



Building Cisco Multilayer Switched Networks (BCMSN)

Layer 2 Quality of Service (QoS)

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DiffServ QoS Review

- Goal is for network to enforce QoS policy based on traffic classes
 - E.g. “differentiate” voice vs. data
- Model only works if markings are correct
 - E.g. if network sees voice and data as the same class, voice isn’t preferred
- True end-to-end QoS design must enforce proper marking and classification policy down to the layer 2 access level

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DiffServ Classification

- For IP over Ethernet, DiffServ classification occur in one of three ways...
- Layer 2
 - Ethernet CoS
- Layer 3
 - IP Precedence & DSCP
- Layer 4+
 - TCP/UDP ports
 - NBAR

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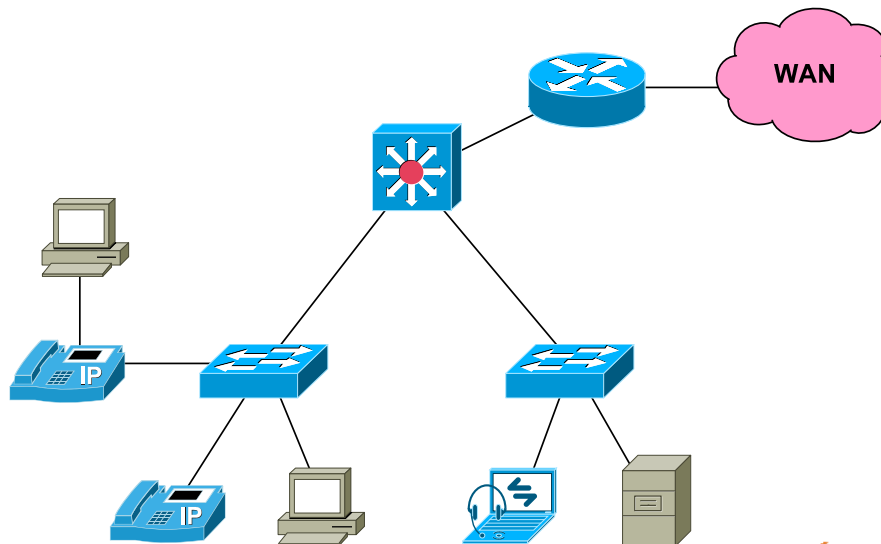
Trust Boundaries

- Catalyst switches enforce marking and classification policy based on “trust” boundaries
 - Trusted ports maintain markings received
 - Untrusted ports remark/rewrite/overwrite markings received
- Trust boundary typically occurs on...
 - Switch to host facing ports
 - Switch to IP phone facing ports
 - Switch to switch facing ports
- Goal of the trust boundary is to ensure correct inbound marking, which in turn allows correct outbound classification

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Trust Boundary Examples



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Configuring Trust Boundaries

- Trust state is configured per-port with the `mls qos trust` command
- Trust can be defined based on...
 - CoS
 - IP Precedence
 - DSCP
 - CDP (`cisco-phone`)
- For ports connected to IP phones, separate “extension” trust can be defined with `switchport priority extend [cos | trust]`

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Voice VLANs

- A single physical link can connect to a phone and PC at the same time
- Voice & data traffic must have some way of being differentiated
- 802.1Q trunk encapsulation typically used for this separation
- Also allows encoding of CoS value
 - Regular Ethernet header has no CoS field

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Voice VLAN Variations

```
SW1#
interface FastEthernet0/1
  switchport access vlan 20
  switchport voice vlan 10
!
interface FastEthernet0/2
  switchport access vlan 20
  switchport voice vlan dot1p
!
interface FastEthernet0/3
  switchport access vlan 20
  switchport voice vlan untagged
!
interface FastEthernet0/4
  switchport access vlan 20
  switchport voice vlan none
```

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Layer 2 AutoQoS

- Layer 2 AutoQoS simplifies QoS implementation for VoIP
- Effectively a macro that defines...
 - Trust boundaries
 - Marking policy
 - Classification policy
 - Queueing policy
- Configured as port-level `auto qos voip`
`[cisco-phone | cisco-softphone | trust]`