configure the **bandwidth remaining** only for the other classes.
- The BRR ratio that you can configure is 1–63 (1-4096).
- **Egress Weighted Random Early Detection (WRED)**
 - WRED is based on the discard-class only.
 - The class-map match condition is based on the QoS group whereas the WRED is based on the discard class.
 - The queuing features such as shape or bandwidth supports WRED in a class.
 - Supports minimum and maximum thresholds (bytes or microseconds only).
 - The two WRED profiles that are supported per class are DC0 and DC1.
- Queue limit (in bytes and usec).

For more information on QoS, refer the [Quality of Service Configuration Guidelines for RSP3 Module](#).

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Restrictions For Layer 3 Terminated MLPPP Interface

- QoS in ingress is not supported.
- Different bandwidth ranges cannot be combined in the same policy. You cannot configure BRR in one class and BRP in another class for the same policy.
- When configuring BRR or BRP, 15% of the total bandwidth should be allocated to the class-default.
- For policy without any queuing actions (for example, classification), you should remove the policy first before changing members in a multilink interface to a different interface module.

How to Configure QoS on Layer 3 Terminated MLPPP Interface

Configuring Classification

Configuring Class Map

The following is a sample configuration to create class map that matches any of the listed criteria.

```
class-map match-any qos-group0
  match qos-group 0
class-map match-any qos-group1
  match qos-group 1
class-map match-any qos-group2
  match qos-group 2
class-map match-any qos-group3
  match qos-group 3
class-map match-any qos-group4
  match qos-group 4
class-map match-any qos-group5
  match qos-group 5
class-map match-any qos-group6
  match qos-group 6
class-map match-any qos-group7
  match qos-group 7
```

Enabling SDM Template

Enter the following command to enable the **egr_l3vpn_cm** SDM template:

```
Router(config)# sdm prefer enable_egr_l3vpn_cm
```



Note Starting with Cisco IOS XE 17.14.1 release, you must enable the **egr_l3vpn_cm** template before attaching a policy map to an interface.

For the SDM template to take effect, restart the router.

Configuring Policy Map

The following is a sample configuration to create a policy map for Layer 3 egress QoS group that specifies several classes.

```
policy-map l3egressqos-groupbrp
  class qos-group0
  class qos-group1
  class qos-group2
  class qos-group3
  class qos-group4
  class qos-group5
  class qos-group6
  class qos-group7
```

You can apply the policy map on the MLPPP interface.

```
router#configure terminal
router(config)#interface Serial10/7/19.1
router(config-if)#service-policy output l3egressqos-groupbrp
router(config-if)#end
```

Configuring Shaping

The following is a sample configuration for a Layer 3 egress QoS group for a policy map having class QoS groups 0, 1, and 2 configured with shape average.

```
policy-map l3egressqos-groupbrp
class qos-group0
    shape average 384000
class qos-group1
    shape average 384000
class qos-group2
    shape average 384000
```

Configuring Bandwidth

The following is a sample configuration for a Layer 3 egress QoS group for a policy map having class QoS groups 0, 1, and 2 configured with various bandwidth percent.

```
policy-map l3egressqos-groupbrp
class qos-group0
    bandwidth percent 10
class qos-group1
    bandwidth percent 10
class qos-group2
    bandwidth percent 20
```

Configuring Bandwidth Remaining Percent

The following is a sample configuration for a Layer 3 egress QoS group for a policy map having class QoS groups 0, 1, and 2 configured with various bandwidth remaining percent.

```
policy-map l3egressqos-groupbrp
class qos-group0
    bandwidth remaining percent 10
class qos-group1
    bandwidth remaining percent 20
class qos-group2
    bandwidth remaining percent 30
```

Configuring Bandwidth Remaining Ratio

The following is a sample configuration for a Layer 3 egress QoS group for a policy map having class QoS groups 0, 1, and 2 configured with various bandwidth remaining ratio.

```
policy-map l3egressqos-groupbrp
class qos-group0
    bandwidth remaining ratio 10
class qos-group1
    bandwidth remaining ratio 20
```

```
class qos-group2
    bandwidth remaining ratio 30
```

Configuring Priority

The following is a sample configuration for a Layer 3 egress QoS group for a policy map having class QoS groups 0 configured with shape priority percent.

```
policy-map l3egressqos-groupbrp
class qos-group0
    priority Percent 20
policy-map l3egressqos-groupbrp
class qos-group0
    priority percent 40
```

Configuring WRED

```
class-map match-all qos1
    match qos-group 1
policy-map egress
    class qos1
        shape average 100000000
        queue-limit 300 us
        random-detect discard-class-based
        random-detect discard-class 0 100 us 200 us 100
        random-detect discard-class 1 200 us 300 us 100
```

Verifying QoS Configuration on Layer 3 Terminated MLPPP Interface

The following **show policy-map** command for egress QoS shows bandwidth that is configured for each QoS group.

```
router#show policy-map
Policy Map l3egressqos-groupbrp
  Class qos-group0
    bandwidth 10 (%)
  Class qos-group1
    bandwidth 10 (%)
  Class qos-group2
    bandwidth 10 (%)
  Class qos-group3
    bandwidth 10 (%)
  Class qos-group4
    bandwidth 10 (%)
  Class qos-group5
    bandwidth 10 (%)
  Class qos-group6
    bandwidth 10 (%)
  Class qos-group7
    bandwidth 10 (%)
```

The following **show policy-map interfac** command shows the policy map statistics on the MLPPP interface.

```
router#show policy-map interface Multilink 1
Serial0/7/19.1
Service-policy output: l3egressqos-groupbrp
  Class-map: qos-group0 (match-any)
    1135 packets, 1135000 bytes
    30 second offered rate 303000 bps
  Match: qos-group 0
  Class-map: qos-group1 (match-any)
    1135 packets, 1135000 bytes
    30 second offered rate 303000 bps
  Match: qos-group 1
  Class-map: qos-group2 (match-any)
    1135 packets, 1135000 bytes
    30 second offered rate 303000 bps
  Match: qos-group 2
  Class-map: qos-group3 (match-any)
    1135 packets, 1135000 bytes
    30 second offered rate 303000 bps
  Match: qos-group 3
  Class-map: qos-group4 (match-any)
    1135 packets, 1135000 bytes
    30 second offered rate 303000 bps
  Match: qos-group 4
  Class-map: qos-group5 (match-any)
    1135 packets, 1135000 bytes
    30 second offered rate 303000 bps
  Match: qos-group 5
  Class-map: qos-group6 (match-any)
    1135 packets, 1135000 bytes
    30 second offered rate 303000 bps
  Match: qos-group 6
  Class-map: qos-group7 (match-any)
    1135 packets, 1135000 bytes
    30 second offered rate 303000 bps
  Match: qos-group 7
  Class-map: class-default (match-any)
    0 packets, 0 bytes
    30 second offered rate 0000 bps, drop rate 0000 bps
  Match: any
```

The following **show platform hardware** command details the egress QoS resource details for debugging purposes.

```
router#show platform hardware pp active feature qos resource-summary 0
RSP3 QoS Resource Summary
Type                               Total      Used      Free
-----
QoS TCAM                           2048         0      2048
VOQs                                49152       784    48368
QoS Policers                        32768         0    32768
QoS Policer Profiles                1023         0    1023
Ingress CoS Marking Profiles         16          1     15
Egress CoS Marking Profiles          16          1     15
Ingress Exp & QoS-Group Marking Profiles 64          3     61
Ingress QOS LPM Entries             32768         0    32768

router#show platform hardware pp active feature qos resource-summary 1
RSP3 QoS Resource Summary
Type                               Total      Used      Free
-----
QoS TCAM                           2048         0      2048
```

```
VOQs                    49152      784      48368
QoS Policers            32768      0      32768
QoS Policer Profiles    1023       0      1023
Ingress CoS Marking Profiles  16        1       15
Egress CoS Marking Profiles  16        1       15
Ingress Exp & QoS-Group Marking Profiles  64        3       61
Ingress QoS LPM Entries  32768     0      32768
```

```
router#show platform ha pp active bshell "diag cosq voq con=1"
```

```
Ingress VOQs Sizes (format: [queue_id(queue_size)]):
```

```
[8504(1032192B)]      [8505(1032192B)]      [8506(1032192B)]      [8507(1031168B)]
[8508(1032192B)]      [8509(1032192B)]      [8510(1032192B)]      [8511(1032192B)]
```

```
router#show platform ha pp active bshell "diag count voq voq queue=8504"
```

```
voq[8504] num_cosq[1 ]
  voq max occupancy0 level: 12, refresh: true
  voq enqueue packet: 240[]
  voq dequeue packet: 1358182[]
  voq total discarded packet: 3315[]
  voq deleted packet: 0[]
```

