Deploying Cisco IWAN QoS

Quality of Service (QoS) has already proven itself as the enabling technology for the convergence of voice, video, and data networks. As business needs evolve, so do demands on QoS technologies. The need to protect voice, video, and critical data with QoS mechanisms is extremely important on the WAN because access speeds are much lower than the LAN networks that feed them.

When configuring WAN-edge QoS, you are defining how traffic egresses your network. It is critical that the classification, marking, and bandwidth allocations align to the service provider, offering to ensure consistent QoS treatment end to end.

Figure 1 shows a typical 8-class queuing model for a Cisco Intelligent WAN (IWAN) deployment. Voice traffic is put into a strict priority queue and the rest of the traffic is put into class-based weighted fair queues. The bandwidth remaining percentages must equal 100%.

The values used below are a good starting point, but the final numbers should be based on an analysis of your traffic patterns over a period of time.

The following table shows how to combine the twelve classes into a typical 4-class SP model.

When the access rate of an interface is different from the service rate, traffic shapers are used to limit the transmit rate. A shaper will guarantee that traffic will not exceed the contracted rate. A nested queuing policy will force queuing to engage at the contracted sub-line rate to prioritize packets prior to shaping.

Policers typically drop traffic, but traffic shapers delay excess traffic, smoothing bursts and preventing unnecessary drops.

Shapers are very common with Ethernet WAN, as well as Non-Broadcast Multiple-Access (NBMA) network topologies such as Frame-Relay and ATM.

The Per-Tunnel QoS for DMVPN feature allows the configuration of a QoS policy on a DMVPN hub on a per-tunnel basis. The QoS policy on a tunnel instance allows you to shape the tunnel traffic to individual spokes (parent policy) and to differentiate between traffic classes within the tunnel for appropriate treatment (child policy).

Traffic is regulated from the central site (hub) routers to the remote-site routers on a per-tunnel (spoke) basis. The hub site is unable to send more traffic than a single remote-site can handle, and this ensures that high bandwidth hub sites do not overrun lower bandwidth remote-sites.
Implementing 8-class Egress Queuing and 4-class SP Mapping

1. On all routers, create the 8-class QoS queuing model using class-maps with match dscp to combine the twelve classes.
2. On the hub border routers, create the 4-class SP mapping using set dscp tunnel.
3. On the remote site routers, create the 4-class SP mapping using set dscp.

Class-map for 8-class QoS Model

- class-map match-any VOICE
  - match dscp ef
- class-map match-any INTERACTIVE-VIDEO
  - match dscp cs4 af11 af12 af13 af21 af22 af23
  - match dscp cs1
- class-map match-any STREAMING-VIDEO
  - match dscp cs5 af31 af32 af33
- class-map match-any NET-CTRL
  - match dscp cs6
- class-map match-any CALL-SIGNALING
  - match dscp cs3
- class-map match-any CRITICAL-DATA
  - match dscp cs2 af11 af12 af13 af21 af22 af23
- class-map match-any SCAVENGER
  - match dscp cs1

Hub Border Router:

Policy-map for 4-class service provider offering

- policy-map WAN
  - class INTERACTIVE-VIDEO
    - bandwidth remaining percent 30
    - random-detect dscp-based
    - set dscp tunnel af31
  - class STREAMING-VIDEO
    - bandwidth remaining percent 10
    - random-detect dscp-based
    - set dscp tunnel af31
  - class NET-CTRL
    - bandwidth remaining percent 5
    - set dscp tunnel cs6
  - class CALL-SIGNALING
    - bandwidth remaining percent 4
    - set dscp tunnel af21
  - class CRITICAL-DATA
    - bandwidth remaining percent 25
    - random-detect dscp-based
    - set dscp tunnel af21

Remote Site Router:

Policy-map for 4-class service provider offering

- policy-map WAN
  - class INTERACTIVE-VIDEO
    - bandwidth remaining percent 30
    - random-detect dscp-based
    - set dscp af31
  - class STREAMING-VIDEO
    - bandwidth remaining percent 10
    - random-detect dscp-based
    - set dscp af31
  - class NET-CTRL
    - bandwidth remaining percent 5
    - set dscp cs6
  - class CALL-SIGNALING
    - bandwidth remaining percent 4
    - set dscp af21
  - class CRITICAL-DATA
    - bandwidth remaining percent 25
    - random-detect dscp-based
    - set dscp ef

Implementing Per-Tunnel Traffic Shaping

1. On the hub border router, create the child shaper policies for each remote site bandwidth type using the policy-map for the service provider.
2. List the available policies as nhrp map groups on the hub tunnel interfaces.
3. Create a "shape only" parent policy and apply it on the hub outbound physical interface.
4. On the remote site router, signal from the spoke to the hub using the nhrp group command specifying the correct bandwidth policy.

This creates a per-tunnel shaper for each remote site on the hub border router.

You can find more details about configuring QoS for IWAN in the IWAN Technical Design Guide. The full routers configurations used in the CVD Lab can be found in the IWAN Configurations Files Guide.

Cisco Validated Design (CVD)

Branch WAN: http://www.cisco.com/go/cvd/wan

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