



# QoS for IP Voice and Video

How Cisco IT Uses QoS for Critical Applications



## A Cisco on Cisco Case Study: Inside Cisco IT

# Overview

- Challenge

  - New applications require special data handling – especially voice and video

- Solution

  - Standards of classification, QoS, and QoS management in both LAN and WAN

  - Low Latency Queuing (LLQ) and Class Based Weighted Fair Queuing (CBWFQ)

- Results

  - QoS provides better quality, better traffic handling during congestion

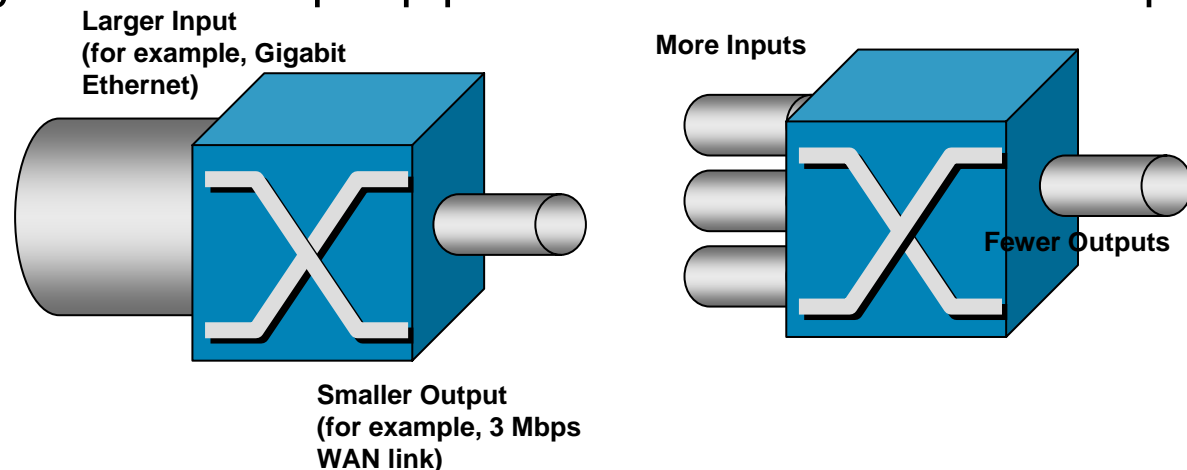
- Next Steps

  - Expanding QoS use in network – to VPN, labs, MPLS, SAN, and more

# Challenge - New Applications Require Special Data Handling

- Previous IP networks sent data that (mostly) tolerated delay
- New applications have new QoS requirements
  - IP voice is sensitive to latency, jitter, packet drops
  - IP video is sensitive to latency, packet drops
- Added bandwidth demands can overrun links

When larger or more input pipes meet smaller or fewer output pipes



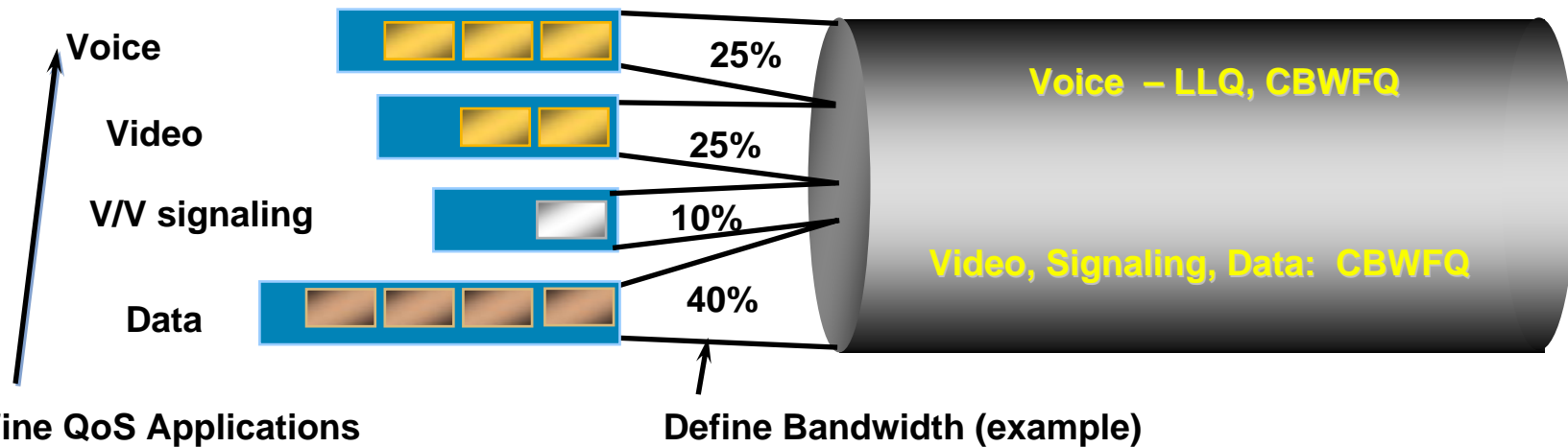
# Challenge - New Applications Require Special Data Handling (Contd.)

- QoS can be applied incrementally, but is much easier to manage if applied as a standard

# Solution - Standards of Classification, QoS, and QoS Management

- Classification of services: Separating voice, video, and special data applications
- Marking services at a trusted edge: Marking traffic as close to the device as possible (IP phone, video camera, application server)
- CBWFQ: Guarantees a minimum amount of bandwidth during congestion based upon the service class marks
- LLQ: Provides a priority queue for voice, which pushes all voice packets to the front of the queue, ensuring that voice packets aren't stuck behind larger data packets
- NBAR: Recognizes special application traffic and classifies that traffic appropriately

# Class-Based WFQ - QoS Guarantees Plus Bandwidth Efficiency

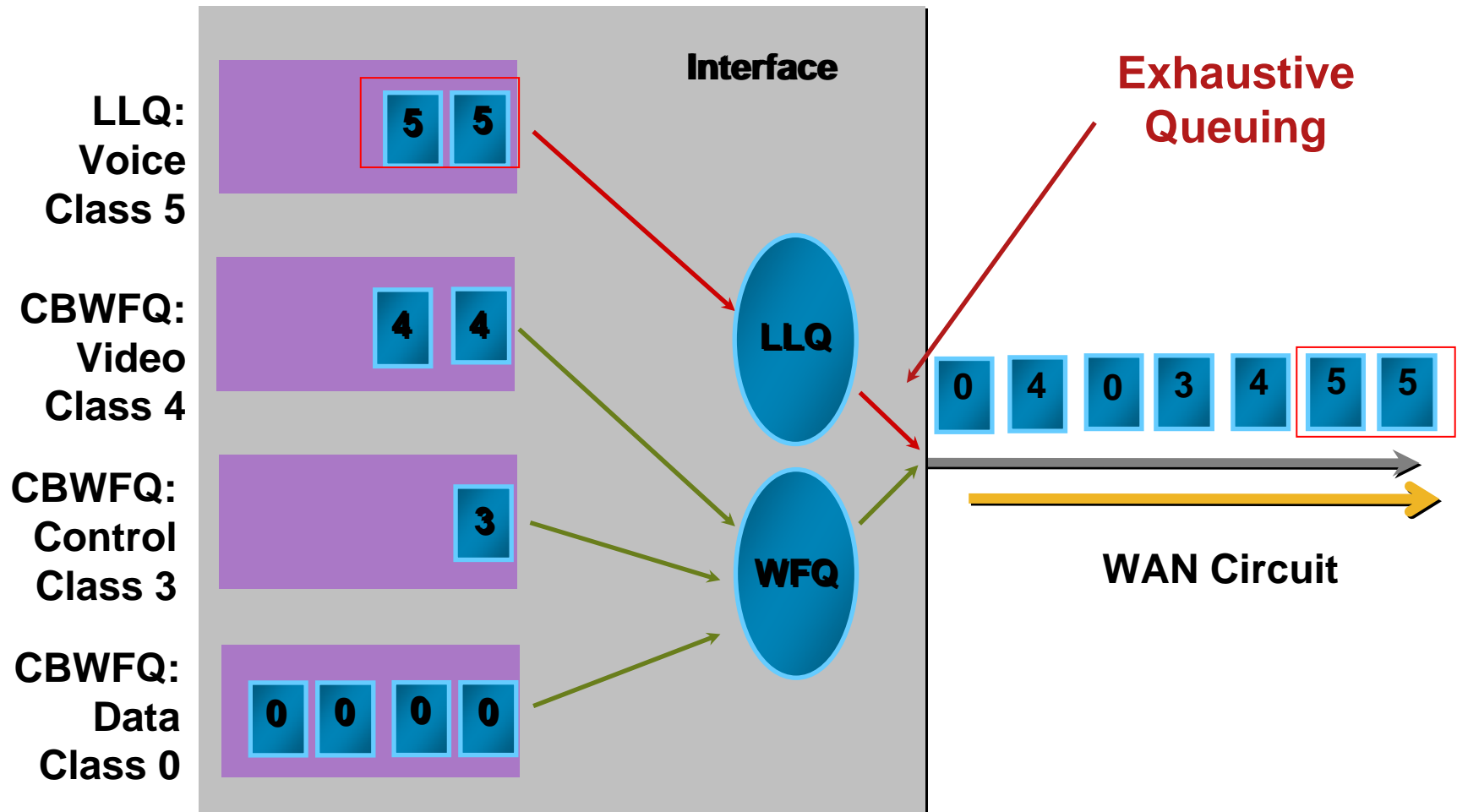


- Buffering (LLQ) controls latency for voice
- Weights (CBWFQ) guarantee minimum bandwidth
- Bandwidth percentage allocation defined according to link size
- Unused capacity is shared among the other three classes

# Class-Based WFQ - QoS Guarantees Plus Bandwidth Efficiency (Contd.)

- Each queue is separately configured for QoS
- Benefits
  - Minimum latency for voice traffic
  - Class of service SLAs supported for all data classes
  - No wasted bandwidth

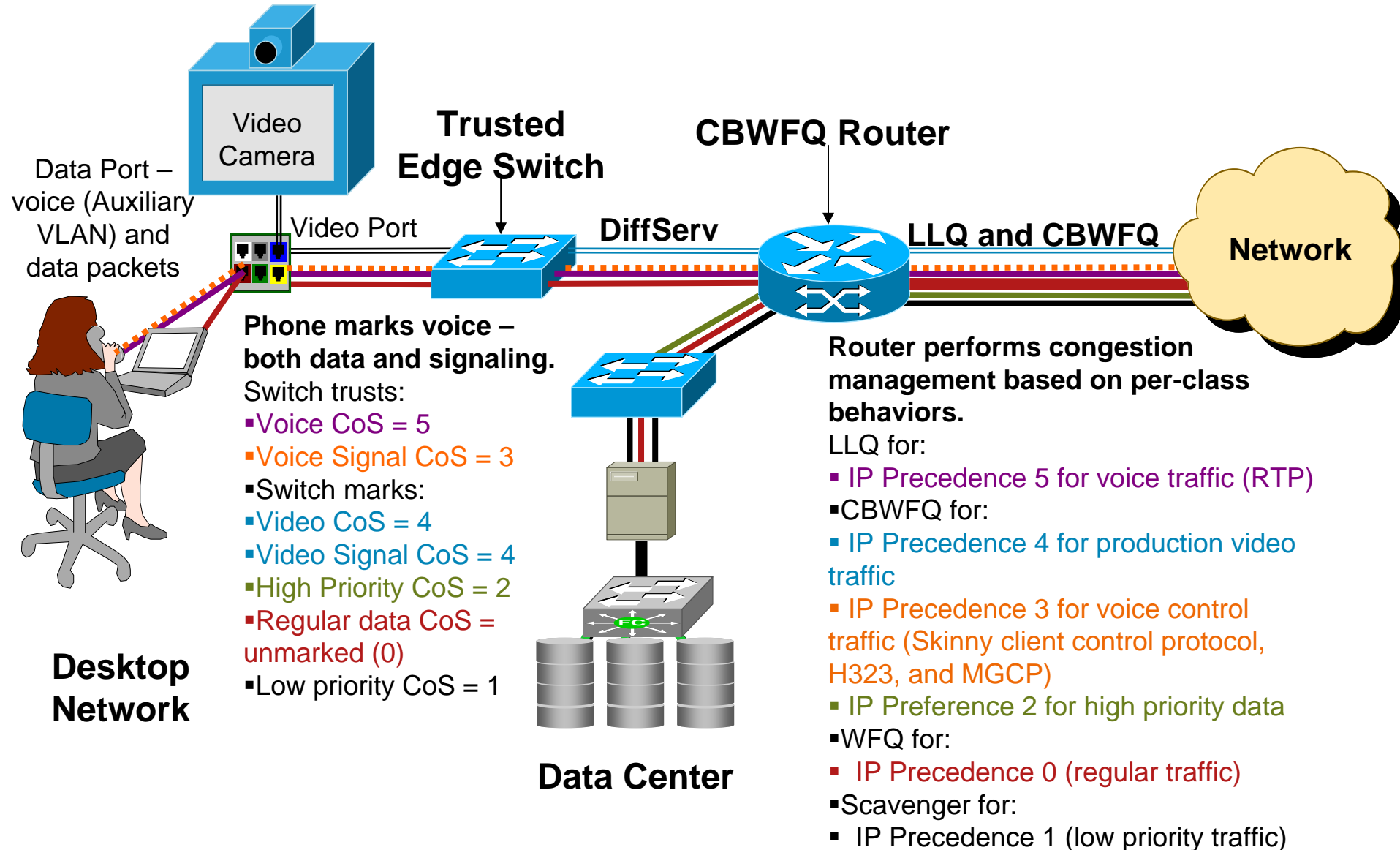
# Low Latency Queuing (LLQ) for Voice



# Cisco IT Classes of Service

Service Class	Service
Class 6	Network control traffic among switches and routers
Class 5	IP voice traffic (with LLQ)
Class 4	IP video traffic
Class 3	Voice and video signaling traffic
Class 2	Reserved for future use
Class 1	Low priority (scavenger class) traffic
Class 0	Default data traffic

# LAN and WAN QoS



# Results - QoS Provides Better Quality

- Users hear better voice quality
  - Voice packets given priority
- The network handles congestion gracefully
  - Less important traffic is dropped first

# Next Steps - Expanding QoS Use in Network

- Lab traffic with QoS needs: Labs are not trusted traffic sources, but may need QoS
- IP voice over VPN: Home office users starting to need QoS over the Internet
- QoS over MPLS VPN: Service providers handle and bill for varying classes of service differently
- Call admission control: Gatekeeper handling of oversubscription needs to know the network topology

# Next Steps - Expanding QoS Use in Network (Contd.)

- Desktop trusted edge: Cisco IT is migrating trusted edge to desktop to support desktop videoconferencing
- Storage networking: Cisco IT is beginning to put very high volume SAN traffic across the LAN, and is studying how best to use QoS to support SAN and other traffic needs during congestion

To read the entire case study, or for additional Cisco IT case studies on a variety of business solutions, visit Cisco on Cisco: Inside Cisco IT

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**CISCO**



**Americas Headquarters**

Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
[www.cisco.com](http://www.cisco.com)  
Tel: 408 526-4000  
800 553-NETS (6387)  
Fax: 408 527-0883


**Asia Pacific Headquarters**

Cisco Systems, Inc.  
168 Robinson Road  
#28-01 Capital Tower  
Singapore 068912  
[www.cisco.com](http://www.cisco.com)  
Tel: +65 6317 7777  
Fax: +65 6317 7799

**Europe Headquarters**

Cisco Systems International BV  
Haarlerbergpark  
Haarlerbergweg 13-19  
1101 CH Amsterdam  
The Netherlands  
[www-europe.cisco.com](http://www-europe.cisco.com)  
Tel: +31 0 800 020 0791  
Fax: +31 0 20 357 1100

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