Computer Supported Cooperative Work: Past, Present, and Future Vision

Panel on Computer Supported Cooperative Work

9th Annual ON*VECTOR International Photonics Workshop

Calit2@UC San Diego

February 9, 2010

Dr. Larry Smarr

Director, California Institute for Telecommunications and Information Technology

Harry E. Gruber Professor,

Dept. of Computer Science and Engineering

Jacobs School of Engineering, UCSD

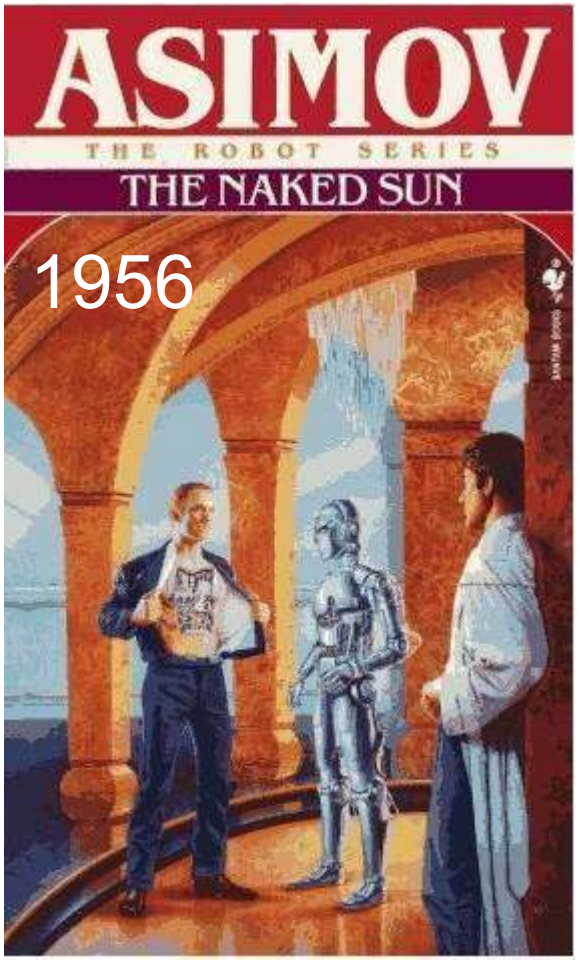
Twitter: lsmarr

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Over Fifty Years Ago, Asimov Described a World of Telepresence



A policeman from Earth, where the population all lives underground in close quarters, is called in to investigate a murder on a distant world. This world is populated by very few humans, rarely if ever, coming into physical proximity of each other. Instead the people "View" each other with trimensional “holographic” images.

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A Simulation of Telepresence

Using Analog Communications to Prototype the Digital Future

"What we really have to do is eliminate distance between individuals who want to interact with other people and with other computers."
— Larry Smarr, Director, NCSA

- **Televisualization:**
  - **Telepresence**
  - **Remote Interactive Visual Supercomputing**
  - **Multi-disciplinary Scientific Visualization**







"We're using satellite technology…to demo what It might be like to have high-speed fiber-optic links between advanced computers in two different geographic locations."

— Al Gore, Senator
Chair, US Senate Subcommittee on Science, Technology and Space

ATT & Sun

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SIGGRAPH 1989

NCSA

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Caterpillar / NCSA: Distributed Virtual Reality for Global-Scale Collaborative Prototyping





NCSA™

Real Time Linked Virtual Reality and Audio-Video Between NCSA, Peoria, Houston, and Germany

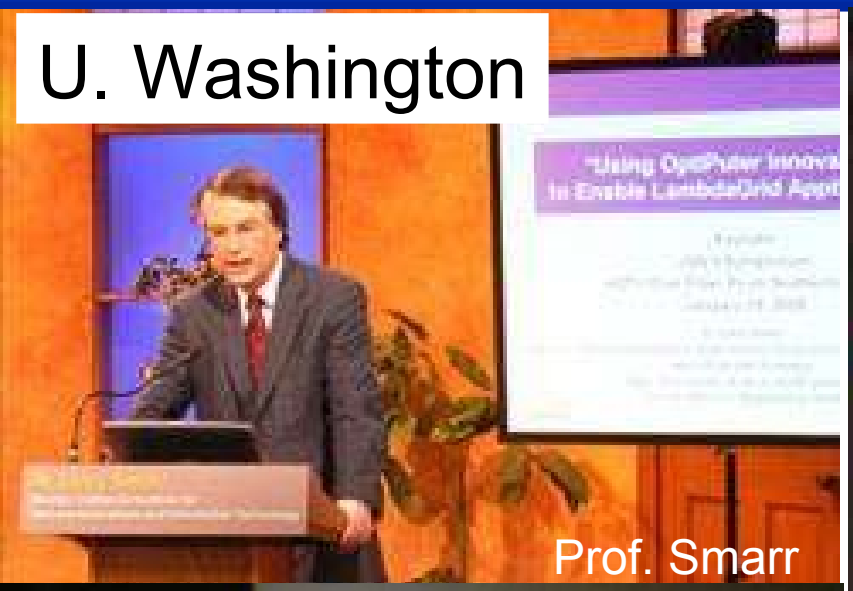
1996

www.sv.vt.edu/future/vt-cave/apps/CatDistVR/DVR.html

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Gigabit HD Streams Over Lambdas Will Radically Transform Global Collaboration







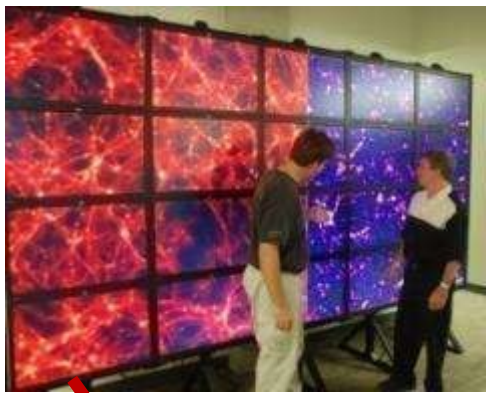
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"I can see every hair on your head!"—Prof. Aoyama

Source: U Washington Research Channel

it²

Academic Research "OptIPlatform" Cyberinfrastructure: A 10Gbps Lightpath Collaboratory



End User OptIPortal



Instruments



HD/4k Telepresence



HD/4k Video Cams

HPC



10G Lightpaths

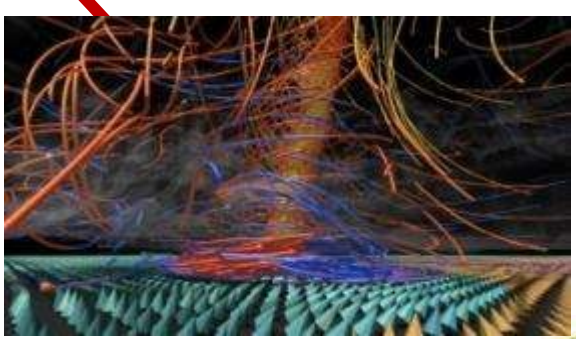


TeraGrid

Campus Optical Switch



Data Repositories & Clusters



HD/4k Video Images

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OptIPlanet Collaboratory Persistent Infrastructure Between Calit2 and U Washington



OptIPuter

Ginger Armbrust's Diatoms: Micrographs, Chromosomes, Genetic Assembly

ROCKS

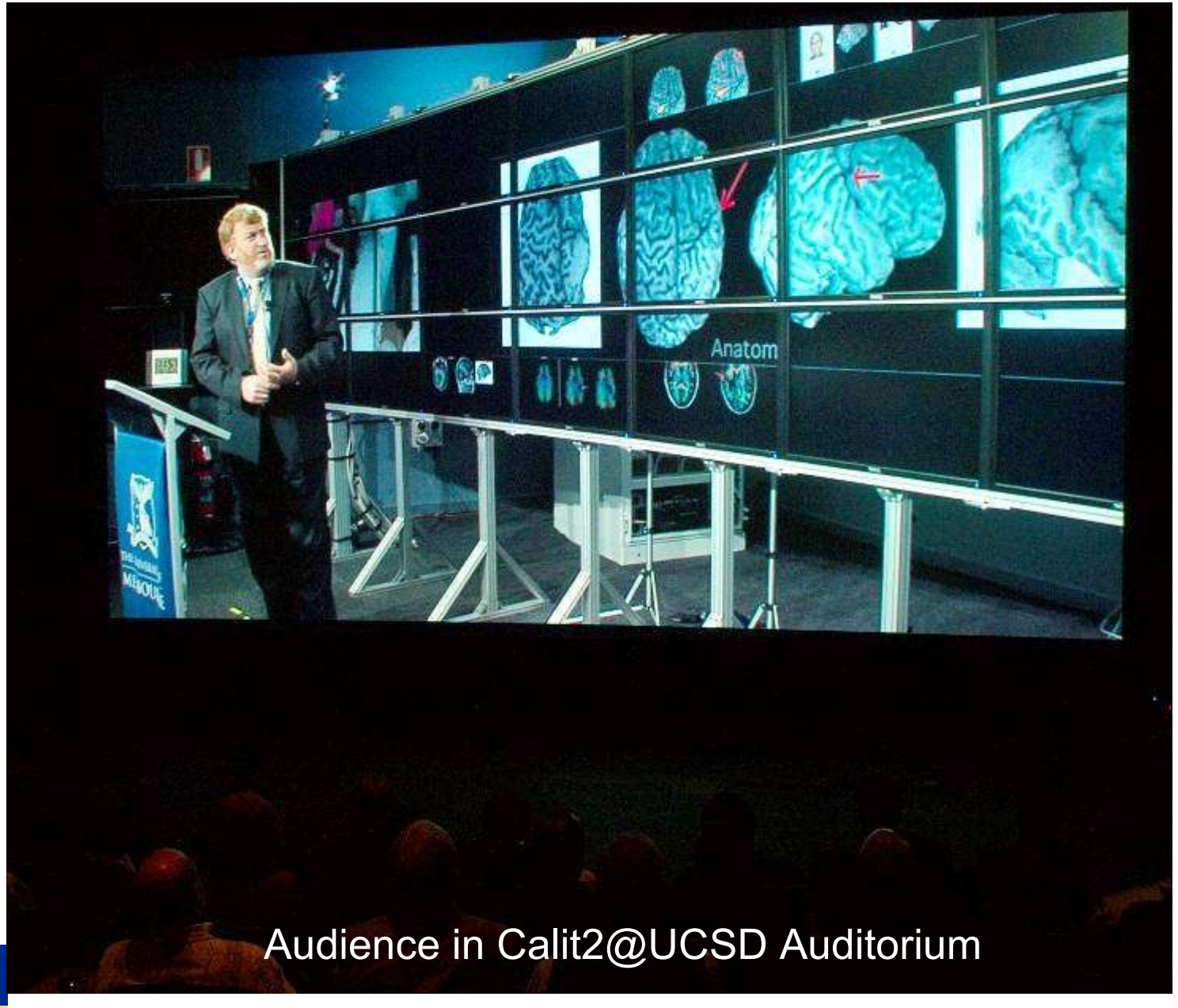




iHDTV: 1500 Mbits/sec Calit2 to UW Research Channel
Over 10,000 Mbps
Pacific Wave/CENIC
Dedicated Optical Fiber

it2

Univ. Melbourne Professor Graeme Jackson Planning Brain Surgery for Severe Epilepsy

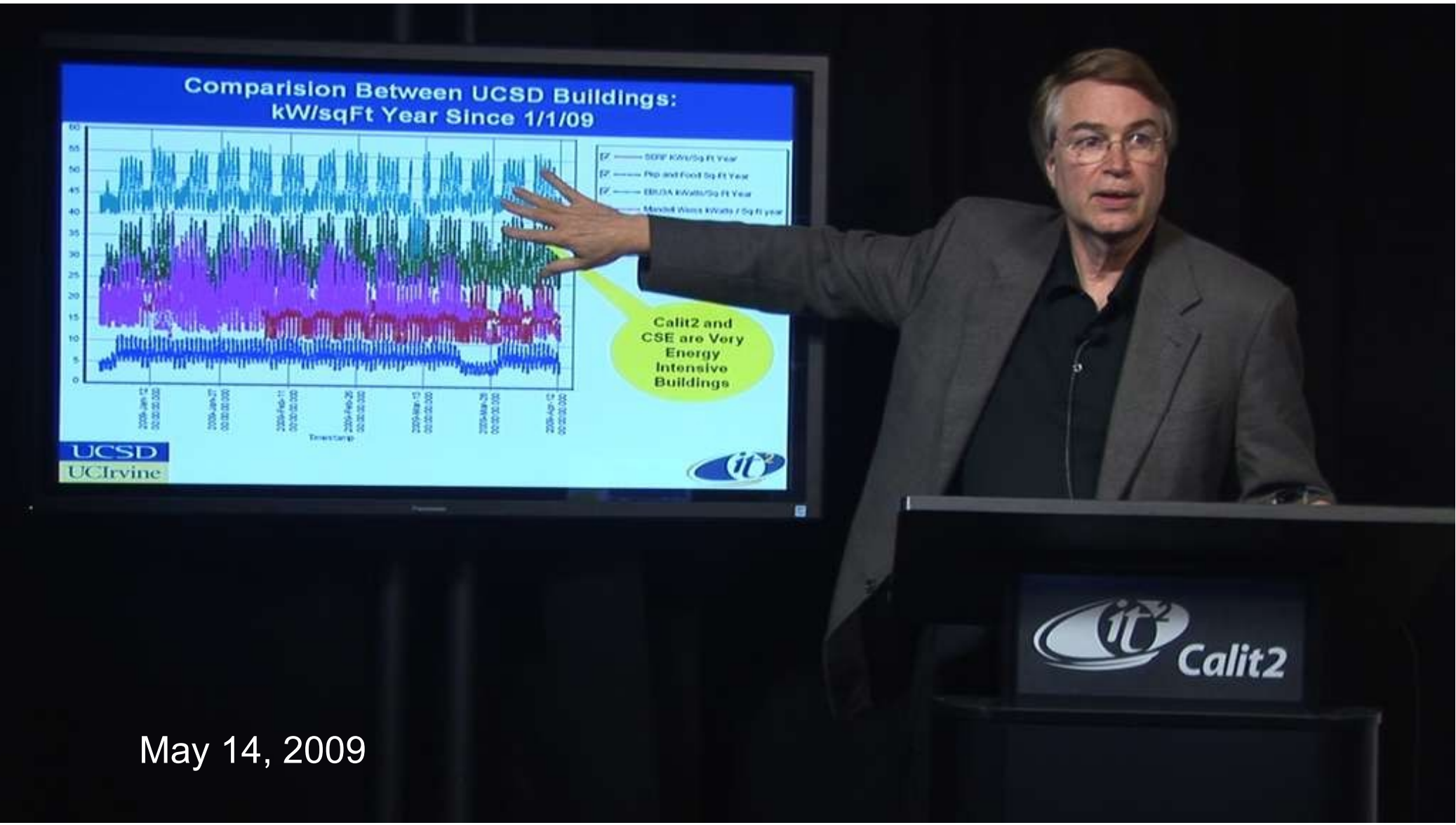


Audience in Calit2@UCSD Auditorium

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www.calit2.net/newsroom/release.php?id=1219

Monash Undergraduate Research Projects Abroad
Research Seminar Series 2009



May 14, 2009

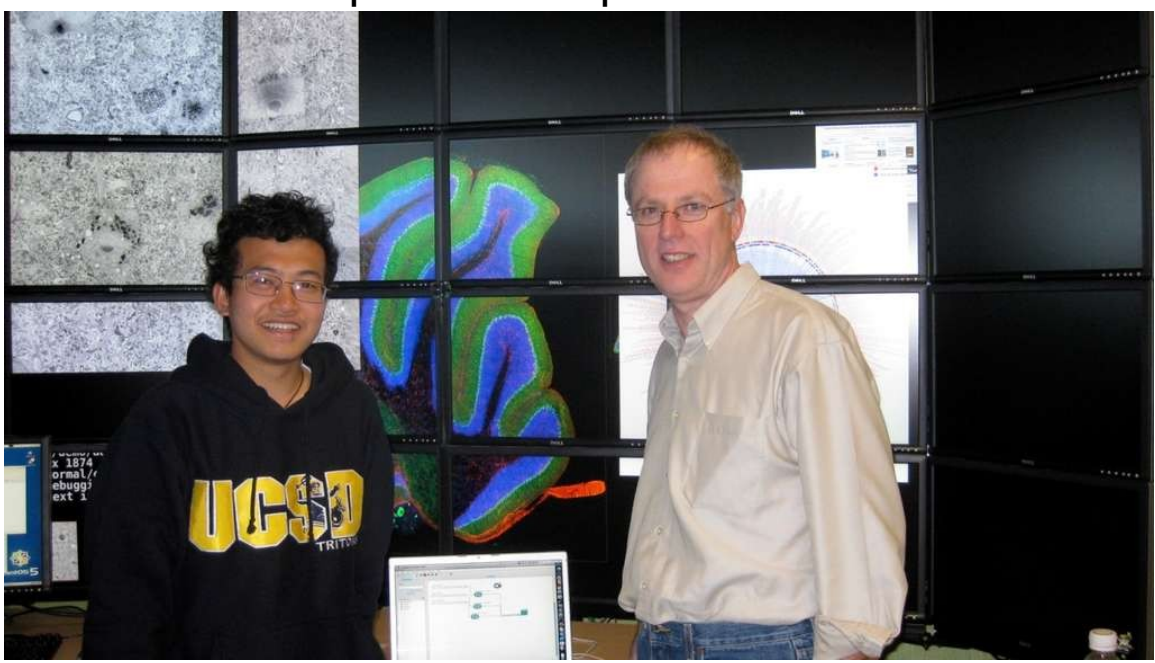
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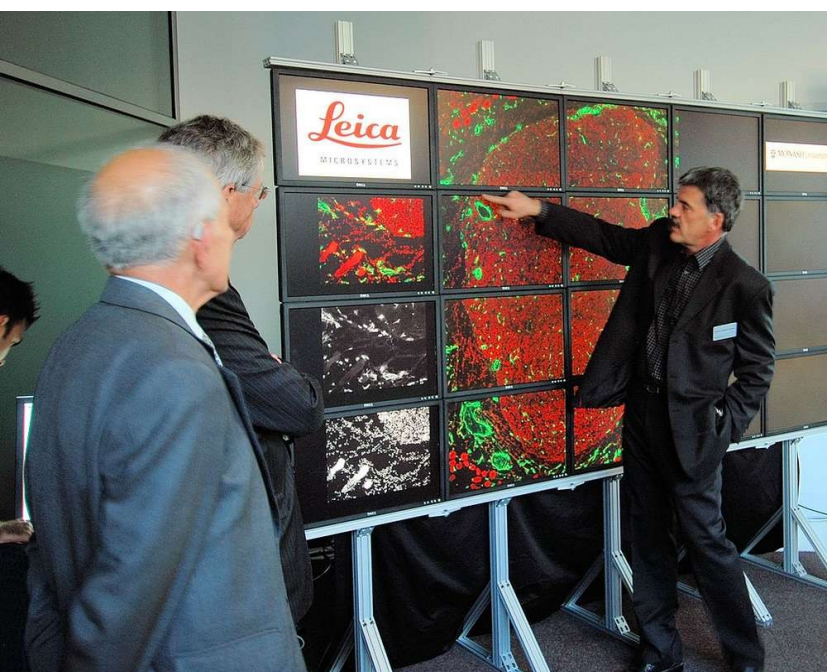
Virtual Microscopy & Analysis Using Scientific Workflows



Remote Control of Leica Microscope from Kepler Nov 2008

First OptIPortal/Kepler Link Feb 2009



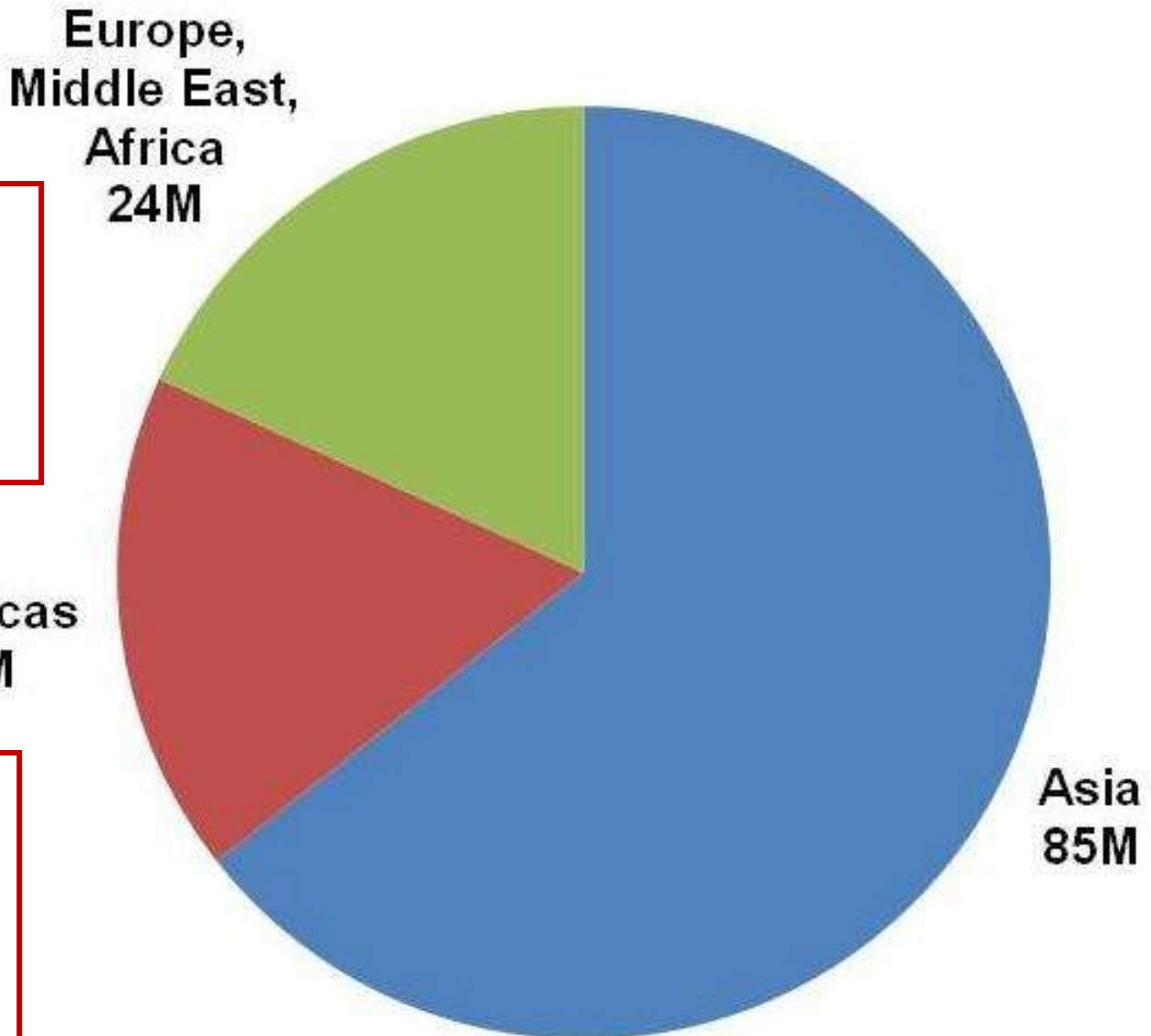


First Remote Control of Leica Microscope in Germany to OptIPortal in Australia Using Kepler March 2009

Source: David Abramson, U Monash

Globally Fiber to the Premise is Growing Rapidly, Mostly in Asia

FTTP Connections Growing at ~30%/year

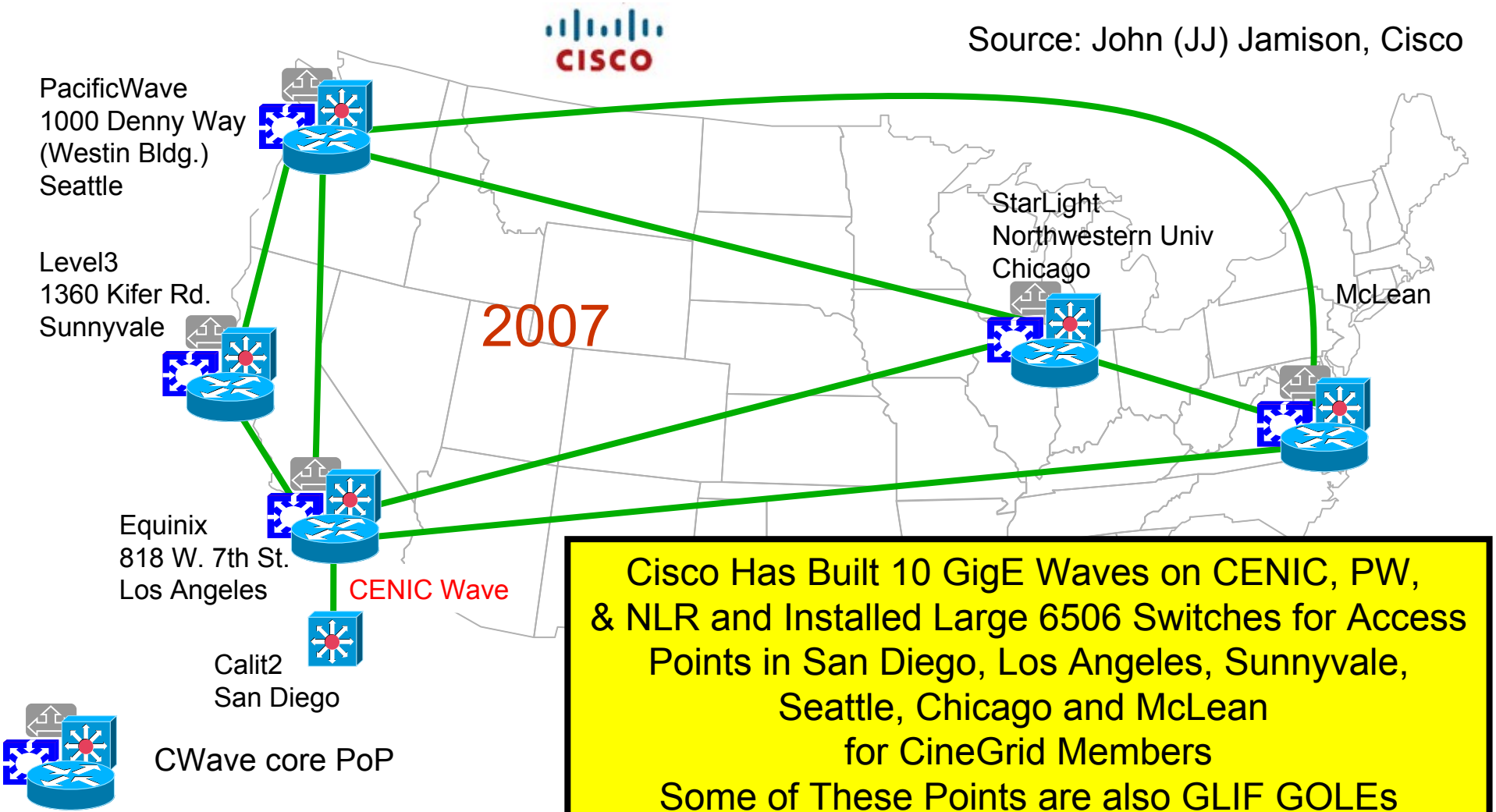


130 Million Households with FTTH in 2013

Source: Heavy Reading (www.heavyreading.com), the market research division of Light Reading (www.lightreading.com).

Cisco CWave for CineGrid: A New Cyberinfrastructure for High Resolution Media Streaming*

Source: John (JJ) Jamison, Cisco



Cisco Has Built 10 GigE Waves on CENIC, PW, & NLR and Installed Large 6506 Switches for Access Points in San Diego, Los Angeles, Sunnyvale, Seattle, Chicago and McLean for CineGrid Members
Some of These Points are also GLIF GOLEs

First Tri-Continental Premier of a Streamed 4K Feature Film With Global HD Discussion



CRCA

CISCO
C-wave
CineGrid

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4K Transmission Over 10Gbps--
4 HD Projections from One 4K Projector

it²

CineGrid Skywalker Sound Northern/Southern California Audiovisual Collaboration

Photo: Tom DeFanti, Calit2

December 9, 2009



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Peter Otto, Calit2, UCSD Music Dept.

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CineGrid 4K Remote Microscopy
USC to Calit2



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Richard Weinberg, USC

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High Definition Video Connected OptIPortals: Virtual Working Spaces for Data Intensive Research



LifeSize HD

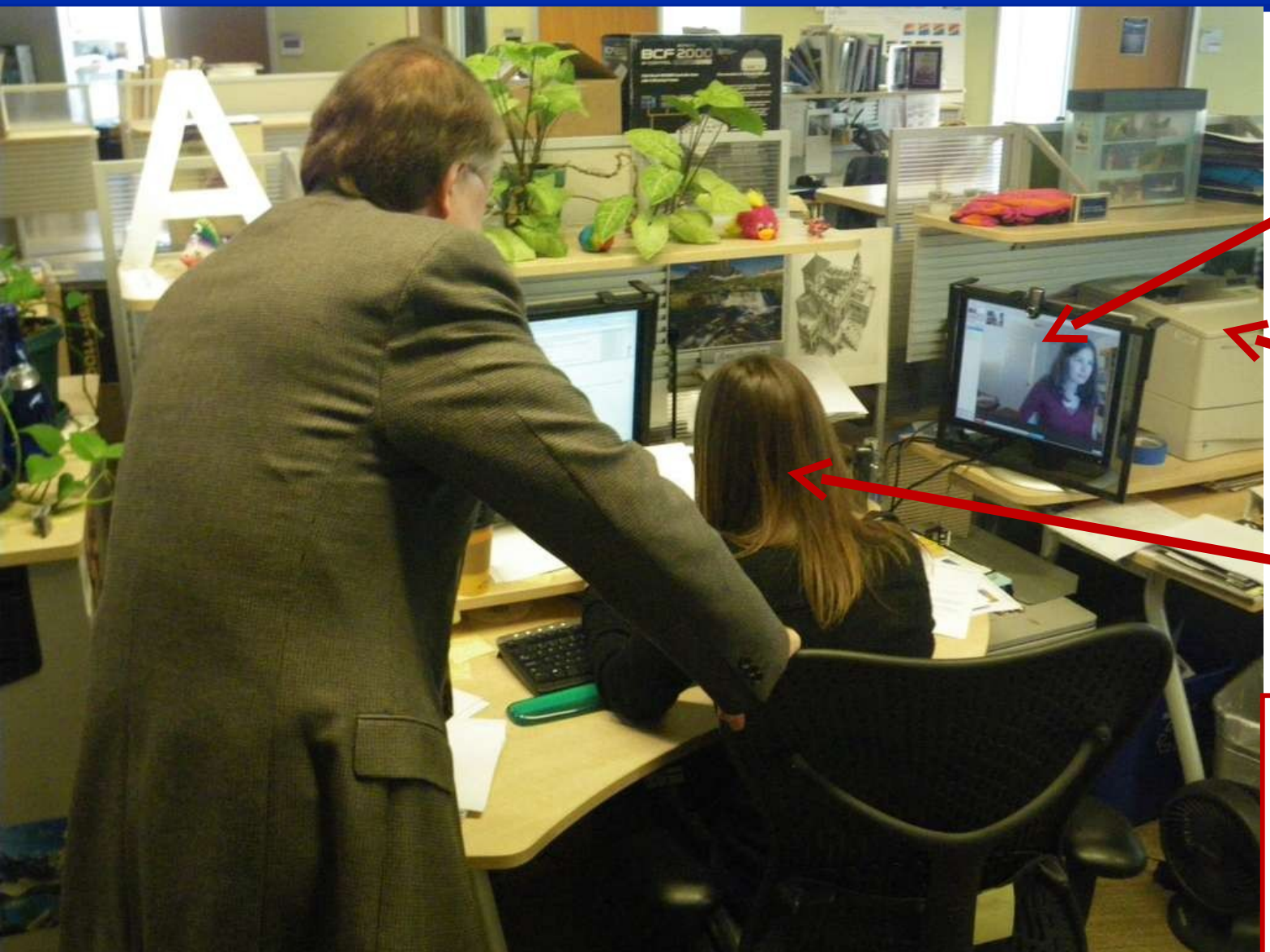
NASA Ames
Lunar Science Institute
Mountain View, CA

NASA Interest
in Supporting
Virtual Institutes

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Source: Falko Kuester, Kai Doerr Calit2; Michael Sims, NASA

Working in the Virtual/Physical World



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We Run Video Sykpe Continuously
During Office Hours

it²

Linking the Calit2 Auditoriums at UCSD and UCI with LifeSize HD for Shared Seminars



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Photo by Erik Jepsen, UC San Diego

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Becoming Dragon-A Mixed Reality, Durational Performance Combining Virtual Reality, Motion Capture, Second Life



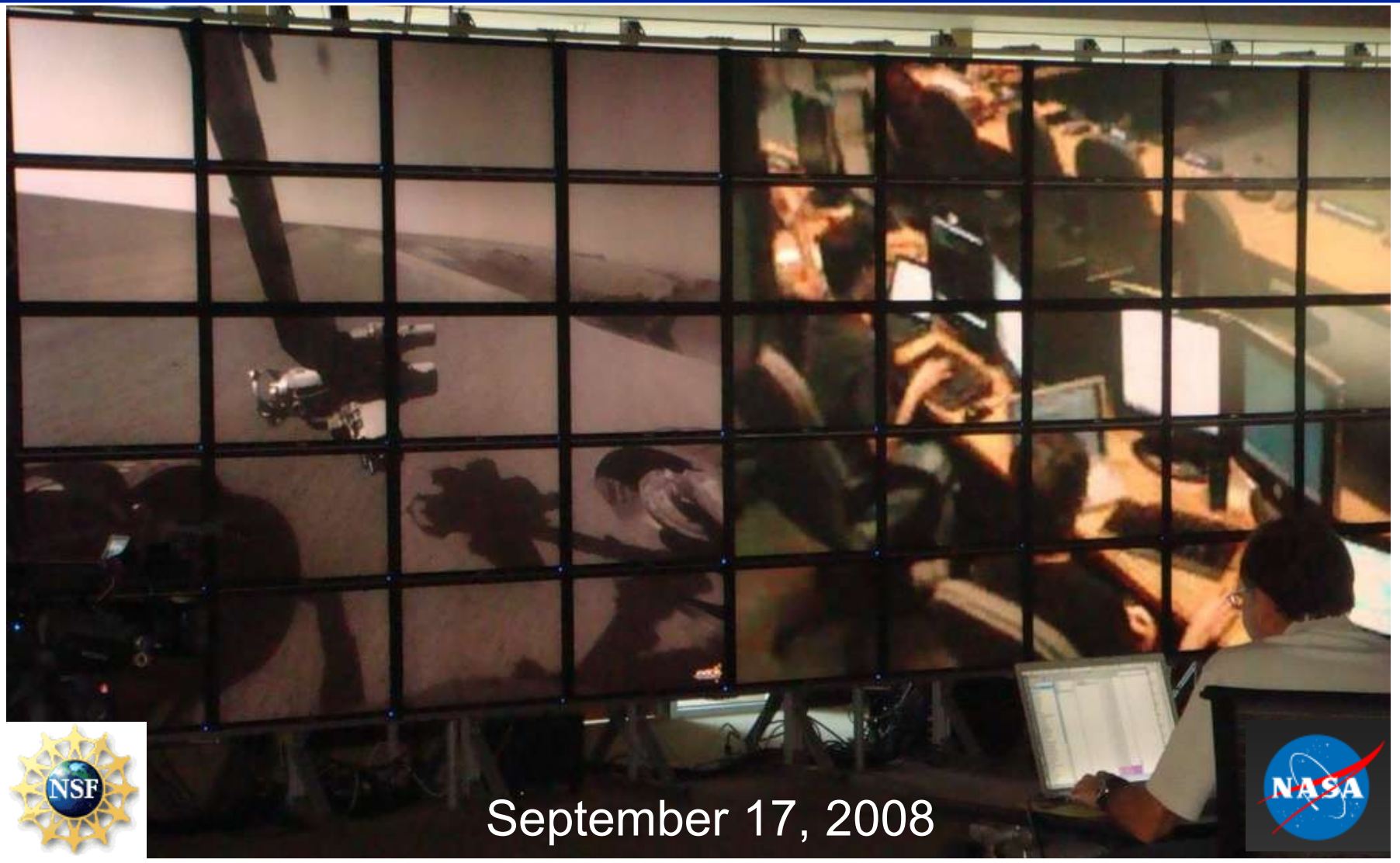
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365 hours, from December 1-17th, 2008

Source: Micha Cárdenas, CRCA, Calit2

it2

Remote Control of Scientific Instruments: Live Session with JPL and Mars Rover from Calit2



Source: Falko Kuester, Calit2; Michael Sims, NASA