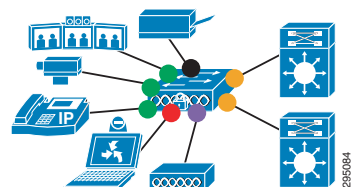


Role in Medianet Campus Network

The Catalyst 3650/3850 series switches are engineered to serve as a converged access switch in wired and wireless medianet campus networks. As such, these switches may connect directly to a variety of endpoints and distribution-layer switches, as shown in Figure 1.

Figure 1 Cisco Catalyst 3650/3850 Switch in a Medianet Campus Network



QoS Design Steps

There are two main steps to configure QoS on Cisco Catalyst 3650/3850 series switches:

1. Configure Ingress QoS Model(s):
 - Trust DSCP Model
 - Conditional Trust Model (wired ports only)
 - Service Policy Models
2. Configure Egress Queuing
 - Wired Queuing Models: 1P7Q3T or 2P6Q3T
 - Wireless Queuing Model: 2P2Q+AFD

Step 1: Configure Ingress QoS Model(s)

The three most utilized ingress QoS models for medianet campus networks are:

- Trust DSCP Model
- Conditional Trust Model
- Service Policy Models

Combinations of these ingress QoS models may be used at the same time.

Trust DSCP Model

Wired ports on the Catalyst 3650/3850 default to a trusted state (shown as orange circles in Figure 1), but wireless ports default to an untrusted state. Nonetheless, wireless ports can also be configured to be trusted by the global configuration command: **no qos wireless-default-untrust**.

Conditional Trust Model

The Conditional Trust model configures the interface to *dynamically* accept markings from endpoints that have met a specific condition, such as a successful CDP negotiation (switch ports set to conditional trust are shown as green circles in Figure 1).

This model is suitable for switch ports connecting to:

- Cisco IP phones—**trust device cisco-phone**
- Cisco TelePresence Systems—**trust device cts**
- Cisco IP Video Surveillance cameras—**trust device ip-camera**
- Cisco Digital Media Players—**trust device media-player**

This model is also suitable for PCs and untrusted devices, since the ports connecting to such devices will remain in their default untrusted state (shown as black circles in Figure 1).

Service Policy Models

There may be cases where administrators require more detailed or granular policies on their ingress edges and as such they may construct MQC-based policies to implement classification, marking, and/or policing policies. These policies are constructed with:

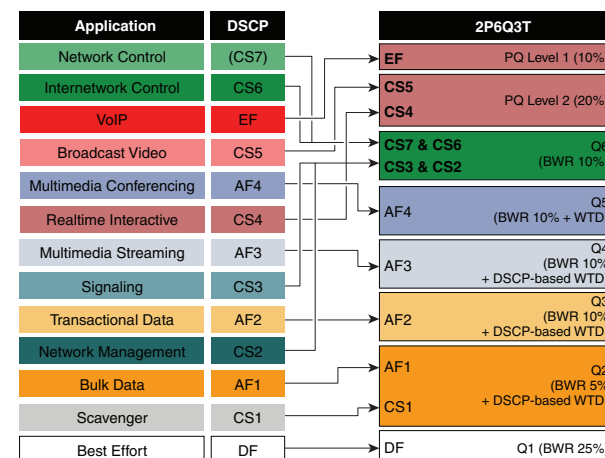
- **class-maps** which identify the flows using packet markings or by access-lists or other criteria
- **policy-maps** which specify policy actions to be taken on a class-by-class basis
- **service-policy** statements which apply a specific policy-map to an interface(s) and specify direction

On the Catalyst 3650/3850, service policies may be applied to wired or wireless ports (shown as red circles in Figure 1) or to individual wireless clients (shown as purple circles in Figure 1).

Step 2a: Configure Egress Queuing for Wired Ports

Wired ports can be configured with either a 1P7Q3T or 2P6Q3T egress queuing model. The only difference between the two models is whether a second priority queue is configured via the **priority level 2** policy-map action command.

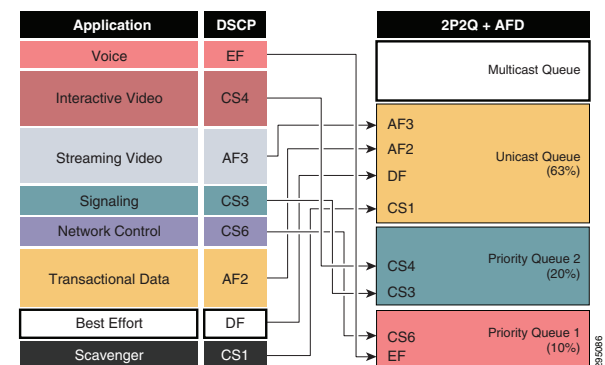
Figure 2 Catalyst 3650/3850 2P6Q3T (Wired Port) Egress Queuing Model



Step 2b: Configure Egress Queuing for Wireless Ports

The Catalyst 3650/3850 switch supports two levels of priority queuing on wireless ports, as well as one non-priority queue for unicast traffic and one non-priority queue for multicast traffic. The switch also supports a bandwidth control algorithm, Approximate Fair Drop (AFD), to provide fairness between radios, SSIDs, and even individual clients

Figure 3 Catalyst 3650/3850 2P2Q+AFD (Wireless Port) Egress Queuing Model



Cisco Validated Design (CVD)

The Cisco Validated Designs for a Catalyst 3650/3850 series switch in the role of a converged access switch in a medianet campus network are presented below.

Step 1: Configure Ingress QoS Model :

Trust DSCP Model:

Wired Ports : <default>

Wireless Ports:

```
no qos wireless-default-untrust
```

Conditional Trust Model:

```
trust device cisco-phone or
trust device cts or
trust device ip-camera or
mls qos trust device media-player
```

Service Policy Models:

[class-maps omitted for brevity]

```
policy-map MARKER
class VOIP
set dscp ef
class MULTIMEDIA-CONFERENCING
set dscp af41
class SIGNALING
set dscp cs3
class TRANSACTIONAL-DATA
set dscp af21
class BULK-DATA
set dscp af11
class SCAVENGER
set dscp cs1
class DEFAULT
set dscp default
```

Wired Port Application:

```
interface GigabitEthernet 1/0/1
service-policy input MARKER
```

Wireless SSID Application:

```
wlan WLAN-1
service-policy input MARKER
```

Per-Wireless-Client Application:

```
wlan WLAN-1
service-policy client input MARKER
```

Step 2a: Configure 1P7Q3T or 2P6Q3T Egress Queuing on Wired Ports (2P6Q3T Example is shown) :

```
policy-map 2P6Q3T
class PRIORITY-QUEUE
priority level 1
police rate percent 10
class REAL-TIME-VIDEO-QUEUE
priority level 2
police rate percent 20
class CONTROL-MGMT-QUEUE
bandwidth remaining percent 10
queue-buffers ratio 10
class MULTIMEDIA-CONFERENCING-QUEUE
bandwidth remaining percent 10
queue-buffers ratio 10
queue-limit dscp af43 percent 80
queue-limit dscp af42 percent 90
queue-limit dscp af41 percent 100
class MULTIMEDIA-STREAMING-QUEUE
bandwidth remaining percent 10
queue-buffers ratio 10
queue-limit dscp af33 percent 80
queue-limit dscp af32 percent 90
queue-limit dscp af31 percent 100
class TRANSACTIONAL-DATA-QUEUE
bandwidth remaining percent 10
queue-buffers ratio 10
queue-limit dscp af23 percent 80
queue-limit dscp af22 percent 90
queue-limit dscp af21 percent 100
class BULK-SCAVENGER-DATA-QUEUE
bandwidth remaining percent 5
queue-buffers ratio 10
queue-limit dscp values af13 cs1 percent 80
queue-limit dscp values af12 percent 90
queue-limit dscp values af11 percent 100
class class-default
bandwidth remaining percent 25
queue-buffers ratio 25
```

Wired Port Application:

```
interface GigabitEthernet 1/0/1
service-policy output 2P6Q3T
```

Step 2b: Configure 2P2Q+AFD Egress Queuing on Wireless Ports :

```
policy-map port_child_policy
class non-client-nrt-class
bandwidth remaining ratio 7
class RT1
priority level 1
police rate percent 10
conform-action transmit
exceed-action drop
class RT2
priority level 2
police rate percent 20
conform-action transmit
exceed-action drop
class class-default
bandwidth remaining ratio 63
```

Note: This policy is applied automatically to all wireless ports and thus no explicit service-policy attachment statement is needed.

Note: Highlighted commands are interface specific; otherwise these are global.