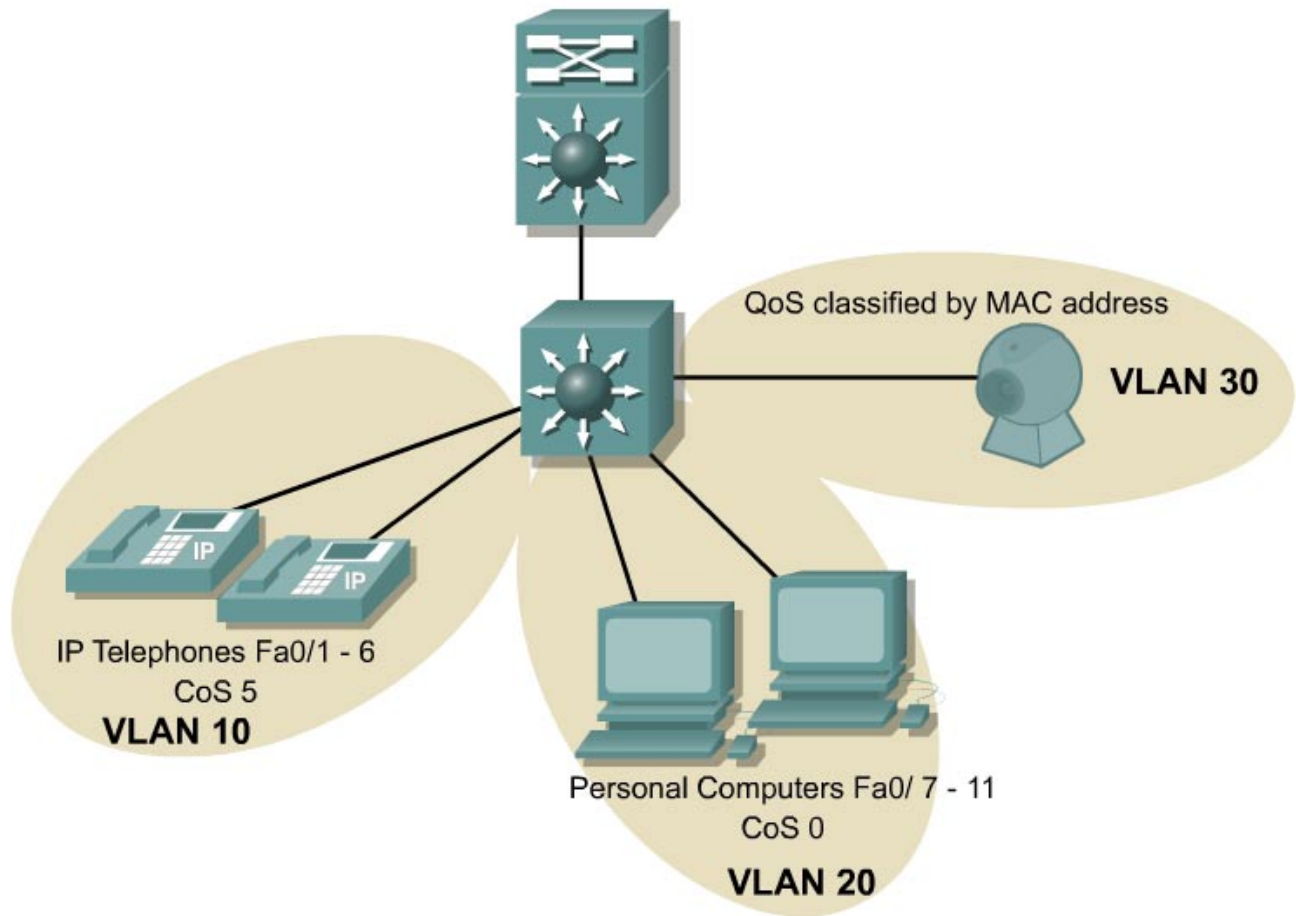


## Lab 8.9.2 Introduction to the Modular QoS Command-Line Interface



### Objective

Configuring Quality of Service (QoS) involves classifying, marking, and policing traffic flows. It is often necessary to apply the same rules to various classes of traffic or to apply the same policy to many interfaces on a switch. The IOS uses a Modular QoS Command line interface (MQC) to avoid repetition and to make it easier to modify settings.

This lab introduces the MQC, which is an important part of the QoS configuration on an IOS based switch or router.

This lab also introduces the concept of the Differentiated Services Code Point (DSCP), which is used to mark packets with a QoS identifier.

This lab is designed for use with the Catalyst 3550 switch and builds on Lab 8.9.1.

## Scenario

The marketing department access switch has been configured for Layer 2 class of service (CoS). However, this does not provide a QoS indicator that can be carried end-to-end through the network. To achieve this, the packets must be marked at Layer 3 using the DCSP field in the IP packet as the packets move into the distribution-layer switch. In the previous lab, traffic was marked using the CoS as frames entered the access-layer switch. In this lab a Layer 3 DSCP will be set according to the existing Layer 2 CoS of the frames.

The marketing department personnel occasionally use an IP based audio-conferencing phone. Since this is not used often, a switch port does not need to be reserved on every access-layer switch. The workers would like to be able to unplug the nearest network device and plug the audio-conferencing phone into that port. Ensure that this device receives the same treatment as other voice traffic in the network.

## Step 1

Configure the host names for the Access1 and Dist1 switches. Then configure a gigabit trunk between the access and distribution layer switches.

```
Access1(config)#interface gigabitethernet 0/1
Access1(config-if-range)#switchport mode trunk

Dist1(config)#interface gigabitethernet 0/1
Dist1(config-if-range)#switchport trunk encapsulation dot1q
Dist1(config-if-range)#switchport mode trunk
```

## Step 2

Before using the Catalyst 3550, the QoS functionality must be enabled by using the `mls qos` command.

```
Dist1(config)#mls qos
```

This step does not apply to the Catalyst 2950 since the QoS features of the 2950 are always available.

## Step 3

Traffic from the audio-conference device must be identified before it can be classified. In the previous lab, the incoming access port was used to identify frames and set the CoS. An incoming port cannot be used in this lab because the marketing people want to move the device from port to port. One mechanism that could be used to identify traffic from the audio-conference device is an IP access list. The problem with this solution is that the audio conference device will require different IP addresses if it is used on ports in different VLANs. This will make it more difficult to manage the ACL. The solution is to use a MAC-based ACL.

In this lab an example MAC address will be used. Substitute the MAC address of an available PC to facilitate testing.

Configure a MAC ACL on the distribution layer switch to identify traffic originating from the audio conference device.

```
Dist1(config)#mac access-list extended audioconference
Dist1(config-ext-macl)#permit host 0000.0a00.0111 any
```

## Step 4

Verify the configuration of the MAC ACL using the `show access-lists` command.

```
Dist1#show access-lists
Extended MAC access list audioconference
  permit host 0000.0a00.0111 any
```

## Step 5

The first component of the Modular QoS CLI is the `class-map`. The `class-map` defines the traffic types that will receive the same QoS treatment.

The `class-map` command uses various match statements to define the traffic. If `match-all` is used, the traffic must satisfy all of the match statements. If `match-any` is used, traffic that matches any of the statements will join the traffic class.

Each class-map is given a name that is used to reference the class-map.

Create a class-map called `voicetraffic` that matches all of the criteria specified.

```
Dist1(config)#class-map match-all voicetraffic
```

The `match` command is used to identify traffic that will become part of the class-map. Use the following command to examine the possible criteria for a match.

```
Dist1(config-cmap)#match ?
```

Create a match using the named ACL that was previously defined.

```
Dist1(config-cmap)#match access-group name audioconference
```

## Step 6

Verify the configuration using the `show class-map` command.

```
Dist1#show class-map
Class Map match-all voicetraffic (id 2)
  Match access-group name audioconference

Class Map match-any class-default (id 0)
```

The switch will automatically create a class-map called `class-default`. Match statements can also be assigned to this class-map.

## Step 7

After defining the traffic class with the class-map statement, define the actions that should be taken on each class of traffic with the policy-map statement. Like the class-map, the policy-map is given a name.

```
Dist1(config)#policy-map from-access-layer
```

The format of the policy-map is a reference to a traffic class and one or more actions that must be applied to the traffic. For the traffic class named `voicetraffic`, specify that the DSCP should be set to

40. When the **set** command is configured, use the question mark (?) to examine the extensive range of actions that can be taken on a traffic class.

```
Dist1(config-pmap)#class voicetraffic
Dist1(config-pmap-c)#set ip dscp 40
```

After specifying an action for traffic originating from the audio-conference device, determine the QoS requirements of traffic originating from any other hosts attached to the access-layer switch. Assume that suitable CoS values have been provided by the access-layer switch and configure the class-default policy so that the CoS value of all other traffic is trusted.

```
Dist1(config-pmap)#class class-default
Dist1(config-pmap-c)#trust cos
```

## Step 8

Use the **show policy-map** command to verify the policy-map.

```
Dist1#show policy-map
Policy Map from-access-layer
  class voicetraffic
    set ip dscp 40
  class class-default
    trust cos
```

## Step 9

The final configuration step for MCQ is applying the policy to an interface. This is accomplished by using the **service-policy** command on the required interface.

```
Dist1(config)#interface gigabitethernet 0/1
Dist1(config-if)#service-policy input from-access-layer
```

## Step 10

Use the **show mls qos interface gigabitethernet 0/1** command to verify that the service-policy has been applied to the interface correctly.

## Configuration File

```
DIST1
hostname Dist1
!
!
ip subnet-zero
ip routing
!
mls qos
!
class-map match-all voicetraffic
    match access-group name audioconference
!
!
policy-map from-access-layer
    class voicetraffic
        set ip dscp 40
    class class-default
        trust cos
!
!
spanning-tree extend system-id
!
mac access-list extended audioconference
    permit host 0000.0a00.0111 any
!
!
!
interface Port-channel1
    switchport trunk encapsulation dot1q
    switchport mode trunk
    no ip address
!
interface FastEthernet0/1
    no ip address
!
interface FastEthernet0/2
    no ip address
!
interface FastEthernet0/3
    no ip address
!
interface FastEthernet0/4
    no ip address
!
interface FastEthernet0/5
    no ip address
!
interface FastEthernet0/6
    no ip address
!
interface FastEthernet0/7
    no ip address
!
interface FastEthernet0/8
    no ip address
!
interface FastEthernet0/9
```

```

    no ip address
    !
interface FastEthernet0/10
    no ip address
    !
interface FastEthernet0/11
    no ip address
    !
interface FastEthernet0/12
    no ip address
    !
interface FastEthernet0/13
    no ip address
    !
interface FastEthernet0/14
    no ip address
    !
interface FastEthernet0/15
    no ip address
    !
interface FastEthernet0/16
    no ip address
    !
interface FastEthernet0/17
    no ip address
    !
interface FastEthernet0/18
    no ip address
    !
interface FastEthernet0/19
    no ip address
    !
interface FastEthernet0/20
    no ip address
    !
interface FastEthernet0/21
    no ip address
    !
interface FastEthernet0/22
    no ip address
    !
interface FastEthernet0/23
    no ip address
    !
interface FastEthernet0/24
    no ip address
    !
interface GigabitEthernet0/1
    switchport trunk encapsulation dot1q
    no ip address
    !
interface GigabitEthernet0/2
    switchport trunk encapsulation dot1q
    switchport mode trunk
    no ip address
    service-policy input from-access-layer
    !
interface Vlan1
    ip address 10.0.1.1 255.255.255.0
    !

```

```
interface Vlan10
  ip address 10.0.10.1 255.255.255.0
  !
interface Vlan20
  ip address 10.0.20.1 255.255.255.0
  !
interface Vlan30
  ip address 10.0.30.1 255.255.255.0
  !
ip classless
ip http server
!
!
!
!
line con 0
line vty 5 15
!
end
```

## ACCESS1

```
hostname Access1
!
!
ip subnet-zero
!
spanning-tree extend system-id
!
!
interface Port-channel1
  switchport mode trunk
  no ip address
!
interface FastEthernet0/1
  no ip address
  mls qos trust cos
!
interface FastEthernet0/2
  no ip address
  mls qos trust cos
!
interface FastEthernet0/3
  no ip address
  mls qos trust cos
!
interface FastEthernet0/4
  no ip address
  mls qos trust cos
!
interface FastEthernet0/5
  no ip address
  mls qos trust cos
!
interface FastEthernet0/6
  no ip address
  mls qos trust cos
!
interface FastEthernet0/7
  switchport access vlan 20
  no ip address
  mls qos cos override
!
interface FastEthernet0/8
  switchport access vlan 20
  no ip address
  mls qos cos override
!
interface FastEthernet0/9
  switchport access vlan 20
  no ip address
  mls qos cos override
!
interface FastEthernet0/10
  switchport access vlan 20
  no ip address
  mls qos cos override
!
interface FastEthernet0/11
  switchport access vlan 20
```

```
no ip address
mls qos cos override
!
interface FastEthernet0/12
  switchport access vlan 20
  no ip address
  mls qos cos 3
  mls qos trust cos
!
interface GigabitEthernet0/1
  switchport mode access
  no ip address
!
interface GigabitEthernet0/2
  switchport mode trunk
  no ip address
!
interface Vlan1
  ip address 10.0.1.2 255.255.255.0
  no ip route-cache
!
interface Vlan20
  ip address 10.0.20.20 255.255.255.0
  no ip route-cache
  shutdown
!
ip http server
!
!
line con 0
line vty 0 4
  login
line vty 5 15
  login
!
end
```