“Calit2"

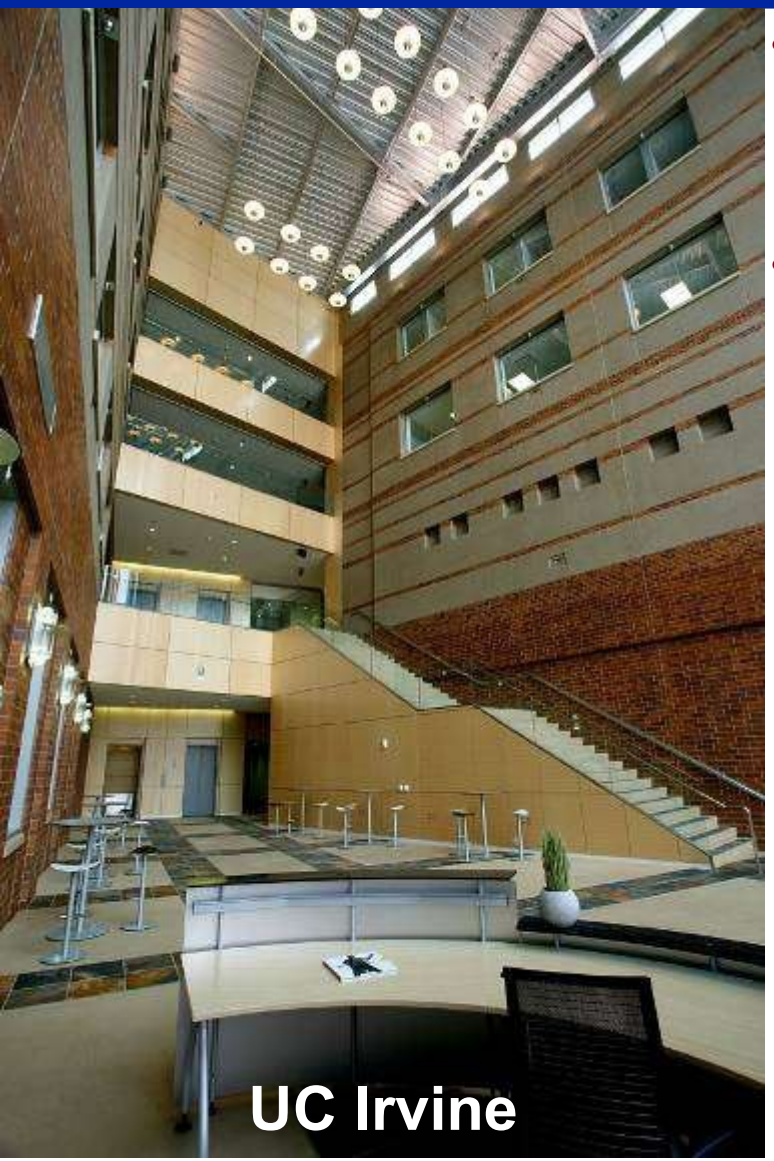
Talk
Nortel Visiting Team
Calit2@UCSD
December 12, 2005

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

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Two New Calit2 Buildings Will Provide Major New Laboratories to Their Campuses



- **New Laboratory Facilities**
  - Nanotech, BioMEMS, Chips, Radio, Photonics, Grid, Data, Applications
  - Virtual Reality, Digital Cinema, HDTV, Synthesis
- **Over 1000 Researchers in Two Buildings**
  - Linked via Dedicated Optical Networks
  - International Conferences and Testbeds

Richard C. Atkinson Hall Dedication Oct. 28, 2005



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www.calit2.net

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The Calit2@UCSD Building is Designed for Prototyping Extremely High Bandwidth Applications

1.8 Million Feet of Cat6 Ethernet Cabling

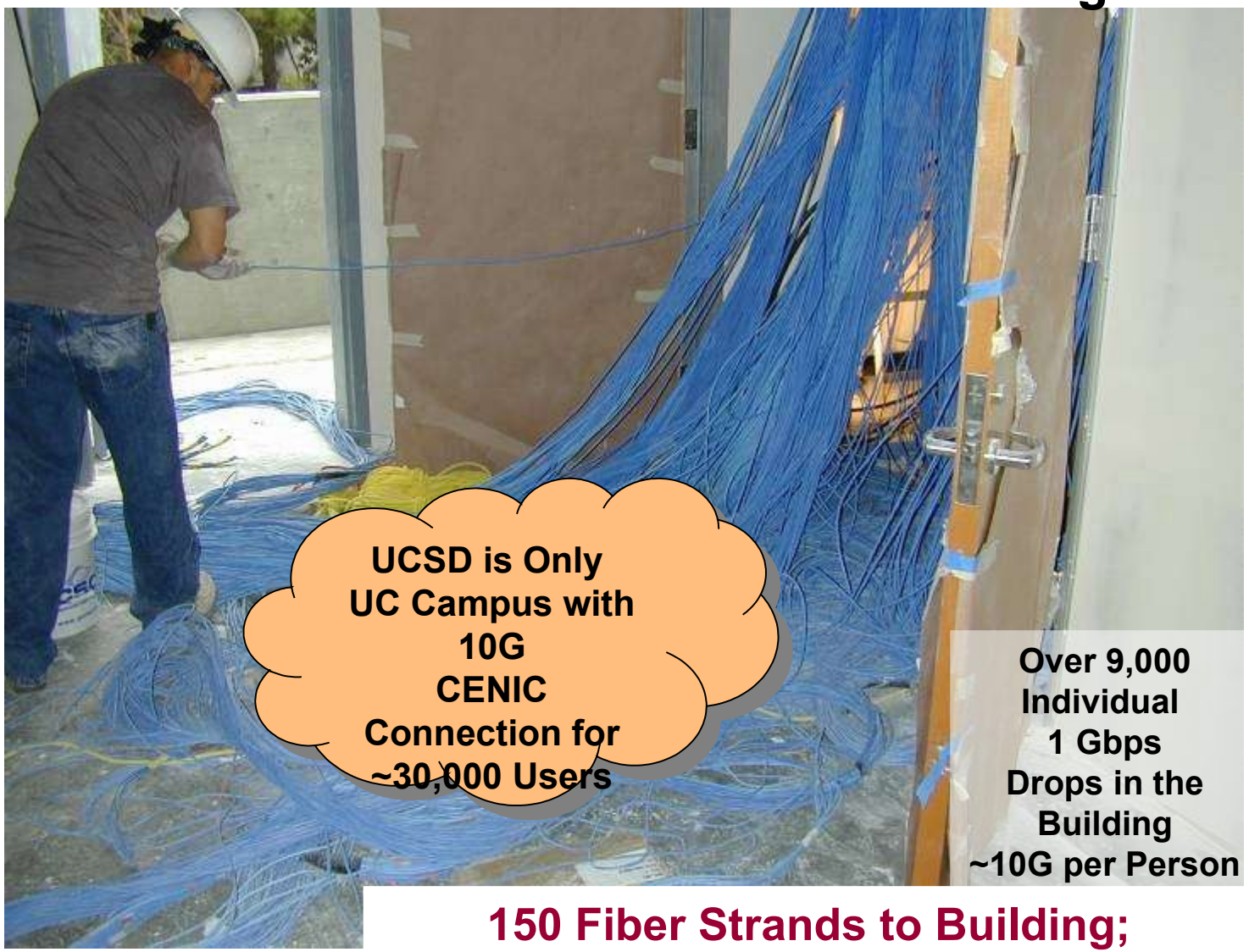


Photo: Tim Beach, Calit2

150 Fiber Strands to Building;
Experimental Roof Radio Antenna Farm
Ubiquitous WiFi

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Calit2@UCSD Is Connected to the World at 10Gbps

Maxine Brown, Tom DeFanti, Co-Chairs

iGrid 2005

THE GLOBAL LAMBDA INTEGRATED FACILITY

www.igrid2005.org



the UC Discovery Grant

September 26-30, 2005

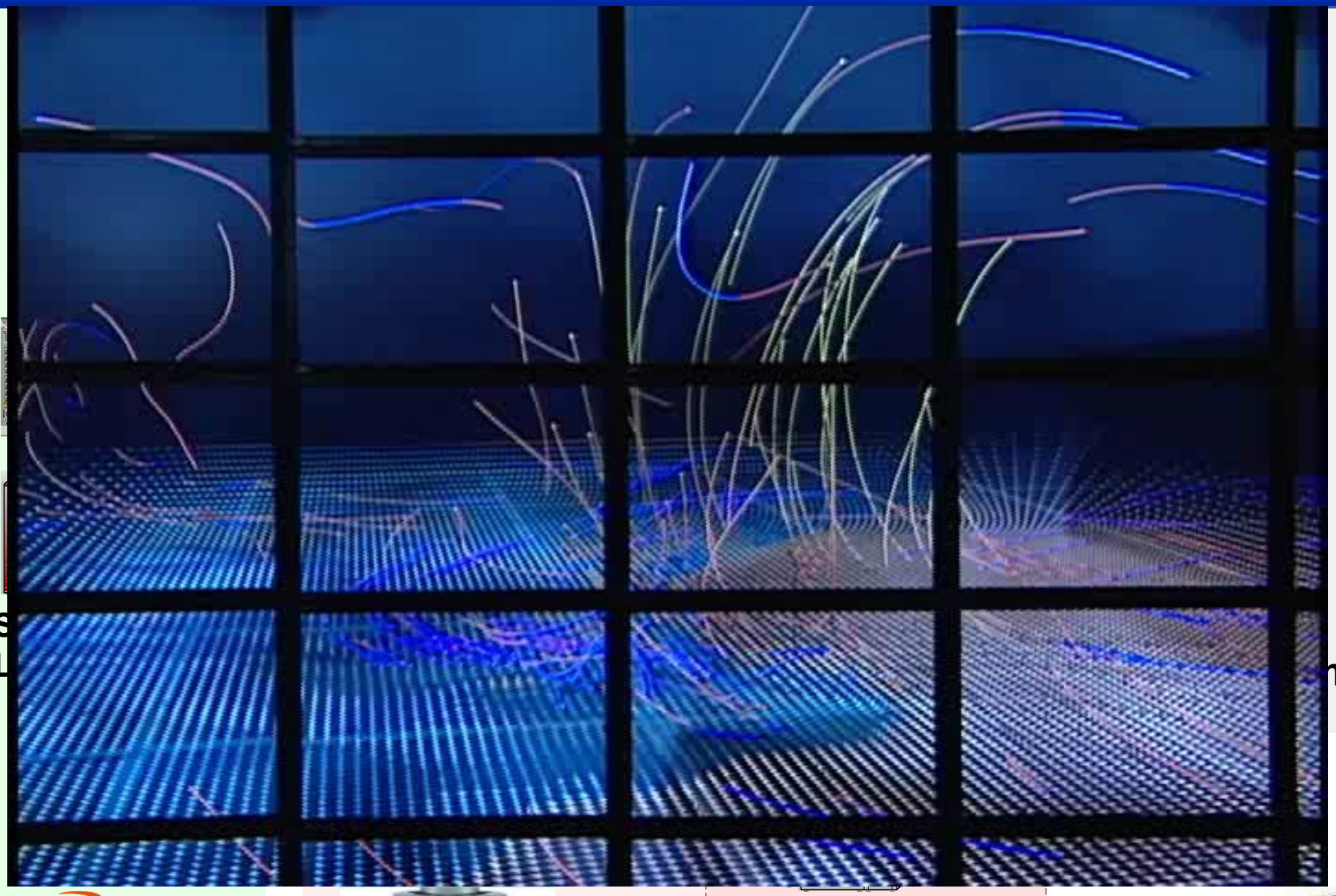
Calit2 @ University of California, San Diego

California Institute for Telecommunications and Information Technology



50 Demonstrations, 20 Counties, 10 Gbps/Demo

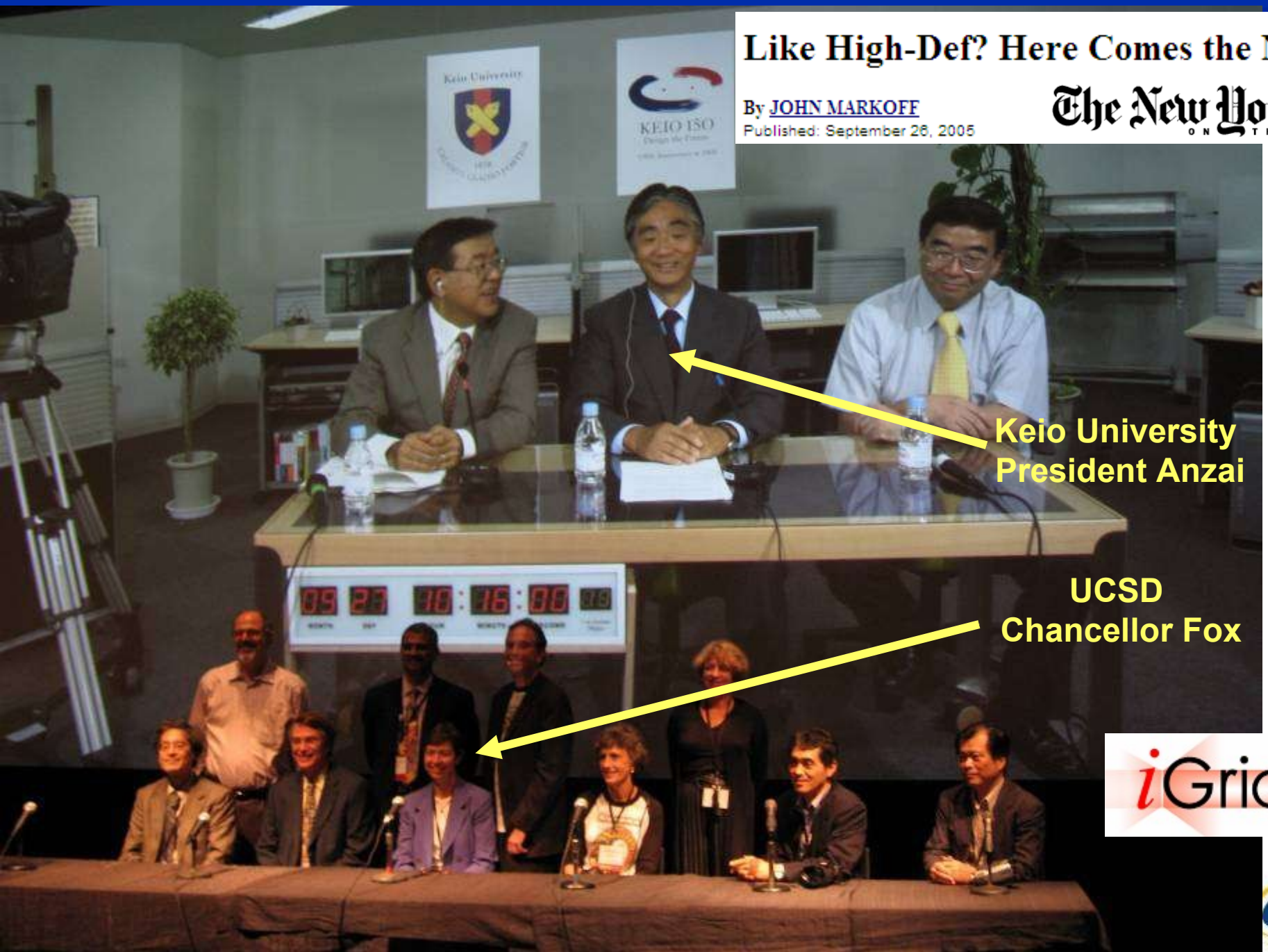
Nortel 10Gb Line-Speed Security Demo – iGrid@Calit2
Less than 500 nsecs Latency Added



Tile display
Visualization

Source Data
Linux Cluster

First Trans-Pacific Super High Definition Telepresence Meeting in New Calit2 Digital Cinema Auditorium



Like High-Def? Here Comes the Next Level

By JOHN MARKOFF
Published: September 26, 2005

The New York Times ON THE WEB

Keio University President Anzai

UCSD Chancellor Fox

Lays Technical Basis for Global Digital Cinema

Sony
NTT
SGI

iGrid 2005

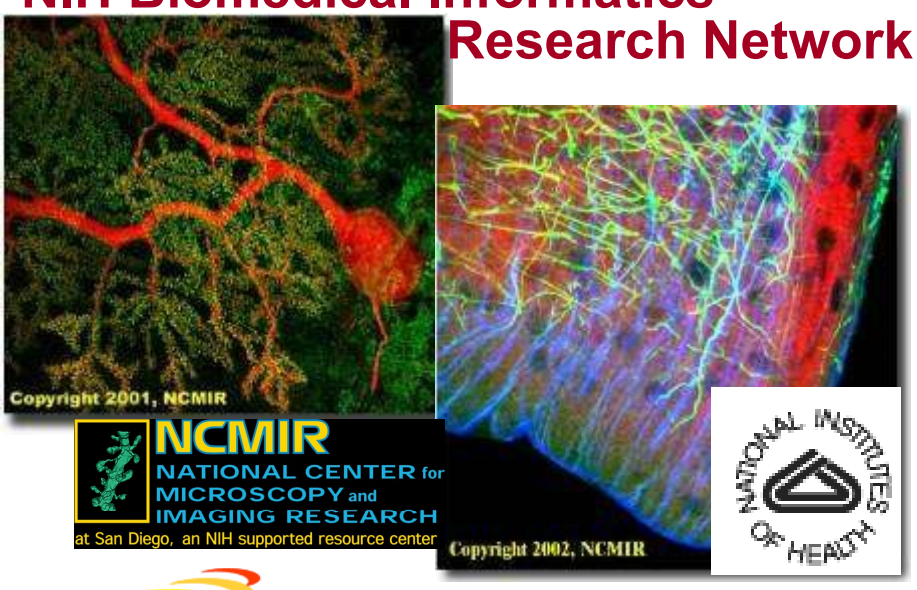
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The OptIPuter Project –

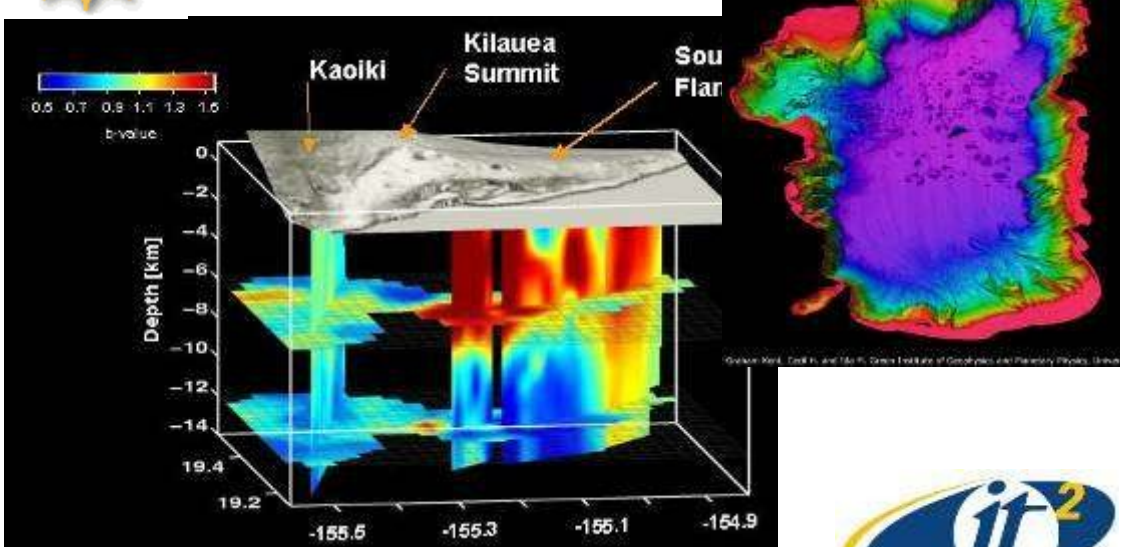
Creating a LambdaGrid "Web" for Gigabyte Data Objects

- **NSF Large Information Technology Research Proposal**
  - Calit2 (UCSD, UCI) and UIC Lead Campuses—Larry Smarr PI
  - Partnering Campuses: USC, SDSU, NW, TA&M, UvA, SARA, NASA
- **Industrial Partners**
  - IBM, Sun, Telcordia, Chiaro, Calient, Glimmerglass, Lucent
- **$13.5 Million Over Five Years**
- **Linking Global Scale Science Projects to User's Linux Clusters**

NIH Biomedical Informatics Research Network



NSF EarthScope and ORION



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SDSC SAN DIEGO SUPERCOMPUTER CENTER

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The Optical Core of the UCSD Campus-Scale Testbed -- Evaluating Packet Routing versus Lambda Switching

Goals by 2007:

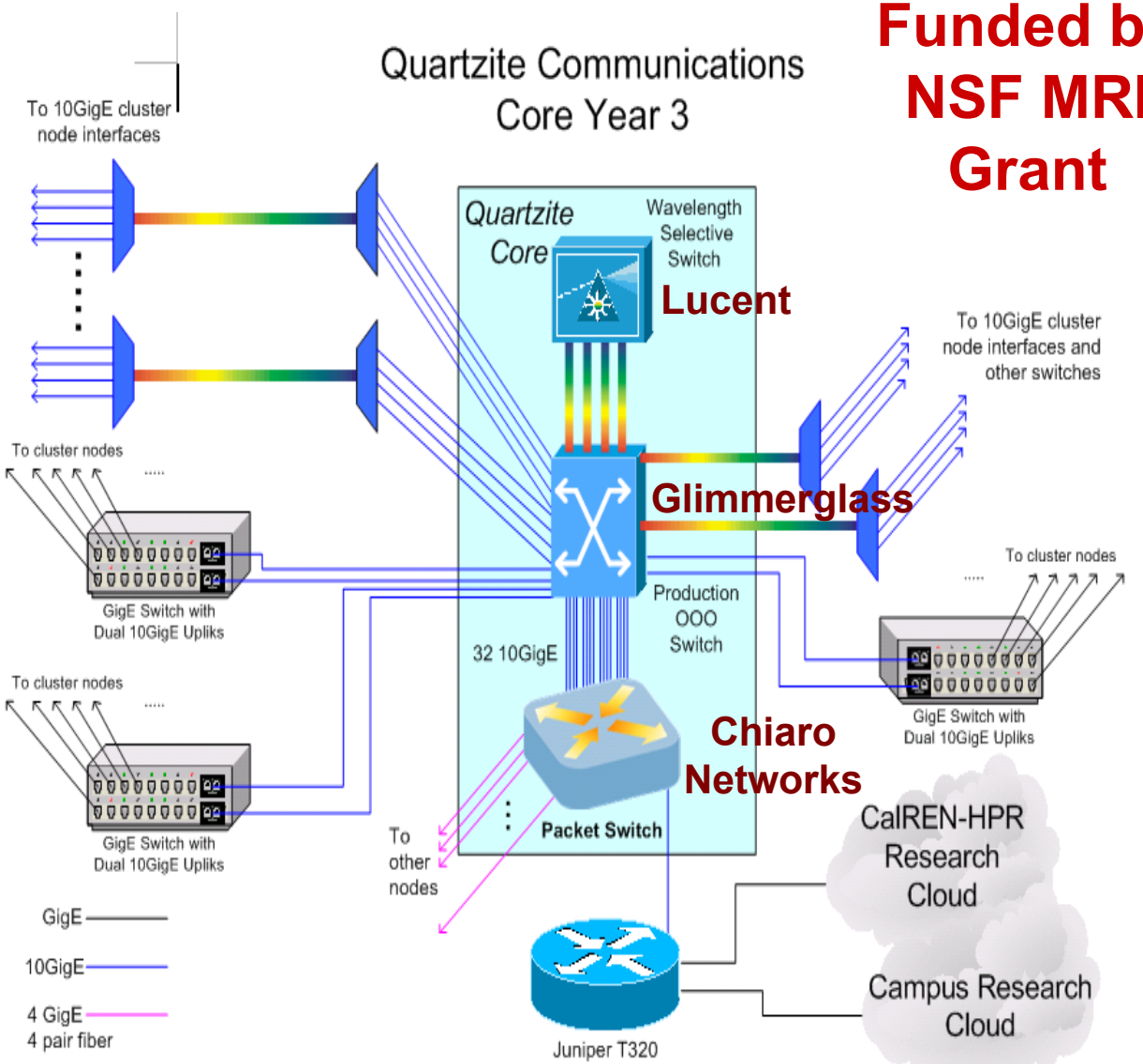
>= 50 endpoints at 10 GigE

>= 32 Packet switched

>= 32 Switched wavelengths

>= 300 Connected endpoints

Approximately 0.5 TBit/s Arrive at the "Optical" Center of Campus
Switching will be a Hybrid Combination of:
Packet, Lambda, Circuit -- OOO and Packet Switches Already in Place



Funded by NSF MRI Grant

Source: Phil Papadopoulos, SDSC, Calit2

Toward an Interactive Gigapixel Display

- Scalable Adaptive Graphics Environment (SAGE) Controls:
- 100 Megapixels Display
  - 55-Panel
- 1/4 TeraFLOP
  - Driven by 30-Node Cluster of 64-bit Dual Opterons
- 1/3 Terabit/sec I/O
  - 30 x 10GE interfaces
  - Linked to OptIPuter
- 1/8 TB RAM
- 60 TB Disk

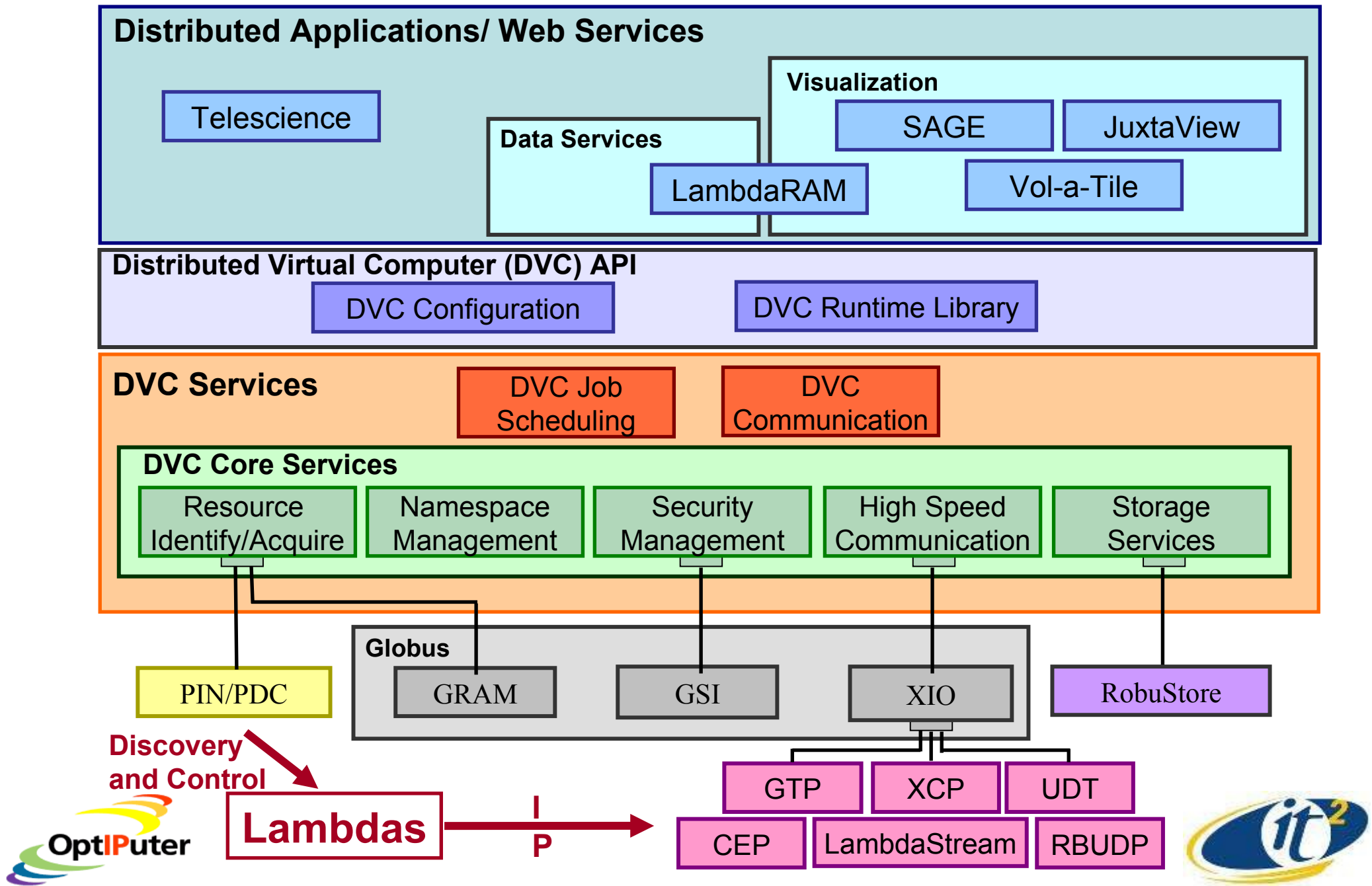
NSF LambdaVision MRI@UIC

Calit2 is Building a LambdaVision Wall in Each of the UCI & UCSD Buildings



Source: Jason Leigh, Tom DeFanti, EVL@UIC
OptIPuter Co-PIs

OptIPuter Software Architecture--a Service-Oriented Architecture Integrating Lambdas Into the Grid



Calit2's Direct Access Core Architecture Will Create Next Generation Metagenomics Server

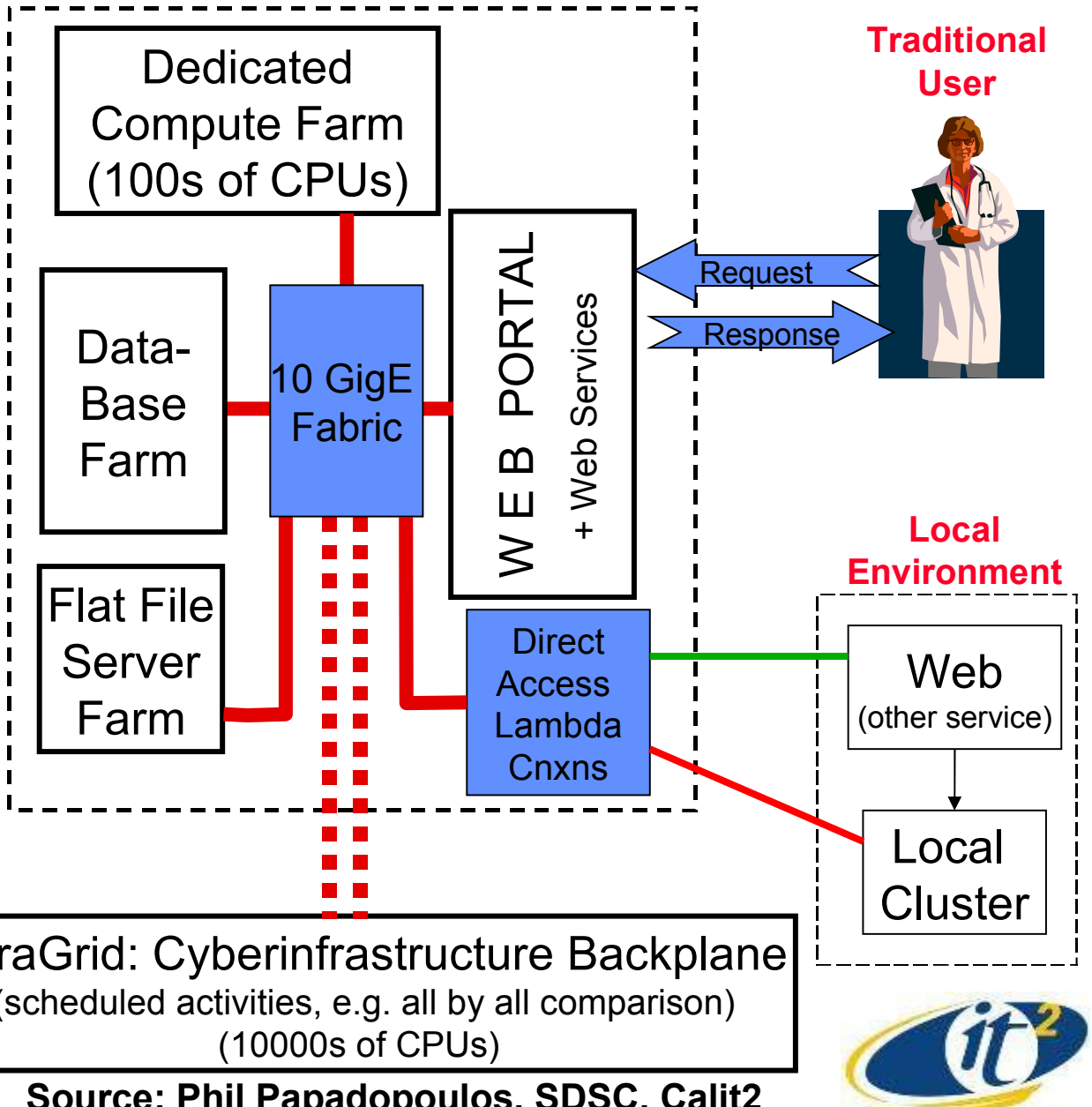
Sargasso Sea Data

Sorcerer II Expedition (GOS)

JGI Community Sequencing Project

Moore Marine Microbial Project

NASA Goddard Satellite Data



Source: Phil Papadopoulos, SDSC, Calit2

CENTER FOR EARTH OBSERVATIONS & APPLICATIONS

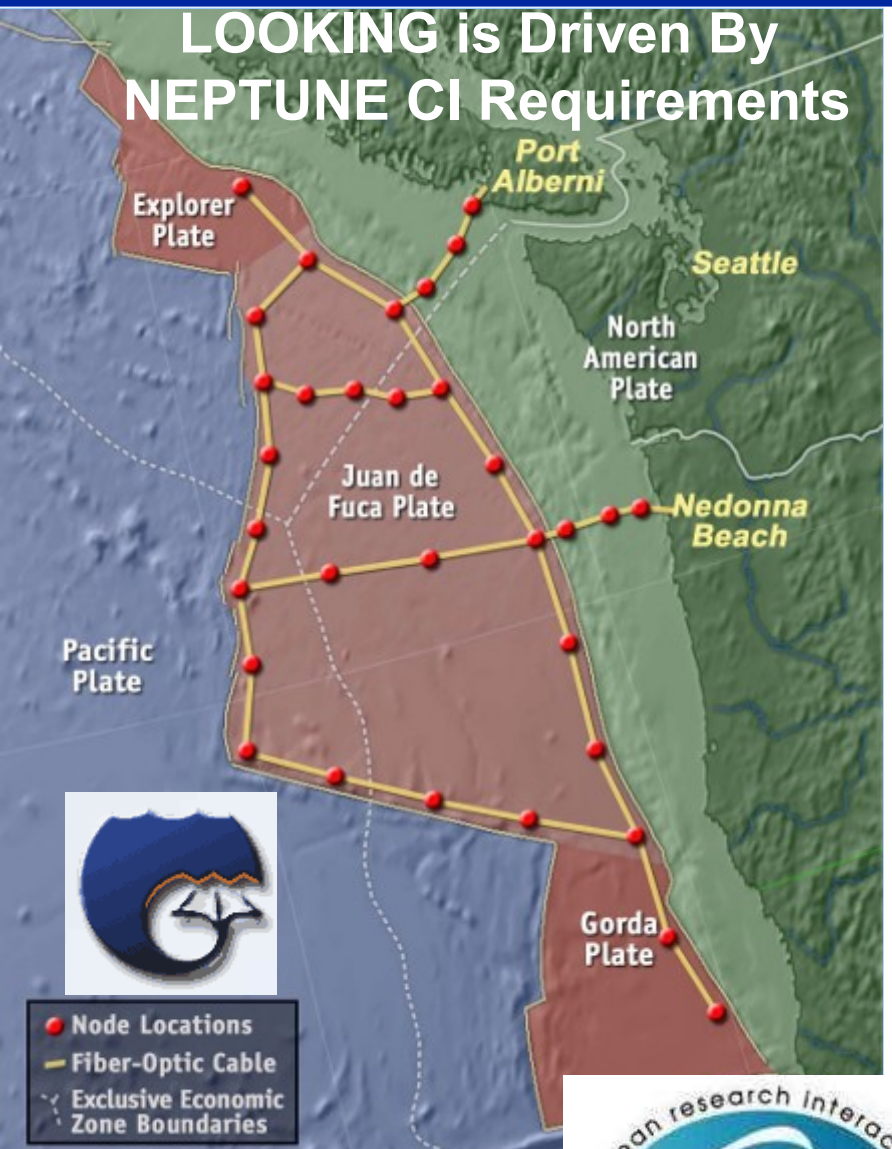
J. Craig Venter INSTITUTE

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SDSC SAN DIEGO SUPERCOMPUTER CENTER

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Adding Web & Grid Services to Optical Channels to Provide Real Time Control of Ocean Observatories



LOOKING:
(Laboratory for the Ocean Observatory Knowledge Integration Grid)

http://lookingtosea.ucsd.edu/

- **Goal:**
  - Prototype Cyberinfrastructure for NSF's Ocean Research Interactive Observatory Networks (ORION) Building on OptIPuter
- **LOOKING NSF ITR with PIs:**
  - John Orcutt & Larry Smarr - UCSD
  - John Delaney & Ed Lazowska –UW
  - Mark Abbott – OSU
- **Collaborators at:**
  - MBARI, WHOI, NCSA, UIC, CalPoly, UVic, CANARIE, Microsoft, NEPTUNE-Canarie

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NSF

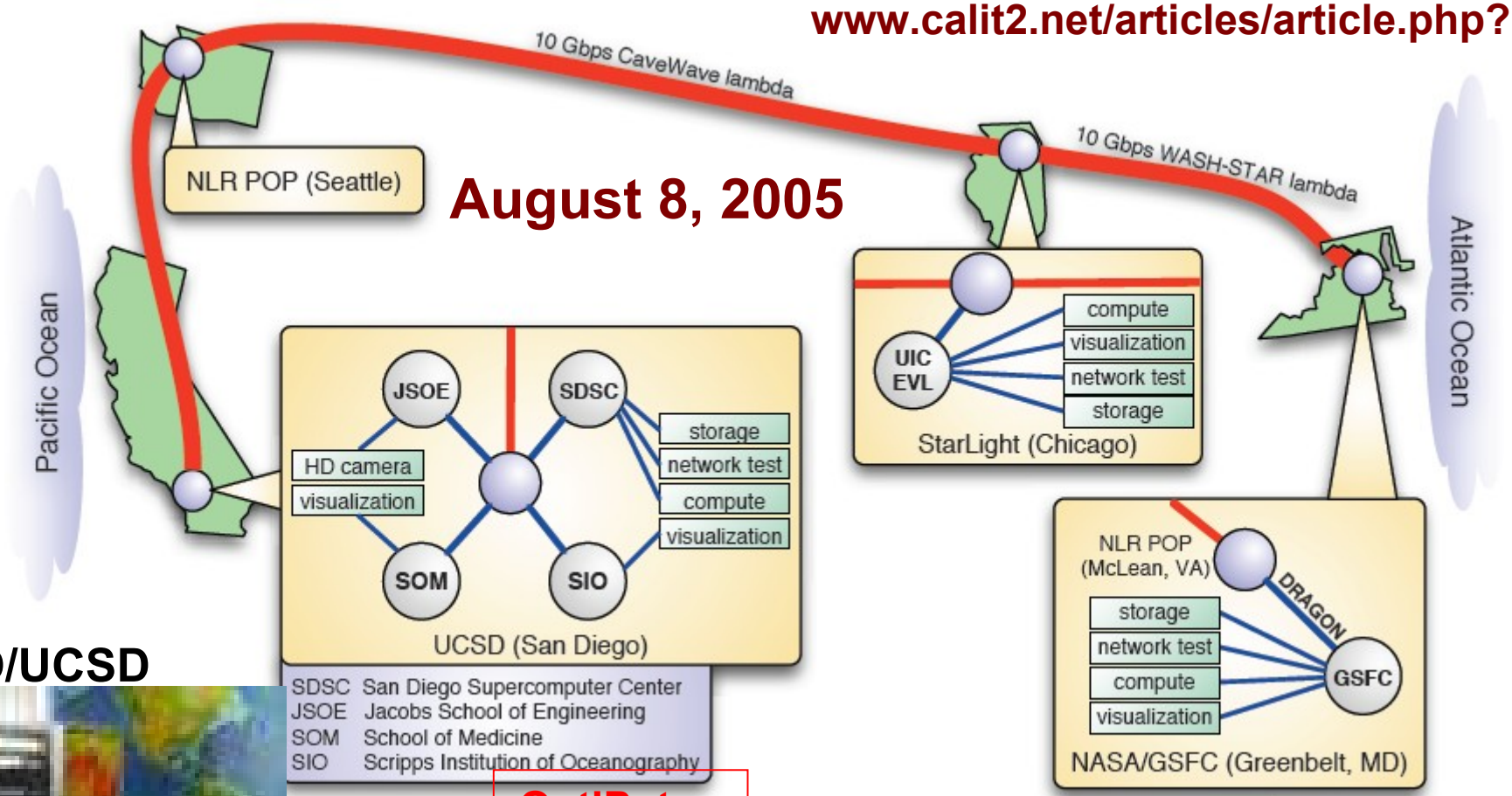
ocean research interactive ORION observatory networks

Making Management of Gigabit Flows Routine

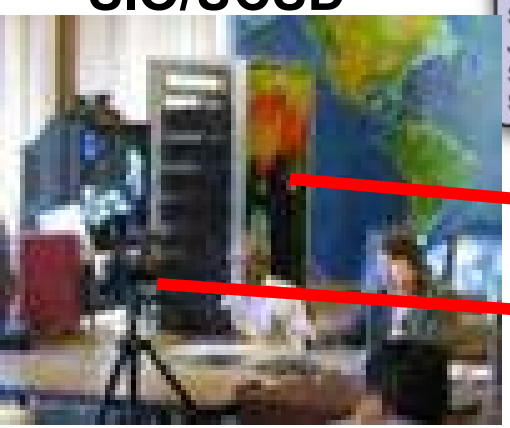
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Partnering with NASA to Combine Telepresence with Remote Interactive Analysis of Data Over National LambdaRail

www.calit2.net/articles/article.php?id=660



SIO/UCSD



OptIPuter Visualized Data

HDTV Over Lambda



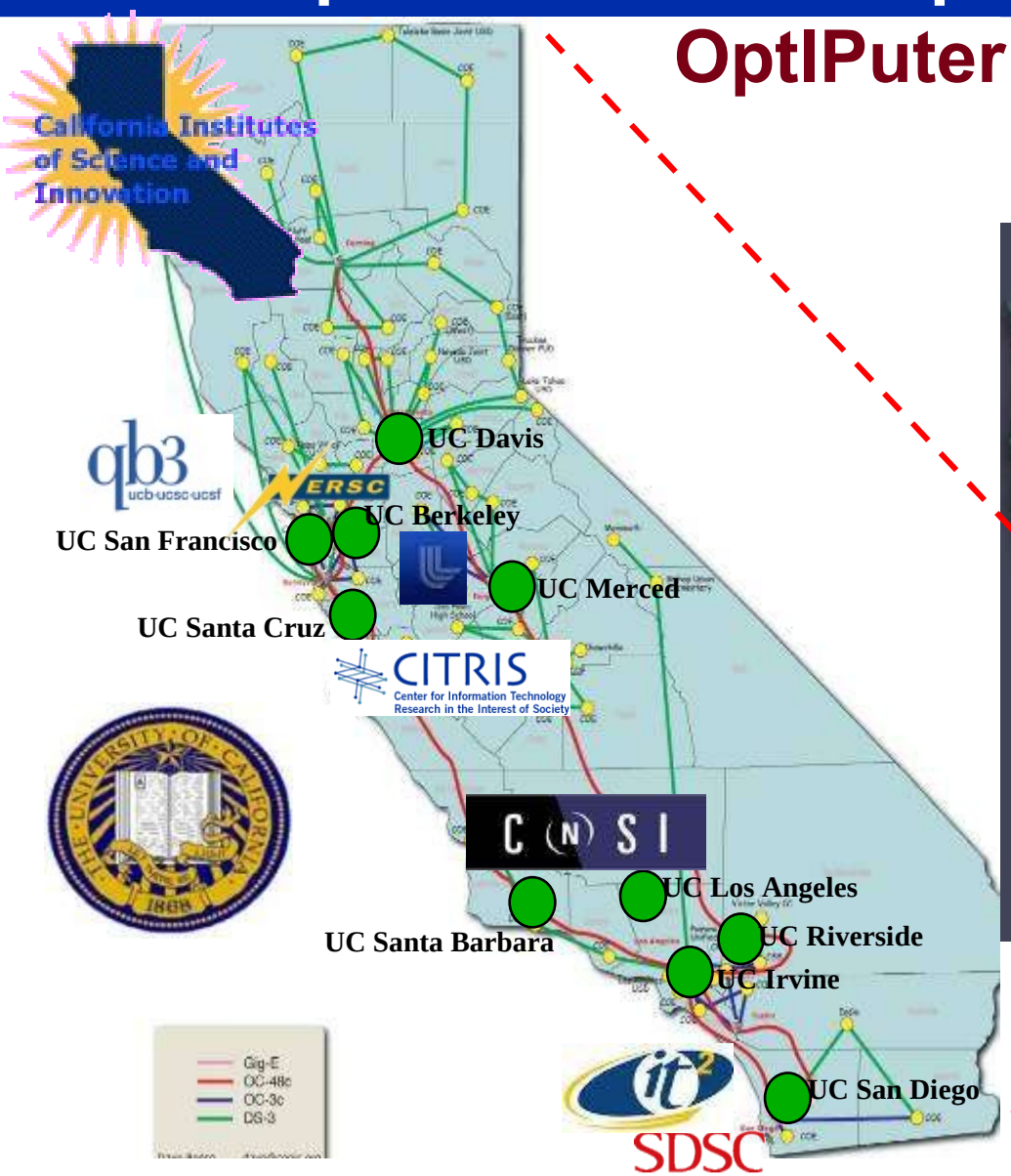
NASA Goddard

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Calit2/SDSC Proposal to Create a UC Cyberinfrastructure of OptIPuter "On-Ramps" to TeraGrid Resources

OptIPuter + CalREN-XD + TeraGrid = "OptiGrid"

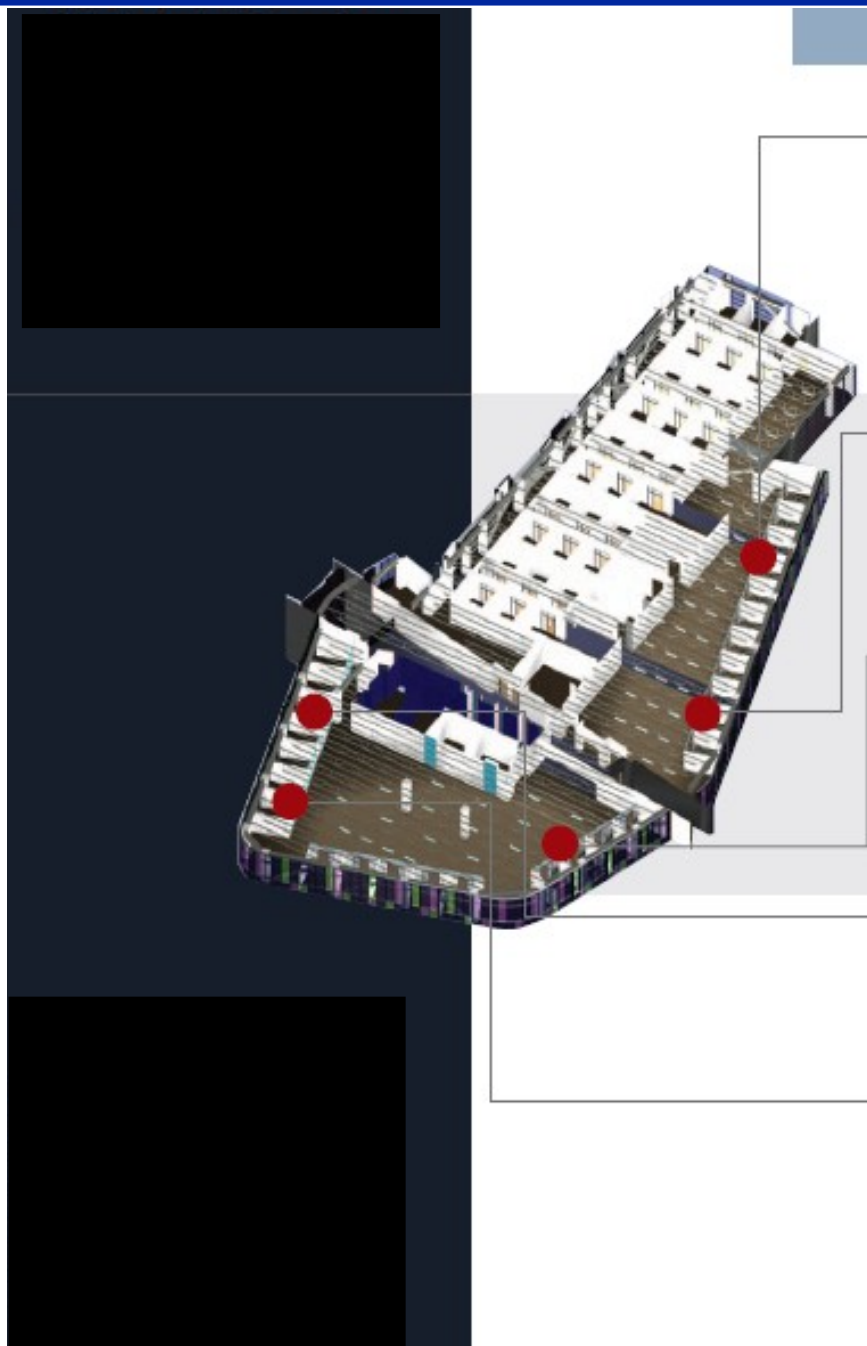




Creating a Critical Mass of End Users on a Secure LambdaGrid

Source: Fran Berman, SDSC

Interdisciplinary Groups in Networks, Circuits, and Information Theory



Center for Networked Systems

CNS is a university-industry partnership with 20-plus engineering faculty who do fundamental research and technology development for robust, secure, and open networked systems. Corporate members include AT&T, Alcatel, Hewlett-Packard, QUALCOMM and Sun Microsystems.

Advanced Network Sciences Group

Research projects focused on theoretical aspects of communication network performance analysis, including random networks, distributed control, and statistical multiplexing.

Information Theory and Applications Center

New center at Calit2 with 25 faculty from six departments. Applications range from compression, communication, and error correction to bioinformatics, neuroscience, data mining, machine learning, cryptography, and finance.

Circuits Group

Calit2 collaboration with Center for Wireless Communications research teams for development and testing of wireless circuits.

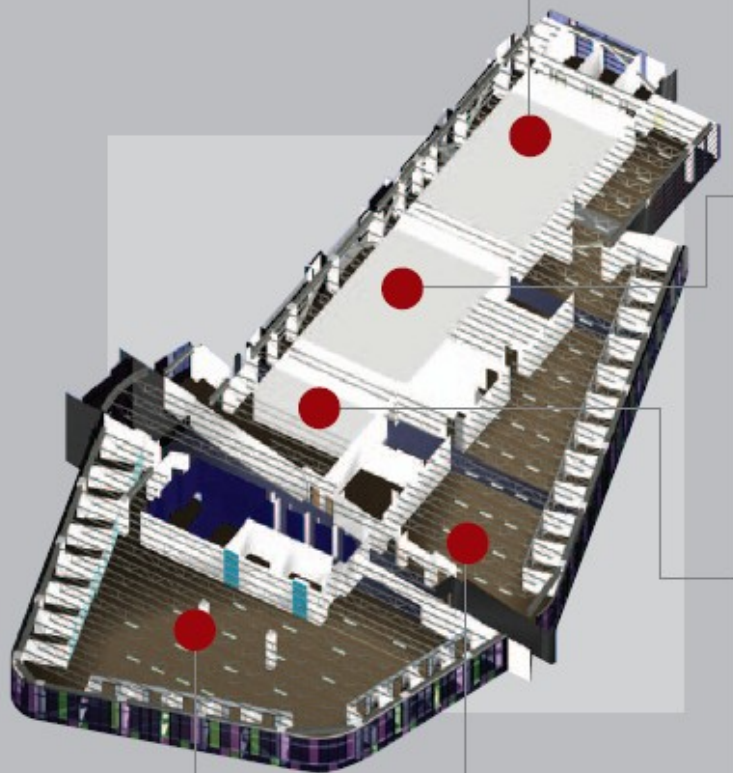
Tactical Mobile Ad-Hoc Networks

Calit2 investigators at UCSD and UC Irvine are part of this six-university initiative on space-time processing for tactical mobile ad-hoc networks. Funded by DoD's Multidisciplinary University Research Initiative.

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Circuits and Wireless



Millimeter-wave and Low-Noise Circuits Laboratory

World-class analog/mixed-signal/microwave/millimeter-wave circuits lab. Research includes intelligent RF, multiple-antenna systems (MIMO), ADCs, DACs, PPLs, LNAs, MEMS and sensors.

High-Power Amplifier Laboratory

High and low-power RF amplifier experiments for high efficiency and high linearity. DC/DC 'super' converter with very high 95% efficiency and versatile power sharing for maximum battery life and minimum cooling. Wireless protocol-aware battery management circuits for maximizing the useful bits transmitted and received by a wireless device under each charge and over the life of the battery.

Circuit Assembly Laboratory

Pre-production assembly and test of prototype circuits for large-scale demonstrations of wireless networks for telecommunications, telematics, sensors, safety and disasters. Production capabilities for building dozens of modules of requisite types for each system.

UCSD Division Administration

Office of the Director, administrative services, business office, communications, industry relations.

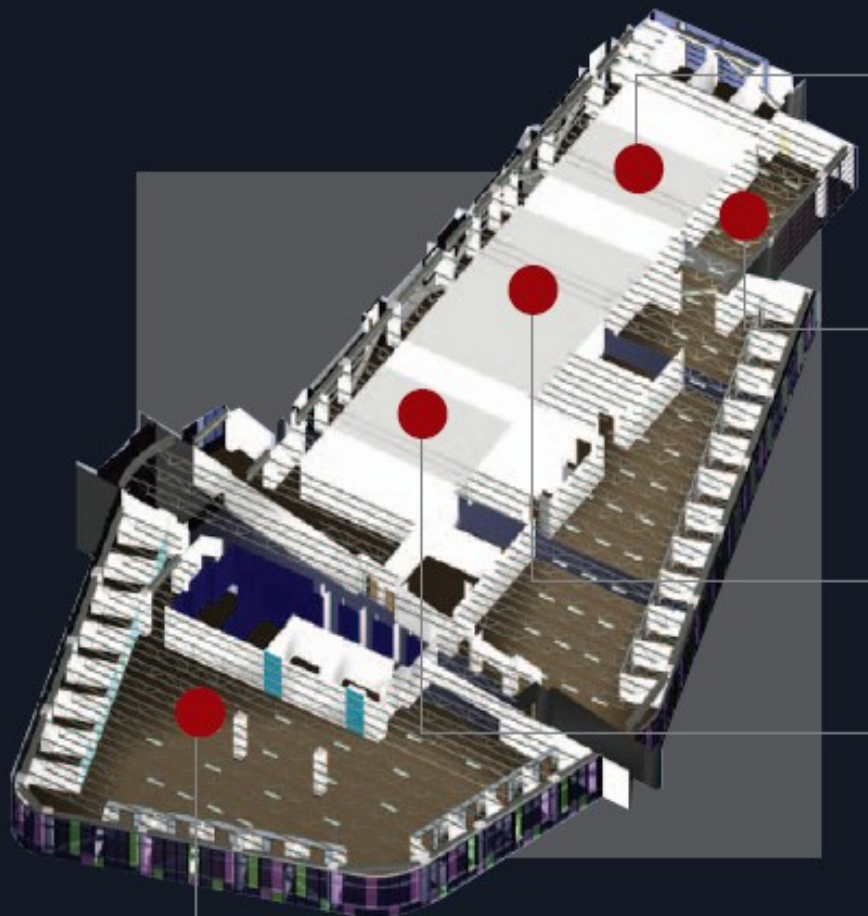
Calit2 Project/Program Management

Offices of project managers and support staff working on existing and prospective faculty-led research projects in Calit2.

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Wireless SensorNets Driving an Ultra High Bandwidth Fiber Optic Backbone Create a Planetary Scale Computer



Systems-on-Chip Laboratory

SOC lab provides infrastructural support for hardware/software platforms, including CalRadio, and research on networking protocols and embedded processing for mobile applications.

Undergraduate Research Laboratory

This lab supports undergraduate research as part of senior-level, project-based courses as well as the Calit2 Scholars summer research program.

Photonics and OptIPuter Laboratory

Photonics research and OptIPuter network infrastructure development.

Wireless Platforms Laboratory

Current platforms under development and test include portable software defined radio, bench-top software defined radio, wireless pulse oximeter, wireless/paperless patient tag, ground-based wireless mesh network nodes, wireless smart-door control, wireless patient drug dosage monitor, and UAV-based wireless mesh network nodes.

Calit2 Academic Professionals

Calit2 staff researchers range from recent Ph.D. graduates to seasoned engineers from the private sector.

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