



Internet2 Commons: Context and Partnerships

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Toronto Access Grid Retreat

29 June 2004

Context and Partnerships

- Context

Where does the Internet2 Commons fit into Internet2 generally?

- Partnerships

Who does the Commons partner with, how and why?

Context and Partnerships: Focusing on Communities

- Broadest sense, everything Internet2 does is collaboration.
- The Commons specifically focuses on supporting Community Collaboration, (maybe involving human “flywheels”).
- Corporate and University Members provide tools and Commons provides support for community usage.

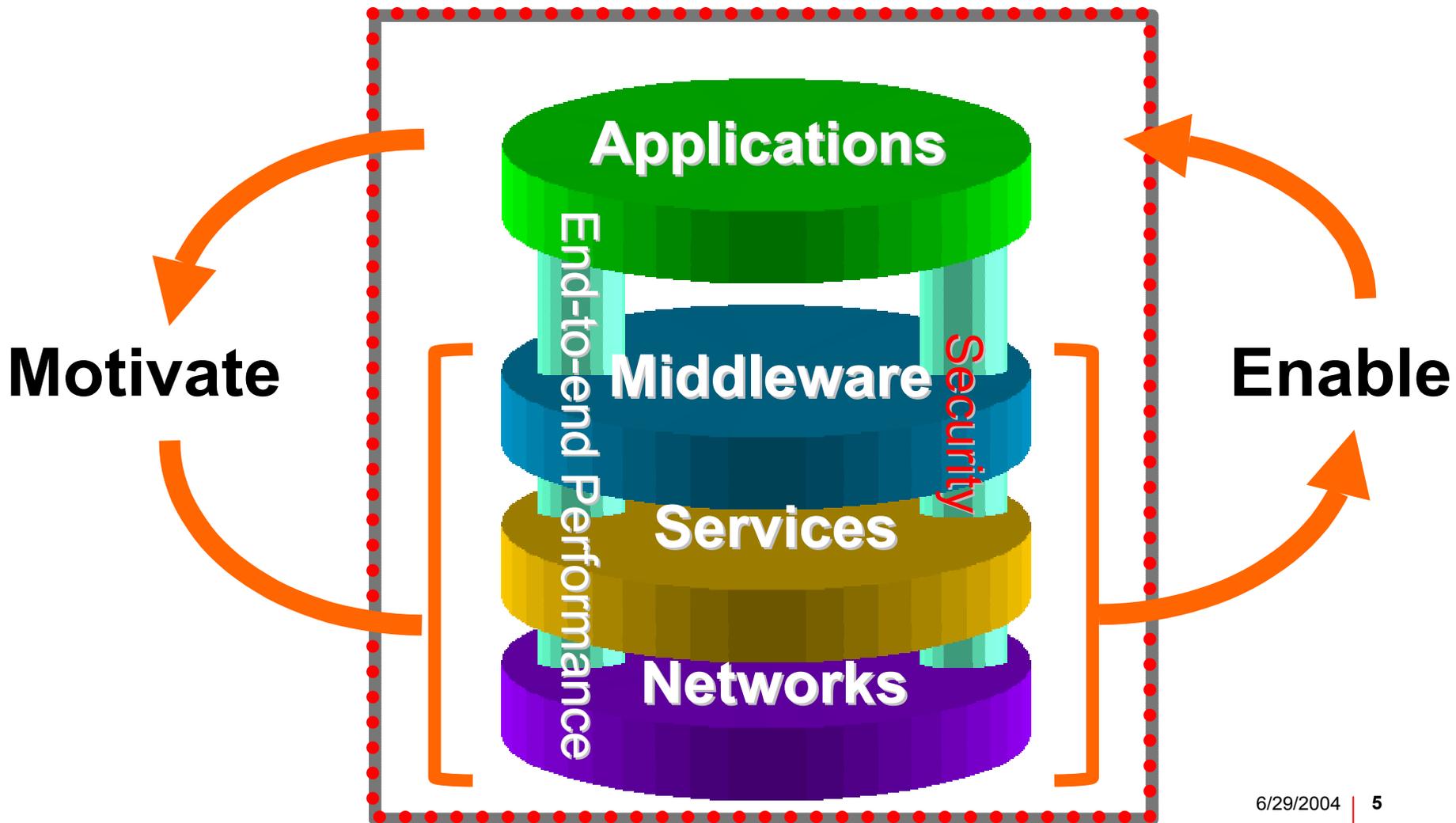
Internet2 Mission

Develop and deploy advanced network applications and technologies for research and education, accelerating the creation of tomorrow's Internet.

("Imagineering")

Internet2 is a member organization, a community of over 4 million teachers, students, researchers and affiliates.

Internet2 Today (and Tomorrow)



Infrastructure to Application

Polycom and Internet2



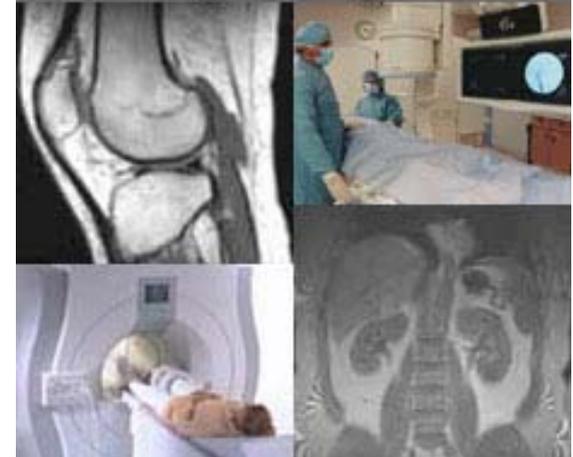
partners in education



Internet2 @ unm



**Internet2 Radiology
Working Group**



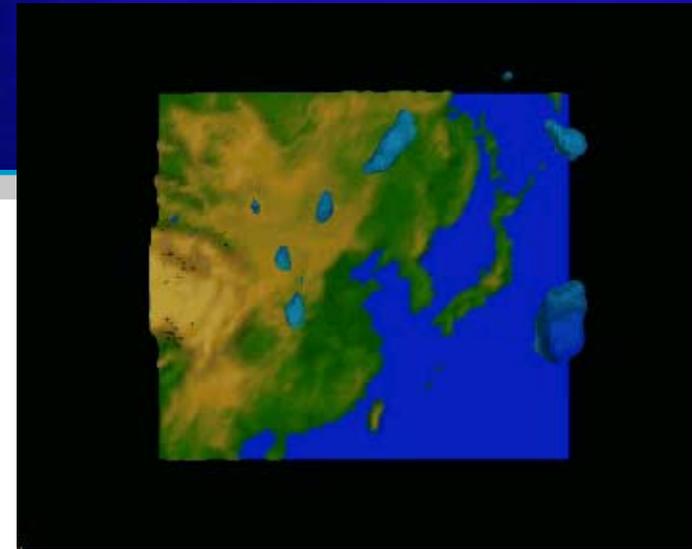
Application Attributes

- Interactive collaboration
- Real-time access to remote resources



Attributes, cont.

- Large-scale, multi-site computation and data mining
- Shared virtual reality
- Any combination of the above



Apps Working Groups, Advisory Groups, SIGs, and BoFs

- Health Sciences
- Veterinary Medicine
- Arts & Humanities
- Arts Performance
- High Energy and Nuclear Physics
- Geospatial Apps
- Orthopaedic Surgery
- Network Storage
- Digital Video
- Videoconferencing
- ResearchChannel
- Presence & Integrated Comm.
- Voice over IP
- Web collaboration BoF
- ...

Apps Discipline Approach

Broad Outreach
Internet2 Days, web site, application flyers

Health
Sciences

Arts &
Humanities

Science &
Engineering

Applications
Community

Internet2
Commons

Apps Program Managers

- Work with defined communities on integrating advanced technologies that support the discipline
- How we can help
 - Connect you with Internet2 resources and with people doing similar work
 - Help learn from other projects
 - Watch for trends
- What we do not do
 - Run your Internet2 project
 - Lay wires, code applications, etc.

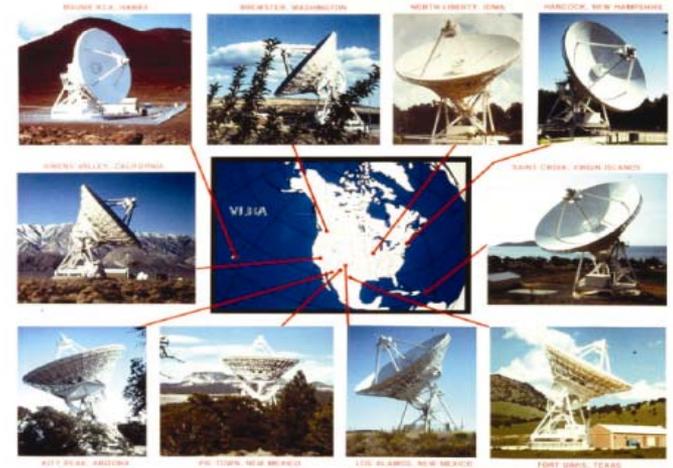
High Energy and Nuclear Physics (HENP)

- Physics has traditionally been one of the “power users” of all networks
- Physicists are generating Terabytes of data (1,000,000,000,000 or 1×10^{12}) per experiment from the CERN lab in Switzerland
- Types of network usage:
 - Bulk data transfers that are extremely resistant to data loss.
 - VRVS expects multicast and low-latency/jitter networks for effective video conferencing



As a mature community, we learn as much from the HENP community as they do from us (it could be argued that we are the students).

- Astronomers collect data about a star from many different earth based antennae and send the data to a specialized computer for analysis on a 24x7 basis.
- VLBI is not as concerned with data loss as they are with long term stability.
- The end goal is to send data at 1Gb/s from over 20 antennae that are located around the globe.



Internet2 works closely with the VLBI researchers and assists where we can. We are the teachers, but probably not for long.

- NEON is in the early stages of their development
- Their research goals and science plan is fairly well understood.
- Using advanced networks to connect researchers, data and sensors is assumed.
- The specific ways in which advanced networking will be integrated into their project still needs to be investigated.



As a new group in the Internet2 community, the Program Managers are identifying areas in which advanced networking experience can be used to further NEON's research

A New Community: Games

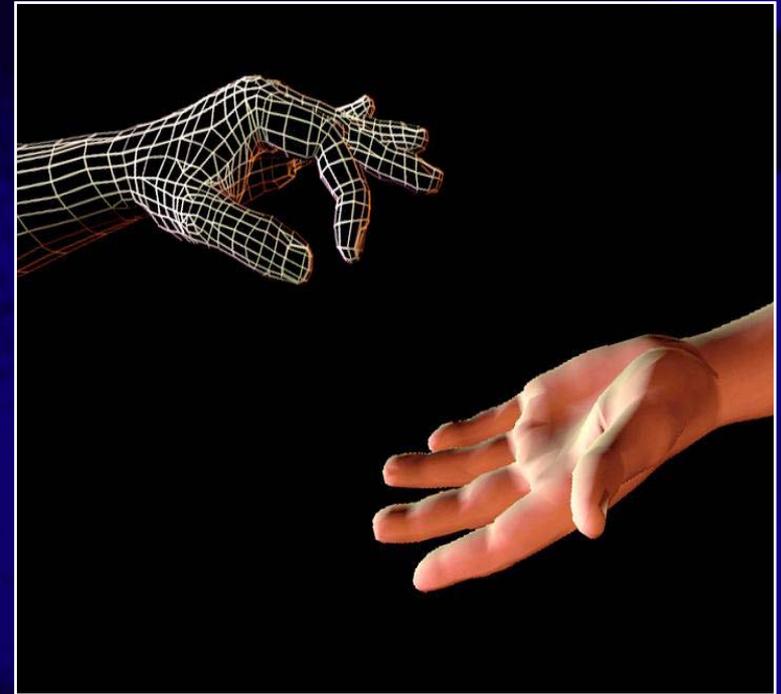


We are looking for communities that will push networking research in multiple areas, particularly areas that will become

- There are many examples of communities that might fall into this category. One of Internet2's objectives is to identify technologies, users and applications that will change the way we look at the network
- Is this Science or Art, disaster or dollars for Warner Bros?
 - Shared 3D visualizations, persistent world environments, real time interaction, trusted user communities, etc.



The scope of the Internet2 Health Science Workgroup includes clinical practice, medical and related biological research, education, and medical awareness in the public.



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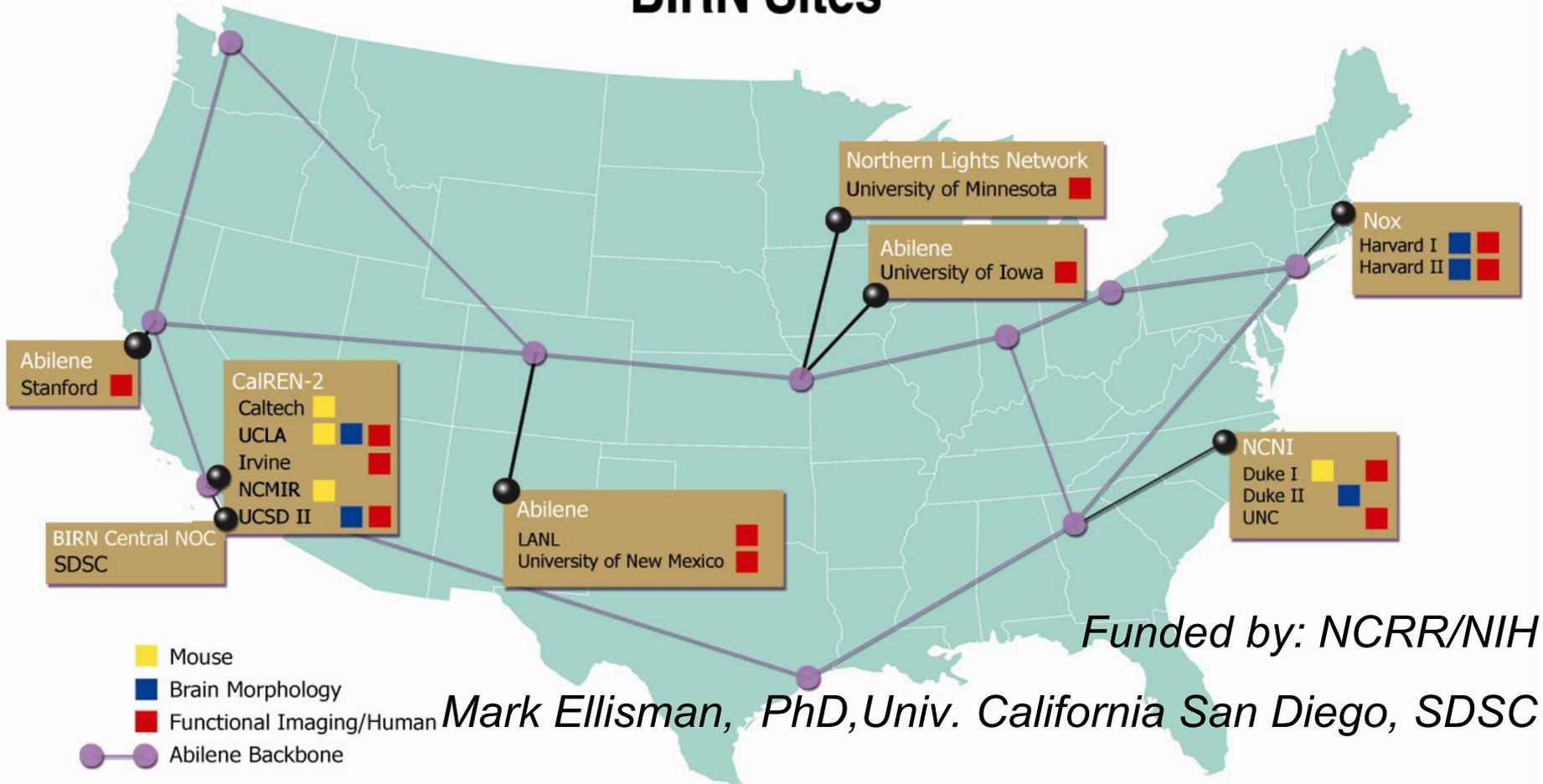
Key Health Science Members

- 86 Academic Medical Centers (AAMC)
- 130 Health Science related colleges
 - Public Health, Nursing, Dentistry, Pharmacy
- Affiliate Members
 - NIH, FDA, NSF, NASA, NOAA
 - Howard Hughes Medical Institute
- Pharmaceutical Companies (Big Rx)
 - Johnson&Johnson, Pfizer, Eli Lilly
- TeleHealth
 - Prous Science, Cisco, IBM, Microsoft, SUN, Polycom, Ford Motor Company

CLINICAL: Why Physicians Participate in Internet2

- **Extend the provision of better healthcare**
 - TeleHealth (eHealth)
 - National Tumor Board
 - Develop Clinical Skills and Assessment (AAMC partnership)
- **Distributed data sharing**
 - Electronic Health Record
 - Presence and Integrated Communications (VoIP, RFID)
 - Advanced visualization Computer Assisted Surgery
 - Computer Aided Diagnosis
- **Collaboration independent of boundaries**
 - Geography: Second Opinion Networks/Night Hawking
 - Time: Learning Technology (Distance Education)
 - Computation: Knowledge Management

BIRN Sites

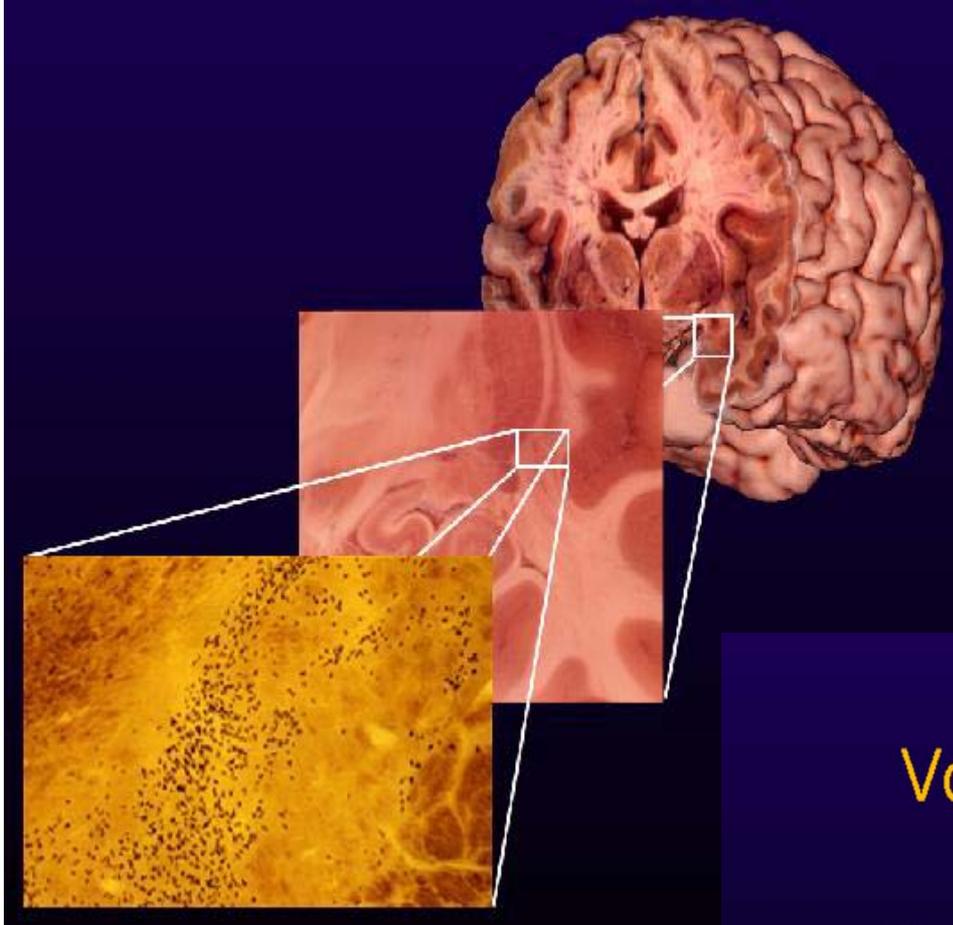


Funded by: NCRRR/NIH

Mark Ellisman, PhD, Univ. California San Diego, SDSC

www.nbirn.net

EACH BRAIN REPRESENTS A LOT OF DATA



Volume sizes by resolution -
brain = 1500 cm³

GB = Gigabyte = 10⁹
TB = Terabyte = 10¹²
PB = Petabyte = 10¹⁵

Voxel size	B&W (1 B/p)	High res (2 B/p)	Color (3 B/p)
cm	1.5 KB	3 KB	4.5 KB
mm	1.5 MB	3 MB	4.5 MB
10 μm	1.5 TB	3 TB	4.5 TB
μm	1.5 PB	3 PB	4.5 PB

***AND COMPARISONS
MUST BE MADE
BETWEEN MANY
(fMRI)***

Slide courtesy of Arthur Toga (UCLA)

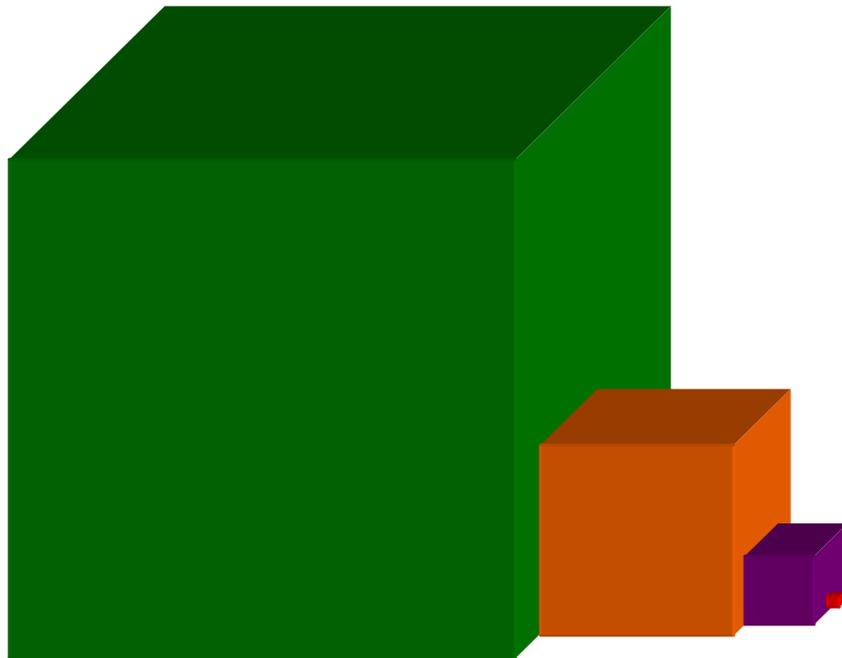
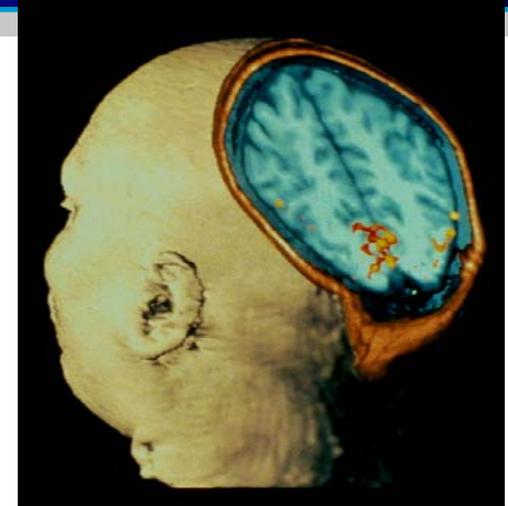


Time Needed to Move Brain Images Across the Internet

Voxel size: 1 mm

Imaging Technology: Current color MRI

Data generated: 4.5 Megabytes



643 seconds

56 Kbps Modem

36 seconds

Broadband Internet

0.4 seconds

Typical LAN

0.006 seconds

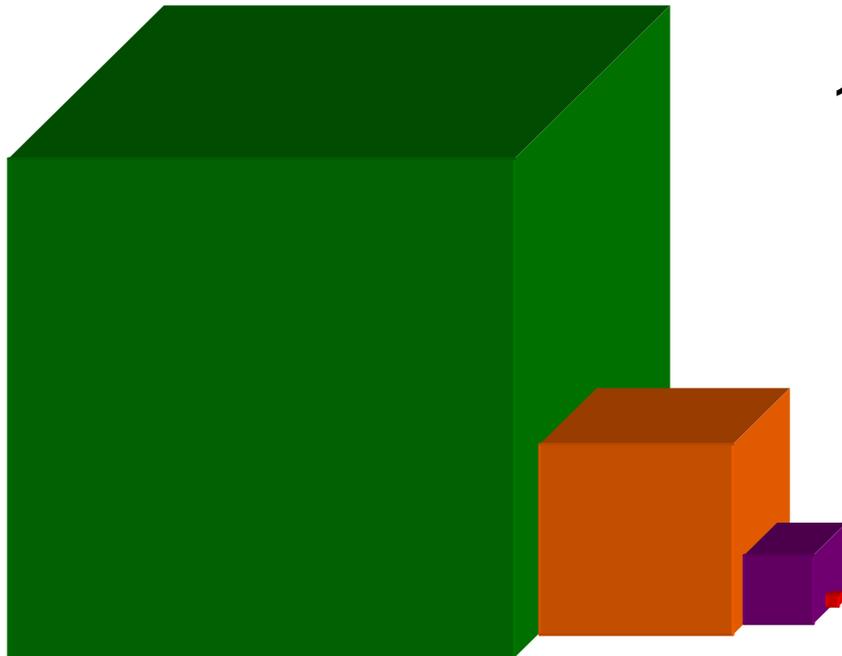
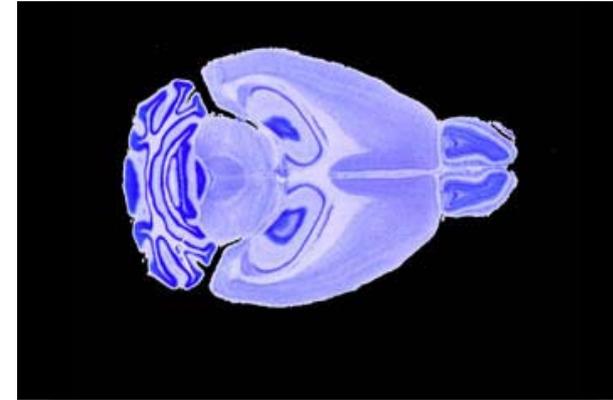
Current Internet2
Record (5.6 Gbps)

Time Needed to Move Brain Images Across the Internet

Voxel size: 10 μm

Imaging Technology: Current color fMRI

Data generated: 4.5 Terabytes



178,571 hours

56 Kbps Modem

10,000 hours

Broadband Internet

100 hours

Typical LAN

1.8 hours

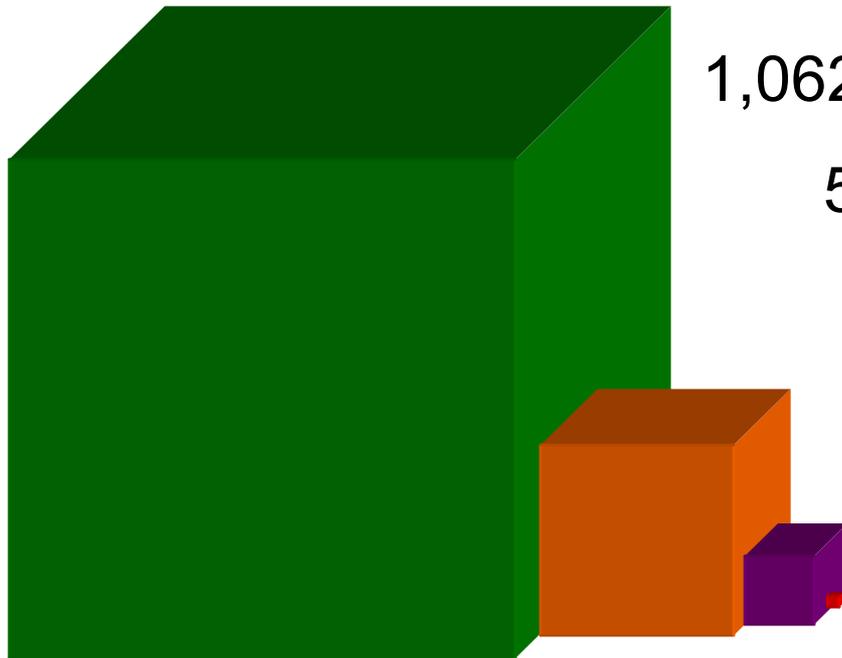
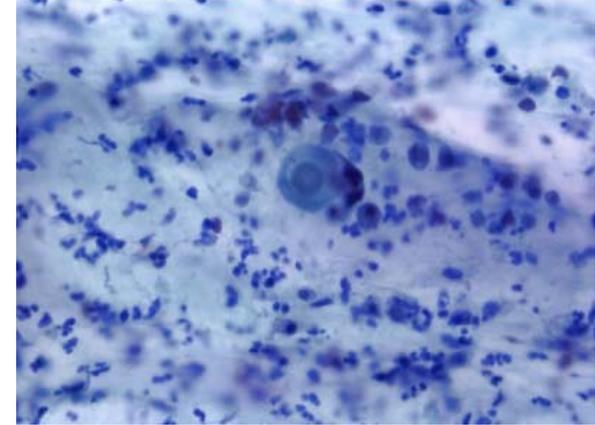
Current Internet2
Record (5.6 Gbps)

Time Needed to Move Brain Images Across the Internet

Voxel size: 1 μm

Imaging Technology: Near-future color fMRI

Data generated: 4.5 Petabytes



1,062,925.17 weeks

56 Kbps Modem

59,523.8 weeks

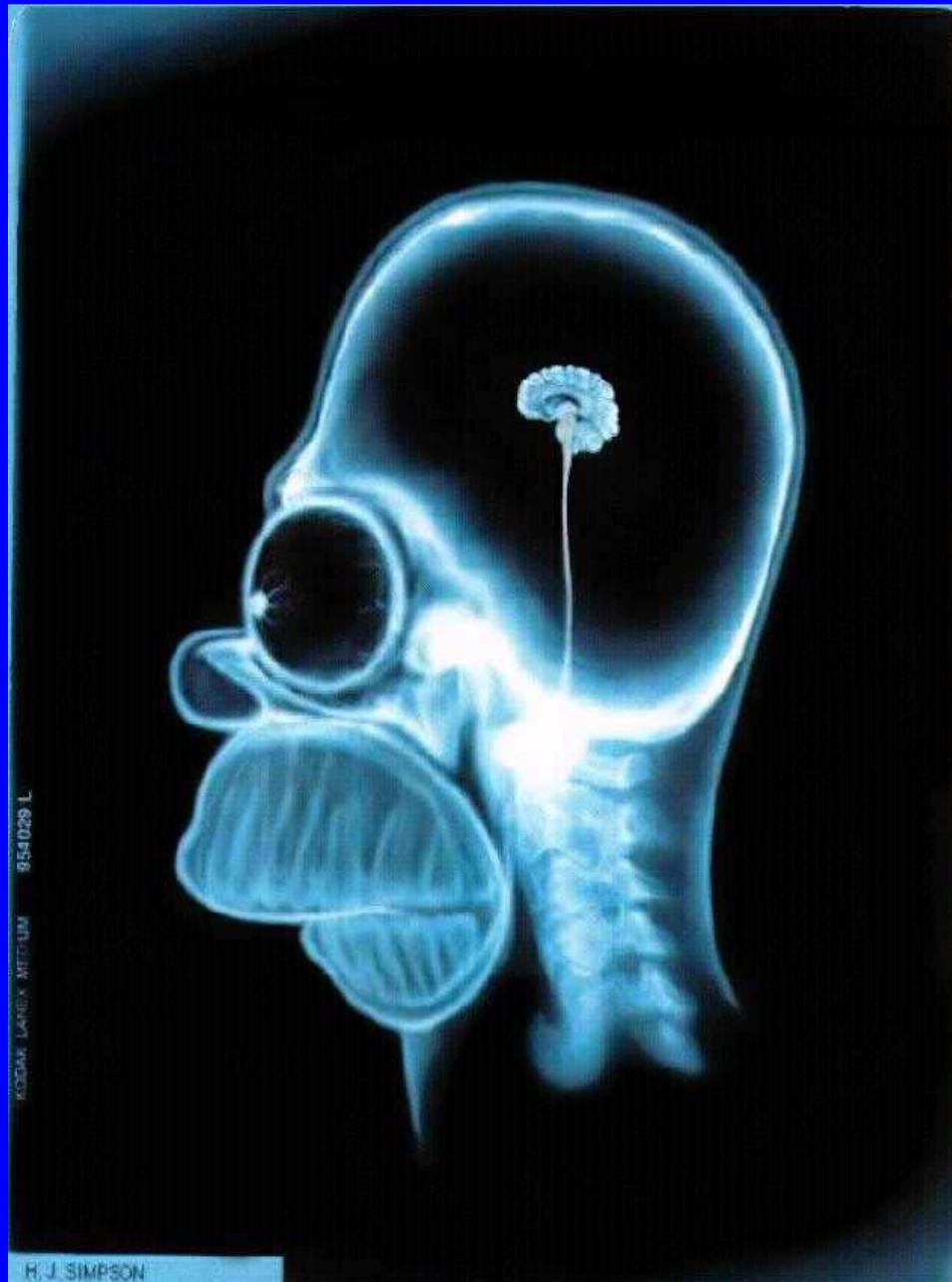
Broadband Internet

181.7 weeks

Typical LAN

10.6 weeks

Current Internet2
Record (5.6 Gbps)



KODAK LAROX MEDIUM 854028 L

H. J. SIMPSON

Slide Courtesy of BIRN

Education: Why Faculty Participate in Internet2

- Rich resources from student endpoints to centralized powerful computation and large storage
- Students absorb multiple channels of information



Remote, Real-time Simulation for Teaching Human Anatomy and Surgery

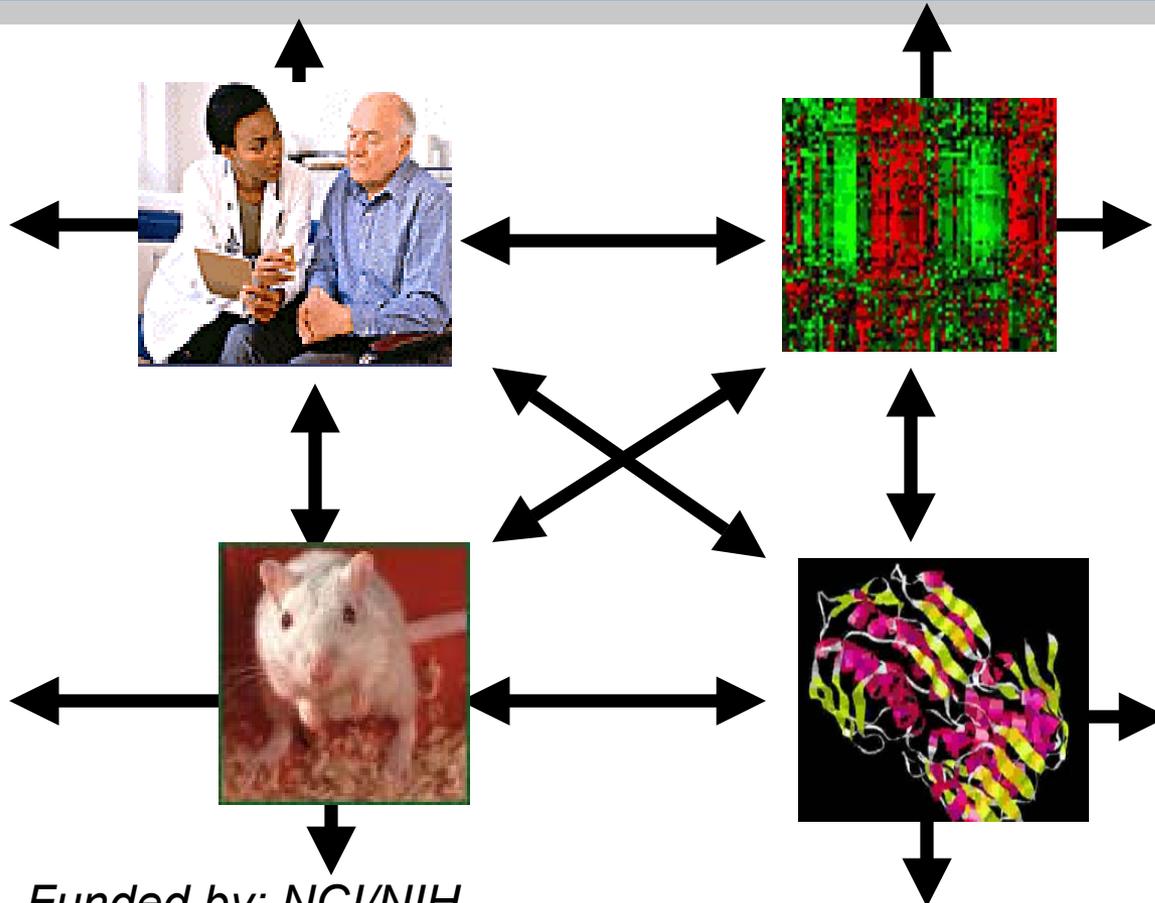
- Demonstrate remote, real-time teaching of human anatomy and surgery
- Deliver real-time simulation and visualization technologies
- Network-based architecture will allow for multiple high-resolution stereo-graphic displays and haptic devices



**Stanford University
School of
Medicine
Stanford, CA**



Research Team of the Future: Cancer Biomedical Informatics Grid



- Global Cancer Research Community
- Grid deployment to Cancer Centers
- Bioinformatics infrastructure
- Public data sources

Funded by: NCI/NIH

<http://cabig.nci.nih.gov/>

David States, MD, PhD

New World Symphony

Michael Tilson Thomas



photo by R. Andrew Lepley

Pinchas Zukerman



WSU/FSU Telematic Dance Coaching Session



- Internet2 advanced networking technologies applied to distance learning for dance
- Enabling schools to collaborate and share resources
- Providing students with access to experts

www.dance.wayne.edu

Cultivating Communities: Dance in the Digital Age

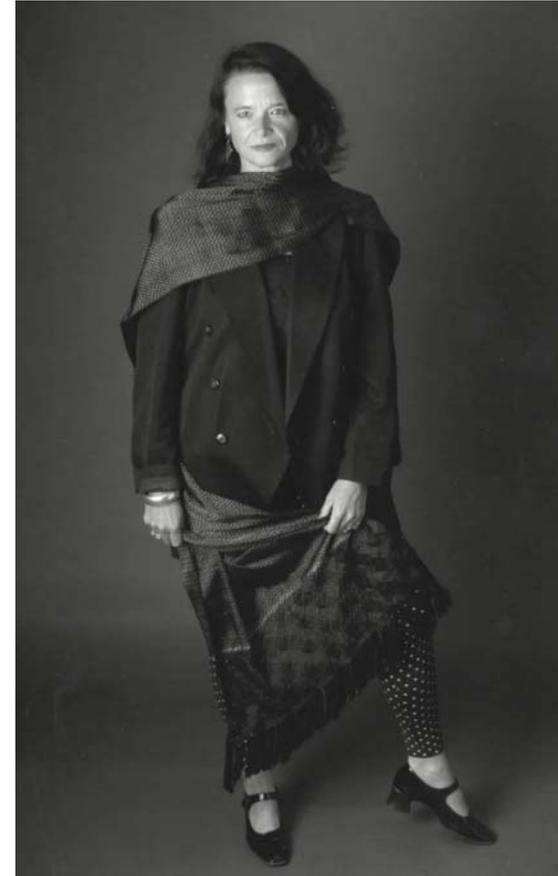
Case Western Reserve and
Cleveland Institute of Music:



The Bing Theater, University of Southern California, Oct 2002

Transcontinental Poetry Reading: A Tribute to Kenneth Koch

- Live transcontinental reading of Kenneth Koch's "Twenty Poems"
- Seven Internet2 campuses provided videoconferencing



Poet Anne Waldman

Virtual Event, April 2003

New Communities

- **Museum Community**
- **Foreign Language Instruction**
- **Archaeology**
- **Architecture**

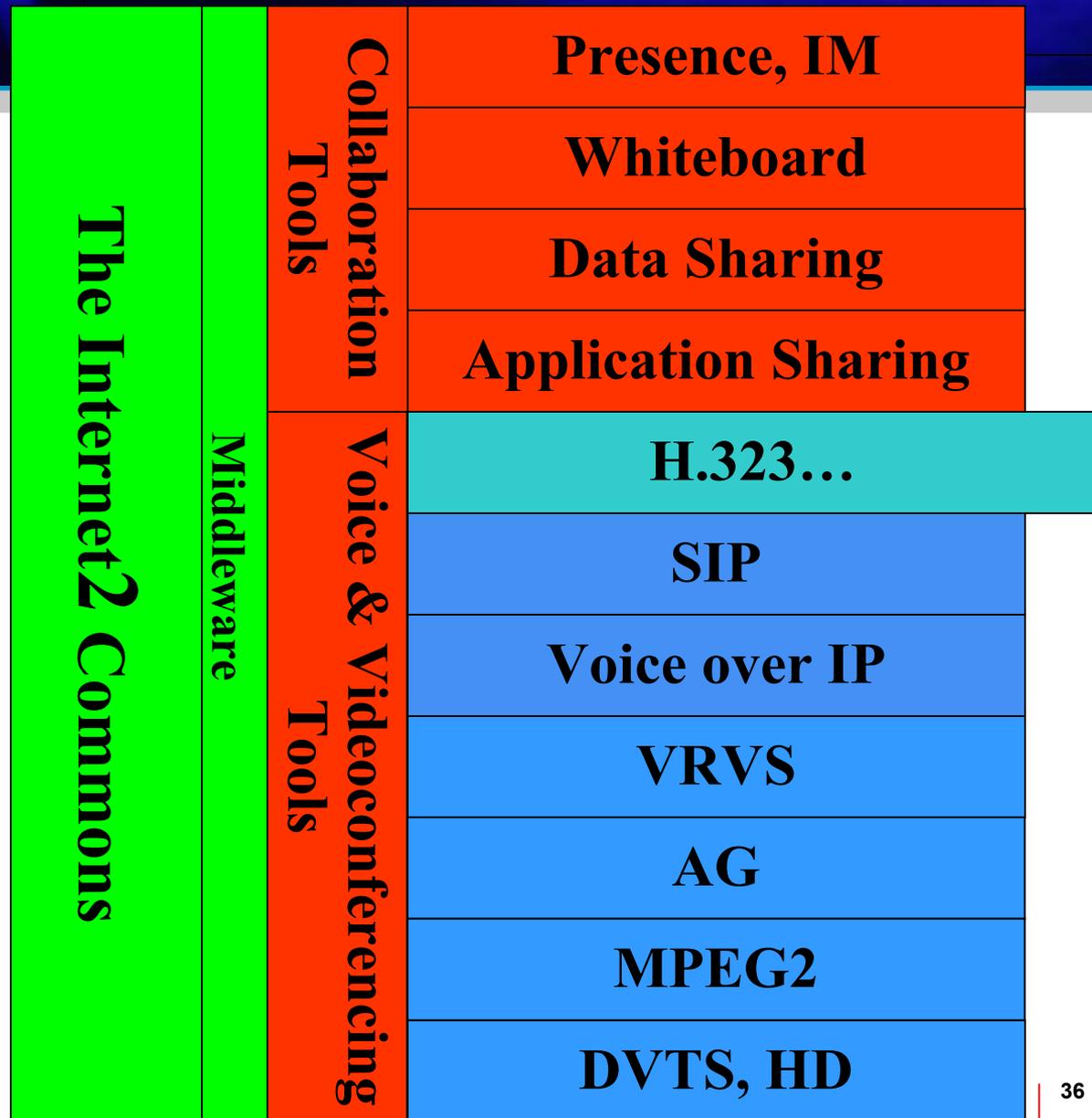


Internet2 Commons

29 June 2004

- Promote and facilitate remote collaboration by means of innovative and integrated, standards-based Internet technologies.
- Create collaboration services that are...
 - Useful
 - Sustainable
 - Affordable
 - Scalable

DVI Vision of the Commons



Video Middleware

- Further the development of middleware for digital video and related areas.
- Focus on resource discovery, authentication, and authorization for point-to-point and multi-point videoconferencing
- Next on the agenda: Federated approach to secure Video conferencing

VidMid – VC Accomplishments

- commObject became an ITU-T standard known as H.350 in August 2003.
- Directory of Directories for Video Conferencing, SURFnet, Netherlands
 - Initial Demo, March 2004, Indianapolis, IN
- Workshops
 - H.350 Workshop, March 2004, Indianapolis, IN
- Demos
 - H.323 endpoint self configuration using H.350 and authentication against LDAP, October 2003, Indianapolis, IN
 - ECS gatekeeper using H.350, October 2003, Indianapolis, IN
 - SIP User Agent self configuration using H.350 and authentication against LDAP, March 2004, Indianapolis, IN

- Launched H.323 Videoconferencing Service '03
 - Production, subscription-based service
 - Feature-rich; GDS; Firewall traversal
 - Conference streaming and archiving
 - HELP! 8a-8p NOC (OARnet/OSU)
- Quarterly Trainings (100+ site coordinators)
- Studying Web Collaboration Tools and Extending Service Suite to the Desktop
 - Extensive member interviews. “What functions do you need?”
 - Data Collaboration Survey with ViDe. “What features?”
 - Testing VRVS, WebOffice, IMFirst, Wave3 Session, FVC

Advanced Video Collaboration

- Access Grid (& NEMO)
- Microsoft Conference XP
- Comet DVIP and DVTS
 - Digital Video Transport System
 - Courtesy of Fujitsu Labs and WIDE
 - Videoconferencing and broadcasting
- HDTV projects
 - ResearchChannel/Internet2 Working Group
 - MPEG-2 via JVC components

“3-D” Collaboration

- Voice – Video – Data
- Must be Reliable and Easy
- Reliability currently depends on a stable physical environment with tested A/V & network infrastructure
- Ease of use currently depends on an intermediary (site coordinator/node operator) who masks complexity
- Successful implementation enables...

Room-based Collaboration

A stable, media-rich environment where multiple channels deliver information
(professional IT assistance not pictured)



Slide courtesy:
Parvati Dev, Stanford University



What about me?

“Desktop” Collaboration

- Need mobility & dis-intermediation
- Requires user-friendly tools with solid performance
 - All-in-one solution for everybody: totally inter-operable Videoconferencing, VoIP, POTS, IM, Data Collaboration, Shared Apps, Remote controls...
 - AG?, VRVS, IMFirst, WebOffice, Conf XP, WaveThree Session, Click-to-Meet...

Specialized Desktop Solutions

Or, instead of the “Swiss Army Knife”

- Specialized functionality designed for content communities with unique, possibly transient, need-sets
- Tools likely will be created for and by community members with IT skills specifically for the current application with no eye to scalability or longevity

Complexity? No problem



Community and Technology

- New aesthetics & personae emerge as we establish complex virtual relationships mediated by the internet.



Internet2 Commons

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