

AutoQoS for Medianet

As of August 2010, an updated version of AutoQoS was released for the Catalyst 2960-G/S, 3560-G/E/X, and 3750-G/E/X family of switches (with IOS Release 12.2(55)SE). This release was directly based on the recommendations put forward in the Enterprise QoS SRND, Release 4.0 to support rich-media applications; in fact, the global configuration command for this version of AutoQoS is **auto qos srnd4**.

In addition, in October 2012 a corresponding (Modular QoS command-line interface [MQC]-based) version of AutoQoS SRND4 was released for the Catalyst 4500 series switches as part of Cisco IOS 15.1(1)SG and IOS XE 3.3.0SG.

This appendix discusses the functionality and options of this latest AutoQoS feature, in addition to the details the QoS configurations that it automatically generates.

Note Because of the differences between Multi-Layer Switch (MLS)-QoS and MQC-based QoS, not all AutoQoS models and features are identically supported on the Catalyst 2K/3K as compared to the Catalyst 4K.

Note Some configuration variations may exist between the recommendations in the QoS SRND 4.0 (and this book) as compared with the AutoQoS-generated commands; these variations are relatively minor and are primarily the result of the product teams engineering preferences/constraints.

AutoQoS SRND4 Models for Cisco Catalyst 2960/3560/3750 Series Switches

AutoQoS-SRND4, which can be shortened to AutoQoS for the sake of simplicity, presents the network administrator with four main ingress QoS policy options in interface configuration mode:

- **auto qos trust {cos | dscp}**: This option configures the port to statically trust either class of service (CoS) or differentiated services code point (DSCP). If neither CoS nor DSCP are explicitly specified, the **auto qos trust** command will configure, by default, CoS trust on Layer 2 switch ports and DSCP trust on Layer 3 routed interfaces.
- **auto qos video [cts | ip-camera]**: This new option provides automatic configuration support for both Cisco TelePresence Systems (via the **cts** keyword) in addition to IP video-surveillance cameras (via the **ip-camera** keyword).
- **auto qos classify {police}**: This option provides a generic template that can classify and mark up to six classes of Medianet traffic and can optionally provision data plane policing/scavenger-class QoS policy elements for these traffic classes (via the optional **police** keyword).
- **auto qos voip [cisco-phone | cisco-softphone | trust]**: This option provides not only legacy support for Auto QoS VoIP IP telephony deployments but also expands on these models to include provisioning for additional classes of rich-media applications and to include data plane policing/scavenger-class QoS policy elements to protect and secure these applications.

Each ingress option is automatically complemented by a complete set of ingress and egress queuing configurations, complete with both CoS- and DSCP-to-queue mappings, as shown in Figure A-1.

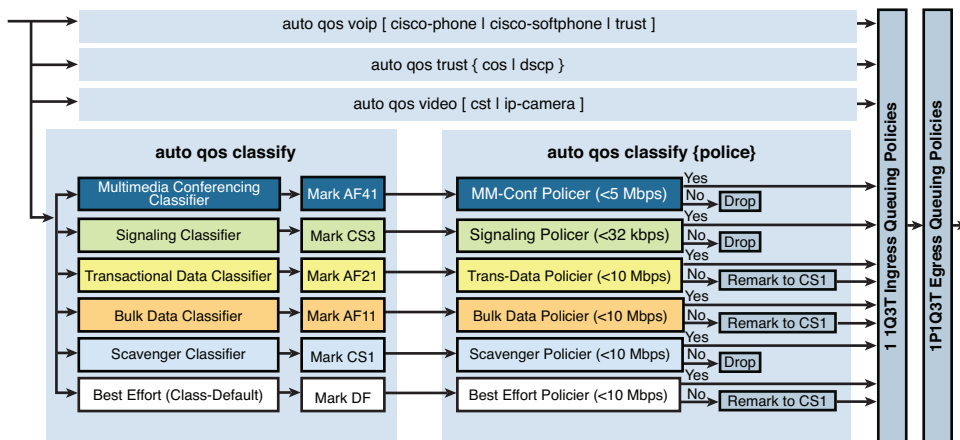


Figure A-1 AutoQoS SRND4 Models

The complete configurations provisioned by each of these new AutoQoS model options, along with the complete ingress and egress queuing configurations, are detailed in the following sections. For the sake of logical development, however, **auto qos voip** model is discussed last, because it combines several policy elements from other AutoQoS model options.

AutoQoS Trust Models

The **auto qos trust** interface command configures static trust policies on the ports or interfaces that it is configured on. If the port is operating as a Layer 2 switch port, (by default) CoS trust is configured; whereas, if the port is operating as a Layer 3 routed interface, (by default) DSCP trust is configured.

Example A-1 shows the configuration of AutoQoS trust on a Layer 2 switch port.

Example A-1 *AutoQoS Trust Applied on a Layer 2 Switch Port*

```
! This section configures autoqos trust on a L2 switch port
C3750(config)# interface GigabitEthernet1/0/1
C3750(config-if)# description L2-ACCESS-PORT
C3750(config-if)# switchport access vlan 10
C3750(config-if)# switchport voice vlan 110
C3750(config-if)# spanning-tree portfast
C3750(config-if)# auto qos trust
! Autoconfigures static trust policy
! (+ ingress and egress queuing policies)
```

You can verify the effect of this **auto qos trust** policy on a Layer 2 switch port by the **show run interface** command, as shown in Example A-2.

Example A-2 *AutoQoS Trust Applied on a Layer 2 Switch Port Verification: show run interface*

```
C3750# show run interface GigabitEthernet1/0/1
Building configuration...
Current configuration : 251 bytes
!
interface GigabitEthernet1/0/1
description L2-ACCESS-PORT
switchport access vlan 10
switchport voice vlan 110
srr-queue bandwidth share 1 30 35 5
queue-set 2
priority-queue out
mls qos trust cos
```

```

! AutoQoS has configured the port to static CoS-trust
auto qos trust
spanning-tree portfast
end
C3750#

```

AutoQoS Video Models

Besides supporting IP telephony devices such as Cisco IP phones and softphones (via AutoQoS-VoIP), AutoQoS now also supports video devices, such as Cisco TelePresence Systems (CTS) and IP video-surveillance cameras, both of which support conditional trust via CDP-negotiation.

Cisco TelePresence Systems (CTS) can mark their video flow and their audio flows with to CoS 4 and DSCP CS4. In addition, any voice traffic originating from the Cisco 7975G IP Phone, which is an integral part of the CTS, is marked to CoS 5 and DSCP EF. Furthermore, any signaling traffic—whether for the CTS or the IP phone—is marked CoS 3 and DSCP CS3.

Similar to **auto qos trust** behavior, **auto qos video cts** dynamically extends CoS trust to CTS systems connecting to Layer 2 switch ports (by default) and dynamically extends DSCP trust to CTS systems connecting to Layer 3 routed interfaces (by default).

CTS systems are usually connected to Layer 2 switch ports, however, as shown in Example A-3.

Example A-3 *AutoQoS Video CTS Configuration on a Layer 2 Switch Port*

```

C3750(config)# interface GigabitEthernet1/0/1
C3750(config-if)# description L2-ACCESS-PORT-TO-CTS
C3750(config-if)# switchport access vlan 10
C3750(config-if)# switchport voice vlan 110
C3750(config-if)# spanning-tree portfast
C3750(config-if)# auto qos video cts
! Autoconfigures conditional-trust policy for CTS
! (+ ingress and egress queuing policies)

```

Nonetheless, should an administrator choose to trust DSCP instead of CoS, he can still do so while using the **auto qos video cts** command, simply by manually adding an **mls qos trust dscp** interface command to the configuration.

This design option demonstrates a simple, yet powerful point: AutoQoS configurations may be modified and tailored to specific administrative needs or preferences. In other words, deploying AutoQoS is not an “all-or-nothing” option, but rather one that may be viewed as a generic template on which custom-tailored designs may be overlaid. Even

with a moderate amount of manual configuration, AutoQoS can still significantly expedite Medianet QoS deployments and greatly reduce manual configuration errors in the process.

Unlike CTS devices, IP video-surveillance cameras are only required to mark their video (and if supported, audio) flows at Layer 3 (typically to DSCP CS5/40). This allows for more flexible deployment models because these cameras do not therefore have to be deployed in dedicated VLANs connecting to the access switch via an 802.1Q trunk. Therefore, the **auto qos video ip-camera** interface command dynamically extends DSCP trust to such devices, after these have successfully identified themselves to the switch via CDP. DSCP trust is dynamically extended whether the port is configured as a Layer 2 switch port or as a Layer 3 routed interface, as shown in Example A-4.

Example A-4 *AutoQoS Video IP Camera Configuration on a Layer 2 Switch Port*

```
C3750(config)# interface GigabitEthernet1/0/1
C3750(config-if)# description L2-ACCESS-PORT-TO-IPVS-CAMERA
C3750(config-if)# switchport access vlan 10
C3750(config-if)# switchport voice vlan 110
C3750(config-if)# spanning-tree portfast
C3750(config-if)# auto qos video ip-camera
! Auto-configures conditional-trust policy for IPVS
! (+ ingress and egress queuing policies)
```

You can verify the effect of this **auto qos video ip-camera** policy on a Layer 2 switch port by the **show run interface** command, as shown in Example A-5.

Example A-5 *AutoQoS Video IP Camera Applied on a Layer 2 Switch Port Verification: show run interface*

```
C3750# show run interface GigabitEthernet 1/0/1
Building configuration...
Current configuration : 309 bytes
!
interface GigabitEthernet1/0/1
description L2-ACCESS-PORT-TO-IPVS-CAMERA
switchport access vlan 10

srr-queue bandwidth share 1 30 35 5
queue-set 2
priority-queue out
mls qos trust device ip-camera
! AutoQoS conditional-trust policy for ip-camera devices
mls qos trust dscp
```

```
! AutoQoS has configured DSCP trust to be dynamically extended
auto qos video ip-camera
spanning-tree portfast
end
```

In a similar vein to the CTS (DSCP trust) example, should an administrator want to extend CoS trust instead of DSCP trust to IPVS cameras, he could add `mls qos trust cos` to the `auto qos video ip-camera` interface configuration.

AutoQoS Classify and Police Models

The AutoQoS classify and police models provide a generic template to support additional rich-media and data applications, providing a classification (and optional policing) model for these. These models are most suitable for switch ports connecting to PC endpoint devices.

Six application classes (multimedia Conferencing, Signaling, Transactional Data, Bulk Data, Scavenger, and Best-Effort) are automatically defined via class maps. Each class map references an associated extended IP access list. These IP access lists define the TCP and UDP port numbers of the given class of applications are based on sample ports. *However, it cannot be overemphasized that these are just generic application examples for these classes and the administrator can add/change/delete the access list entries to match on their specific applications.*

Example A-6 shows the application of the `auto qos classify` command on a Layer 2 switch port.

Example A-6 AutoQoS Classify Configuration on a Layer 2 Switch Port

```
C3750(config)# interface GigabitEthernet1/0/1
C3750(config-if)# description L2-ACCESS-PORT-TO-PC
C3750(config-if)# switchport access vlan 10
C3750(config-if)# spanning-tree portfast
C3750(config-if)# auto qos classify
! Autoconfigures classify policy
! (+ ingress and egress queuing policies)
```

You can verify the effect of this `auto qos classify` policy on a Layer 2 switch port by the `show run` command, as shown in Example A-7.

Example A-7 AutoQoS Classify Configuration on a Layer 2 Switch Port Verification: `show run`

```
C3750# show run
Building configuration...
```

```

<snip>
! This section defines the class maps for AutoQoS-Classify
! Each class map is associated with an extended IP access list
class-map match-all AUTOQOS_MULTIENTHANCED_CONF_CLASS
  match access-group name AUTOQOS-ACL-MULTIENTHANCED-CONF
class-map match-all AUTOQOS_DEFAULT_CLASS
  match access-group name AUTOQOS-ACL-DEFAULT
class-map match-all AUTOQOS_TRANSACTION_CLASS
  match access-group name AUTOQOS-ACL-TRANSACTIONAL-DATA
class-map match-all AUTOQOS_SIGNALING_CLASS
  match access-group name AUTOQOS-ACL-SIGNALING
class-map match-all AUTOQOS_BULK_DATA_CLASS
  match access-group name AUTOQOS-ACL-BULK-DATA
class-map match-all AUTOQOS_SCAVANGER_CLASS
  match access-group name AUTOQOS-ACL-SCAVANGER
!
! This section defines the policy map for AutoQoS-Classify
policy-map AUTOQOS-SRND4-CLASSIFY-POLICY
  class AUTOQOS_MULTIENTHANCED_CONF_CLASS
    set dscp af41
    ! Marks multimedia conferencing traffic to AF41
  class AUTOQOS_BULK_DATA_CLASS
    set dscp af11
    ! Marks bulk data traffic to AF11
  class AUTOQOS_TRANSACTION_CLASS
    set dscp af21
    ! Marks transactional data traffic to AF21
  class AUTOQOS_SCAVANGER_CLASS
    set dscp cs1
    ! Marks scavenger traffic to CS1
  class AUTOQOS_SIGNALING_CLASS
    set dscp cs3
    ! Marks signaling traffic to CS3
  class AUTOQOS_DEFAULT_CLASS
    set dscp default
    ! An explicit default class marks best effort traffic to DF
!
<snip>
! This section applies the AutoQoS-Classify policy map to the interface
interface GigabitEthernet1/0/1
  description L2-ACCESS-PORT-TO-PC
  switchport access vlan 10

  srr-queue bandwidth share 1 30 35 5
  queue-set 2

```

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```
priority-queue out
auto qos classify
spanning-tree portfast
service-policy input AUTOQOS-SRND4-CLASSIFY-POLICY
  ! Attaches the AutoQoS-Classify service policy to the interface
!
<snip>
! This section defines the extended IP access lists for AutoQoS-Classify
ip access-list extended AUTOQOS-ACL-BULK-DATA
  permit tcp any any eq 22
  permit tcp any any eq 465
  permit tcp any any eq 143
  permit tcp any any eq 993
  permit tcp any any eq 995
  permit tcp any any eq 1914
  permit tcp any any eq ftp
  permit tcp any any eq ftp-data
  permit tcp any any eq smtp
  permit tcp any any eq pop3
ip access-list extended AUTOQOS-ACL-DEFAULT
  permit ip any any
ip access-list extended AUTOQOS-ACL-MULTIENHANCED-CONF
  permit udp any any range 16384 32767
ip access-list extended AUTOQOS-ACL-SCAVANGER
  permit tcp any any range 2300 2400
  permit udp any any range 2300 2400
  permit tcp any any range 6881 6999
  permit tcp any any range 28800 29100
  permit tcp any any eq 1214
  permit udp any any eq 1214
  permit tcp any any eq 3689
  permit udp any any eq 3689
  permit tcp any any eq 11999
ip access-list extended AUTOQOS-ACL-SIGNALING
  permit tcp any any range 2000 2002
  permit tcp any any range 5060 5061
  permit udp any any range 5060 5061
ip access-list extended AUTOQOS-ACL-TRANSACTIONAL-DATA
  permit tcp any any eq 443
  permit tcp any any eq 1521
  permit udp any any eq 1521
  permit tcp any any eq 1526
  permit udp any any eq 1526
  permit tcp any any eq 1575
  permit udp any any eq 1575
```



```

permit tcp any any eq 1630
permit udp any any eq 1630
!
<snip>

```

As you can see from the configuration output in Example A-7, the **auto qos classify** command generates class maps, associated extended IP access lists, and a policy map that is attached to the interface (along with input and output queuing policies, which are discussed in detail a following section). Again, note that the IP access list entries shown here are based on sample *ports and are just generic application examples for these classes. You can add/change/delete the access list entries to match on your specific applications.*

In addition, should the administrator want to enable data plane policing/Scavenger class QoS policies on these application classes, he may do so by including the option keyword **police** in conjunction with the **auto qos classify** interface command, as shown in Example A-8.

Example A-8 AutoQoS Classify and Police Configuration on a Layer 2 Switch Port

```

C3750(config)# interface GigabitEthernet1/0/1
C3750(config-if)# description L2-ACCESS-PORT-TO-PC
C3750(config-if)# switchport access vlan 10
C3750(config-if)# spanning-tree portfast
C3750(config-if)# auto qos classify police
! Auto-configures classify & police policy
! (+ ingress and egress queuing policies)

```

You can verify the effect of this **auto qos classify police** policy on a Layer 2 switch port by the **show run** command, as shown in Example A-9.

Note For the sake of brevity and to minimize redundancy, the class maps and extended IP access lists (which are identical to those shown in Example A-7) are not repeated in future examples.

Example A-9 AutoQoS Classify and Police Configuration on a Layer 2 Switch Port Verification: show run

```

C3750# show run
Building configuration...
<snip>
!
! This section configures the global policed-DSCP markdown map

```

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```
mls qos map policed-dscp 0 10 18 to 8
! DSCP 0 (DF), 10 (AF11) and 18 (AF21) are marked down to 8 (CS1)
! if found to be in excess of their (respective) policing rates
!
<snip>
! This section defines the policy-map for AutoQoS-Classify-Police
policy-map AUTOQOS-SRND4-CLASSIFY-POLICE-POLICY
class AUTOQOS_MULTITIENHANCED_CONF_CLASS
set dscp af41
police 5000000 8000 exceed-action drop
! Multimedia-conf is marked AF41 and policed to drop at 5 Mbps
class AUTOQOS_BULK_DATA_CLASS
set dscp af11
police 10000000 8000 exceed-action policed-dscp-transmit
! Bulk-data is marked AF11 and policed to re-mark (to CS1) at 10 Mbps
class AUTOQOS_TRANSACTION_CLASS
set dscp af21
police 10000000 8000 exceed-action policed-dscp-transmit
! Trans-data is marked AF21 and policed to re-mark (to CS1) at 10 Mbps
class AUTOQOS_SCAVANGER_CLASS
set dscp cs1
police 10000000 8000 exceed-action drop
! Scavenger traffic is marked CS1 and policed to drop at 10 Mbps
class AUTOQOS_SIGNALING_CLASS
set dscp cs3
police 32000 8000 exceed-action drop
! Signaling is marked CS3 and policed to drop at 32 Kbps
class AUTOQOS_DEFAULT_CLASS
set dscp default
police 10000000 8000 exceed-action policed-dscp-transmit
! An explicit default class marks all other IP traffic to DF
! and polices all other IP traffic to re-mark (to CS1) at 10 Mbps
!
<snip>
! This section applies the AutoQoS-Classify-Police policy map to the interface
interface GigabitEthernet1/0/1
description L2-ACCESS-PORT-TO-PC
switchport access vlan 10
switchport voice vlan 110
srr-queue bandwidth share 1 30 35 5
queue-set 2
priority-queue out
auto qos classify police
spanning-tree portfast
service-policy input AUTOQOS-SRND4-CLASSIFY-POLICE-POLICY
```

```

! Attaches the AutoQoS-Classify service policy to the interface
!
<snip>

```

As you can see from the configuration output in Example A-9, the two principle changes in the configuration attributable to the **police** keyword used in conjunction with the **auto qos classify** command are as follows:

- A globally defined **policed-dscp** map to mark down DF (0), AF11 (10), and AF21 (18) to CS1 (8)—if found to be exceeding their respective policing rates.
- An amended policy map that polices multimedia conferencing traffic (to drop if exceeding 5 Mbps), bulk data (to re-mark if exceeding 10 Mbps), transactional data (to re-mark if exceeding 10 Mbps), scavenger (to drop if exceeding 10 Mbps), signaling (to drop if exceeding 32 Kbps), and best-effort traffic (to re-mark if exceeding 10 Mbps).

AutoQoS VoIP Models

As with legacy AutoQoS-VoIP, there are three deployment options for AutoQoS (SRND4) VoIP: **trust**, **cisco-phone**, and **cisco-softphone**. Figure A-2 illustrates these updated **auto qos voip** deployment options—complete with ingress and egress queuing configurations.

An important point to be noted is that because the SRND4 versions of **auto qos voip** expand functionality beyond the original AutoQoS-VoIP feature, you must indicate which version of this AutoQoS-VoIP is desired. By default, simply entering **auto qos voip** interface configuration commands will invoke legacy AutoQoS-VoIP configurations. However, if you first enter **auto qos srnd4** in the global configuration command *before* applying these **auto qos voip** interface configuration commands, the SRND4 versions of **auto qos voip** will be applied.

Each of these **auto qos voip** deployment options is detailed in turn.

AutoQoS VoIP Trust Model

The first deployment option of **auto qos voip** is the **trust** option, which is effectively a legacy deployment option (because this functionality has been relegated by the previously discussed **auto qos trust** option). Like **auto qos trust**, **auto qos voip trust** configures static CoS trust on Layer 2 switch ports and static DSCP trust on Layer 3 routed interfaces. However, unlike **auto qos trust**, there is no additional **cos** or **dscp** keyword option to override these default trust settings (but this may be manually overridden with an explicitly defined **mls qos trust [cos | dscp]** interface configuration command).

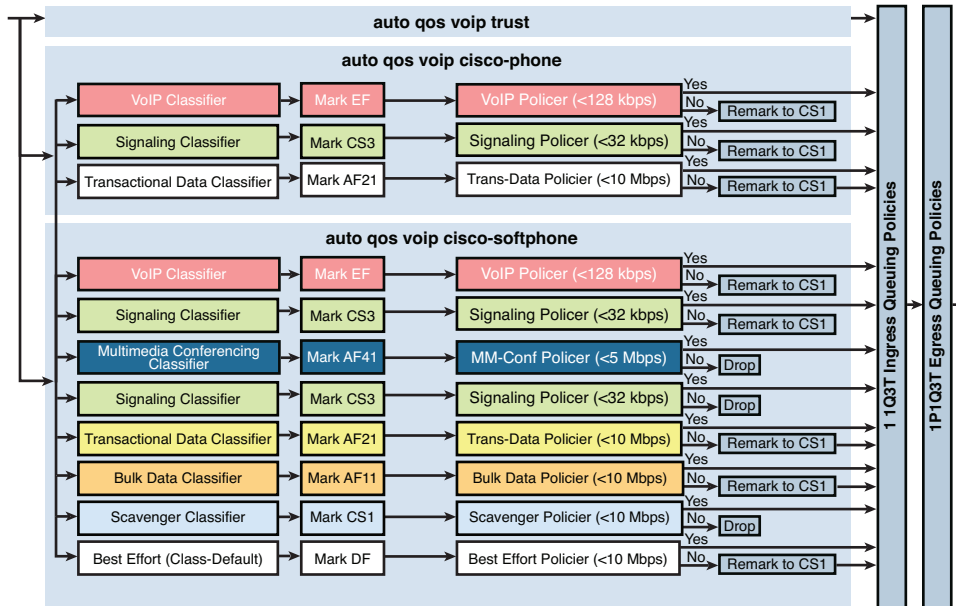


Figure A-2 AutoQoS SRND4 VoIP Models

AutoQoS VoIP Cisco Phone Model

A second deployment option offered by the (SRND4) **auto qos voip** feature is to use the **cisco-phone** keyword. As previously mentioned, the administrator must first enter **auto qos srnd4** in the global configuration before entering **auto qos voip cisco-phone** on a specific interfaces. When **auto qos voip cisco-phone** is configured on a Layer 2 switch port, it dynamically extends trust CoS to Cisco IP phones; when configured on Layer 3 routed interfaces, it dynamically extends trust DSCP to Cisco IP phones. In addition, this command configures data plane policing/Scavenger class QoS policies on voice, signaling, and best effort traffic, as shown in Example A-10 and Example A-11.

Example A-10 AutoQoS VoIP Cisco Phone (SRND4) Applied on a Layer 2 Switch Port

```
! This section specifies that SRND4 version of AutoQoS is to be enabled
C3750(config)# auto qos srnd4
! Globally defines the current version of AutoQoS to be SRND4
! This section applies AutoQoS (SRND4) to a layer 2 switch port
C3750(config)# interface GigabitEthernet1/0/1
C3750(config-if)# description L2-ACCESS-PORT
C3750(config-if)# switchport access vlan 10
C3750(config-if)# switchport voice vlan 110
C3750(config-if)# spanning-tree portfast
C3750(config-if)# auto qos voip cisco-phone
! Auto-configures conditional-trust + marking + policing for IP Phones
! (+ ingress and egress queuing policies)
```

You can verify the effect of this **auto qos voip cisco-phone** policy on a Layer 2 switch port by the **show run** command, as shown in Example A-11.

Example A-11 *AutoQoS VoIP Cisco Phone (SRND4) Applied on a Layer 2 Switch Port Verification: show run*

```
C3750# show run
Building configuration...
<snip>
! This section confirms the AutoQoS version currently enabled
auto qos srnd4
!
! This section defines the AutoQoS-VoIP-Cisco-Phone (SRND4) Class-Maps
class-map match-all AUTOQOS_VOIP_DATA_CLASS
  match ip dscp ef
  ! Voice is matched on DSCP EF
class-map match-all AUTOQOS_DEFAULT_CLASS
  match access-group name AUTOQOS-ACL-DEFAULT
  ! An explicit default class matches all other traffic via IP ACL
class-map match-all AUTOQOS_VOIP_SIGNAL_CLASS
  match ip dscp cs3
  ! Signaling traffic is matched on CS3
!
! This section defines the AutoQoS-VoIP-Cisco-Phone (SRND4) Policy-Map
policy-map AUTOQOS-SRND4-CISCOPHONE-POLICY
  class AUTOQOS_VOIP_DATA_CLASS
    set dscp ef
    police 128000 8000 exceed-action policed-dscp-transmit
    ! Voice is marked to DSCP EF and re-marked if exceeding 128 Kbps
  class AUTOQOS_VOIP_SIGNAL_CLASS
    set dscp cs3
    police 32000 8000 exceed-action policed-dscp-transmit
    ! Signaling is marked to DSCP CS3 and policed if exceeding 32 Kbps
  class AUTOQOS_DEFAULT_CLASS
    set dscp default
    police 10000000 8000 exceed-action policed-dscp-transmit
    ! An explicit default class marks all other IP traffic to DF
    ! and polices all other IP traffic to re-mark (to CS1) at 10 Mbps
!
! This section attaches the AutoQoS-VoIP-Cisco-Phone (SRND4) policy map to the
interface
interface GigabitEthernet1/0/1
  description L2-ACCESS-PORT
  switchport access vlan 10
  switchport voice vlan 110
  srr-queue bandwidth share 1 30 35 5
```

```

queue-set 2
priority-queue out
mls qos trust device cisco-phone
! AutoQoS has configured a conditional-trust policy for IP Phones
mls qos trust cos
! AutoQoS has configured CoS-trust to be dynamically extended
auto qos voip cisco-phone
spanning-tree portfast
service-policy input AUTOQOS-SRND4-CISCOPHONE-POLICY
! Attaches the AutoQoS-VoIP-Cisco-Phone Policy-Map to the interface
!
<snip>
! This section defines the explicit-default extended IP ACL
ip access-list extended AUTOQOS-ACL-DEFAULT
permit ip any any
!

```

Example A-11 shows that the applied version of **auto qos voip** is **srnd4** and, therefore, voice is policed to re-mark if exceeding 128 Kbps, signaling is policed to re-mark if exceeding 32 Kbps, and best effort traffic is policed to re-mark to scavenger if exceeding 10 Mbps.

AutoQoS VoIP Cisco-Softphone Model

A third deployment option offered by the (SRND4) **auto qos voip** feature is to use the **cisco-softphone** keyword. As previously mentioned, the administrator must first enter **auto qos srnd4** in the global configuration before entering **auto qos voip cisco-softphone** on specific interfaces.

In addition to the Voice and Signaling classes, six additional application classes (multimedia Conferencing, Signaling, Transactional Data, Bulk Data, Scavenger and Best Effort) are automatically defined via class maps. Each class map references an associated extended IP access list. These IP access lists define the TCP and UDP port numbers of the given class of applications, based on the sample ports. *However, it cannot be over-emphasized that these are just generic application examples for these classes and the administrator can add/change/delete the access list entries to match on their specific applications.*

Example A-12 shows the application of **auto qos voip cisco-softphone** on a Layer 2 switch port interface.

Example A-12 AutoQoS VoIP Cisco Softphone (SRND4) Applied on a Layer 2 Switch Port

```

! This section specifies that SRND4 version of AutoQoS is to be enabled
C3750(config)# auto qos srnd4

```

```

! Globally defines the current version of AutoQoS to be SRND4
! This section applies AutoQoS (SRND4) to a layer 2 switch port
C3750(config)# interface GigabitEthernet1/0/1
C3750(config-if)# description L2-ACCESS-PORT
C3750(config-if)# switchport access vlan 10
C3750(config-if)# switchport voice vlan 110
C3750(config-if)# spanning-tree portfast
C3750(config-if)# auto qos voip cisco-softphone
! Autoconfigures conditional-trust + marking +policers for softphones
! (+ ingress and egress queuing policies)

```

You can verify the effect of this **auto qos voip cisco-softphone** policy on a Layer 2 switch port with the **show run** command, as shown in Example A-13.

Note For the sake of brevity and to minimize redundancy, the class maps and extended IP access lists (which are identical to those shown in Example A-7) are not repeated here.

Example A-13 *AutoQoS VoIP Cisco Softphone (SRND4) Applied on a Layer 2 Switch Port Verification: show run*

```

C3750# show run
Building configuration...
<snip>
! This section confirms the AutoQoS version currently enabled
auto qos srnd4
!
<snip>
! This section defines the AutoQoS-VoIP-Cisco-SoftPhone policy map
policy-map AUTOQOS-SRND4-SOFTPHONE-POLICY
class AUTOQOS_VOIP_DATA_CLASS
set dscp ef
police 128000 8000 exceed-action policed-dscp-transmit
! Voice is marked to DSCP EF and re-marked if exceeding 128 Kbps
class AUTOQOS_VOIP_SIGNAL_CLASS
set dscp cs3
police 32000 8000 exceed-action policed-dscp-transmit
! Signaling is marked to DSCP CS3 and re-marked if exceeding 32 Kbps
class AUTOQOS_MULTIHANCED_CONF_CLASS
set dscp af41
police 5000000 8000 exceed-action drop
! MM-Conf is marked to DSCP AF41 and re-marked if exceeding 5 Mbps
class AUTOQOS_BULK_DATA_CLASS
set dscp af11

```

```

police 10000000 8000 exceed-action policed-dscp-transmit
! Bulk Data is marked to DSCP AF11 and re-marked if exceeding 10 Mbps
class AUTOQOS_TRANSACTION_CLASS
set dscp af21
police 10000000 8000 exceed-action policed-dscp-transmit
! Trans-Data is marked to DSCP AF21 and re-marked if exceeding 10 Mbps
class AUTOQOS_SCAVANGER_CLASS
set dscp cs1
police 10000000 8000 exceed-action drop
! Scavenger is marked to DSCP CS1 and re-marked if exceeding 10 Mbps
class AUTOQOS_SIGNALING_CLASS
set dscp cs3
police 32000 8000 exceed-action drop
! Signaling is marked to DSCP CS3 and dropped if exceeding 32 Kbps
class AUTOQOS_DEFAULT_CLASS
set dscp default
! An explicit default class marks all other IP traffic to DF
!
<snip>
! This section attaches the AutoQoS-VoIP-Cisco-SoftPhone (SRND4) policy map to the
interface
interface GigabitEthernet1/0/1
description L2-ACCESS-PORT
switchport access vlan 10
switchport voice vlan 110
srr-queue bandwidth share 1 30 35 5
queue-set 2
priority-queue out
auto qos voip cisco-softphone
spanning-tree portfast
service-policy input AUTOQOS-SRND4-SOFTPHONE-POLICY
! Attaches the AutoQoS-VoIP-Cisco-SoftPhone Policy to the interface
!

```

AutoQoS 1P1Q3T Ingress Queuing Models

Example A-14 shows the AutoQoS SRND4 ingress queuing model configuration. These ingress queuing policies are automatically configured along with any other AutoQoS SRND4 QoS model.

Example A-14 AutoQoS (SRND4) 1P1Q3T Ingress Queuing Verification: *show run*

```

C3750# show run
Building configuration...

```



```

<snip>
! This section displays (non-default) input queue parameters
mls qos srr-queue input bandwidth 70 30
! Q1 is assigned 70% BW via SRR shared weights
! Q2 SRR shared weight is ignored (as it has been configured as a PQ)
mls qos srr-queue input threshold 1 80 90
! Q1 thresholds are configured at 80% (Q1T1) and 90% (Q1T2)
! Q1T3 is implicitly set at 100% (the tail of the queue)
! Q2 thresholds are all set (by default) to 100% (the tail of Q2)
mls qos srr-queue input priority-queue 2 bandwidth 30
! Q2 is enabled as a strict-priority ingress queue with 30% BW
! This section displays (non-default) ingress CoS-to-Queue mappings
mls qos srr-queue input cos-map queue 1 threshold 2 3
! CoS value 3 is mapped to ingress Q1T2
mls qos srr-queue input cos-map queue 1 threshold 3 6 7
! CoS values 6 and 7 are mapped to ingress Q1T3
mls qos srr-queue input cos-map queue 2 threshold 1 4
! CoS values 4 is mapped to ingress Q2 (the PQ)
! This section displays (non-default) ingress DSCP-to-Queue mappings
mls qos srr-queue input dscp-map queue 1 threshold 2 24
! DSCP CS3 is mapped to ingress Q1T2
mls qos srr-queue input dscp-map queue 1 threshold 3 48 49 50 51 52 53 54 55
! DSCP CS6 (48) and non-standard DSCPs 49-55 are mapped to Q1T3
mls qos srr-queue input dscp-map queue 1 threshold 3 56 57 58 59 60 61 62 63
! DSCP CS7 (56) and non-standard DSCPs 57-63 are mapped to Q1T3
mls qos srr-queue input dscp-map queue 2 threshold 3 32 33 40 41 42 43 44 45
! DSCP CS4 (32), CS5 (40) and non-standard DSCPs 33-45 are mapped to Q2T3
mls qos srr-queue input dscp-map queue 2 threshold 3 46 47
! DSCP EF (46) and non-standard DSCP 47 are mapped to Q2T3

```

Note Ingress queuing is not supported on the Cisco Catalyst 2960-S.

AutoQoS 1P3Q3T Egress Queuing Models

Example A-15 shows the AutoQoS SRND4 egress queuing model configuration. These egress queuing policies are automatically configured along with any other AutoQoS SRND4 QoS model.

Example A-15 *AutoQoS (SRND4) 1P3Q3T Egress Queuing Verification: show run*

```

C3750# show run
Building configuration...

```

```

<snip>
! This section displays (non-default) egress CoS-to-Queue mappings
mls qos srr-queue output cos-map queue 1 threshold 3 4 5
! CoS 4 and 5 are mapped to egress Q1T3 (the tail of the PQ)
mls qos srr-queue output cos-map queue 2 threshold 1 2
! CoS 2 is mapped to egress Q2T1
mls qos srr-queue output cos-map queue 2 threshold 2 3
! CoS 3 is mapped to egress Q2T2
mls qos srr-queue output cos-map queue 2 threshold 3 6 7
! CoS 6 and 7 are mapped to Q2T3
mls qos srr-queue output cos-map queue 3 threshold 3 0
! CoS 0 is mapped to Q3T3 (the tail of the default queue)
mls qos srr-queue output cos-map queue 4 threshold 3 1
! CoS 1 is mapped to Q4T3 (tail of the less-than-best-effort queue)
! This section displays (non-default) egress DSCP-to-Queue mappings
mls qos srr-queue output dscp-map queue 1 threshold 3 32 33 40 41 42 43 44 45
! Maps CS4 (32) and DSCPs 33-45 to Q1T3 (the tail of the PQ)
mls qos srr-queue output dscp-map queue 1 threshold 3 46 47
! Maps EF (46) and non-standard DSCP 47 to Q1T3 (the tail of the PQ)
mls qos srr-queue output dscp-map queue 2 threshold 1 16 17 18 19 20 21 22 23
! Maps CS2 (16) and AF2 (18/20/22) and DSCPs 17-23 to Q2T1
mls qos srr-queue output dscp-map queue 2 threshold 1 26 27 28 29 30 31 34 35
! Maps AF3 (26/28/30) and AF41 (34) and DSCPs 27-35 to Q2T1
mls qos srr-queue output dscp-map queue 2 threshold 1 36 37 38 39
! Maps AF42 (36) and AF43 (38) and DSCPs 37-39 to Q2T1
mls qos srr-queue output dscp-map queue 2 threshold 2 24
! Maps CS3 (24) to Q2T2
mls qos srr-queue output dscp-map queue 2 threshold 3 48 49 50 51 52 53 54 55
! Maps CS6 (48) and non-standard DSCPs 49-55 to Q2T3
mls qos srr-queue output dscp-map queue 2 threshold 3 56 57 58 59 60 61 62 63
! Maps CS7 (56) and non-standard DSCPs 57-63 to Q2T3
mls qos srr-queue output dscp-map queue 3 threshold 3 0 1 2 3 4 5 6 7
! Maps DF (0) and DSCPs 1-7 to Q3T3 (tail of best-effort queue)
mls qos srr-queue output dscp-map queue 4 threshold 1 8 9 11 13 15
! Maps CS1 and non-standard DSCPs 9-15 to Q4T1
mls qos srr-queue output dscp-map queue 4 threshold 2 10 12 14
! Maps AF1 (10/12/14) to Q4T2

! This section displays (non-default) egress queue parameters
mls qos queue-set output 1 threshold 1 100 100 50 200
! Q1T1 is set to 100%; Q1T2 is set to 100%;
! Q1 (PQ) Reserve Threshold is set to 100%;
! Q1 (PQ) Maximum (Overflow) Threshold is set to 200%
mls qos queue-set output 1 threshold 2 125 125 100 400
! Q2T1 is set to 125%; Q2T2 is set to 125%;

```

```

! Q2 Reserve Threshold is set to 100%;
! Q2 Maximum (Overflow) Threshold is set to 400%
mls qos queue-set output 1 threshold 3 100 100 100 400
! Q3T1 is set to 100%, Q2T2 is set to 100%
! Q3 Reserve Threshold is set to 100%;
! Q3 Maximum (Overflow) Threshold is set to 400%
mls qos queue-set output 1 threshold 4 60 150 50 200
! Q4T1 is set to 60%; Q4T2 is set to 150%
! Q4 Reserve Threshold is set to 50%;
! Q4 Maximum (Overflow) Threshold is set to 200%
mls qos queue-set output 1 buffers 15 25 40 20
! Allocates 15% of buffers to Q1; 25% to Q2; 40% to Q3 and 20% to Q4
<snip>
! This section displays (non-default) interface egress queuing settings
interface GigabitEthernet1/0/1
description L2-ACCESS-PORT
switchport access vlan 10
switchport voice vlan 110
srr-queue bandwidth share 1 30 35 5
! The SRR sharing weights are set to allocate 30% BW to Q2
! 35% BW to Q3 and 5% BW to Q4
! Q1 SRR sharing weight is ignored, as it will be configured as a PQ
queue-set 2
! The interface(s) is assigned to queue-set 1
priority-queue out
! Q1 is enabled as a strict priority queue
mls qos trust cos
auto qos trust
spanning-tree portfast
!

```

AutoQoS SRND4 Models for Cisco Catalyst 4500 Series Switches

AutoQoS Version 4 (equivalent to AutoQoS SRND4 on the Catalyst 2K/3K series platforms) automatically defines eight policy maps: Three provide backward compatibility with AutoQoS-VoIP, and an additional five support AutoQoS Version 4. These policy maps are as follows:

- AutoQos-VoIP-Input-Cos-Policy
- AutoQos-VoIP-Input-Dscp-Policy
- AutoQos-VoIP-Output-Policy

- AutoQos-4.0-Input-Policy
- AutoQos-4.0-Classify-Input-Policy
- AutoQos-4.0-Cisco-Phone-Input-Policy
- AutoQos-4.0-Cisco-Softphone-Input-Policy
- AutoQos-4.0-Output-Policy

Each of these policy-maps is detailed in turn.

AutoQos-VoIP-Input-Cos-Policy

As shown in Example A-16, the AutoQos-VoIP-Input-Cos-Policy matches VoIP traffic on CoS 5 and 3 for media and signaling (respectively) and associates these with QoS groups 46 and 24 (respectively) for egress queuing (via the AutoQos-VoIP-Output-Policy).

Example A-16 C4500 AutoQoS: AutoQos-VoIP-Input-Cos-Policy

```
C4500# show run
Building configuration...
<snip>
! This section defines the AutoQos-VoIP-Input-Cos-Policy class maps
class-map match-all AutoQos-VoIP-Bearer-Cos
  match cos 5
! VoIP media traffic is matched on CoS 5
class-map match-all AutoQos-VoIP-Control-Cos
  match cos 3
! VoIP signaling traffic is matched on CoS 3

! This section defines the AutoQos-VoIP-Input-Cos-Policy map
policy-map AutoQos-VoIP-Input-Cos-Policy
  class AutoQos-VoIP-Bearer-Cos
    set qos-group 46
! VoIP media is associated with QoS-Group 46 (for queuing)
  class AutoQos-VoIP-Control-Cos
    set qos-group 24
! VoIP signaling is associated with QoS-Group 24 (for queuing)
```

AutoQos-VoIP-Input-Dscp-Policy

Similarly, as shown in Example A-17, the AutoQos-VoIP-Input-Dscp-Policy matches VoIP traffic on DSCP EF for media. However, it matches signaling traffic on both CS3 and AF31 (a legacy marking value for signaling). VoIP media is associated with QoS group

46, and the signaling classes are associated with QoS groups 24 and 26 (respectively) for egress queuing (via the AutoQoS-VoIP-Output-Policy).

Example A-17 *C4500 AutoQoS: AutoQoS-VoIP-Input-Dscp-Policy*

```
C4500# show run
Building configuration...
<snip>
! This section defines the AutoQoS-VoIP-Input-Dscp-Policy class maps
class-map match-all AutoQoS-VoIP-Bearer-Dscp
  match dscp ef
! VoIP media traffic is matched on DSCP EF
class-map match-all AutoQoS-VoIP-Control-Dscp26
  match dscp af31
! VoIP signaling traffic is matched on DSCP AF31 (legacy marking)
class-map match-all AutoQoS-VoIP-Control-Dscp24
  match dscp cs3
! VoIP signaling traffic is matched on CS3

! This section defines the AutoQoS-VoIP-Input-Dscp-Policy map
policy-map AutoQoS-VoIP-Input-Dscp-Policy
  class AutoQoS-VoIP-Bearer-Dscp
    set qos-group 46
! VoIP media is associated with QoS-Group 46 (for queuing)
  class AutoQoS-VoIP-Control-Dscp26
    set qos-group 26
! VoIP signaling (AF31) is associated with QoS-Group 26 (for queuing)
  class AutoQoS-VoIP-Control-Dscp24
    set qos-group 24
! VoIP signaling (CS3) is associated with QoS-Group 24 (for queuing)
```

AutoQoS-VoIP-Output-Policy

As the previously defined AutoQoS-VoIP-Input-Cos-Policy and AutoQoS-VoIP-Input-Dscp-Policy have mapped VoIP media and signaling to respective QoS groups, these QoS groups can be mapped directly to egress queues by the AutoQoS-VoIP-Output-Policy, as shown in Example A-18.

Example A-18 *C4500 AutoQoS: AutoQoS-VoIP-Output-Policy*

```
C4500# show run
Building configuration...
<snip>
! This section defines the AutoQoS-VoIP-Output-Policy class maps
```

```

class-map match-all AutoQos-VoIP-Bearer-QoSGroup
  match qos-group 46
  ! VoIP media traffic is matched on QoS-group 46 for egress queuing
class-map match-all AutoQos-VoIP-Control-QoSGroup26
  match qos-group 26
  ! VoIP signaling (AF31) is matched on QoS-group 26 for egress queuing
class-map match-all AutoQos-VoIP-Control-QoSGroup24
  match qos-group 24
  ! VoIP signaling (CS3) is matched on QoS-group 24 for egress queuing

! This section defines the AutoQos-VoIP-Output-Policy map
policy-map AutoQos-VoIP-Output-Policy
  class AutoQos-VoIP-Bearer-QoSGroup
    set dscp ef
    set cos 5
    priority
    police cir percent 33
  ! VoIP media is marked DSCP EF and CoS 5
  ! and is provisioned with a strict priority service
  ! but limited to 33% BW
  class AutoQos-VoIP-Control-QoSGroup26
    set dscp af31
    set cos 3
    bandwidth remaining percent 5
  ! VoIP signaling (AF31) is marked DSCP AF31 and CoS 3
  ! and is provisioned with a guaranteed-bandwidth service
  class AutoQos-VoIP-Control-QoSGroup24
    set dscp cs3
    set cos 3
    bandwidth remaining percent 5
  ! VoIP signaling (CS3) is marked DSCP CS3 and CoS 3
  ! and is provisioned with a guaranteed-bandwidth service
  class class-default
    dbl
  ! DBL is enabled on the default class

```

AutoQos-4.0-Input-Policy

The AutoQos-4.0-Input-Policy, shown in Example A-19, is intended for ports that are connected to *trusted* endpoints, and therefore bases classification on CoS/DSCP markings. These markings are then mapped to corresponding QoS groups for egress queue mapping (via the AutoQos-4.0-Output-Policy).

Example A-19 *C4500 AutoQoS: AutoQos-4.0-Input-Policy*

```
C4500# show run
Building configuration...
<snip>
! This section defines the AutoQos-4.0-Input-Policy class maps
class-map match-any AutoQos-4.0-VoIP
  match dscp ef
  match cos 5
! VoIP is matched on DSCP EF and CoS 5
class-map match-all AutoQos-4.0-Broadcast-Vid
  match dscp cs5
! Broadcast Video is matched on DSCP CS5
class-map match-all AutoQos-4.0-Realtime-Interact
  match dscp cs4
! Realtime Interactive is matched on DSCP CS4
class-map match-all AutoQos-4.0-Network-Ctrl
  match dscp cs7
! Network Control is matched on DSCP CS7
class-map match-all AutoQos-4.0-Internetwork-Ctrl
  match dscp cs6
! Internetwork Control is matched on DSCP CS6
class-map match-any AutoQos-4.0-Signaling
  match dscp cs3
  match cos 3
! Signaling is matched on DSCP CS3 and CoS 3
class-map match-all AutoQos-4.0-Network-Mgmt
  match dscp cs2
! Network management is matched on DSCP CS2
class-map match-any AutoQos-4.0-Multimedia-Conf
  match dscp af41
  match dscp af42
  match dscp af43
! Multimedia Conferencing is matched on AF4
class-map match-any AutoQos-4.0-Multimedia-Stream
  match dscp af31
  match dscp af32
  match dscp af33
! Multimedia Streaming is matched on AF3
class-map match-any AutoQos-4.0-Transaction-Data
  match dscp af21
  match dscp af22
  match dscp af23
! Transactional Data is matched on AF2
class-map match-any AutoQos-4.0-Bulk-Data
```

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```
match dscp af11
match dscp af12
match dscp af13
! Bulk Data is matched on AF1
class-map match-all AutoQos-4.0-Scavenger
  match dscp cs1
! Scavenger is matched on DSCP CS1

! This section defines the AutoQos-4.0-Input-Policy map
policy-map AutoQos-4.0-Input-Policy
  class AutoQos-4.0-VoIP
    set qos-group 32
! VoIP media is associated with QoS-Group 32 (for queuing)
  class AutoQos-4.0-Broadcast-Vid
    set qos-group 32
! Broadcast Video is associated with QoS-Group 32 (for queuing)
  class AutoQos-4.0-Realtime-Interact
    set qos-group 32
! Realtime Interactive is associated with QoS-Group 32 (for queuing)
  class AutoQos-4.0-Network-Ctrl
    set qos-group 16
! Network Control is associated with QoS-Group 16 (for queuing)
  class AutoQos-4.0-Internetwork-Ctrl
    set qos-group 16
! Internetwork Control is associated with QoS-Group 16 (for queuing)
  class AutoQos-4.0-Signaling
    set qos-group 16
! Signaling is associated with QoS-Group 16 (for queuing)
  class AutoQos-4.0-Network-Mgmt
    set qos-group 16
! Network Management is associated with QoS-Group 16 (for queuing)
  class AutoQos-4.0-Multimedia-Conf
    set qos-group 34
! Multimedia Conf is associated with QoS-Group 34 (for queuing)
  class AutoQos-4.0-Multimedia-Stream
    set qos-group 26
! Multimedia Streaming is associated with QoS-Group 26 (for queuing)
  class AutoQos-4.0-Transaction-Data
    set qos-group 18
! Transactional Data is associated with QoS-Group 18 (for queuing)
  class AutoQos-4.0-Bulk-Data
    set qos-group 10
! Bulk Data is associated with QoS-Group 10 (for queuing)
  class AutoQos-4.0-Scavenger
    set qos-group 8
! Scavenger is associated with QoS-Group 8 (for queuing)
```


AutoQos-4.0-Classify-Input-Policy

In contrast to the previous model, the AutoQos-4.0-Classify-Input-Policy, shown in Example A-20, is intended for ports that are connected to *untrusted* endpoints, and therefore bases classification on extended IP ACLs for marking and queuing (via the AutoQos-4.0-Output-Policy).

Example A-20 C4500 AutoQoS: AutoQos-4.0-Classify-Input-Policy

```
C4500# show run
Building configuration...
<snip>
! This section defines AutoQos-4.0-Classify-Input-Policy class maps
! Each class map is associated with a respective extended ACL
! <Extended ACLs are not shown for the sake of brevity>
class-map match-all AutoQos-4.0-Multimedia-Conf-Classify
  match access-group name AutoQos-4.0-ACL-Multimedia-Conf
class-map match-all AutoQos-4.0-Signaling-Classify
  match access-group name AutoQos-4.0-ACL-Signaling
class-map match-all AutoQos-4.0-Transaction-Classify
  match access-group name AutoQos-4.0-ACL-Transactional-Data
class-map match-all AutoQos-4.0-Bulk-Data-Classify
  match access-group name AutoQos-4.0-ACL-Bulk-Data
class-map match-all AutoQos-4.0-Scavenger-Classify
  match access-group name AutoQos-4.0-ACL-Scavenger
class-map match-all AutoQos-4.0-Default-Classify
  match access-group name AutoQos-4.0-ACL-Default

! This section defines the AutoQos-4.0-Classify-Input-Policy map
policy-map AutoQos-4.0-Classify-Input-Policy
  class AutoQos-4.0-Multimedia-Conf-Classify
    set dscp af41
    set cos 4
    set qos-group 34
! Multimedia Conf is marked DSCP AF41 and CoS 4
! and is associated with QoS-Group 34 (for queuing)
  class AutoQos-4.0-Signaling-Classify
    set dscp cs3
    set cos 3
    set qos-group 16
! Signaling is marked DSCP CS3 and CoS 3
! and is associated with QoS-Group 16 (for queuing)
  class AutoQos-4.0-Transaction-Classify
    set dscp af21
    set cos 2
    set qos-group 18
```

```

! Transactional Data is marked DSCP AF21 and CoS 2
! and is associated with QoS-Group 18 (for queuing)
class AutoQos-4.0-Bulk-Data-Classify
  set dscp af11
  set cos 1
  set qos-group 10
! Bulk Data is marked DSCP AF11 and CoS 1
! and is associated with QoS-Group 10 (for queuing)
class AutoQos-4.0-Scavenger-Classify
  set dscp cs1
  set cos 1
  set qos-group 8
! Scavenger is marked DSCP CS1 and CoS 1
! and is associated with QoS-Group 8 (for queuing)
class AutoQos-4.0-Default-Classify
  set dscp default
  set cos 0
! Best Effort is marked DSCP DF and CoS 0

```

AutoQos-4.0-Cisco-Phone-Input-Policy

In the AutoQos-4.0-Cisco-Phone-Input-Policy, VoIP and signaling traffic (matched by CoS 5 and CoS 3, respectively) are marked to DSCP EF and CS3 (respectively) and associated with QoS groups 32 and 16 (respectively). In addition, VoIP is policed to 128 Kbps and signaling is policed to 32 Kbps; both traffic classes will be re-marked to CS1 (scavenger) if exceeding their respective policing rates. Finally, a data-plane policing policy is applied to the default class to re-mark endpoint-generated flows as scavenger if above 10 Mbps. The AutoQos-4.0-Cisco-Phone-Input-Policy is shown in Example A-21.

Example A-21 C4500 AutoQoS: AutoQos-4.0-Cisco-Phone-Input-Policy

```

C4500# show run
Building configuration...
<snip>
! <class maps are omitted for brevity and to minimize redundancy>
! This section defines the AutoQos-4.0-Cisco-Phone-Input-Policy map
policy-map AutoQos-4.0-Cisco-Phone-Input-Policy
  class AutoQos-4.0-VoIP-Data-Cos
    set dscp ef
    set qos-group 32
  police cir 128000 bc 8000
    conform-action transmit
    exceed-action set-dscp-transmit cs1
    exceed-action set-cos-transmit 1

```

```

! VoIP is marked DSCP EF & associated with QoS-group 32 (for queuing)
! and is policed to 128 Kbps and re-marked as scavenger if exceeding
class AutoQos-4.0-VoIP-Signal-Cos
  set dscp cs3
  set qos-group 16
  police cir 32000 bc 8000
    conform-action transmit
    exceed-action set-dscp-transmit cs1
    exceed-action set-cos-transmit 1
! Signaling is marked DSCP CS3 & associated with QoS group 16
! and is policed to 32kbps and re-marked as scavenger if exceeding
class AutoQos-4.0-Default-Classify
  set dscp default
  set cos 0
  police cir 10000000 bc 8000
    conform-action transmit
    exceed-action set-dscp-transmit cs1
    exceed-action set-cos-transmit 1
! Best Effort is marked DSCP DF & CoS 0
! and is policed to 10 Mbps and re-marked as scavenger if exceeding

```

AutoQos-4.0-Cisco-Softphone-Input-Policy

The AutoQos-4.0-Cisco-Softphone-Input-Policy expands on the previous model to include data plane policing on all traffic classes, and is shown in Example A-22.

Example A-22 C4500 AutoQoS: AutoQos-4.0-Cisco-Softphone-Input-Policy

```

C4500# show run
Building configuration...
<snip>
! <class maps are omitted for brevity and to minimize redundancy>
! This section defines the AutoQos-4.0-Cisco-Softphone-Input-Policy map
policy-map AutoQos-4.0-Cisco-Softphone-Input-Policy
  class AutoQos-4.0-VoIP-Data
    set dscp ef
    set cos 5
    set qos-group 32
    police cir 128000 bc 8000
      conform-action transmit
      exceed-action set-dscp-transmit cs1
      exceed-action set-cos-transmit 1
! VoIP is marked DSCP EF & CoS 5
! and is associated with QoS-group 32 (for queuing)

```

```
! and is policed to 128 Kbps and re-marked as scavenger if exceeding
class AutoQos-4.0-VoIP-Signal
  set dscp cs3
  set cos 3
  set qos-group 16
  police cir 32000 bc 8000
    conform-action transmit
    exceed-action set-dscp-transmit cs1
    exceed-action set-cos-transmit 1
! Signaling is marked DSCP CS3 & CoS 3
! and is associated with QoS group 16 (for queuing)
! and is policed to 32 Kbps and re-marked as scavenger if exceeding
class AutoQos-4.0-Multimedia-Conf-Classify
  set dscp af41
  set cos 4
  set qos-group 34
  police cir 5000000 bc 8000
    conform-action transmit
    exceed-action drop
! Multimedia conferencing is marked DSCP AF41 & CoS 4
! and is associated with QoS group 34 (for queuing)
! and is policed to 5 Mbps and re-marked as scavenger if exceeding
class AutoQos-4.0-Signaling-Classify
  set dscp cs3
  set cos 3
  set qos-group 16
  police cir 32000 bc 8000
    conform-action transmit
    exceed-action drop
! Signaling is marked DSCP CS3 & CoS 3
! and is associated with QoS group 16 (for queuing)
! and is policed to 32 Kbps and re-marked as scavenger if exceeding
class AutoQos-4.0-Transaction-Classify
  set dscp af21
  set cos 2
  set qos-group 18
  police cir 10000000 bc 8000
    conform-action transmit
    exceed-action set-dscp-transmit cs1
    exceed-action set-cos-transmit 1
! Transactional data is marked DSCP AF21 & CoS 2
! and is associated with QoS group 18 (for queuing)
! and is policed to 10 Mbps and re-marked as scavenger if exceeding
class AutoQos-4.0-Bulk-Data-Classify
  set dscp af11
```

```

set cos 1
set qos-group 10
police cir 10000000 bc 8000
  conform-action transmit
  exceed-action set-dscp-transmit cs1
  exceed-action set-cos-transmit 1
! Transactional data is marked DSCP AF11 & CoS 1
! and is associated with QoS group 10 (for queuing)
! and is policed to 10 Mbps and re-marked as Scavenger if exceeding
class AutoQos-4.0-Scavenger-Classify
  set dscp cs1
  set cos 1
  set qos-group 8
  police cir 10000000 bc 8000
    conform-action transmit
    exceed-action drop
! Scavenger is marked DSCP CS1 & CoS 1
! and is associated with QoS group 8 (for queuing)
! and is policed to 10 Mbps and re-marked as Scavenger if exceeding
class AutoQos-4.0-Default-Classify
  set dscp default
  set cos 0
! Best effort is marked DSCP DF & CoS 0

```

AutoQos-4.0-Output-Policy

Because the previously defined AutoQoS-4.0 input policies have mapped application classes to their respective QoS-groups, these QoS groups can be mapped directly to egress queues by the AutoQos-4.0-Output-Policy, as shown in Example A-23.

Example A-23 C4500 AutoQoS: AutoQos-4.0-Output-Policy

```

C4500# show run
Building configuration...
<snip>
! <class maps are omitted for brevity and to minimize redundancy>
! This section defines the AutoQos-4.0-Output-Policy map
policy-map AutoQos-4.0-Output-Policy
  class AutoQos-4.0-Scavenger-Queue
    bandwidth remaining percent 1
! Scavenger traffic is constrained to 1% BWR
  class AutoQos-4.0-Priority-Queue
    priority
  police cir percent 30 bc 33 ms

```

```
conform-action transmit
exceed-action drop
! VoIP traffic is given strict-priority service
! but is limited to 33%
class AutoQos-4.0-Control-Mgmt-Queue
bandwidth remaining percent 10
! Control and Management traffic is given 10% BWR
class AutoQos-4.0-Multimedia-Conf-Queue
bandwidth remaining percent 10
! Multimedia conferencing traffic is given 10% BWR
class AutoQos-4.0-Multimedia-Stream-Queue
bandwidth remaining percent 10
! Multimedia streaming traffic is given 10% BWR
class AutoQos-4.0-Trans-Data-Queue
bandwidth remaining percent 10
dbl
! Transactional data traffic is given 10% BWR with DBL
class AutoQos-4.0-Bulk-Data-Queue
bandwidth remaining percent 4
dbl
! Bulk data traffic is given 5% BWR with DBL
class class-default
bandwidth remaining percent 25
dbl
! Best effort traffic is given 25% BWR with DBL
```

Additional Reading

Cisco Enterprise Medianet Campus QoS Design 4.0: http://www.cisco.com/en/US/docs/solutions/Enterprise/WAN_and_MAN/QoS_SRND_40/QoS_Campus_40.html

Cisco Medianet Campus AutoQoS At-A-Glance: <http://www.cisco.com/en/US/docs/solutions/Enterprise/Video/autoqosmediacampus.pdf>

Cisco Catalyst 3750 AutoQoS Configuration Guide: http://www.cisco.com/en/US/docs/switches/lan/catalyst3750x_3560x/software/release/15.0_2_se/configuration/guide/swqos.html#wp1231112

Cisco Catalyst 4500 AutoQoS Configuration Guide: http://www.cisco.com/en/US/docs/switches/lan/catalyst4500/15.1/XE_330SG/configuration/guide/qos_mrg.html#wp1563359