Configuring QoS on the Satellite System

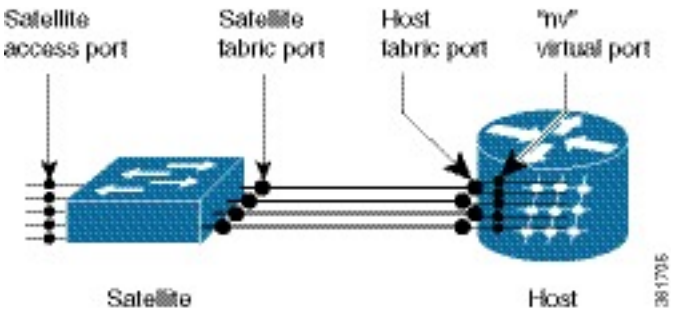
QoS Offload on Satellite

The Satellite System enables you to configure a topology in which one or more satellite switches complement one or more CRS Router, to collectively deploy a single virtual switching system. In this system, the satellite switches act under the management control of the routers. The connections between the CRS Router and the satellite switches are called the Inter-chassis link (ICL), which is established using standard Ethernet interfaces.

The ICL link between the and the satellite gets oversubscribed by the access interfaces on the satellite box. This is because the QoS policies applied on the satellite interfaces are programmed on the CRS Router Line card locally. Therefore, the flow of traffic on the ICL from the satellite switch is not controlled. This leads a loss of high-priority traffic due to congestion on the ICL.

This figure shows the ports where the QoS policies may be applied.

Figure 1: Satellite and Host connection



Benefits of QoS Offload

The QoS offload feature protects the control packets when Satellite fabric links (SFL) is congested. The offloading of QoS policies helps to drop excess traffic at the ingress direction (or access ports) and prioritize the protocol control traffic at the egress direction (or SFL).

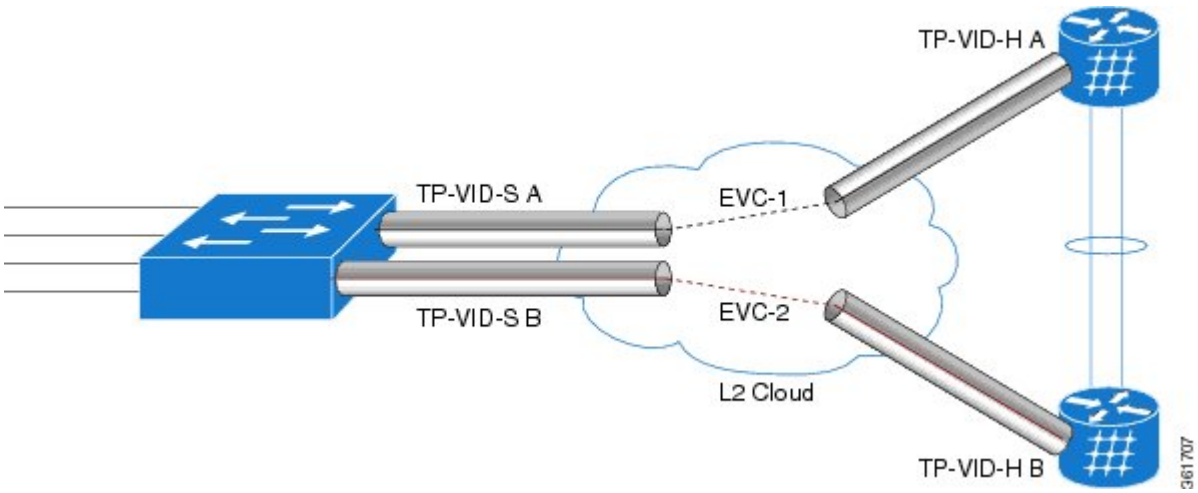
QoS Offload on Different Topologies

The QoS Offload feature is supported on these satellite topologies:

L2 Fabric Architecture

In the L2 Fabric architecture, a satellite is connected to one or more hosts through one or more ethernet virtual circuit (EVC) in the Layer 2 Fabric network. An EVC is identified by two transport VLAN IDs, TPVID- S and TP-VID-H. TP-VID-S is the satellite side transport VLAN ID and TP-VID-H is the host side transport VLAN ID.

Figure 2: L2 Fabric Architecture



Here is the sample configuration that displays the QoS policy being offloaded in the L2 Fabric architecture.

```
interface TenGigabitEthernet 0/1/0/0
nv satellite-fabric-link satellite 100
 remote-ports GigabitEthernet 0/0/0-5
service-policy output <policy-map name>
encapsulation dot1q 20
!
!
```

In this configuration, the ICL link is created on the VLAN and EVC is provisioned as an interface in the host-side. The nV satellite fabric interface is created under this interface. The service-policy is configured in the nv mode and the QoS policy is offloaded on the ICL link where the VLAN is connected to the Host.

Restrictions

- Policy on sub-interfaces is not supported.
- Classification based on access group is not supported.

QoS Offload Scenarios

This section describes the various QoS offload scenarios on different interfaces on different satellite topologies.

Service-policy on Access Port over Physical Interface

In this scenario, the QoS policy is configured on the access port or in the ingress direction over the physical interface of the satellite.

In this example, the policy_A service-policy is directly applied on the Ethernet interface on the satellite. Thus, policy_A stays on the CRS Router and there is no offloading in this example.

```
interface gigabitEthernet 100/0/0/0
 service-policy input/output policy_A
 !
 !
```

In this example, the policy_B service-policy is configured under the nv mode, and the QoS policy is completely offloaded to the Satellite.

```
interface gigabitEthernet100/0/0/0
 nv
  service-policy input policy_B
```

Figure 3: Service-policy on Access Port over Physical Interface (Single Host)

Service-policy on Access Port over Bundle Interface

In this scenario, the QoS policy is configured on the bundle access port or in the ingress direction over the bundle interface of the satellite.

In this example, similar to one for the physical interface, the QoS service-policy is configured under the nv mode and the policy-map is offloaded on the satellite bundle-ether interface.

```
interface GigabitEthernet 100/0/0/1
 bundle-id 1
!
interface GigabitEthernet 100/0/0/1
 bundle-id 1
!
interface bundle-ether 1
 nv
 service-policy input<Policy-map name>
!
!
```

Figure 4: Service-policy on Access Port over Bundle Interface

Service-policy on SFLs over Physical Interface (L2 Fabric)

In this scenario, the QoS policy is configured on the VLAN interface or in the egress direction over the physical interface of the satellite.

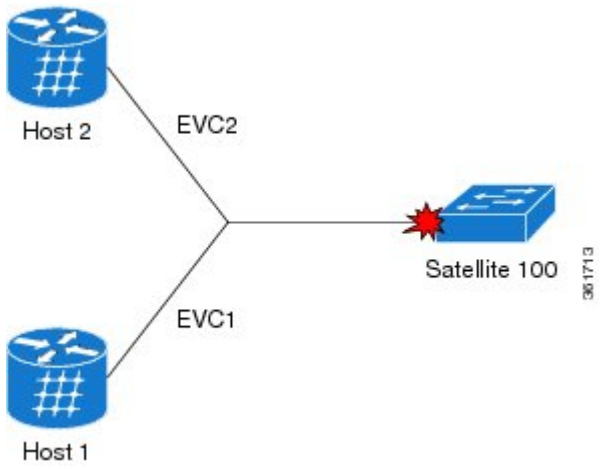
In this example, the QoS policy-map is applied to the host-facing bundle SFL under the nv mode and the QoS policy is offloaded to the satellite 100 (9000v) through one of the EVC of the L2 Fabric network.

```
interface TenGigabitEthernet 0/1/0/0
 nv satellite-fabric-link satellite 100
 remote-ports GigabitEthernet 0/0/0-5
  service-policy output <Policy-map-name>
!
```

In this example, the QoS policy-map is applied to the host-facing bundle SFL under the nv mode and the QoS policy is offloaded to the satellite 100 (901) through one of the EVC of the L2 Fabric network.

```
interface TenGigabitEthernet 0/1/0/0
 nv satellite-fabric-link satellite 100
 remote-ports GigabitEthernet 0/0/0-5
  service-policy output <Policy-map-name>
!
```

Figure 5: Service-policy on SFLs over Physical Interface (L2 Fabric)



Supported Platform-Specific Information for QoS Offload

This section describes the supported capability matrix, various supported classification combinations, and the supported scalability matrix for 9000v and ASR 901 satellites.

Supported Capability Matrix

The example shows how to configure the access policy at the ingress of the access interface and ICL policy at the egress of the ICL interface.

```
interface GigabitEthernet200/0/0/10
```

```
nv
  service-policy input access
!
!

interface Bundle-Ether200
ipv4 point-to-point
ipv4 unnumbered Loopback3000
nv
  satellite-fabric-link satellite 200
   service-policy output icl
   redundancy
    iccp-group 10
   !
   remote-ports GigabitEthernet 0/0/0-43
  !
!
!
policy-map icl
class icl1
  bandwidth remaining percent 5
!
class icl2
  bandwidth remaining percent 4
!
class icl3
  priority level 1
!
class icl4
  bandwidth remaining percent 1
!
class class-default
  bandwidth remaining percent 1
!
end-policy-map
!

RP/0/RSP1/CPU0:vkg3(config)#show running-config policy-map access
policy-map access
class access1
  set qos-group 1
!
class access2
  set qos-group 2
!
class access3
  set qos-group 3
!
class access4
  set qos-group 4
!
class class-default
!
end-policy-map
!

class-map match-any access1
match cos 1
match precedence 1
end-class-map
!
class-map match-any access2
match cos 2
match precedence 2
```

```
end-class-map
!
class-map match-any access3
match cos 3
match precedence 3
end-class-map
!
class-map match-any access4
match cos 4
match precedence 4
end-class-map
!
class-map match-any icl1
match qos-group 1
end-class-map
!
class-map match-any icl2
match qos-group 2
end-class-map
!
class-map match-any icl3
match qos-group 3
end-class-map
!
class-map match-any icl4
match qos-group 4
end-class-map
!
```

The example shows the service policy status of the ICL interface.

```
RP/0/RSP1/CPU0:vkg3(config)#do show qos status interface bundle-ether 200 nv
Bundle-Ether200 direction input: Service Policy not installed

Bundle-Ether200  Satellite: 200 output: icl

     Last Operation Attempted :  IN-PLACE MODIFY
     Status                   :  ACTIVE
```

The example shows the service policy status of the access interface.

```
RP/0/RSP1/CPU0:vkg3(config)#do show qos status interface gigabitEthernet 200/0/0/10 nv

GigabitEthernet200/0/0/10  Satellite: 200 input: access

     Last Operation Attempted :  IN-PLACE MODIFY
     Status                   :  ACTIVE
GigabitEthernet200/0/0/10 direction output: Service Policy not installed
```

Feature	Support on 9000v Platform	Range	Restrictions
Classification			
Ingress			

Feature	Support on 9000v Platform	Range	Restrictions
COS	Yes	0-7	The cos classification is done on the outer vlan tag. **Note** The cos classification based on match-rule is not applicable for untagged packets on the ingress direction.
IP DSCP	Yes	0-63	IP DSCP is supported for untagged, single-tagged, double-tagged, and mac-in-mac packets on the ingress direction, from the access-side. IP DSCP is supported for IPv4 and IPv6.
IP PREC	Yes	0-7	IP PREC is supported for untagged, single-tagged, double-tagged, and mac-in-mac packets on the ingress direction, from the access-side. IP PR is supported only for IPv4.
MPLS EXPERIMENTAL TOPMOST	Yes	0-7	The mpls experimental topmost feature is supported only for the untagged packets on the ingress direction, from the access-side.
VLAN	Yes	1-4096	The vlan classification is done on the outer vlan tag based on the policies and the cos value applied on the outer vlan tag. **Note** The vlan classification based on outer vlan tag is not applicable for untagged packets on the ingress direction.
Egress			

Feature	Support on 9000v Platform	Range	Restrictions
QOS-GROUP	Yes	1-5	A class-map with multiple "match qos-group" statements is not supported. **Note** • qos-group 0 corresponds to class-default, hence, it cannot be configured. • qos-group 6 and qos-group 7 are reserved, and hence, it cannot be configured.
COS	Yes	0-7	The cos classification is done on the outer vlan tag. **Note** The cos classification based on match-rule is not applicable for untagged packets on the ingress direction.
IP DSCP	Yes	0-63	IP DSCP is supported for untagged, single-tagged, double-tagged, and mac-in-mac packets on the ingress direction, from the access-side. IP DSCP is supported only for IPv4.
IP PREC	Yes	0-7	IP PREC is supported for untagged, single-tagged, double-tagged, and mac-in-mac packets on the ingress direction, from the access-side. IP PR is supported only for IPv4.

Feature	Support on 9000v Platform	Range	Restrictions
MPLS EXPERIMENTAL TOPMOST	Yes	0-7	The mpls experimental topmost feature is supported only for the untagged packets on the ingress direction, from the access-side.
VLAN	Yes	1-4096	The vlan classification is done on the outer vlan tag based on the policies and the cos value applied on the outer vlan tag. **Note** The vlan classification based on outer vlan tag is not applicable for untagged packets on the ingress direction.
Marking			
Ingress			
COS	Yes	0-7	The cos marking is done on the vlan tag that is added by the satellite on the direction towards host.
IP DSCP	Yes	0-63	IP DSCP is supported for untagged, single-tagged, double-tagged, and mac-in-mac packets on the ingress direction, from the access-side.
MPLS EXPERIMENTAL IMPOSITION	No	0-7	—
IP PREC	Yes	0-7	IP PREC is supported for untagged, single-tagged, double-tagged, and mac-in-mac packets on the ingress direction, from the access-side.

Feature	Support on 9000v Platform	Range	Restrictions
QOS-GROUP	Yes	0-5	The qos-group marking feature is only used to redirect packets to a particular queue. The set qos-group 0 on ingress policy is necessary to send the packets to queue 0 on ICL. **Note** If the QoS classification rule at the ICL interface in the egress and ingress direction matches, then the packets are directed to the configured group, else the packets are directed to the class-default group.
Queuing			
Egress			
Bandwidth Percent	Yes	—	For a 9000v satellite, bandwidth value cannot be configured under qos-group 3. A combination of bandwidth types cannot be configured. For example, the bandwidth command can be configured either with kbps, or remaining percent, or remaining ratio, but not with a combination of all.
Bandwidth Remaining Percent	Yes	—	
Bandwidth Remaining Ratio	Yes	—	

Feature	Support on 9000v Platform	Range	Restrictions
Priority	Yes	—	When a priority level is configured at the host, it by default gets configured to priority percent 95 85 on the satellite. The priority action cannot be combined with other queuing actions. Only one class-map with a priority action can be configured. On 9000v satellites, the priority action is only supported under qos-group 3.
Priority Percent	Yes	—	
Random Detect Discard-class-based	No	Discard-class: 0-2 Thresholds: 1-8192000	—
Shape Average	Yes	8000- 10000000000	On 9000v satellites, the shape average command cannot be configured under qos-group 3.
HQOS	No	—	—
Rate Limiting (Only Ingress)			

Feature	Support on 9000v Platform	Range	Restrictions
1R2C	Yes	CIR/PIR: 8000-10000000000 Burst bytes: 1000-256000000 Burst ms:1-2000	The bytes can be configured in milliseconds (ms) only if CIR is in percent. **Note** • CIR stands for Committed Information Rate and PIR stands for Peak Information Rate. • Transmit and marking actions are not supported together.
2R3C	Yes		If the exceed-action command is configured, then violate-action is copied from exceed-action, by default. If the exceed-action is not configured, then violate-action and exceed-action are dropped. **Note** • 2R3C statistics are supported only for conform & violate actions. • Transmit and marking actions are not supported together.

Supported Classification Combination

These are the allowed classification combination in CRS Router:

- COS + IP DSCP
- IP DSCP +VLAN
- COS + VLAN

- IP DSCP + IP PREC

Note The IP DSCP + IP PREC combination is not supported for 9000v.

The table lists the allowed classification combinations in 9000v:

Match-all class map	DSCP + PREC + COS
	PREC + DSCP + VLAN
Match-any class map	VLAN + COS + PREC + DSCP
	DSCP + VLAN + COS
	DSCP + PREC + COS
	VLAN + COS + PREC

Note For NCS 5000 Series Satellite, COS+DSCP match is the only supported classification combination on ingress. For Egress, policies can only match on qos-group (1 per class-map). For Egress offload policies on NCS 5000 Series Satellite, it is mandatory to configure eight class-maps including class-default for eight queues, even if all the class maps are not in use.

Supported Scalability Matrix for 9000v

Class-map with options	**Number of Field Programmable (FP) entries needed per policy-map(max 8 classes)**	**Max policy-maps supported**
cos (0-7)	7 + 1 (class default)	2304/8 = 288
ip dscp (0-63)	7 + 1	2304/8 = 288
ip precedence (0-7)	7 + 1	2304/8 = 288
vlan (1-4094)	7 + 1	2304/8 = 288
match-any or match-all with single argument		
cos + dscp cos+ prec cos + vlan dscp + vlan prec + vlan	2 *7 + 1 (class-default) = 15	2304/15 = 153.6

Class-map with options	Number of Field Programmable (FP) entries needed per policy-map(max 8 classes)	Max policy-maps supported
match-any with maximum arguments to the match parameters		
cos (max 4)+ ip precedence (max 4)	8 * 7 + 1 (class-default) = 57	2304/57 = 40.4
cos (4) + ip dscp (8)	12 * 7 + 1 (class-default)= 85	2304/85 = 27.1
cos (4) + vlan (30)	34 * 7 + 1 = 239	2304/239 = 9.6
vlan (30) + ip prec (4)	34 *7 + 1 = 239	2304/239 = 9.6
vlan (30)+ip dscp (8)	38*7 + 1 =267	2304/267 = 8.6
match-all with maximum arguments		
cos (4) + ip dscp (8)	32 *7 + 1=225	2304/225 = 10.2
cos (4) + vlan (30)	120 *7+ 1=841	2304/841 = 2.7
vlan (30) + ip prec (4)	120*7+1=841	2304/841 = 2.7
cos (4) + ip prec (4)	16 *7 +1= 113	2304/113 = 20.3
vlan (30) + ip dscp (8)	240 *7 + 1 = 1681	2304/1681 =1.3

QoS Offload Configuration Overview

Three steps to configure QoS Offload are:

1. Create a class-map of the type ‘qos’.
2. Create a policy-map of the type ‘qos’ using the above configured class map.
3. Bind QoS policy to Satellite interfaces such as physical access, bundle access, physical ICL, and bundle ICL.

To modify a QoS Offload configuration:

1. Modify the class-map or policy-map without unbinding the policy-map from the applied interface.

Note QoS Offload configuration with **police rate** in **pps** unit is not supported.

Sample QoS Offload Configuration

```
class-map match-any my_class
 match dscp 10
 end-class-map
!
policy-map my_policy
 class my_class
 police rate percent 30
!
end-policy-map
!
interface GigabitEthernet100/0/0/9
 ipv4 address 10.1.1.1 255.255.255.0
  nv
   service-policy input my_policy
!
!
```

Prerequisites for QoS Offload Configuration

You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance. Before configuring the QoS offload feature, you must have these hardware and software installed in your chassis.

- Hardware—Cisco ASR 9000 Series Aggregation Services Routers with Cisco ASR 9000 Enhanced Ethernet line cards as the location of Inter Chassis Links and Cisco ASR9000v
- Software—Cisco IOS XR Software Release 5.2.2 or higher for ASR9000v and ASR 901 satellites.

Offloading Service-policy on Physical Access Port

Perform these tasks to offload the service-policy on the physical access port. This procedure offloads the service-policy in the ingress direction of the Satellite Ethernet interface.

SUMMARY STEPS

1. **configure**
2. **class-map** [**type qos**] [**match-any**] [**match-all**] *class-map-name*
3. **match precedence***precedence-value* [*precedence-value1 ... precedence-value6*]
4. **end-class-map**
5. **policy-map** [**type qos**] *policy-name*
6. **class** *class-name*
7. **set qos-group** *qos-group-value*
8. **exit**
9. **end-policy-map**
10. **interface** *type interface-path-id*
11. **nv**
12. **service-policy input** *policy-map*
13. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**class-map** [**type qos**] [**match-any**] [**match-all**] *class-map-name* **Example:** `RP/0/RP0/CPU0:router(config)# class-map match-any class1`	Creates a class map to be used for matching packets to the class specified and enters the class map configuration mode. If you specify **match-any**, one of the match criteria must be met for traffic entering the traffic class to be classified as part of the traffic class. This is the default. If you specify **match-all**, the traffic must match all the match criteria.
Step 3	**match precedence***precedence-value* [*precedence-value1 ... precedence-value6*] **Example:** `RP/0/RP0/CPU0:router(config-cmap)# match precedence 5`	Identifies IP precedence values as match criteria. • Value range is from 0 to 7. • Reserved keywords can be specified instead of numeric values.
Step 4	**end-class-map** **Example:** `RP/0/RP0/CPU0:router(config-cmap)# end-class-map`	Ends the class map configuration.
Step 5	**policy-map** [**type qos**] *policy-name* **Example:** `RP/0/RP0/CPU0:router(config)# policy-map policy1`	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy and enters the policy map configuration mode.
Step 6	**class** *class-name* **Example:** `RP/0/RP0/CPU0:router(config-pmap)# class class1`	Specifies the name of the class whose policy you want to create or change.
Step 7	**set qos-group** *qos-group-value* **Example:** `RP/0/RP0/CPU0:router(config-pmap-c)# set qos-group 5`	Sets the QoS group identifiers on IPv4 or MPLS packets.
Step 8	**exit** **Example:** `RP/0/RP0/CPU0:router(config-pmap)# exit`	Returns the router to policy map configuration mode.

	Command or Action	Purpose
Step 9	**end-policy-map** **Example:** `RP/0/RP0/CPU0:router(config-pmap)# end-policy-map`	Ends the policy map configuration.
Step 10	**interface** *type interface-path-id* **Example:** `RP/0/RP0/CPU0:router(config)# interface gigabitethernet 100/0/0/0`	Configures an interface and enters the interface configuration mode.
Step 11	**nv** **Example:** `RP/0/RP0/CPU0:router(config-if)# nv`	Enters the satellite network virtualization (nV) configuration submode.
Step 12	**service-policy input** *policy-map* **Example:** `RP/0/RP0/CPU0:router(config-if-nV)# service-policy input policy1`	Attaches a policy map to an input interface to be used as the service policy for that interface.
Step 13	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session. • **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.

Offloading Service-policy on Bundle Access Port

Perform these tasks to offload the service-policy on the bundle access port. This procedure offloads the service-policy in the ingress direction of the Satellite Ethernet interface.

SUMMARY STEPS

1. **configure**
2. **class-map** [**type qos**] [**match-any**] [**match-all**] *class-map-name*
3. **match precedence***precedence-value*
4. **end-class-map**
5. **policy-map** [**type qos**] *policy-name*

6. **class** *class-name*
7. **set qos-group** *qos-group-value*
8. **exit**
9. **end-policy-map**
10. **interface** *type interface-path-id*
11. **bundle id** *bundle-id*
12. **nv**
13. **service-policy input** *policy-map*
14. Use the **commit** or **end** command.
15. **exit**
16. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**class-map** [**type qos**] [**match-any**] [**match-all**] *class-map-name* **Example:** `RP/0/RP0/CPU0:router(config)# class-map match-any class2`	Creates a class map to be used for matching packets to the class specified and enters the class map configuration mode. If you specify **match-any**, one of the match criteria must be met for traffic entering the traffic class to be classified as part of the traffic class. This is the default. If you specify **match-all**, the traffic must match all the match criteria.
Step 3	**match precedence***precedence-value* **Example:** `RP/0/RP0/CPU0:router(config-cmap)# match precedence 6`	Identifies IP precedence values as match criteria. • Value range is from 0 to 7. • Reserved keywords can be specified instead of numeric values.
Step 4	**end-class-map** **Example:** `RP/0/RP0/CPU0:router(config-cmap)# end-class-map`	Ends the class map configuration.
Step 5	**policy-map** [**type qos**] *policy-name* **Example:** `RP/0/RP0/CPU0:router(config)# policy-map policy2`	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy and enters the policy map configuration mode.
Step 6	**class** *class-name* **Example:**	Specifies the name of the class whose policy you want to create or change.

	Command or Action	Purpose
	`RP/0/RP0/CPU0:router(config-pmap)# class class2`	
Step 7	**set qos-group** *qos-group-value* **Example:** `RP/0/RP0/CPU0:router(config-pmap-c)# set qos-group 5`	Sets the QoS group identifiers on IPv4 or MPLS packets.
Step 8	**exit** **Example:** `RP/0/RP0/CPU0:router(config-pmap)# exit`	Returns the router to policy map configuration mode.
Step 9	**end-policy-map** **Example:** `RP/0/RP0/CPU0:router(config-pmap)# end-policy-map`	Ends the policy map configuration.
Step 10	**interface** *type interface-path-id* **Example:** `RP/0/RP0/CPU0:router(config)# interface bundle-ether 1`	Configures an interface and enters the interface configuration mode.
Step 11	**bundle id** *bundle-id* **Example:** `RP/0/RP0/CPU0:router(config-if)# bundle id 1`	Creates a multilink interface bundle with the specified bundle ID.
Step 12	**nv** **Example:** `RP/0/RP0/CPU0:router(config-if)# nv`	Enters the satellite network virtualization (nV) configuration submode.
Step 13	**service-policy input** *policy-map* **Example:** `RP/0/RP0/CPU0:router(config-if-nV)# service-policy input policy2`	Attaches a policy map to an input interface to be used as the service policy for that interface.
Step 14	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session.

	Command or Action	Purpose
		• **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.
Step 15	**exit** **Example:** `RP/0/RP0/CPU0:router(config-if)# exit`	Returns the router to global configuration mode.
Step 16	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session. • **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.

Offloading Service-policy on Physical Satellite Fabric Link

Perform these tasks to offload the service-policy on the physical Satellite Fabric Link (SFL). This procedure offloads the service-policy in the egress direction of SFL.

SUMMARY STEPS

1. **configure**
2. **class-map** [**type qos**] [**match-any**] [**match-all**] *class-map-name*
3. **match qos-group** [*qos-group-value*]
4. **end-class-map**
5. **policy-map** [**type qos**] *policy-name*
6. **class** *class-name*
7. **bandwidth** {*bandwidth* [*units*] | **percent** *value*}
8. **exit**
9. **end-policy-map**
10. **interface** *type interface-path-id*
11. **nv**
12. **satellite-fabric-link satellite** *satellite_id*
13. **remote-ports** *interface_type remote_subslot*
14. **service-policy output** *policy-map*
15. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**class-map** [**type qos**] [**match-any**] [**match-all**] *class-map-name* **Example:** `RP/0/RP0/CPU0:router(config)# class-map match-any class3`	Creates a class map to be used for matching packets to the class specified and enters the class map configuration mode. If you specify **match-any**, one of the match criteria must be met for traffic entering the traffic class to be classified as part of the traffic class. This is the default. If you specify **match-all**, the traffic must match all the match criteria.
Step 3	**match qos-group** [*qos-group-value*] **Example:** `RP/0/RP0/CPU0:router(config-cmap)# match qos-group 5`	Specifies service (QoS) group values in a class map to match packets. • *qos-group-value* identifier argument is specified as the exact value or range of values from 0 to 63. • Up to eight values (separated by spaces) can be entered in one match statement. • **match qos-group**command is supported only for an egress policy.
Step 4	**end-class-map** **Example:** `RP/0/RP0/CPU0:router(config-cmap)# end-class-map`	Ends the class map configuration.
Step 5	**policy-map** [**type qos**] *policy-name* **Example:** `RP/0/RP0/CPU0:router(config)# policy-map policy3`	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy and enters the policy map configuration mode.
Step 6	**class** *class-name* **Example:** `RP/0/RP0/CPU0:router(config-pmap)# class class3`	Specifies the name of the class whose policy you want to create or change.
Step 7	**bandwidth** {*bandwidth* [*units*] | **percent** *value*} **Example:** `RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth percent 13`	Specifies the bandwidth allocated for a class belonging to a policy map.

	Command or Action	Purpose
Step 8	**exit** **Example:** `RP/0/RP0/CPU0:router(config-pmap)# exit`	Returns the router to policy map configuration mode.
Step 9	**end-policy-map** **Example:** `RP/0/RP0/CPU0:router(config-pmap)# end-policy-map`	Ends the policy map configuration.
Step 10	**interface** *type interface-path-id* **Example:** `RP/0/RP0/CPU0:router(config)# interface TenGigE 0/1/0/0`	Configures an interface and enters the interface configuration mode.
Step 11	**nv** **Example:** `RP/0/RP0/CPU0:router(config-if)# nv`	Enters the satellite network virtualization (nV) configuration submode.
Step 12	**satellite-fabric-link satellite** *satellite_id* **Example:** `RP/0/RP0/CPU0:router(config-if-nV)# satellite-fabric-link satellite 100`	Specifies an interface as an Interface Control Plane Extender(ICPE) inter-chassis link (ICL). **Note** The Interface Control Plane Extender(ICPE) infrastructure has a mechanism to provide the Control Plane of an interface physically located on the Satellite device in the local Cisco IOS XR software.
Step 13	**remote-ports** *interface_type remote_subslot* **Example:** `RP/0/RP0/CPU0:router(config-satellite-fabric-link)# remote-ports Satellite-Ether 0/0/0-9`	Configures the remote satellite ports 0 to 9.
Step 14	**service-policy output** *policy-map* **Example:** `RP/0/RP0/CPU0:router(config-satellite-fabric-link)# service-policy output policy3`	Attaches a policy map to an output interface to be used as the service policy for that interface.
Step 15	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session.

	Command or Action	Purpose
		• **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.

Offloading Service-policy on Bundle SFL

Perform these tasks to offload the service-policy on the bundle Satellite Fabric Link (SFL). This procedure offloads the service-policy in the egress direction of SFL.

SUMMARY STEPS

1. **configure**
2. **class-map** [**type qos**] [**match-any**] [**match-all**] *class-map-name*
3. **match qos-group** [*qos-group-value*]
4. **end-class-map**
5. **policy-map** [**type qos**] *policy-name*
6. **class** *class-name*
7. **bandwidth** {*bandwidth* [*units*] | **percent** *value*}
8. **exit**
9. **end-policy-map**
10. **interface** *type interface-path-id*
11. **bundle id** *bundle-id*
12. **nv**
13. **satellite-fabric-link satellite** *satellite_id*
14. **remote-ports***interface_type remote_subslot*
15. **service-policy output** *policy-map*
16. Use the **commit** or **end** command.
17. **exit**
18. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**class-map** [**type qos**] [**match-any**] [**match-all**] *class-map-name* **Example:**	Creates a class map to be used for matching packets to the class specified and enters the class map configuration mode. If you specify **match-any**, one of the match criteria must be met for traffic entering the traffic class to be classified

	Command or Action	Purpose
	`RP/0/RP0/CPU0:router(config)# class-map match-any class4`	as part of the traffic class. This is the default. If you specify **match-all**, the traffic must match all the match criteria.
Step 3	**match qos-group** [*qos-group-value*] **Example:** `RP/0/RP0/CPU0:router(config-cmap)# match qos-group 5`	Specifies service (QoS) group values in a class map to match packets. • *qos-group-value* identifier argument is specified as the exact value or range of values from 0 to 63. • Up to eight values (separated by spaces) can be entered in one match statement. • **match qos-group**command is supported only for an egress policy.
Step 4	**end-class-map** **Example:** `RP/0/RP0/CPU0:router(config-cmap)# end-class-map`	Ends the class map configuration.
Step 5	**policy-map** [**type qos**] *policy-name* **Example:** `RP/0/RP0/CPU0:router(config)# policy-map policy4`	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy and enters the policy map configuration mode.
Step 6	**class** *class-name* **Example:** `RP/0/RP0/CPU0:router(config-pmap)# class class4`	Specifies the name of the class whose policy you want to create or change.
Step 7	**bandwidth** {*bandwidth* [*units*] | **percent** *value*} **Example:** `RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth percent 13`	Specifies the bandwidth allocated for a class belonging to a policy map.
Step 8	**exit** **Example:** `RP/0/RP0/CPU0:router(config-pmap)# exit`	Returns the router to policy map configuration mode.
Step 9	**end-policy-map** **Example:** `RP/0/RP0/CPU0:router(config-pmap)# end-policy-map`	Ends the policy map configuration.
Step 10	**interface** *type interface-path-id* **Example:**	Configures an interface and enters the interface configuration mode.

	Command or Action	Purpose
	`RP/0/RP0/CPU0:router(config)# interface Bundle-Ether 2`	
Step 11	**bundle id** *bundle-id* **Example:** `RP/0/RP0/CPU0:router(config-if)# bundle id 2`	Creates a multilink interface bundle with the specified bundle ID.
Step 12	**nv** **Example:** `RP/0/RP0/CPU0:router(config-if)# nv`	Enters the satellite network virtualization (nV) configuration submode.
Step 13	**satellite-fabric-link satellite** *satellite_id* **Example:** `RP/0/RP0/CPU0:router(config-if)# satellite-fabric-link satellite 100`	Specifies an interface as an Interface Control Plane Extender(ICPE) inter-chassis link (ICL). **Note** The Interface Control Plane Extender(ICPE) infrastructure has a mechanism to provide the Control Plane of an interface physically located on the Satellite device in the local Cisco IOS XR software.
Step 14	**remote-ports***interface_type remote_subslot* **Example:** `RP/0/RP0/CPU0:router(config-satellite-fabric-link)# remote-ports GigabitEthernet 0/0/0-5`	Configures the remote satellite ports 0 to 5.
Step 15	**service-policy output** *policy-map* **Example:** `RP/0/RP0/CPU0:router(config-satellite-fabric-link)# service-policy output policy4`	Attaches a policy map to an output interface to be used as the service policy for that interface.
Step 16	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session. • **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.
Step 17	**exit** **Example:**	Returns the router to global configuration mode.

	Command or Action	Purpose
	`RP/0/RP0/CPU0:router(config-if)# exit`	
Step 18	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session. • **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.

Offloading Service-policy on L2 Fabric Physical SFL

Perform these tasks to offload the service-policy on L2 Fabric physical Satellite Fabric Link (SFL). This procedure offloads the service-policy in the egress direction of SFL.

SUMMARY STEPS

1. **configure**
2. **class-map** [**type qos**] [**match-any**] [**match-all**] *class-map-name*
3. **match qos-group** [*qos-group-value1*]
4. **end-class-map**
5. **policy-map** [**type qos**] *policy-name*
6. **class** *class-name*
7. **bandwidth** {*bandwidth* [*units*] | **percent** *value*}
8. **exit**
9. **end-policy-map**
10. **interface** *type interface-path-id*
11. **encapsulation dot1q***vlan-identifier*
12. **nv**
13. **satellite-fabric-link satellite** *satellite_id*
14. **remote-ports***interface_type remote_subslot*
15. **service-policy output** *policy-map*
16. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:**	Enters global configuration mode.

	Command or Action	Purpose
	`RP/0/RP0/CPU0:router# configure`	
Step 2	**class-map** [**type qos**] [**match-any**] [**match-all**] *class-map-name* **Example:** `RP/0/RP0/CPU0:router(config)# class-map match-any class5`	Creates a class map to be used for matching packets to the class specified and enters the class map configuration mode. If you specify **match-any**, one of the match criteria must be met for traffic entering the traffic class to be classified as part of the traffic class. This is the default. If you specify **match-all**, the traffic must match all the match criteria.
Step 3	**match qos-group** [*qos-group-value1*] **Example:** `RP/0/RP0/CPU0:router(config-cmap)# match qos-group 5`	Specifies service (QoS) group values in a class map to match packets. • *qos-group-value* identifier argument is specified as the exact value or range of values from 0 to 63. • Up to eight values (separated by spaces) can be entered in one match statement. • **match qos-group**command is supported only for an egress policy.
Step 4	**end-class-map** **Example:** `RP/0/RP0/CPU0:router(config-cmap)# end-class-map`	Ends the class map configuration.
Step 5	**policy-map** [**type qos**] *policy-name* **Example:** `RP/0/RP0/CPU0:router(config)# policy-map policy5`	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy and enters the policy map configuration mode.
Step 6	**class** *class-name* **Example:** `RP/0/RP0/CPU0:router(config-pmap)# class class5`	Specifies the name of the class whose policy you want to create or change.
Step 7	**bandwidth** {*bandwidth* [*units*] | **percent** *value*} **Example:** `RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth percent 13`	Specifies the bandwidth allocated for a class belonging to a policy map.
Step 8	**exit** **Example:** `RP/0/RP0/CPU0:router(config-pmap)# exit`	Returns the router to policy map configuration mode.

	Command or Action	Purpose
Step 9	**end-policy-map** **Example:** `RP/0/RP0/CPU0:router(config-pmap)# end-policy-map`	Ends the policy map configuration.
Step 10	**interface** *type interface-path-id* **Example:** `RP/0/RP0/CPU0:router(config)# interface TenGigabitEthernet 0/1/0/0.1`	Configures an interface and enters the interface configuration mode.
Step 11	**encapsulation dot1q***vlan-identifier* **Example:** `RP/0/RP0/CPU0:router(config-if)# encapsulation dot1q 20`	Defines the encapsulation format as IEEE 802.1Q (**dot1q**), and specifies the VLAN identifier.
Step 12	**nv** **Example:** `RP/0/RP0/CPU0:router(config-subif)# nv`	Enters the satellite network virtualization (nV) configuration submode.
Step 13	**satellite-fabric-link satellite** *satellite_id* **Example:** `RP/0/RP0/CPU0:router(config-if-nV)# satellite-fabric-link satellite 100`	Specifies an interface as an Interface Control Plane Extender(ICPE) inter-chassis link (ICL). **Note** The Interface Control Plane Extender(ICPE) infrastructure has a mechanism to provide the Control Plane of an interface physically located on the Satellite device in the local Cisco IOS XR software.
Step 14	**remote-ports***interface_type remote_subslot* **Example:** `RP/0/RP0/CPU0:router(config-satellite-fabric-link)# remote-ports GigabitEthernet 0/0/0-5`	Configures the remote satellite ports 0 to 5.
Step 15	**service-policy output** *policy-map* **Example:** `RP/0/RP0/CPU0:router(config-satellite-fabric-link)# service-policy output policy5`	Attaches a policy map to an output interface to be used as the service policy for that interface.
Step 16	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session.

	Command or Action	Purpose
		• **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.

Configuration Examples for QoS Offload

Note While the examples use 1G access ports and 10G fabric ports, the same can be applied to Cisco NCS 5000 series 10G access and 10G/100G fabric ports for supported scenarios.

Offloading Service-policy on Physical Access Port: Example

In this example, a service-policy called policy1 is created. This service policy is associated to a class map called class1 through the use of the class command, and then the service policy is attached in the input direction on a GigabitEthernet interface 100/0/0/0. This service-policy is configured under the nv mode and thus the QoS policy is offloaded to the satellite.

```
config
class-map match-any class1
 match precedence 6
 end-class-map
!
policy-map policy1
 class class1
  set qos-group 5
 !
interface gigabitEthernet 100/0/0/0
nv
service-policy input policy1
end or commit
```

Offloading Service-policy on Bundle Access Port: Example

In this example, a service-policy called policy2 is created. This service policy is associated to a class map called class2 through the use of the class command. The service policy is then attached in the input direction on a bundle-ether interface with bundle id as 1 that has two bundle member links—GigabitEthernet interface 100/0/0/1 and GigabitEthernet interface 100/0/0/2. This service-policy is configured under the nv mode and thus the QoS policy is offloaded to the satellite bundle-ether interface.

```
config
class-map match-any class2
 match precedence 6
 end-class-map
!
policy-map policy2
 class class2
```

```
  set qos-group 5
  end-policy-map
 !
interface bundle-ether 1
bundle-id 1
nv
service-policy input policy2
end or commit
!
end or commit
```

Offloading Service-policy on Physical SFL: Example

In this example, a service-policy called policy3 is created, which is associated to a class map called class3 through the use of the class command. The service policy is applied to the host-facing satellite fabric link (SFL) on the satellite 100 and attached in the output direction on a TenGigE interface 0/1/0/0. This is configured under the nv mode and thus the QoS policy is offloaded to the satellite.

```
config
class-map match-any class3
 match qos-group 5
 end-class-map
!
policy-map policy3
 class class3
  bandwidth percent 13
 !
interface TenGigE 0/1/0/0
nv satellite-fabric-link satellite 100
remote-ports GigabitEthernet 0/0/0-9
service-policy output policy3
end or commit
```

Offloading Service-policy on Bundle SFL: Example

In this example, a service-policy called policy4 is created, which is associated to a class map called class4 through the use of the class command. The service policy is applied to the host-facing bundle satellite fabric link (SFL) on the satellite 100 and attached in the output direction on the bundle-ether interface with bundle id 2 that has two bundle member links—TengGig interface 0/1/0/0 and TengGig interface 0/1/0/1. This is configured under the nv mode and thus the QoS policy is offloaded to the satellite.

```
config
class-map match-any class4
 match qos-group 5
 end-class-map
!
policy-map policy4
 class class4
  bandwidth percent 13
 !
interface Bundle-ether 2
nv satellite-fabric-link satellite 100
remote-ports GigabitEthernet 0/0/0-5
service-policy output policy4
exit/commit
interface TengGig 0/1/0/0
bundle-id 2
!
```

```
interface TengGig 0/1/0/1
bundle-id 2
!
end or commit
```

Offloading Service-policy on L2 Fabric physical SFL: Example

In this example, a service-policy called policy5 is created, which is associated to a class map called class5 through the use of the class command. The service policy is applied to the host-facing bundle SFL under the nv mode and attached in the output direction on the TenGigabitEthernet 0/1/0/0.1 sub-interface. The QoS policy is offloaded to the satellite 100 in the L2 Fabric network.

```
config
class-map match-any class5
 match qos-group 5
 end-class-map
!
policy-map policy5
 class class5
  bandwidth percent 13
 !
interface TenGigabitEthernet 0/1/0/0.1
encapsulation dot1q 20
nv satellite-fabric-link satellite 100
remote-ports GigabitEthernet 0/0/0-5
service-policy output policy5
end or commit
```