Introduction to IP Video Streaming and Conferencing
(or "Video Is Your Friend!")
Session 2010
Agenda—Video Is Your Friend!

- Why IP Video Now?
- Mission-Critical Applications
- IP Video Technology

Technology Advancements Make IP Video Possible

- Networking
  - Higher Speed
  - Standard Protocols
  - Wider Connectivity
- Multimedia
  - Better Compression
  - Multimedia-Ready PCs
  - Authoring Tools
Critical Network Concerns

Video Deployment Concerns...

- Network bandwidth
  - Business-quality video
- Network services
  - Quality of service
  - Consistency of service
  - Security
  - Video management
- Adoption of standards

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- Why IP Video Now?
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Top Applications

- E-Learning
  - Online training
  - Distance learning
- Corporate communications
- Business meetings
- Business TV

Corporate E-Learning

Need

- Want to train all employees on Windows 2000 applications
- Need to offer group classes and allow some to learn at their own pace
- Prefer not to take employees out of their offices for training
Corporate E-Learning

Solution

- Deliver quality Windows 2000 training to employees quickly
- Schedule video broadcasts with web-based collaboration and offer video-on-demand
- All classes can be taken at employees' desktops

Business Meeting Need

Need

- Want to accelerate time to market for a project involving people in several remote locations
- Minimize the amount of travel, yet maintain personal communication and highly interactive collaborative workgroup
Solution

- Reduce travel with regular virtual team meetings using data, voice, and video collaboration
- Install videoconferencing equipment to support multipoint meetings
- Use gateway to tie into existing ISDN networks

Corporate Communications

Need

- Want to deliver important messages to all employees at the same time
- Distributed global workforce, can’t bring everyone together into the same room
**Corporate Communications**

**Solution**

- Deliver important messages quickly to each employee
- Broadcast to desktops over IP Multicast to conserve bandwidth and increase quality
- Repeat broadcast to reach more employees

![Diagram showing corporate communication solution]

**Live, Interactive E-Learning**

**Need**

- Want to offer more foreign languages and honors courses
- Need more students and teachers to fill classes in each school
- Some students leave school to take courses at the university

![Diagram showing live, interactive e-learning need]
Live, Interactive E-Learning

Solution

- Combine all students and teachers in the district into one virtual classroom
- Videoconferencing solution provides for live, interactive instruction
- Students stay in their schools

WAN

Agenda—Video Is Your Friend!

- Why IP Video Now?
- Mission-Critical Applications
- IP Video Technology
I. Sharing Live Video

II. H.323 Significance

III. Multicast

IV. Quality of Service

V. Encoding

Sharing Live Video

We want to share live video between two or more stations.
What Are the Basic Elements?

- Call Setup
- Address Translation
- Bandwidth Allocation
- Security
- Multipoint Routing
- QoS (Delay and Jitter)
- Connecting to Legacy Systems

How Is a Call Setup?

- Objective: Jack wants to ‘call’ Yvette
- How: Gatekeeper sets up the call
How Are Addresses Translated?

Objective: Jack wants to ‘call’ Yvette
How: Gatekeeper translates addresses

How Are Dissimilar Networks Connected?

Objective: Yvette wants to ‘call’ Ms. Gomez, at another company
How: Gateway provides connectivity
What Are the Basic Elements?

- Call Setup
- Address Translation
- Bandwidth Allocation
- Security
- Multipoint Routing
- QoS (Delay and Jitter)
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How Is Bandwidth Managed?

Objective: Jack wants to ‘call’ Yvette
How: Gatekeeper allocates bandwidth

Can I use all of this bandwidth?
Let me check the criteria!

Gatekeeper

Jack
xxxMB Bandwidth

Yvette
How Is Access Controlled?

Objective: Ms. Gomez wants to ‘call’ Yvette
How: Gatekeeper authorizes the call

✔ Call Setup
✔ Address Translation
✔ Bandwidth Allocation
✔ Security
  • Multipoint Routing
  • QoS (Delay and Jitter)
  • Connecting to Legacy Systems
How Is a 3-Way Call Made?

Objective: Jack wants to ‘call’ Yvette and Ms. Gomez
How: Multipoint Routing by the Multipoint Control Unit

Can I Ensure a Quality Call?

Objective: Jack wants to improve the quality of the ‘call’
How: the Multimedia Conference Manager Gatekeeper provides QoS mechanisms to reduce delay and jitter
What Are the Basic Elements?

- Call Setup
- Address Translation
- Bandwidth Allocation
- Security
- Multipoint Routing
- QoS (Delay and Jitter)

• Connecting to Legacy Systems

How Can I Connect to a Legacy System?

- Objective: Jack wants to ‘call’ the boardroom with a legacy system
- How: Video terminal adapter connects to legacy systems
What Are the Basic Elements?

✔ Call Setup
✔ Address Translation
✔ Bandwidth Allocation
✔ Security
✔ Multipoint Routing
✔ QoS (Delay and Jitter)
✔ Connecting to Legacy Systems

Gatekeeper and Gateway
Gatekeeper
Gatekeeper
Gatekeeper
Multipoint Control Unit
Gatekeeper—MCM
Video Terminal Adapter

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ITU-T H.323 Standard

- H.323-compliant products interoperate, allowing users to communicate data, voice, and video over IP networks without concern for compatibility
- Applications include:
  - Internet/IP phones
  - Desktop conferencing
  - Multimedia Web sites
  - Internet commerce
  - And more…

Type of H.323 Endpoints

- Terminal
- MCU
- Gatekeeper
- Proxy
- Gateway
- Internet
- Telephone Network
  - ISDN, POTS
- IP Network
Cisco Router IOS MCM

Multimedia Conference Manager

- MCM Gatekeeper
  - Address resolution
  - User authorization
  - Zone bandwidth management

- MCM Proxy
  - Address translation
  - QoS-incapable, non-Cisco gateways
  - Security

H.323 Gatekeeper Functionality

- Address translation
  Performs alias address to transport address translation

- Admissions control
  Authorizes LAN access based on call authorization, bandwidth, etc.

- Call control signaling
  Gatekeeper completes call signaling with endpoints, or processes the call signaling itself

- Call authorization
  Accepts or rejects calls from a terminal based on authorization

- Bandwidth management
  Controls the number of terminals permitted to access a LAN

- Call management
  Maintains a list of active calls
Gatekeeper Zones

A Zone Is the Collection of All Terminals, Gateways, and Multipoint Control Units Managed by One H.323 Gatekeeper

Gatekeeper Zones Are Logical Areas Reflective of Network Topology and Provide Administrative Convenience

H.323 Multipoint Videoconference

LAN 1
- IP/VC 3510 MCU
- H.323 Endpoint Yvette
- H.323 Endpoint Thiagi
- IP/VC 3530 VTA

LAN 2
- Router with MCM
- T1
- H.323 Endpoint
- Jack
- PRI 384kbps

Customer’s Team
- H.320 Room System
- H.320 Desktop System

Customer
- 384kbps

IP/VC 3525 Gateway
H.323 Review

- H.323-compliant products interoperate, allowing users to communicate data, voice, and video over IP networks without concern for compatibility
- H.323 endpoints—terminals, gateways, gatekeepers, multipoint control units, proxies
- H.323 Gatekeepers perform many critical tasks for sharing live video
- Multimedia Conference Manager is a specialized gatekeeper with two subsystems—MCM gatekeeper and MCM proxy
- Gatekeeper zones are a convenience for call management

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Types of Video Programs

Scheduled Program
One-Way, One-to-Many (Push Model)
Bandwidth: One Stream to many Viewers, IP Multicast

Small Casting
Scheduled Program characteristics
Network partially supports IP multicast Bandwidth

OnDemand Program
One-Way, Point-to-Point (Pull Model)
Bandwidth: One Stream per Viewer

Videoconferencing
Live Two-Way, Small Groups
Bandwidth: One+ Streams per User

Unicast Transmission

Data

One Source to One Destination

One-Way, One-to-Many (Push Model)
Bandwidth: One Stream to many Viewers, IP Multicast

Network partially supports IP multicast Bandwidth

One-Way, Point-to-Point (Pull Model)
Bandwidth: One Stream per Viewer

Live Two-Way, Small Groups
Bandwidth: One+ Streams per User

One Source to One Destination
IP/TV Components Interacting for OnDemand Programs

1. Viewer receives a list of OnDemand programs from the Content Manager

2. Viewer makes OnDemand request to Content Manager

3. Content Manager redirects Viewer to least busy Server

4. Viewer makes OnDemand program request of Server

5. Server sends OnDemand program to Viewer via unicast

6. Status and control messages are sent between Server and Viewer
Broadcast Transmission

Data

One Source to “All” Destinations

Multicast Transmission

Data

One Source to Many Destinations
IP/TV Components Interacting for a Scheduled Program

1. Viewer receives program descriptions from the Content Manager

2. Viewer joins the multicast group associated with the scheduled program

3. Scheduled programs are sent from the Server to the Viewer via multicast group

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Quality of Service (QoS) for Video

- Guaranteed availability
  - Prioritization of mission-critical versus non-critical applications
  - Interactive and time-sensitive applications
  - Data, voice, and video integration

- Key Cisco IOS technologies
  - Signaling
  - Queuing, traffic shaping, and filtering
  - Management, policy control, and accounting

Cisco IOS QoS Signaling

- Signaling is how end stations or network nodes implement QoS priorities across the network according to policy
  - An IP network uses part of the IP packet header to request special handling of priority or time-sensitive traffic

- QoS signaling for voice includes:
  - IP precedence
  - Resource Reservation Protocol (RSVP)
IP Precedence

- Partitions traffic (video) into classes of service
  Defines congestion handling and bandwidth allocation for each class

- Provides flexibility for precedence assignment, including customer assignment (by application or access router) and network assignment based on IP or MAC address, physical port, or application

- Can be mapped into adjacent technologies to deliver end-to-end QoS policies in a heterogeneous network environment

RSVP Requests Bandwidth for Voice Traffic

- I need 1-Mbps bandwidth and 200-ms delay
- Reserve 1-Mbps bandwidth on this network
- This application needs 1-Mbps bandwidth and 200 ms delay
- Reserve 1-Mbps bandwidth on this line
**Agenda**

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**Video Compression Standards**

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MPEG-1

- Delivers video and audio at CD quality
- Bit stream standard compressed for audio and video
- Optimized to fit into a bandwidth of 1.5 Mbps
- Compressed in non real-time, decompressed in real-time
- Compression performed in hardware, decompression in hardware or software

MPEG-2

- Delivers video and audio at broadcast quality
- Applications: HDTV, video-on-demand
- Runs at data rates between 4 and 9 Mbps
- Real-time compression and encoding possible
MPEG-4

• Applications: mobile audio, visual applications, electronic newspaper sources

• Low bit rate compression intended for 64-Kbps connections

Summary
Planning a Video Network

- Identify video technologies to address your application requirements
- Match your network bandwidth with your application quality needs
- Enable your network for IP Multicast
- Ensure quality of service (QOS)
- Video is your friend!

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