

# **Videoconferencing & Collaboration Technology at NLM: Seeking Assistance**

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- **Videoconferencing research in telemedicine, distance learning, & presence**
- **Externally funded projects**
- **Internal Collaboratory technologies & applications**
- **Observations/outcomes**
- **Future research activities**

# Collaboration Technology

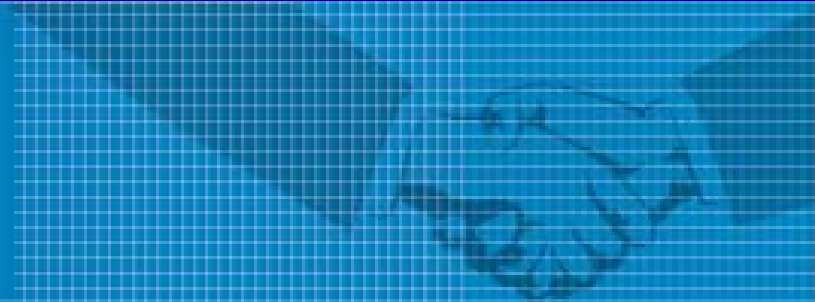
- **Broad definition** – Any tool allowing people to work together and exchange information.
- **Narrower definition** – Any tool allowing people to work together and exchange information *online*.
- **Narrowest definition** – Any tool allowing people to work together and exchange information *synchronously online*.

# Videoconferencing Technology

- **Non-Internet** - Via satellite, microwave, ISDN (H.320)
- **Internet protocol (IP)** - Off-the-shelf & emerging

# Venue

*The Collaboratory for  
High Performance Computing  
and Communications*



<http://collab.nlm.nih.gov>

# The Learning Center



# Collaboratory



# Goals

- Explore alternative technologies of possible use to NLM.
- Establish a communications infrastructure for internal work and demonstrations.
- Develop general knowledge and understanding of technologies used in advanced networking projects.



# Significance

- Interest in video over advanced networks by Internet2 community generally and our collaborators
  - Need to develop first hand knowledge of technology/application problems
  - Need to demonstrate/explain applications funded
  - Need to participate in activities of the Internet2 community

# NLM Supported Research Using Videoconferencing

## ■ **Telemedicine research projects:**

Beth Israel Deaconess Medical Center, Charles R. Drew University, East Carolina University, Georgetown University, Indiana University, Johns Hopkins University, Northrop Grumman, University of Iowa, University of Maryland, University of Missouri, University of West Virginia

## ■ **Distance learning research projects:**

Stanford University, University of Chicago

## ■ **Both:**

George Mason University, University of Washington

# Videoconferencing Research

- Telemedicine
- Distance learning
- Presence

# Telemedicine Research

- **Application areas** – Store & forward, home monitoring, clinician interactive
- **Criteria** - Diagnostic relevance, access, satisfaction/acceptance, cost

Source: Hersh, et al. (2001) Telemedicine for the Medicare Program. Evidence Report/Technology Assessment No. 24 & Supplement, Agency for Healthcare Research & Quality.

# Telemedicine Outcomes

- **Use > research (feasibility)**
- **Cost savings**
- **Improved access**
- **Clinical outcomes/diagnostic relevance**

# Diagnostic Relevance

- **Type of service** – Clinical interactive and home monitoring vs. store and forward
- **Specialty area** – Specialties with face to face encounters & video diagnostics
- **Patient condition** – Saliency of symptoms relevant to video and not masked by video quality

# Supported Telemedicine Studies

- Privacy & uninterrupted attention
- Zone of comfort
- Important but restricted clinical relevance
- Technology access factors
- Diagnostic relevance/network performance

# Distance Learning Research

- **Types of distance learning** – Synchronous, asynchronous, blended
- **Outcomes** – No significant differences
- **Attrition** – Setting, self-learning, isolation
- **Access** – Time/place flexibility
- **Preferences** – Convenience vs. classroom
- **Technology** – Video with interaction is better than without; social presence helps; video  $\neq$  face to face



# **Videoconferencing in Distance Learning Research**

- **Video valued**
- **Different onsite/offsite interaction**
- **Usually with groups**
- **Usually with a single instructor**
- **Usually compares onsite with offsite**

# Supported Distance Learning Research

- Often add-on to other applications
- Increased access
- Infrastructure and presence extending
  - 3D imaging and virtual reality
  - Haptic interfaces
- Increased learning with 3D

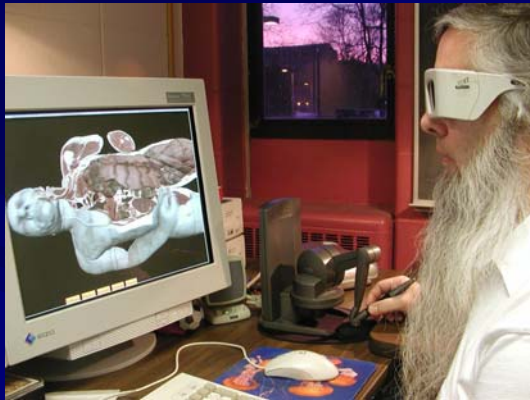
# Video & Presence

- **Greater psychological distance**
- **Restricted point of view**
- **Less view control**
- **Poor resolution/cue recognition**
- **More explicit handovers**

# Presence Research

- **Identifying presence effects in applications**
  - Task variables
  - Social learning variables
- **Extending presence in the collaboration environment**
  - Application sharing & eye gaze
  - Virtual and augmented reality, 3D video

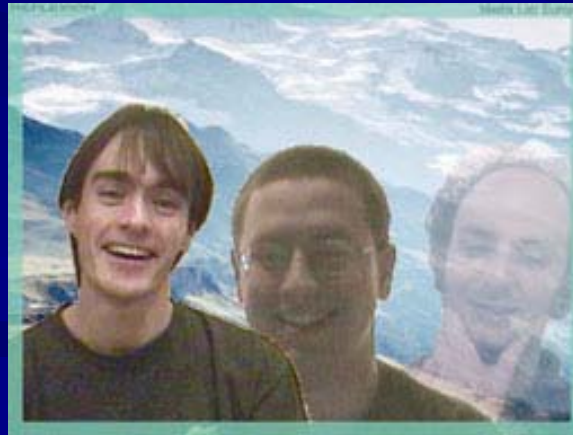
# Extending Presence



Stanford 3D/Haptic



Virtual Office



Reflection

# The Collaboratory & Videoconferencing

- Videoconferencing technologies
- Technology applications
- Observations & outcomes
- Future research activities

# Videoconferencing Technologies

- **Proprietary/quasi-standard** – iCOSM (MotionJPEG), StarValley (MPEG2), vBrick (MPEG2), Session (wavelet)
- **Standard/open source** – Polycom, VCON, First Virtual and other H.323 (Session 2) products; Access Grid

# National Meeting Demonstrations

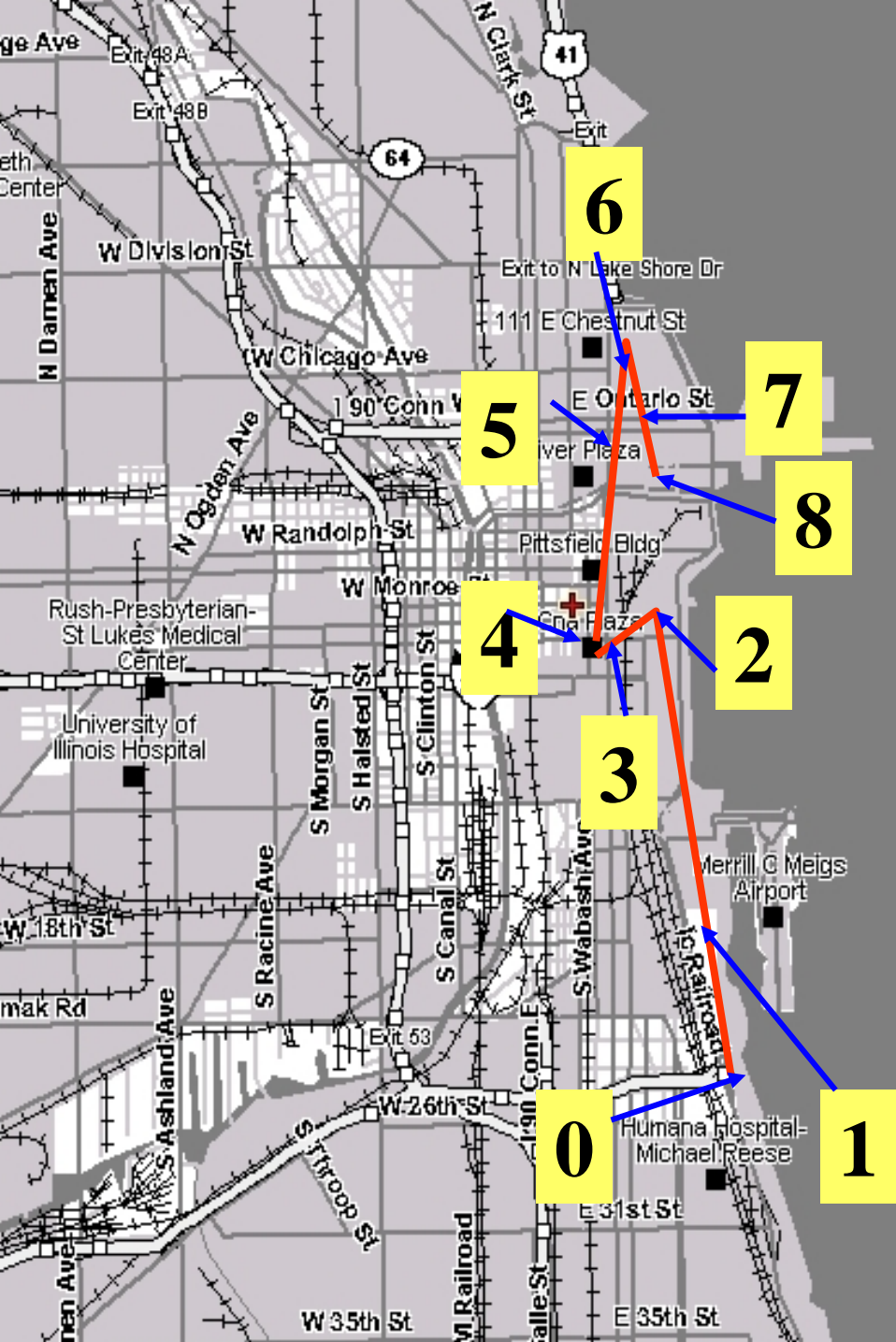
- **Radiological Society of North America – 2004, 2003, 2002, 2001, 2000**
- **American Society of Clinical Pathologists – 2002**
- **Internet2 Member Meetings – 2001, 2002**
- **Slice of Life – 2002, 2000**
- **National Association for Equal Opportunity in Higher Education – 2001**



# Demonstrations



Radiological Society of North America Annual Meeting 2003



# Metropolitan Research And Education Network, Links to McCormick, ICN, MREN GigaPOP, Abilene

- 0) McCormick Place
- 1) GE Link from McCormick to
- 2) ICN Hub at JRT Building
- 3) OC3 Link from ICN JRT Hub  
to MREN GigaPOP1
- 4) MREN GigaPOP1 at 225 Randolph
- 5) OC12 Link from MREN GigaPOP1  
↔ MREN GigaPOP2 at 710 NLSD,
- 6) MREN GigaPOP2 at 710 NLSD
- 7) MREN GE Link to Abilene  
At 455 CFC
- 8) Abilene/Qwest Hub at 455 CFC

Source: J. Mambretti@MREN

# Other Activities

- Internal demos
- Distant presentations/Project TOUCH
- University of Missouri Virtual Site Visit
- Internet2 Virtual Member Meeting
- Internet2 Working Group Meetings
- King-Drew HS/Charles R. Drew University
- Kids on the Grid



H.323 Presentations

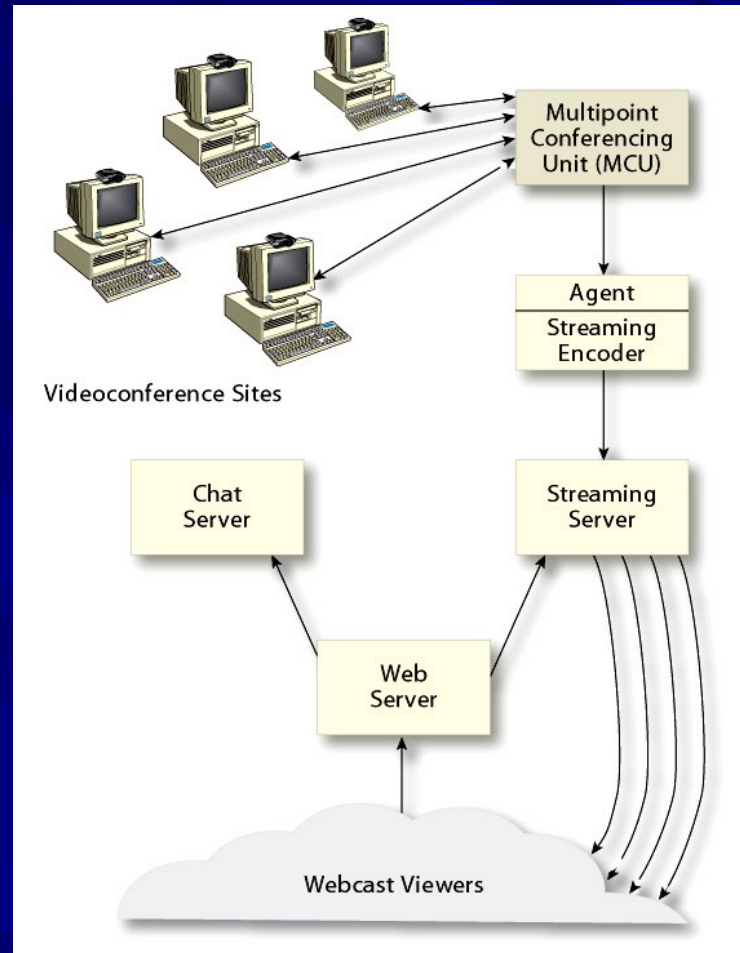


Access Grid Seminars



MPEG2 Board of Regents Demonstration

# Videoconferencing/Webcasting Experiment (2001)



Locatis, et al. (2003). Webcasting videoconferences over IP: A synchronous communication experiment. *Journal of the American Medical Informatics Association*, 10(2), 150-153.

■ <Guest146> I can see people from 4 locations - please send a URL with their names and affiliations?  
 ■ <Guest61> Does anybody else feel like they are living in an epsidoe of the prisoner?  
 ■ <Scott> In the upper left are Craig Locatis, Charlie Schneiderman and Paul  
 ■ <Guest146> The sound is terrible now...  
 ■ <eric> Houston, we have a problem  
 ■ <Scott> In the lower left are Suzanne Stensaas and Sharon Dennis  
 ■ <eric> Sound is back to "normal"  
 ■ <Guest146> Sound is great now!  
 ■ <Scott> In the upper right is Sebastian ?Unterhaage - UCLA  
 ■ Ralph Yes I think I feel like we're in the middle of "the Village".  
 ■ <Guest59> Does anyone know if this webcast is also being recording for 're-broadcast'?  
 ■ <eric>Echoing is still a problem  
 ■ <Guest146> The sound is poor now  
 ■ <Guest146> I would like to know more about the tecnology used to get this event up and running. One thing is - how did you get to broadcast from 4 locuations?  
 ■ Guest99 Quit (Web Browser left the chat web page)  
 ■ <Ralph> I think Craig's question here about interactivity can be misleading-- what adds costs is media development/delivery but not interactivty per se.  
 ■ Guest64 has entered the room (hostname: XXXXX.med.mun.ca)  
 ■ <Guest59> I guess he's implying that development and delivery of interactivity is more costly than static content. I guess that's not always true, but probably generally so.  
 ■ Guest196 has entered the room (hostname: XXXXX.med.utoronto.ca)  
 ■ Ralph is now known as Aaron  
 ■ <Guest61> Interactivity bespeaks action on the part of a system or personel (expert or peer); what type of responce mechanism are there, and has anybody ranked them  
 ■ <Guest4> Well, the learning curve for delivering interactivity is probably the rate limiting step.  
 ■ <Aaron> Perhaps a more important question is: Is the courseware based on an effective pedagogy -- not just interactive?  
 ■ <Aaron> What I mean is, interactivity does not necessarily mean multimedia and images -- it means the learner's ability to effect change in the information resource and to communicate with other learners.



Sample chat conversation

Videoconference conversation



# Results

- Technically feasible
- Difficult to manage
- Technical problems
  - Transcoding delays
  - Slower video
  - Webcast firewall problems
- User acceptance



Charles R. Drew University of Medicine & Science -  
Presentations in Medicine (Distant vs Face to Face)

# Technology Observations & Outcomes

- **Videoconferencing over IP is complicated** – Computer, applications, codecs, network, AV technology
- **Network incompatibilities** – Bandwidth, multicast, firewalls
- **Standards** – Number, fluidity

# Other Observations & Outcomes

- **Technology and business strategy**
- **Network accessibility/administration**
- **Illusive collaborators**

# Collaboratory versus Network Security Views of Outside Access



# Collaborators

- Network infrastructure
- Collaboration technology
- Interest
  - In technology
  - In applications/programs
- Scheduling/availability

# Aspects of Future Work

- Theoretical
- Programmatic
- Technical

# Theoretical

- **Independent variables** – Technology + application to address the media/message research paradox
- **Synchronous communication technology** – not just videoconferencing as the technology focus
- **Library programs** – Services, education, product evaluation as the application focus
- **Dependent variables** – Outcome, access, cost & satisfaction measures used in other telemedicine and distance learning studies



# Programmatic

- **Delivery of NLM services – Virtual librarians**
- **NLM distance education – Training on NLM products/services**
- **NLM product improvement – Distant assessment of products/services**

# NLM Services

- Comparison of messaging and videoconferencing for online reference in selected libraries
- Quasi-public terminals for access in public libraries (community library sites randomly assigned to messaging or videoconferencing or the two treatments would be alternated within each site)
- Exit interviews/surveys of users (online or in person)

# Services (continued)

- Replication with other technologies (videoconferencing vs. telephone)
- Replication in other contexts (hospitals and clinics lacking medical library staff)

# Distance Learning

- Comparison of webcasting/chat and videoconferencing technologies for search training
- Random assignment to either treatment in classroom sessions
- Search accuracy, search efficiency, learner satisfaction and learning time measures
- Replication comparing class settings to dispersed and possible scaling to courses

# Product/Service Improvement

- Comparison of videoconferencing and on-site data collection
- On-site and remote monitoring/recording of product use and search behaviors
- Post use interviews and surveys by videoconferencing versus on-site
- Interview and surveys from NLM staff versus independent third parties
- Possible replication to other products or scaling to focus groups

# Technical

- **Continued building/upgrading of infrastructure** – Software testing, conference archiving, webcasting
- **Access Grid community participation** – Testing Access Grid upgrades, developing tools
- **Emerging Technologies** – DVTS, VideoLAN

# Summary

- Reviewed existing research
- Reviewed activities & technology
- Proposed new research
  - Addressing theoretical issues (medium versus message)
  - Programmatic areas (library focus)
  - Technical infrastructure

# Collaboration Anyone?

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