Aggregate EtherChannel Quality of Service

The Aggregate EtherChannel Quality of Service (QoS) feature allows you to apply an aggregate egress-queuing policy-map on a port-channel main interface or subinterface. This feature enables QoS support on the aggregate port-channel main interface for the Cisco ASR 1000 Series Aggregation Services Routers.

Restrictions for Aggregate EtherChannel Quality of Service

- The configuration of QoS on Ethernet Virtual Circuit (EVC) with an aggregate port-channel interface is not supported.

- Point-to-Point Protocol over Ethernet (PPPoE) and IP over Ethernet (IPoE) sessions in the context of the Intelligent Services Gateway (ISG) and Intelligent Wireless Access Gateway (iWAG) (with or without QoS) across an aggregate port-channel interface is not supported.

- Virtual Private LAN Services (VPLS) with QoS on an aggregate port-channel interface is not supported.

- Xconnect with QoS on an aggregate port-channel interface is not supported.

- The use of fragment and service-fragment Modular QoS CLI (MQC) keywords in conjunction with the aggregate port-channel interface type is not supported.

- The aggregate-type port-channel interfaces have the following limitations:

  - All the member links of a port channel must be of the same speed. This prevents a potential packet reordering issue. It is not supported to combine Gigabit Ethernet, Fast Ethernet, or Ethernet interfaces into the same port channel.

- 10-Gigabit Ethernet is supported in Cisco IOS XE 3.16.3 or later (it is not supported in Cisco IOS XE 3.17). 10-Gigabit Ethernet is also supported in Cisco IOS XE Denali 16.3 and later.

- MPOL policy applied on both aggregate port-channel main interface and port-channel sub-interface is not supported by any Cisco IOS XE 3S release and is not supported on Cisco IOS XE Everest 16.5.x or earlier.

- QoS on an aggregate port-channel subinterface is not supported for Cisco IOS XE 3.16.2 or earlier (and it is also not supported in Cisco IOS XE 3.17).

Restrictions for PPPOE Session QoS over Aggregate EtherChannel

- All the member links of a port channel must be of the same speed. This prevents a potential packet reordering issue. It is not supported to combine Gigabit Ethernet, Fast Ethernet, or Ethernet interfaces into the same port channel.

- MPOL policy that is applied on both aggregate port-channel main interface and port-channel sub-interface is not supported.

- MPOL policy applied on both aggregate port-channel interface and PPPOE session is supported. The main interface or sub-interface QoS service policy is limited to only a class-default shaper (it can only contain the class class-default and shape command). Additional QoS configurations are not supported on the main interface or sub-interface when QoS service policies are applied to the main or sub-interface and the PPPOE session simultaneously.

- Before PPPOE session QoS is applied, the following command is required:

  platform qos port-channel-aggregate *port-channel interface*

  If the port-channel is already configured in any form, the above command fails.

- The QoS policy can be applied to an aggregate port-channel interface subject to the following scalability limits:

  - Upto 8 port channels

  - Upto 4 member links in a port channel

  - Member links can be split across multiple shared port adapters (SPAs) and SPA interface processor (SIP) cards

Restrictions for Non-Aggregate EtherChannel Quality of Service

The following restrictions apply if the port-channel is in non-aggregate mode:

- Applying Queuing policy on tunnels sourced on port-channel interface and port-channel sub-interface is not allowed.

- Per-Session QoS (VPN, DMVPN, PPP, PPPoE, PPPoVPDN, and DLEP) is not applied if the port-channel has more than one active member link. For multiple active member links, it is recommended to change the port-channel to aggregate mode.

- Per-Session QoS and Tunnel QoS with queuing features are not supported in load-balancing mode when the session or tunnel destination is reachable via multiple interfaces.

Note For a policy with queueing features, QoS queries CEF to obtain physical interface and port-channel association. If load-sharing is enabled, CEF returns a list of interfaces through which the session is reachable. QoS internally changes the CEF load-sharing method to per-prefix load-sharing to move traffic to a single interface; QoS policy is then applied to this interface. If a single interface is not available, the QoS policy is suspended.

If the interface load-sharing method was changed to per-prefix load-sharing, you must reload the device to return to default load-sharing.

Information About Aggregate EtherChannel Quality of Service

Supported Features for Aggregate EtherChannel Quality of Service

The Aggregate EtherChannel Quality of Service feature supports:

- Flow-based load balancing
- Up to three levels of hierarchy
- Configuration of shaping, absolute bandwidth, and relative bandwidth
- A minimum amount of bandwidth for subclasses (VLANs)
- Input QoS (policing and marking) and output QoS (all queuing features) that are enabled simultaneously on an aggregate port-channel main interface and subinterface

Unsupported Feature Combinations for Aggregate EtherChannel Quality of Service

The following combinations of tunnel-type interfaces with QoS are not supported:

- Generic Routing Encapsulation (GRE) tunnels with queuing policy-maps applied, which egress via a port channel with aggregate queuing
- Static virtual tunnel interface (SVTI) and dynamic virtual tunnel interface (DVTI) with queuing QoS applied, which egress via a port channel with aggregate queuing
- Sub-interface belongs to service group and sub-interface applied with service-policy cannot be configured on the same aggregate port-channel simultaneously
- MPOL - policy applied on both aggregate port-channel main interface and port-channel sub-interface

Note Tunnels without queuing QoS (described above) are supported, but are not recommended because hashing algorithms may overload a given physical interface without adequate diversity in IP addresses.

Scalability for Aggregate EtherChannel Quality of Service

The QoS policy can be applied to an aggregate port-channel interface subject to the following scalability limits:

- Up to 8 port channels

- Up to 4 member links in a port channel

- Member links can be split across multiple shared port adapters (SPAs) and SPA interface processor (SIP) cards

How to Configure Aggregate EtherChannel Quality of Service

This procedure describes how to configure Aggregate EtherChannel QoS on the Cisco ASR 1000 Series Aggregation Services Routers.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **platform qos port-channel-aggregate** *port-channel-number*
4. **interface port-channel** *port-channel-number*
5. **service-instance** *service-instance-number*
6. **service-policy** {**output**} *policy-map*
7. **service-policy** {**input**} *policy-map*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**platform qos port-channel-aggregate** *port-channel-number* **Example:** `router(config)# platform qos port-channel-aggregate 1`	Enables the aggregate port-channel interface.
Step 4	**interface port-channel** *port-channel-number* **Example:** `router(config)# interface port-channel 1`	Enters interface configuration mode to configure a specific port channel.

	Command or Action	Purpose
Step 5	**service-instance** *service-instance-number* **Example:** `router(config)# service-instance 697`	Enables the service instance on the port channel.
Step 6	**service-policy** {**output**} *policy-map* **Example:** `router(config-if)# service-policy output` *egress_policy*	Attaches a policy-map to an output interface to be used as the service policy for that interface.
Step 7	**service-policy** {**input**} *policy-map* **Example:** `router(config-if)# service-policy input` *ingress_policy*	Attaches a policy-map to an input interface to be used as the service policy for that interface.

How to Unconfigure Aggregate EtherChannel Quality of Service

This procedure describes how to unconfigure Aggregate EtherChannel QoS on the Cisco ASR 1000 Series Aggregation Services Routers.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **no interface port-channel** *port-channel-number*
4. **no platform qos port-channel-aggregate** *port-channel-number*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**no interface port-channel** *port-channel-number* **Example:** `router(config)# no interface port-channel 1`	Unconfigures a specific port channel.
Step 4	**no platform qos port-channel-aggregate** *port-channel-number* **Example:**	Disables the aggregate port-channel interface and removes the required QoS policies on it.

Command or Action	Purpose
`router(config)# no platform qos port-channel-aggregate 1`	

Configuration Examples for Aggregate EtherChannel Quality of Service

Enable Service Instance on Aggregate Port-Channel Interface

```
Router(config)#interface po5
Router(config-if)#service instance 697 ethernet
Router(config-if-srv)#service-policy output CUST-PMAP-S-L2ETH-4.65M-20-49-49-1_femo
Router(config-if-srv)#
```

Service Instance on Aggregate Port-Channel Interface

```
Router #show hqf interface po5 | inc layer
   blt (0x7FBAA95BD4D8, index 2, qid 13, fast_if_number 54) layer PHYSICAL
  (max entries 65536) (layer flags 0x10)
    next layer HQFLAYER_SERVICE_GROUP (max entries 65536)
    blt (0x7FBAA95BD3D8, index 0, qid 14, fast_if_number 54) layer SERVICE_GROUP
    (max entries 712) (layer flags 0x10)
      next layer HQFLAYER_SUB_IFC (max entries 712)
      blt (0x7FBAA95BD2D8, index 0, qid 15, fast_if_number 54) layer SUB_IFC
      blt (0x7FBAA95BD1D8, index 697, qid 16, fast_if_number 54) layer SUB_IFC
  (max entries 8) (layer flags 0xD)
   next layer HQFLAYER_CLASS_HIER1 (max entries 8)
          blt (0x7FBAA95BD0D8, index 0, qid 17, fast_if_number 54) layer CLASS_HIER1
          blt (0x7FBAA95BCFD8, index 1, qid 29, fast_if_number 54) layer CLASS_HIER1
          blt (0x7FBAA95BCAD8, index 2, qid 30, fast_if_number 54) layer CLASS_HIER1
          blt (0x7FBAA95BCBD8, index 3, qid 31, fast_if_number 54) layer CLASS_HIER1
          blt (0x7FBAA95BCCD8, index 4, qid 32, fast_if_number 54) layer CLASS_HIER1
```

Example: Configuring Aggregate Port-Channel Interface

```
Router# configure terminal
Router(config)# platform qos port-channel-aggregate 1
Router(config)# interface port-channel 1
Router(config-if)# interface GigabitEthernet1/0/1
Router(config-if)# channel-group 1
Router(config-if)# interface GigabitEthernet1/0/0
Router(config-if)# channel-group 1
Router(config-if)# interface port-channel 1.1
Router(config-subif)# encap
Router(config-subif)# encapsulation dot
Router(config-subif)# encapsulation dot1Q 2
Router(config-subif)# ip addr 14.0.1.2 255.255.255.0
Router(config-subif)# interface port-channel 1.2
Router(config-subif)# encapsulation dot1Q 3
Router(config-subif)# ip addr 14.0.2.2 255.255.255.0
Router(config-subif)# interface port-channel 1.3
Router(config-subif)# encapsulation dot1Q 4
Router(config-subif)# ip addr 14.0.3.2 255.255.255.0
Router(config-subif)# end
```

Example: Configuring a Class Map for QoS

```
Router# configure terminal
Router(config)# class-map vlan_2
Router(config-cmap)# match vlan  2
Router(config-cmap)# class-map vlan_3
Router(config-cmap)# match vlan  3
Router(config-cmap)# class-map vlan_4
Router(config-cmap)# match vlan  4
Router(config-cmap)# class-map prec1
Router(config-cmap)# match precedence 1
Router(config-cmap)# class-map prec2
Router(config-cmap)# match precedence 2
Router(config-cmap)# class-map prec3
Router(config-cmap)# match precedence 3
Router(config-cmap)# class-map prec4
Router(config-cmap)# match precedence 4
Router(config-cmap)# end
```

Example: Configuring a Policy-Map for QoS

```
Router# configure terminal
Router(config)# policy-map child-vlan
Router(config-pmap)# class prec1
Router(config-pmap-c)# police cir percent 20
Router(config-pmap-c-police)# exit
Router(config-pmap-c)# priority level 1
Router(config-pmap-c)# class prec2
Router(config-pmap-c)# police cir percent 40
Router(config-pmap-c-police)# exit
Router(config-pmap-c)# priority level 2
Router(config-pmap-c)# class prec3
Router(config-pmap-c)# bandwidth remaining ratio 3
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# bandwidth remaining ratio 1
Router(config-pmap-c)# random-detect
Router(config-pmap-c)#!
Router(config-pmap-c)# policy-map egress_policy
Router(config-pmap)# class vlan_2
Router(config-pmap-c)# shape average 100000000
Router(config-pmap-c)# service-policy child-vlan
Router(config-pmap-c)# class vlan_3
Router(config-pmap-c)# shape average 200000000
Router(config-pmap-c)# service-policy child-vlan
Router(config-pmap-c)# class vlan_4
Router(config-pmap-c)# shape average 300000000
Router(config-pmap-c)# service-policy child-vlan
Router(config-pmap-c)#!
Router(config-pmap-c)# policy-map ingress_policy
Router(config-pmap)# class vlan_2
Router(config-pmap-c)# police cir 80000000
Router(config-pmap-c-police)# conform-action set-prec-transmit 1
Router(config-pmap-c-police)# class vlan_2
Router(config-pmap-c)# set dscp AF21
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# set dscp 0
Router(config-pmap-c)# end
```

Example: Applying QoS to Port Channel Interface

```
Router# configure terminal
Router(config)# interface port-channel 1
Router(config-if)# service-policy output egress_policy
Router(config-if)# service-policy input ingress_policy
Router(config-if)# end
```

How to Configure Aggregate EtherChannel Subinterface Quality of Service

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **platform qos port-channel-aggregate** *port-channel-number*
4. **interface port-channel** *port-channel-number*
5. **interface port-channel** *port-channel-number.subinterface-number*
6. **service-policy**   {**output**} *policy-map*
7. **service-policy**   {**input**} *policy-map*
8. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**platform qos port-channel-aggregate** *port-channel-number* **Example:** `Device(config)# platform qos port-channel-aggregate 1`	Enables the aggregate port-channel interface.
Step 4	**interface port-channel** *port-channel-number* **Example:** `Device(config)# interface port-channel 1`	Enters interface configuration mode to configure a specific port channel.
Step 5	**interface port-channel** *port-channel-number.subinterface-number*	Enters interface configuration mode to configure a specific port channel subinterface.

	Command or Action	Purpose
	Example: Device(config)# interface port-channel 1.2	
Step 6	**service-policy** {**output**} *policy-map* **Example:** Device(config-if)# service-policy output *egress_policy*	Attaches a policy-map to an output interface to be used as the service policy for that interface.
Step 7	**service-policy** {**input**} *policy-map* **Example:** Device(config-if)# service-policy input *ingress_policy*	Attaches a policy-map to an input interface to be used as the service policy for that interface.
Step 8	**end** **Example:** Device(config)# end	Exits global configuration mode.

How to Unconfigure Aggregate EtherChannel Subinterface Quality of Service

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **no interface port-channel** *port-channel-number.subinterface*
4. **no platform qos port-channel-aggregate** *port-channel-number*
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Device> enable	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** Device# configure terminal	Enters global configuration mode.
Step 3	**no interface port-channel** *port-channel-number.subinterface* **Example:**	Unconfigures a specific port channel subinterface.

	Command or Action	Purpose
	`Device(config)# no interface port-channel 1.2`	
Step 4	**no platform qos port-channel-aggregate** *port-channel-number* **Example:** `Device(config)# no platform qos port-channel-aggregate 1`	Disables the aggregate port-channel interface and removes the required QoS policies on it.
Step 5	**end** **Example:** `Device(config)# end`	Exits global configuration mode.

Configuration Examples for Aggregate EtherChannel Subinterface Quality of Service

Example: Configuring Aggregate Port-Channel Interface and Subinterface

```
Device# configure terminal
Device(config)# platform qos port-channel-aggregate 2
Device(config)# interface port-channel 2
Device(config-if)# interface GigabitEthernet1/1/1
Device(config-if)# channel-group 2
Device(config-if)# interface GigabitEthernet1/1/0
Device(config-if)# channel-group 2
Device(config-if)# interface port-channel 2.200
Device(config-subif)# encapsulation dot1Q 200
Device(config-subif)# ip addr 15.0.1.2 255.255.255.0
Device(config-subif)# interface port-channel 2.300
Device(config-subif)# encapsulation dot1Q 300
Device(config-subif)# ip addr 15.0.2.2 255.255.255.0
Device(config-subif)# end
```

Example: Configuring a Class Map for QoS

```
Device# configure terminal
Device(config)# class-map vlan_2
Device(config-cmap)# match vlan  2
Device(config-cmap)# class-map vlan_3
Device(config-cmap)# match vlan  3
Device(config-cmap)# class-map vlan_4
Device(config-cmap)# match vlan  4
Device(config-cmap)# class-map prec1
Device(config-cmap)# match precedence 1
Device(config-cmap)# class-map prec2
Device(config-cmap)# match precedence 2
Device(config-cmap)# class-map prec3
Device(config-cmap)# match precedence 3
Device(config-cmap)# class-map prec4
```

```
Device(config-cmap)# match precedence 4
Device(config-cmap)# end
```

Example: Configuring a Policy-Map for QoS

```
Device# configure terminal
Device(config)# policy-map subinterface_child
Device(config-pmap)# class prec1
Device(config-pmap-c)# police cir percent 30
Device(config-pmap-c-police)# exit
Device(config-pmap-c)# priority level 1
Device(config-pmap-c)# class prec2
Device(config-pmap-c)# police cir percent 30
Device(config-pmap-c-police)# exit
Device(config-pmap-c)# priority level 2
Device(config-pmap-c)# class prec3
Device(config-pmap-c)# bandwidth remaining ratio 3
Device(config-pmap-c)# class class-default
Device(config-pmap-c)# bandwidth remaining ratio 1
Device(config-pmap-c)#!
Device(config-pmap-c)# policy-map sub_egress_policy
Device(config-pmap-c)# class class-default
Device(config-pmap-c)# shape average 300000000
Device(config-pmap-c)# service-policy subinterface_child
Device(config-pmap-c)#!
Device(config-pmap-c)# policy-map sub_ingress_policy
Device(config-pmap)# class class-default
Device(config-pmap-c)# police cir 80000000
Device(config-pmap-c)# end
```

Example: Applying QoS to Port Channel Subinterface

```
Device# configure terminal
Device(config)# interface port-channel 2.200
Device(config-if)# service-policy output egress_policy
Device(config-if)# service-policy input ingress_policy
Device(config)# interface port-channel 2.300
Device(config-if)# service-policy output egress_policy
Device(config-if)# service-policy input ingress_policy
Device(config-if)# end
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	*Cisco IOS Master Commands List, All Releases*
QoS commands	Cisco IOS Quality of Service Solutions Command Reference

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature.	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Aggregate EtherChannel Quality of Service

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for Aggregate EtherChannel Quality of Service

Feature Name	Releases	Feature Information
Aggregate EtherChannel Quality of Service	Cisco IOS XE Release 3.12S	The Aggregate EtherChannel Quality of Service (QoS) feature allows you to apply an aggregate egress-queuing policy-map on a port-channel main interface or subinterface. This feature enables QoS support on the aggregate port-channel main interface for the Cisco ASR 1000 Series Aggregation Services Routers.
		In Cisco IOS XE Release 3.12S, this feature was implemented on the Cisco ASR 1000 Series Aggregation Services Routers.
Aggregate GEC QoS 10G support	Cisco IOS XE Release 3.16.3S Cisco IOS XE Denali 16.3.1	In Cisco IOS XE Release 3.16.3S, this feature was implemented on the Cisco ASR 1000 Series Aggregation Services Routers.
QoS on GEC portchannel subinterface on ASR1K	Cisco IOS XE Release 3.16.3S Cisco IOS XE Denali 16.3.1	In Cisco IOS XE Release 3.16.3S, this feature was implemented on the Cisco ASR 1000 Series Aggregation Services Routers.
QoS on GEC portchannel subinterface on ISR 4000	Cisco IOS XE Everest 16.6.1	In Cisco IOS XE Everest 16.6.1 release, this feature was implemented on the Cisco ISR 4000 Series Integrated Services Routers.