Applying QoS Features to Ethernet Subinterfaces

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Introduction

This document describes how to apply class–based weighted fair queueing (CBWFQ) and other Cisco IOS®
Software–based Quality of Service (QoS) features on an Ethernet subinterface. An Ethernet subinterface is a
logical interface in Cisco IOS. You can use the modular QoS command–line interface (CLI) (MQC) to create
and apply a service policy to an Ethernet subinterface.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

The information in this document is based on these software and hardware versions:

- Cisco IOS Software 12.2(2)T
- Cisco 2620 router with a Fast Ethernet network module

The information presented in this document was created from devices in a specific lab environment. All of the
devices used in this document started with a cleared (default) configuration. If you are working in a live
network, ensure that you understand the potential impact of any command before using it.

Conventions

For more information on document conventions, refer to Cisco Technical Tips Conventions.

Applying a Service Policy

In general, choosing where to apply a policy depends on the QoS features that your policy is activating. An
Ethernet subinterface supports the following:

- Class–based policing – If you apply a policy with the **police** command to both the interface and the subinterface, only the subinterface policer is active for the traffic that matches the class. Refer to Traffic Policing for more information.
- Class–based marking refer to Classification Overview for more information.
- Class–based shaping refer to Configuring Class–Based Shaping for more information.
- Class–based queueing Queueing is a special case for Ethernet subinterfaces. See the remainder of this section for more information.

A router begins to queue packets when the number of packets that needs to be transmitted out an interface exceeds the output rate of that interface. The excess packets are then queued. A queueing method can be applied to packets waiting to be transmitted.

Cisco IOS logical interfaces do not inherently support a state of congestion and do not support the direct application of a service policy that applies a queueing method. Instead, you first need to apply shaping to the subinterface using either generic traffic shaping (GTS) or class–based shaping. Refer to Policing and Shaping for more information.

The router prints this log message when an Ethernet subinterface is configured with a service policy that applies queueing without shaping:

```
router(config)# interface ethernet0/0.1
router(config-subif)# service-policy output test
 CBWFQ : Not supported on subinterfaces
```

Note that the same rule applies to a Gigabit Ethernet subinterface.

```
c7400(config)# interface gig0/0.1
c7400(config-subif)# service-policy ou
c7400(config-subif)# service-policy output outFE
  CBWFQ : Not supported on subinterfaces
```

In other words, you must configure a hierarchical policy with the **shape** command at the parent level. Use the **bandwidth** command for CBWFQ, or the **priority** command for Low Latency Queueing (LLQ) at lower levels. Class–based shaping limits the output rate and (we can assume) leads to a congested state on the logical subinterface. The subinterface than applies "backpressure," and Cisco IOS begins queueing the excess packets that are held by the shaper.

Applying a Hierarchical Policy

Follow these steps to apply a hierarchical policy:

1. Create a child or lower–level policy that configures a queueing mechanism. In the example below, we configure LLQ using the **priority** command and CBWFQ using the **bandwidth** command. Refer to Congestion Management Overview for more information.

   ```
   policy-map child
    class voice
      priority 512
   ```
2. Create a parent or top–level policy that applies class–based shaping. Apply the child policy as a command under the parent policy since the admission control for the child class is done based on the shaping rate for the parent class.

   ```
   policy-map parent
    class class-default
      shape average 2000000
      service-policy child
   ```

3. Apply the parent policy to the subinterface.

```
interface ethernet0/0.1
 service-policy parent
```

Configuring Class–Based Shaping

In this section, you are presented with the information to configure the features described in this document.

Note: To find additional information on the commands used in this document, use the Command Lookup Tool (registered customers only) .

Configuration

Router 2620A

```
hostname 2620A
!
ip cef
!
class-map match-any dscp46
 match ip dscp 46
class-map match-all telnet_ping_snmp
 match access-group 150
class-map match-all http
 match access-group 154
class-map match-all pop3_smtp
 match access-group 153
!
!
policy-map voice_traffic
 class dscp46
  shape average 30000 10000
 class telnet_ping_snmp
  shape average 20000 15440
 class pop3_smtp
  shape average 20000 15440
 class http
  shape average 20000 15440
!
interface FastEthernet0/0
 ip address 10.10.247.2 255.255.255.0
 duplex auto
 speed auto
!
interface FastEthernet0/0.1
 encapsulation dot1Q 1 native
 ip address 10.1.1.1 255.255.255.0
 service-policy output voice_traffic
```

Verify

This section provides information you can use to confirm your configuration is working properly.

Certain **show** commands are supported by the Output Interpreter tool, which allows you to view an analysis of **show** command output.

- **show policy−map {policy name}** – Displays the configuration of all classes for a specified service policy map.

```
2620A# show policy-map voice_traffic
Policy Map voice_traffic
Class dscp46
Traffic Shaping
Average Rate Traffic Shaping
CIR 30000 (bps) Max. Buffers Limit 1000 (Packets)
Bc 10000
Class telnet_ping_snmp
Traffic Shaping
Average Rate Traffic Shaping
CIR 20000 (bps) Max. Buffers Limit 1000 (Packets)
Bc 15440
Class pop3_smtp
Traffic Shaping
Average Rate Traffic Shaping
CIR 20000 (bps) Max. Buffers Limit 1000 (Packets)
Bc 15440
Class http
Traffic Shaping
Average Rate Traffic Shaping
CIR 20000 (bps) Max. Buffers Limit 1000 (Packets)
Bc 15440

2620A# show policy-map voice_traffic class dscp46
Class dscp46
Traffic Shaping
Average Rate Traffic Shaping
CIR 30000 (bps) Max. Buffers Limit 1000 (Packets)
Bc 10000
```

- **show policy–map interface fast** – Displays match counters for all classes of a specified service policy map.

```
2620A# show policy-map interface fa0/0.1
FastEthernet0/0.1
Service-policy output: voice_traffic
Class-map: dscp46 (match-any)
0 packets, 0 bytes
5 minute offered rate 0 bps, drop rate 0 bps
Match: ip dscp 46
0 packets, 0 bytes
5 minute rate 0 bps
Traffic Shaping
Target     Byte     Sustain    Excess      Interval   Increment Adapt
Rate       Limit    bits/int   bits/int    (ms)       (bytes)   Active
30000      2500     10000      10000       333        1250      –
Queue      Packets  Bytes      Packets    Bytes       Shaping
Depth                          Delayed    Delayed     Active
0          0        0          0          0           no
Class-map: telnet_ping_snmp (match-all)
0 packets, 0 bytes
5 minute offered rate 0 bps, drop rate 0 bps
Match: access-group 150
Traffic Shaping
Target     Byte     Sustain    Excess      Interval   Increment Adapt
Rate       Limit    bits/int   bits/int    (ms)       (bytes)   Active
20000      3860     15440      15440       772        1930      –
Queue      Packets  Bytes      Packets    Bytes       Shaping
Depth                          Delayed    Delayed     Active
0          0        0          0          0           no
Class-map: pop3_smtp (match-all)
0 packets, 0 bytes
5 minute offered rate 0 bps, drop rate 0 bps
Match: access-group 153
Traffic Shaping
Target     Byte     Sustain    Excess      Interval   Increment Adapt
Rate       Limit    bits/int   bits/int    (ms)       (bytes)   Active
```

```
20000     3860    15440    15440    772      1930     -
Queue     Packets  Bytes     Packets  Bytes    Shaping
Depth                        Delayed  Delayed  Active
0         0        0         0        0        no
Class-map: http (match-all)
0 packets, 0 bytes
5 minute offered rate 0 bps, drop rate 0 bps
Match: access-group 154
Traffic Shaping
Target    Byte    Sustain  Excess   Interval Increment Adapt
Rate      Limit   bits/int bits/int (ms)     (bytes)   Active
20000     3860    15440    15440    772      1930     -
Queue     Packets  Bytes     Packets  Bytes    Shaping
Depth                        Delayed  Delayed  Active
0         0        0         0        0        no
Class-map: class-default (match-any)
926 packets, 88695 bytes
5 minute offered rate 0 bps, drop rate 0 bps
Match: any
```

Note: Class−based shaping works at the interface and subinterface level. Cisco IOS 12.2(2.5) introduces the ability to configure shaping on the main interface and IP addresses on the subinterfaces.

Related Information

- **QoS Support Page**
- **Technical Support – Cisco Systems**

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