

Challenges & Opportunities for Distributed Collaboration

Workshop on Advanced
Collaboration Environments
(August 6, 2001)

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Outline

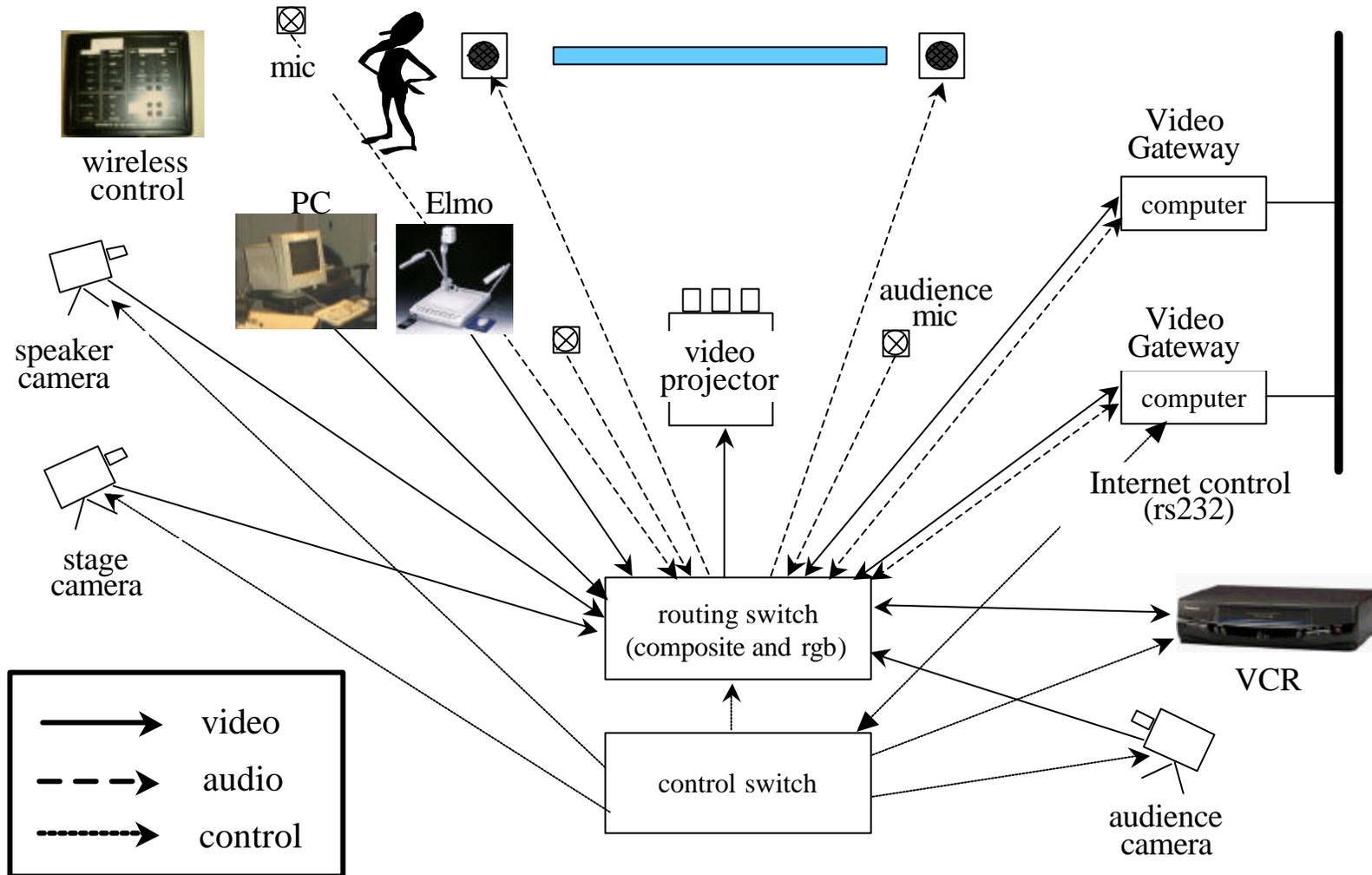
- Background
- Challenges
- Opportunities
- Open Mash Open Source Project

Internet Webcasting

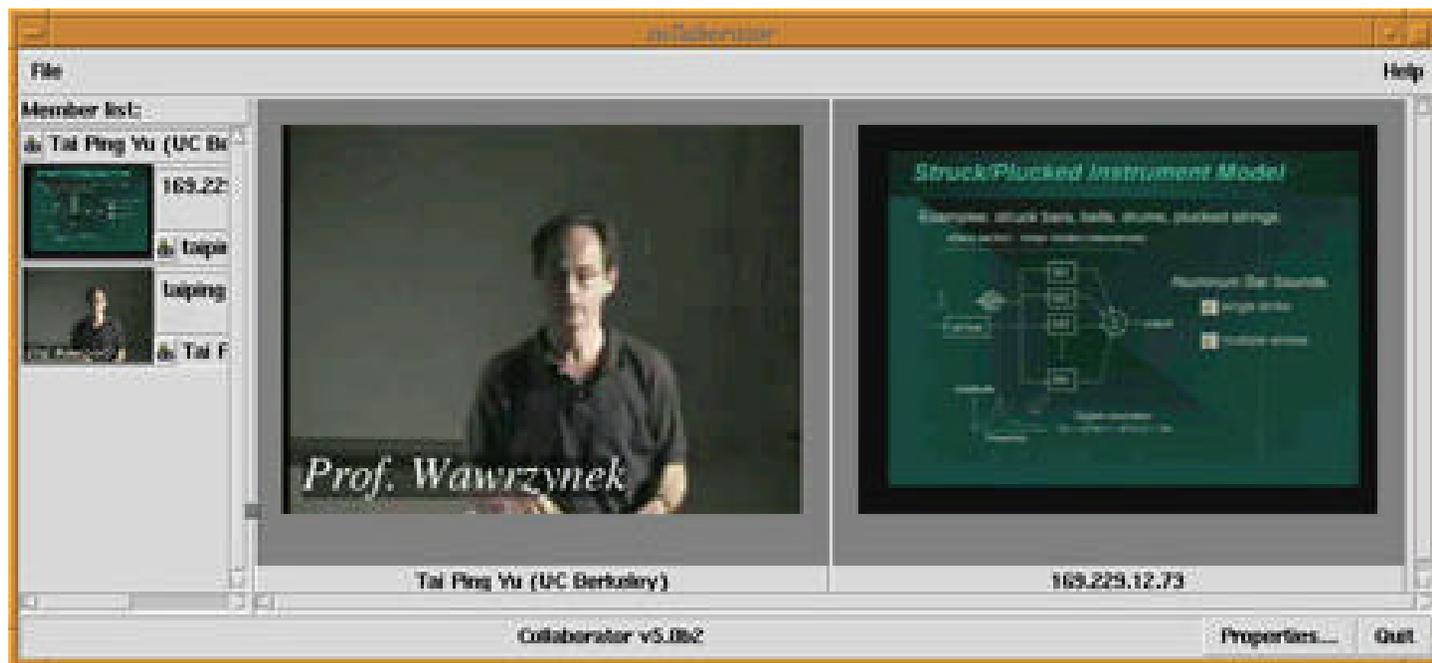
- Berkeley MI G Seminar
 - Weekly seminar webcast on Mbone since Jan '95
 - Multiple streams
 - Speaker + content*
 - Multiple transmissions
 - Low and high bit rate Mbone webcast and Real Networks webcast*
- Mbone production tools
 - Use *vic*, *vat*, etc. for streaming
 - Developed tools to improve production quality
 - Developed infrastructure and tools to reduce cost and effort to produce webcasts

<http://bmrc.berkeley.edu/courseware/mig>

A/V Design



Remote View of Webcast

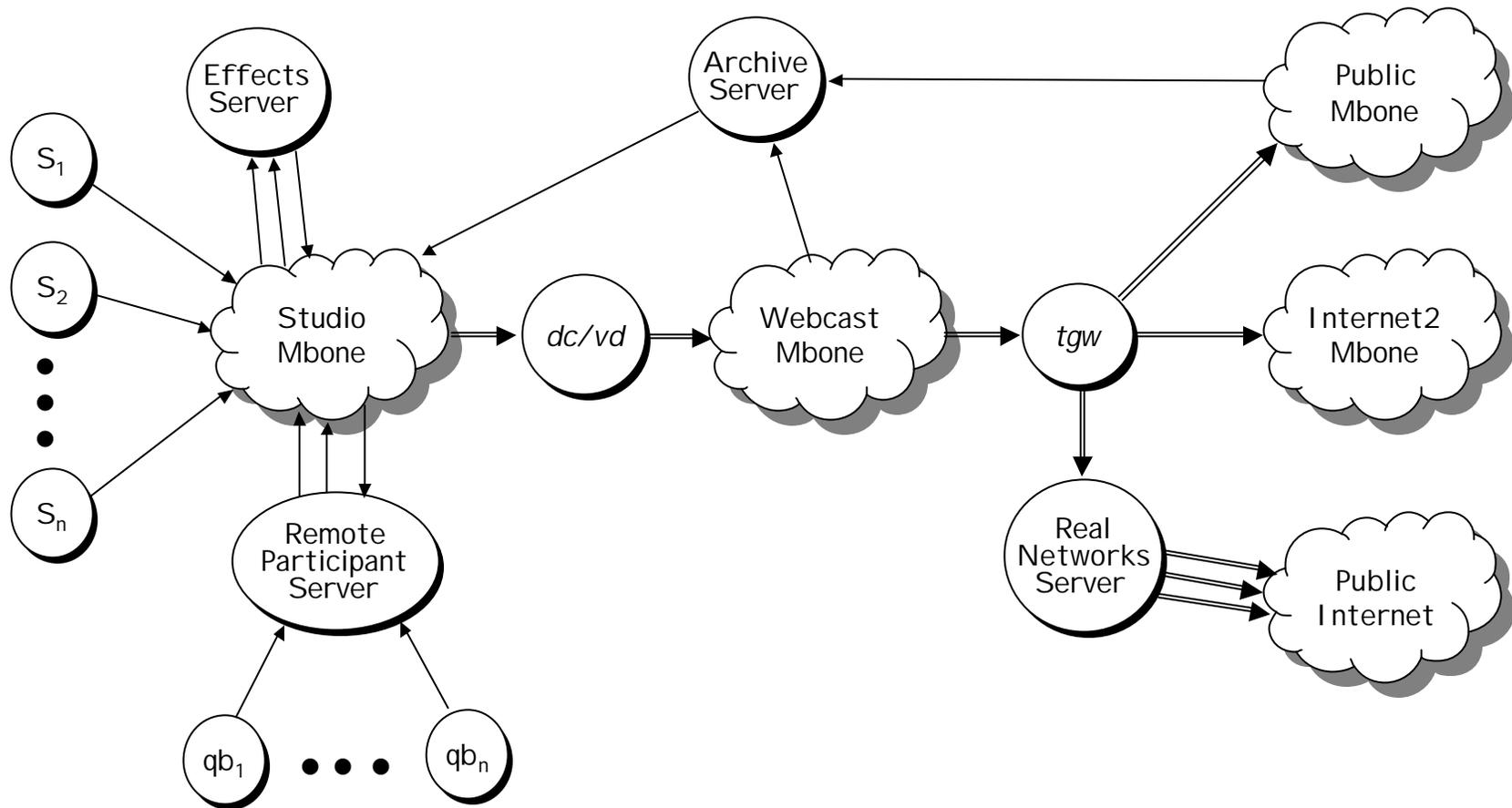


How to Control Equipment?

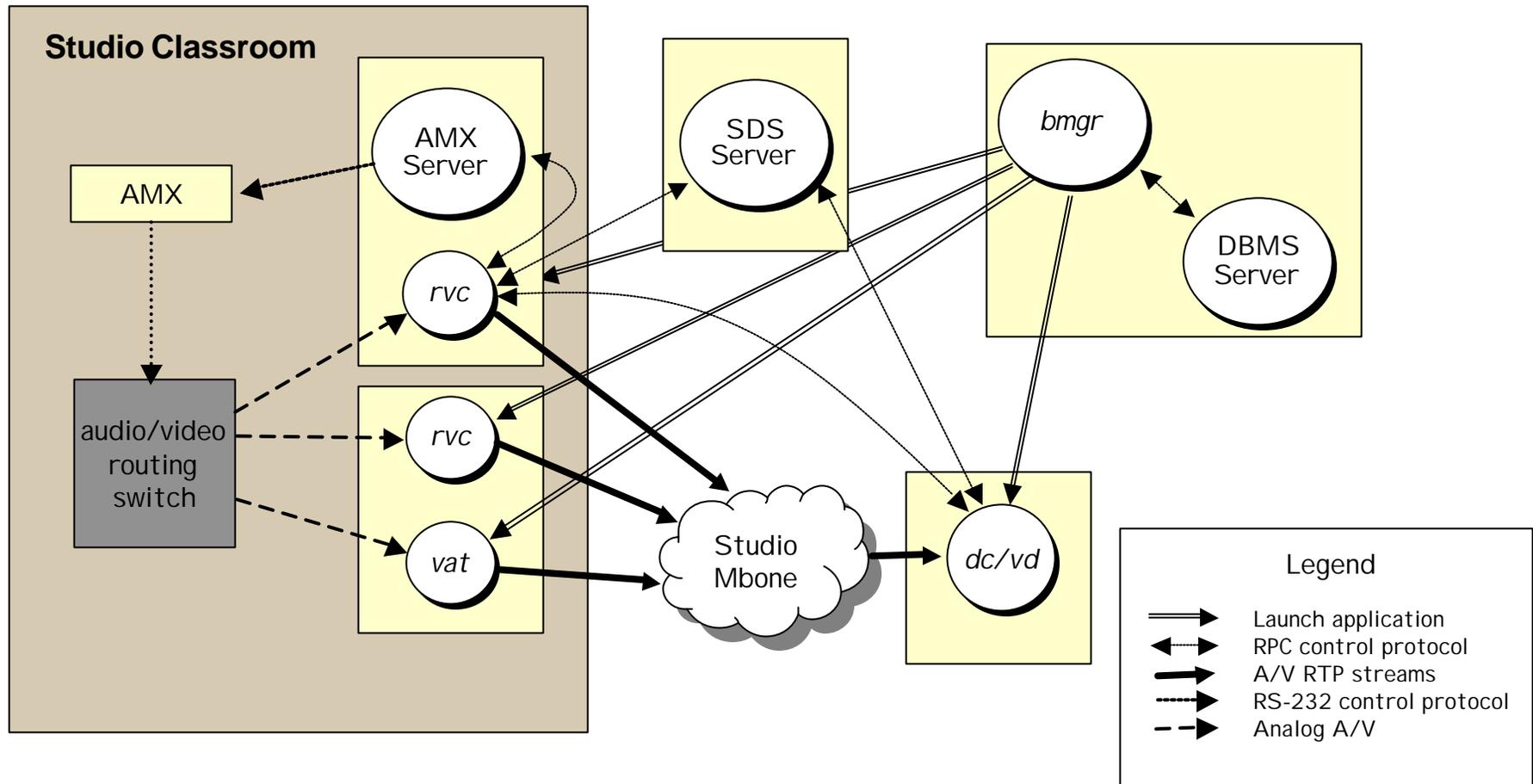


- Must have computer interface to equipment

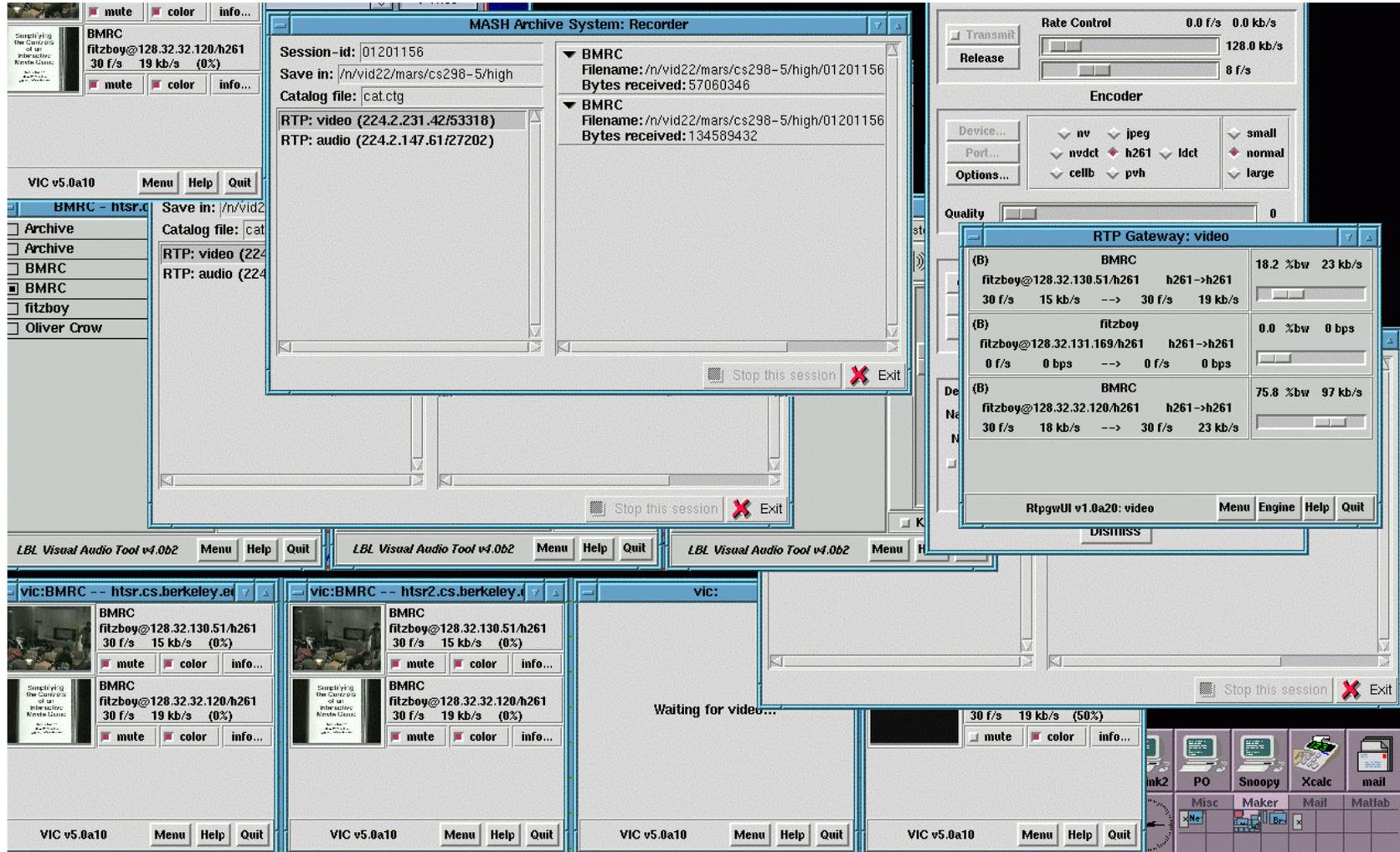
Webcast Production Architecture



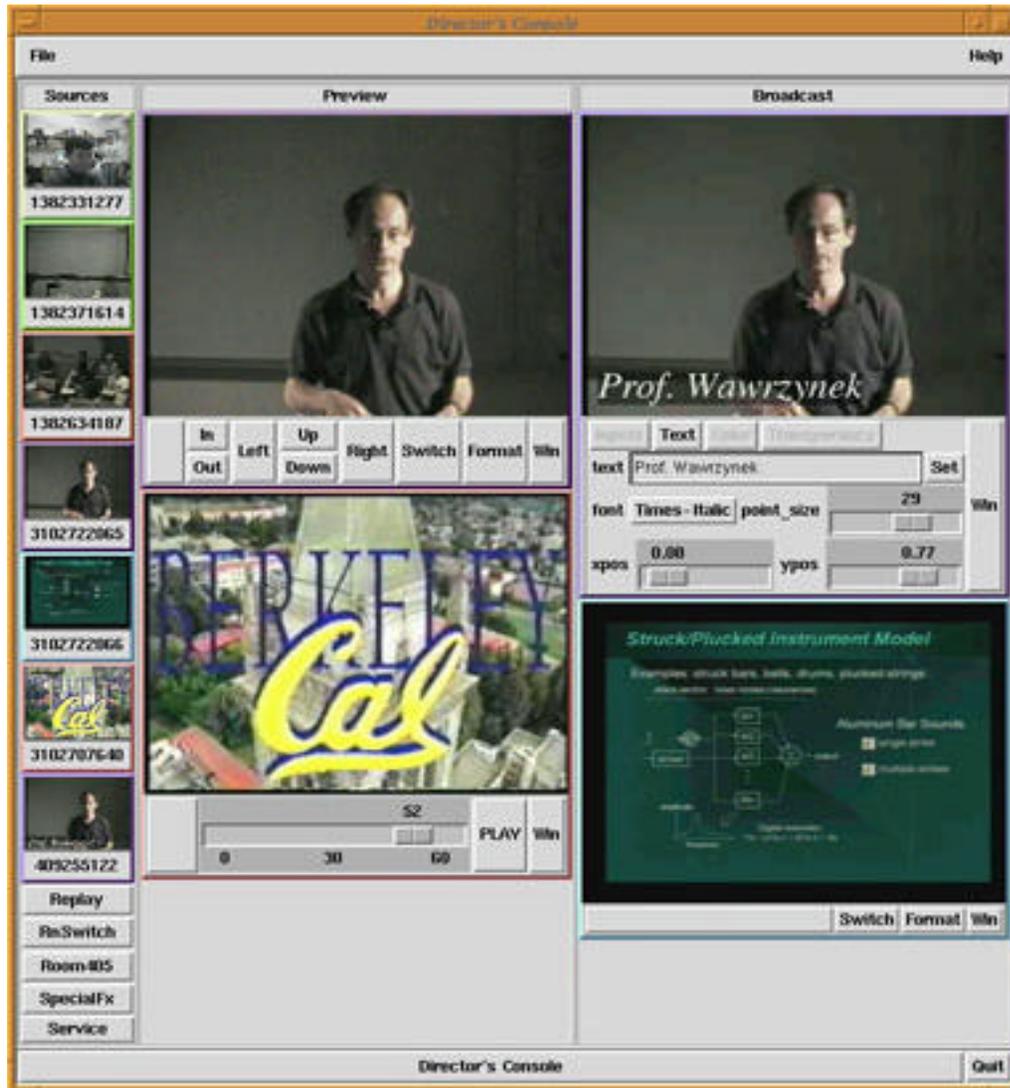
Software Architecture



Screen Dump of Webcast Operator



Director's Console



- Client/server model
- Lists available sources
- Shows current stream(s) in webcast
- Controls to manipulate stream (e.g., move camera or position stored media)
- Extensible interface to support new sources and controls
- Goal is to automate

Berkeley Internet Webcasting System (BIBS)

- Extend webcasting system to regularly scheduled classes on campus

Tried Mbone webcasts but failed

Multicast problems and lack of Windows playback tools

Switched to RN and succeeded beyond expectations

- BIBS Spring 2001

15 classes with >4.5K students enrolled

35 hours of original material each week

20K lectures played each month

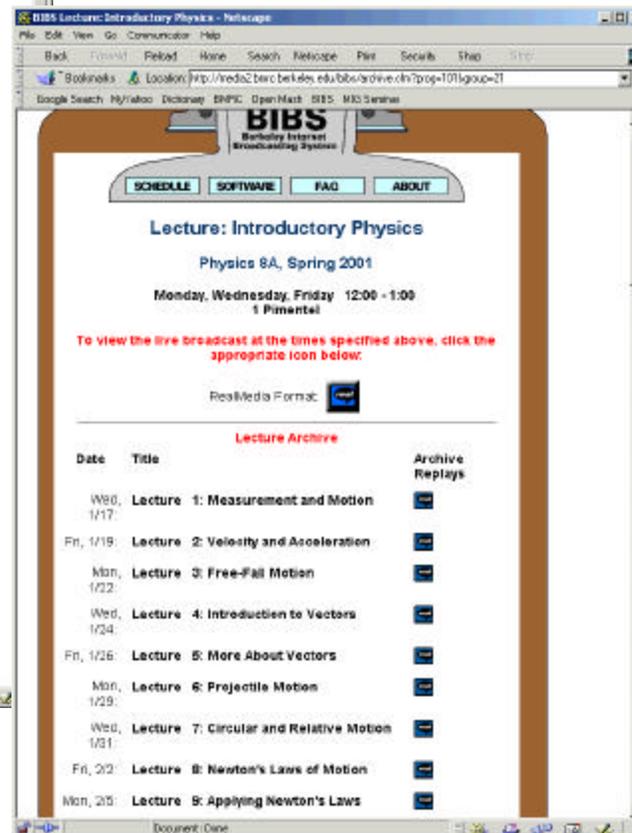
Used for on-demand replay to study for exams

<http://bmrc.berkeley.edu/papers/bibs-report.html>

BIBS Electronic Program Guide (EPG)

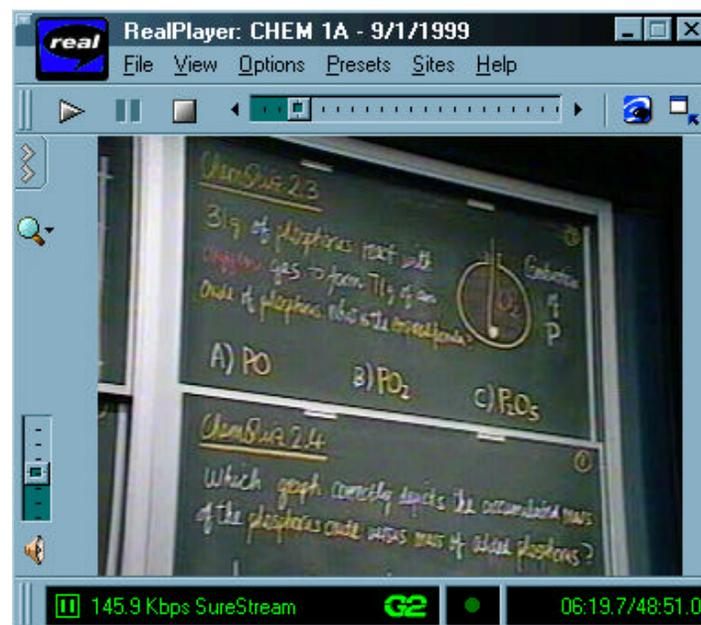
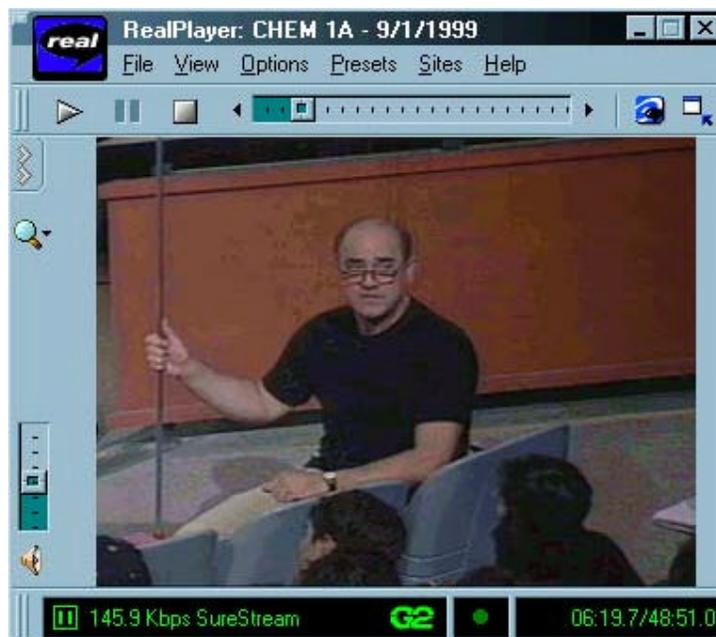


Schedule Page



Class Lectures Page

Client Viewer



Berkeley MIG Seminar

BIBC
Berkeley Internet Broadcasting System

SCHEDULE SOFTWARE FAQ ABOUT

Berkeley Multimedia, Interfaces, and Graphics Seminar

CS 298-5, Spring 2001

Wednesday 1:10 - 2:00
400 Soda Hall (Fujitsu Seminar Room)

visit the [course website](#)

To view the live broadcast at the times specified above, click the appropriate icon below:

RealMedia Format

MP3 on 1Mbps

Seminar Archive

Date	Speakers	Archive Replays
1/17/01	Organizational Meeting (Lawrence A. Rowe, U.C. Berkeley)	
1/24/01	The How and Why of Keynote Systems Streaming Media Measurements (Chris Overton, Keynote Systems, Inc.)	
1/31/01	Distribution Architectures for Dynamic Internet Traffic	

Class Lectures Page

Overview of the TiVo Service Architecture

Wednesday April 11, 2001 1:10 - 2:00 PST 400 Soda Hall (Fujitsu Seminar Room)

Jim Barton
[TiVo, Inc](#)

Read Abstract Watch Seminar

[Slide](#)

The TiVo Service is based on a scalable distributed architecture for the management and provisioning of many different kinds of meta-data for each TiVo subscriber.

This talk provides an overview of the architectural philosophy and actual implementation of the complete end-to-end service platform, including a discussion of the challenges of building a reliable consumer-oriented "black box" using modern computer technologies.

[Click this information at a \[beta\]\(#\) meeting](#) Copyright © 1998-2001 Regents of the University of California

Seminar Lecture Page

Berkeley Lecture Browser

The screenshot displays the Berkeley Lecture Browser interface within a Netscape browser window. The main window is titled "General Chemistry, Lecture 5: Molecular Geometry, Stereochemistry - Netscape". It features a course and lecture title, the speaker's name (Alex Pines), and a video player showing a lecture. The video player includes a progress bar and a timestamp of 01:30.4/51:51.3. To the right of the video player is a "lecture browser" control panel with buttons for "SLIDE WINDOW", "SLIDE INDEX", "SEARCH WINDOW", and "INFO & CREDITS". Below these buttons are "volume" and "mute" controls. The slide window shows a slide titled "Chiral Molecules" with two ball-and-stick models of Alanine, labeled "L" (Left-handed) and "D" (Right-handed). The slide also features a DNA double helix on either side. A "Slide Index" window is open in the foreground, listing 13 items with their respective slide numbers and timestamps. The search results window at the bottom left shows a search for "Lecture" with options to search within the current lecture, the same course/semester, or all lectures.

Course: [General Chemistry](#)
Lecture: [Lecture 5: Molecular Geometry, Stereochemistry](#)
Speaker: [Alex Pines](#)

Slide Number: 11/13 Sync: On Off SYNC TO VIDEO SYNC TO SLIDE

Chiral Molecules

Alanine

L D

Left-handed DNA Helix Right-handed DNA Helix

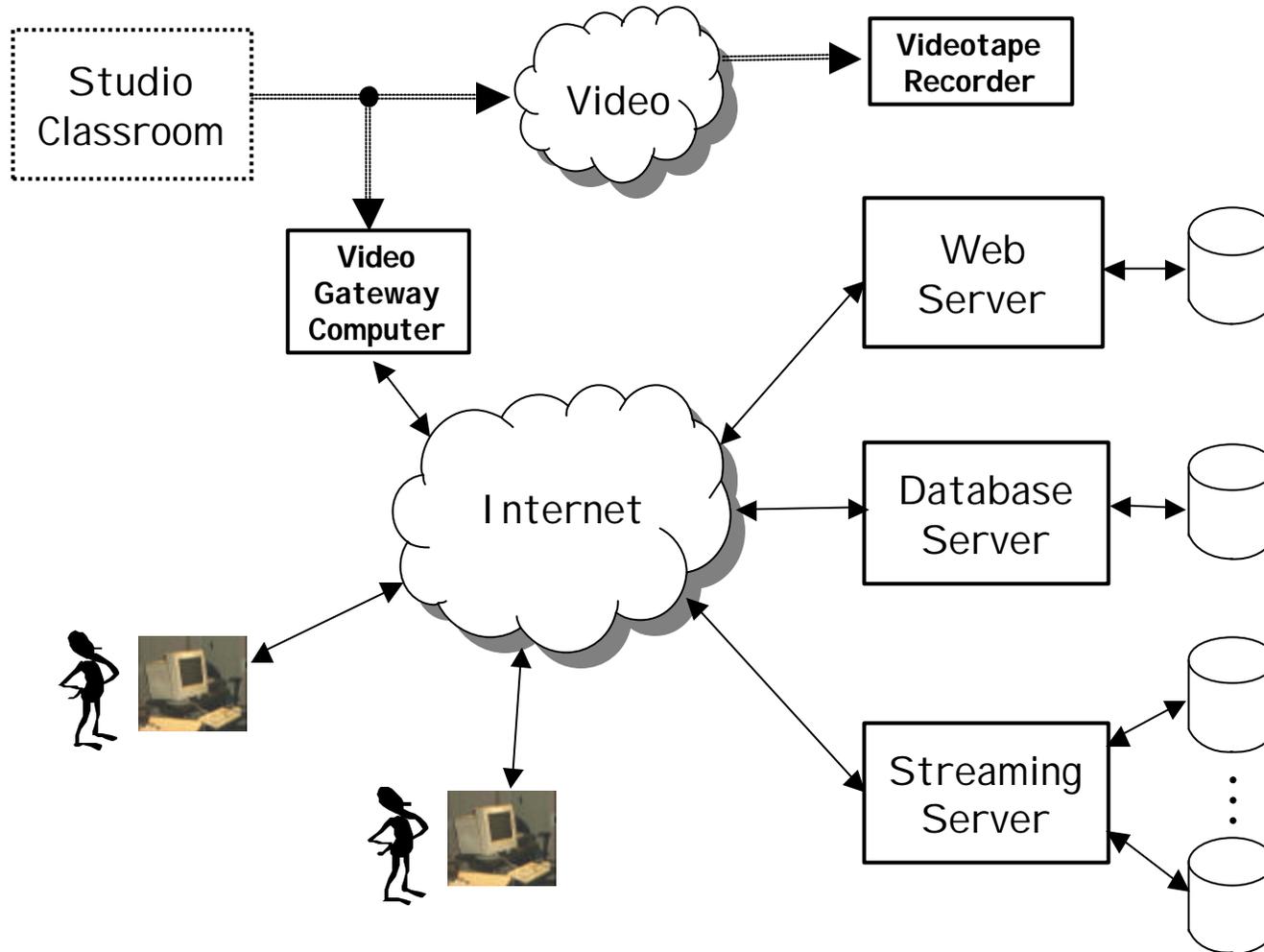
Slide Index

- 1: [Review - Lecture 4 \(1, 4:17\)](#)
- 2: [Review - Lecture 4 \(2, 3:05\)](#)
- 3: [Review - Lecture 4 \(1, 0:55\)](#)
- 4: [VSEPR Shapes \(3, 0:40\)](#)
- 5: [ChemQuiz@ 5.1 \(4, 5:18\)](#)
- 6: [Polymerization \(5, 4:23\)](#)
- 7: [ChemQuiz@ 5.2 \(6, 6:49\)](#)
- 8: [Isomers: Stereo \(Chiral\) \(7, 4:35\)](#)
- 9: [Non Superimposable Mirror Images \(8, 0:10\)](#)
- 10: [Non Superimposable Mirror Images \(9, 1:10\)](#)
- 11: [Chiral Molecules \(10, 3:49\)](#)
- 12: [ChemQuiz@ 5.3 \(11, 5:11\)](#)
- 13: [ChemQuiz 5.4 \(12, 8:19\)](#)

Search Lecture

This lecture Same course, same semester lectures
 Same course lectures All lectures

BIBS System Architecture



What is the “Killer App?”

- Access – web-enabled convenient sharing of data [publishing]
- Teamwork – shared data/apps with communication [collaboration]
 - Synchronous –vs- asynchronous
 - Data visualization and mining

What Lessons are there for Distributed Collaboration?

- Challenges
 - Improve experience
 - Reduce operational problems
 - Lower costs
- Opportunities
 - Declining cost for hardware and bandwidth
 - Exploit intelligent software
 - “Systems solution” thinking

Improve Experience

- Improve audio/video

Higher quality audio, video, and images

Improved codecs, stereo/surround sound audio, RTPtv, etc.

Issue: how to automate resource mgt & control?

Size & placement of windows on display

Audio levels and thresholds

Communication bandwidth (think SDTV and HDTV streams)

- Seamless interaction

Convenient access to shared material and objects

“Put that there,” incorporate portable wireless input devices, etc.

Room & interaction control

Location-independent room control devices

Conversational cues

Eye gaze, turn-taking and signaling (software assist?), sense of presence, etc.

Interaction Example

AG Node Projected Display



Video Image of Remote Site Projected Display

Display After Click-Drag-Drop



1. Click on window in video
2. Drag to open area
3. Drop it
4. System invokes process and window on local screen
 - Shared app => launch local copy and join
 - Non-shared app => launch local copy and set config (e.g., web browser with URL)
 - Non-shared app => open VNC window to remote app

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Operational Issues

- Simplified operation

 - “One button” operation

 - User can open a door and turn on the lights, but not much more*

 - Note: AG “one click” join conference is a great example!*

 - Self diagnose problems

 - Audio doesn't work (i.e., no sound, low/high levels, etc.)*

 - What automatic maintenance could be done at 3 AM
to test remote AG node?*

 - Note: multicast beacon technology is a great example!*

 - Should AG node computers be located in conference room/lab?

- Support multiple types of nodes

 - Personal desktop, conference room, open lab, small/large classroom, etc.

Opportunities

- Declining cost of hardware
 - “God’s on our side” => rooms cheaper over time
 - Still need very low cost entry node (<\$10K)
 - Desktop with 2-3 flat panel displays, speaker, mic (headphones?), and camera*
- Intelligent software and “systems solutions”
 - Think complete solution, not components put together by experts
 - One button to turn on all equipment – maybe a rocker switch on the wall – software auto-launches on equipment and configures for collaboration (e.g., maybe join session with entrance room of random people/locations)*
 - Remote management of all equipment in room?

Opportunities (cont.)

- Mobile AG nodes
 - Similar to Paulos/Canny Personal Roving Presence (PRoP) devices (see www.prop.org)
- Audio/Video MUD/MOO
 - Xerox PARC Jupiter experiment was cut short...
- Sketching/collaboration tool
 - PPT is great for formal presentations, but how do you
 - Pull-up a blank sheet*
 - Sketch on it*
 - Allow other people to mark-up the page*
 - Save the final result & the sequence of operations*
 - Mash MediaBoard is a good foundation

Open Mash Project

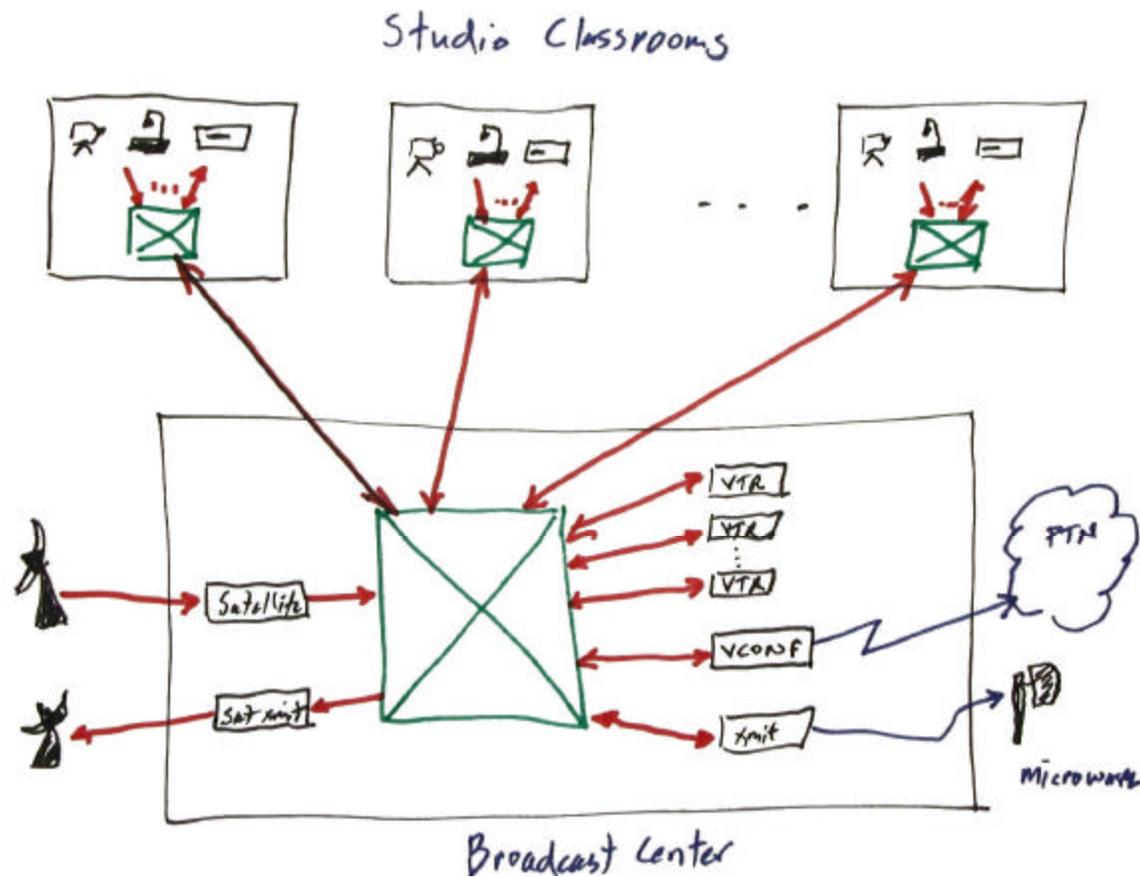
- Public domain, open source project
 - Support, development, documentation and training for Mbone tools => started with Mash software
 - Binary and source distributions
 - Platforms: Sparc, PC Unix, Windows*
 - Source forge project
- Webcasting tools
 - vic, vat, nsdr, dc/vd, rvc, bmgr, tgw, mb, mplug, as/1, mars, etc.*
 - RTPtv – production quality TV over Internet
 - D1 (59.94 fields ps)/CIF (30 fps) images at 2.5-25 Mbs*
 - Stereo Linear 16 audio at 16-48 KHz*
 - Requires low cost mpeg board for Linux box (\$400)*
 - Open Mash modified to play video streams*

Development Projects (AY '02)

- RGB capture tool
 - Hardware board that will digitize RGB directly
 - Integrate with *vic*
 - Explore development of custom codec
- Improved headless *vic* (*rvc*, *rvic*)
 - Play still image, titling, etc.
- H.263 video codec (mpeg?)
 - Add heuristics to existing code
 - Goal: full-sized images, good quality at 500-800 Kbs
- 16-bit audio support and mp3 codec
 - Modify core abstractions so we can build reasonable combined audio/video player with a/v synch
- Video explorer
 - Interface to browse multiple video sources, map source to different sessions, rapidly join/leave sessions, PVR recording, etc.

Example Video Distribution Network

How do you browse the video streams to see what is happening?



Development Projects (cont.)

- Explore new middleware standards initiatives
NSF, Internet2, Grid, MS, Corba, etc. are advocating development of middleware
Streaming media toolkits need to participate, but what is the appropriate standard?
- Some comments...
 - ITU & IETF defines standards for codecs and transport
H.26x, H.72x, H.32x, RTP, RTSP, SD/SAP, etc.
Need standard for media storage and meta files
 - SOAP/xmlRPC fits well with TclDP we use for low-performance control RPC
 - Has CORBA's time finally come?
 - Middleware services must include multicast services
Announce/listen protocol, multicast transport (reliable/unreliable, single-/multiple-source), external device control services, etc.

Summary

- AG/VRVS are just the beginning
- Must build system as easy to use and as reliable as a telephone, TV, etc.
 - “Systems solutions” that sense and adapt
 - Automated systems that work “well enough” are acceptable for many situations
- Add services
- More nodes
- More events