Emerging Trends at Calit2

IEEE Spectrum Editorial Advisory Board
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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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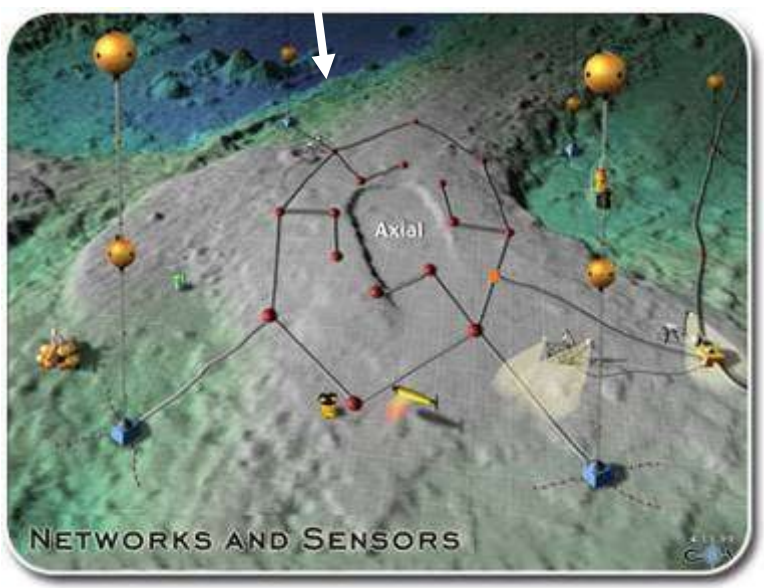
The Ocean Observatories Initiative (OOI) -- a Networked Infrastructure Of Science-Driven Sensor Systems



CONSORTIUM FOR Ocean Leadership
DISCOVERY • UNDERSTANDING • ACTION

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LEO15 Inset Courtesy of Rutgers University, Institute of Marine and Coastal Sciences

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OOI Will Address Science Questions on Coastal, Regional, and Global Scales, Linked by a Common Instrument, Infrastructure, and Information Management System

Source: John Orcutt, Matthew Arrott, SIO/Calit2



OOI CI Team:

- UCSD
  - SIO, Calit2, SDSC
- Rutgers
- WHOI
- Raytheon

A program of JOI Joint Oceanographic Institutions

JOI Awards, Funded by NSF:

- Regional Scale Node
  - ~$150M, UWash
- Global/Coastal Scale Nodes
  - ~$100M, Woods Hole Lead
- Cyberinfrastructure
  - ~$30M, SIO/Calit2 UCSD

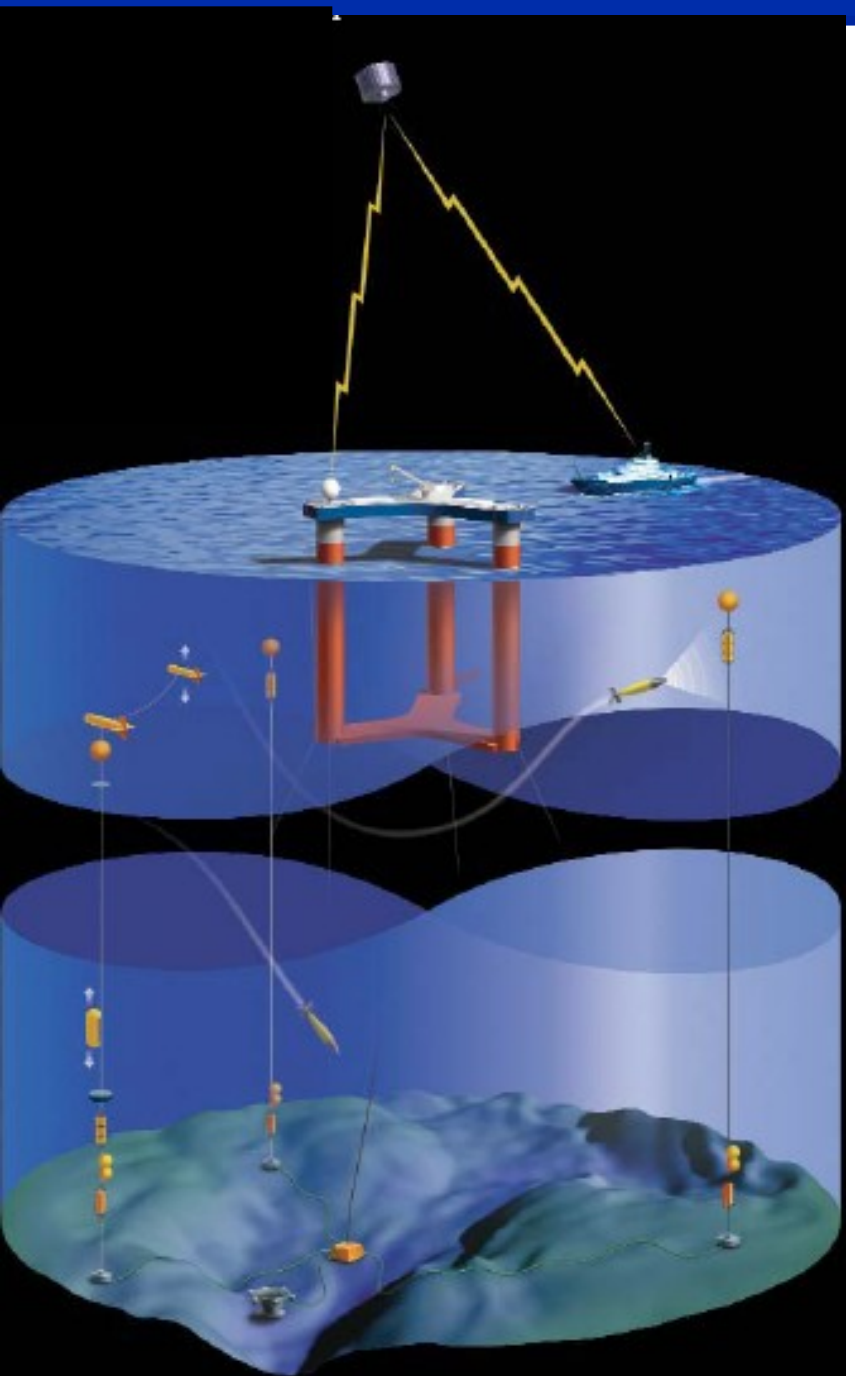
Construction Program
5 Year

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Extended Draft Platform
Proposed Deployment Mid- Atlantic

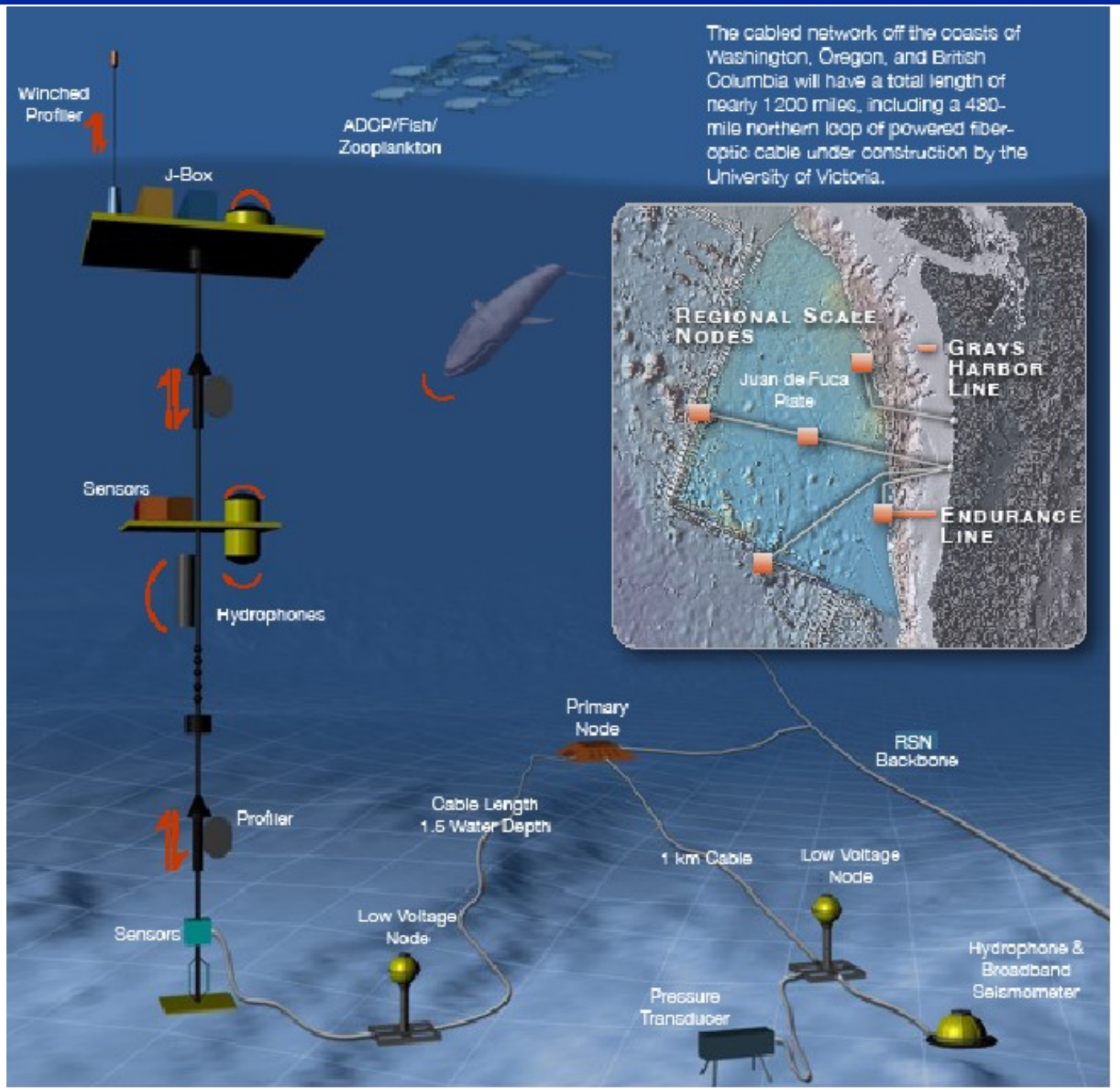
OCEAN OBSERVATORIES INITIATIVE





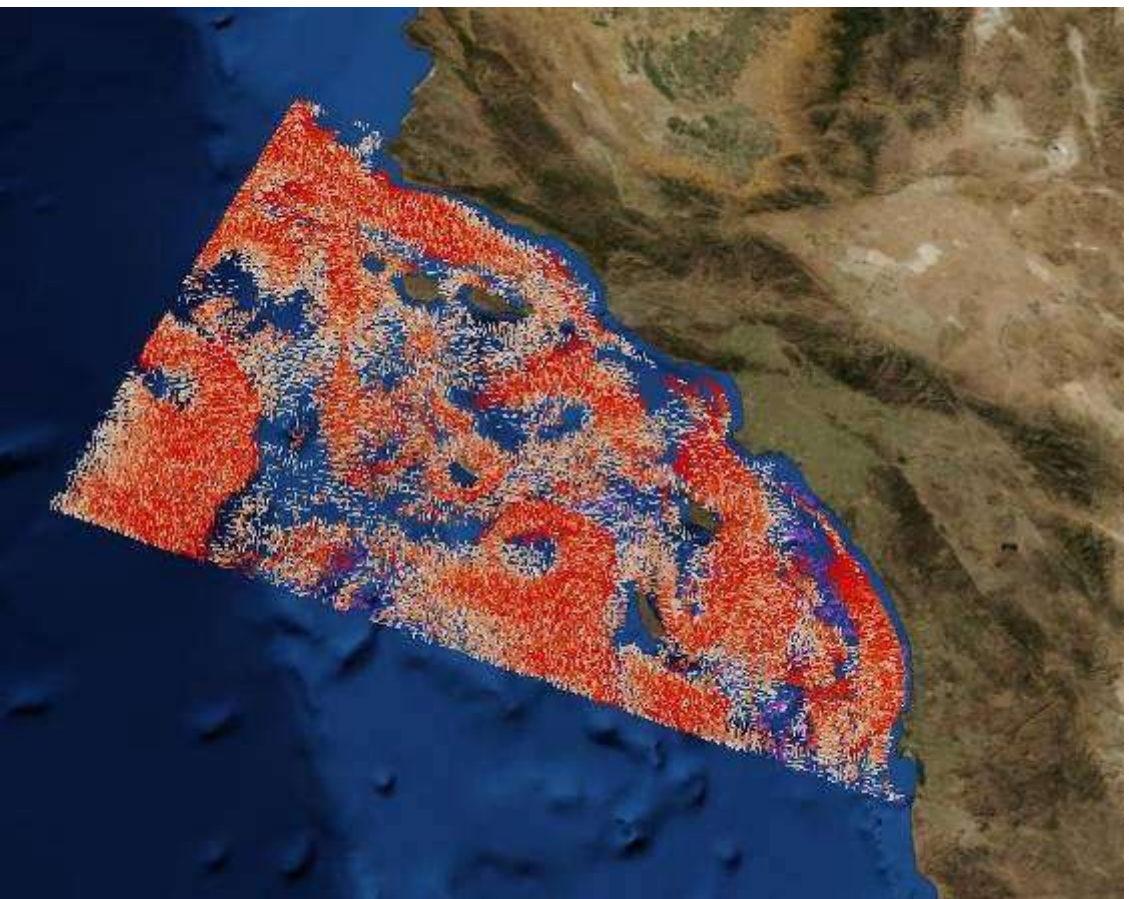
Berger, J., UCSD/SIO O'Sullivan, J., TECHNIP
Halkyard, J., Offshore Engineering Consultants,
Orcutt, J., UCSD/SIO

Mooring and Instrument for the Regional Cabled Node

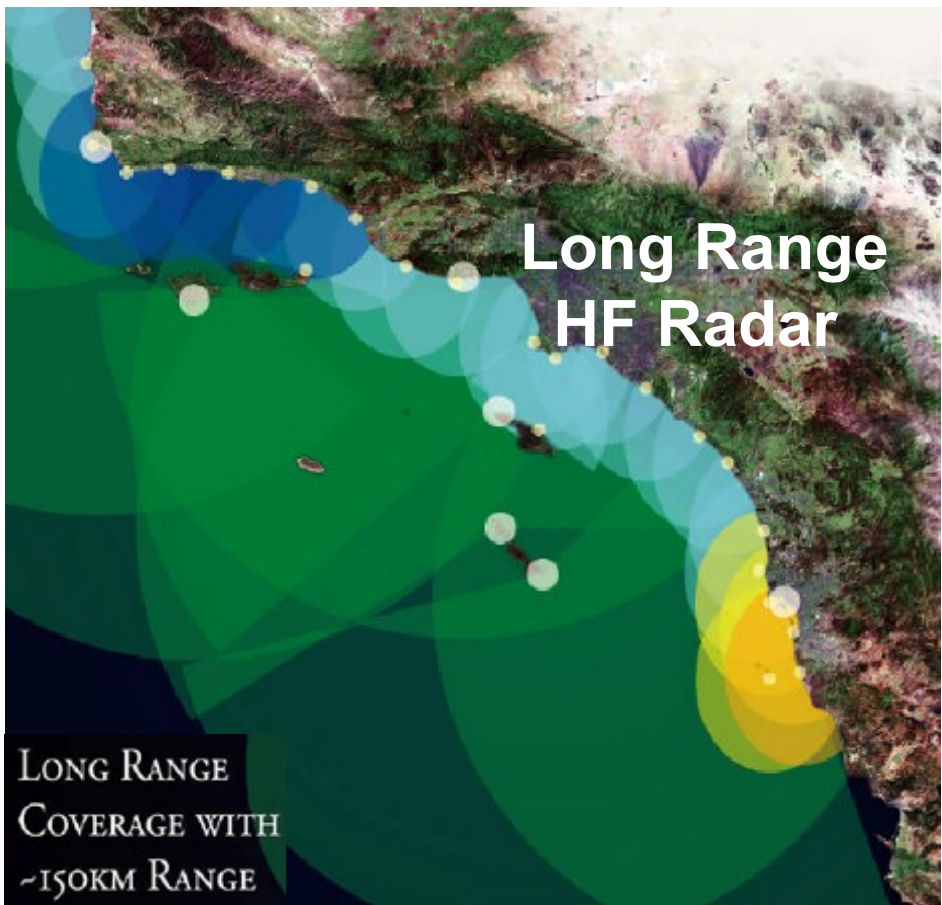


Coupling Data Assimilation Models to Remote Sensor Nets in Near Real Time

Visualization: Philip Weber, Matthew Arrott, Calit2



Source: SCCOOS



JPL ONR MBARI CALIFORNIA INSTITUTE OF TECHNOLOGY

OOI OCEAN OBSERVATORIES INITIATIVE

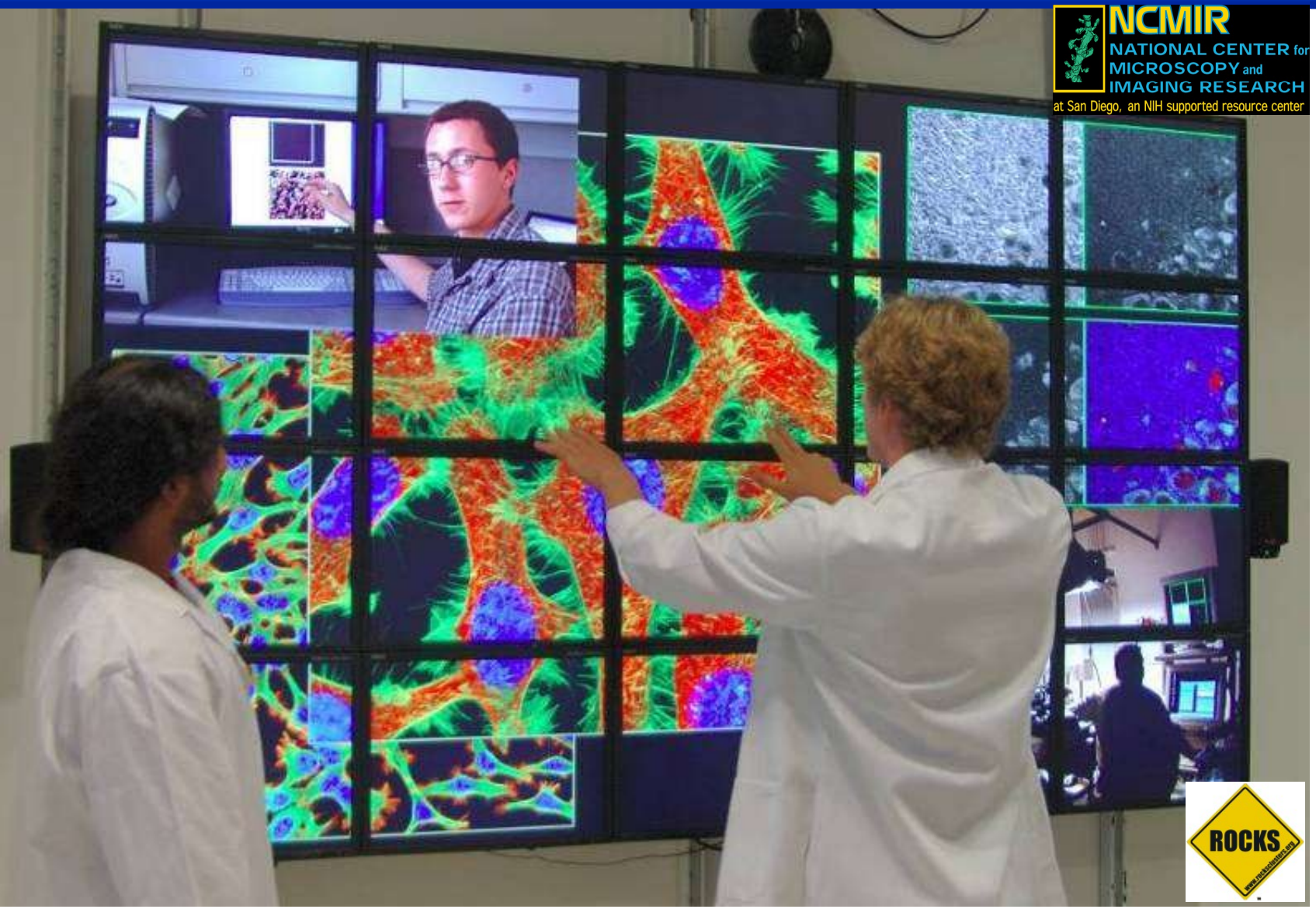
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Regional Ocean Modeling System (ROMS)

http://ourocean.jpl.nasa.gov/

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The OptIPuter Project: Creating High Resolution Portals Over Dedicated Optical Channels to Global Science Data



Scalable Adaptive Graphics Environment (SAGE)

evl electronic visualization laboratory

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Now in Sixth and Final Year

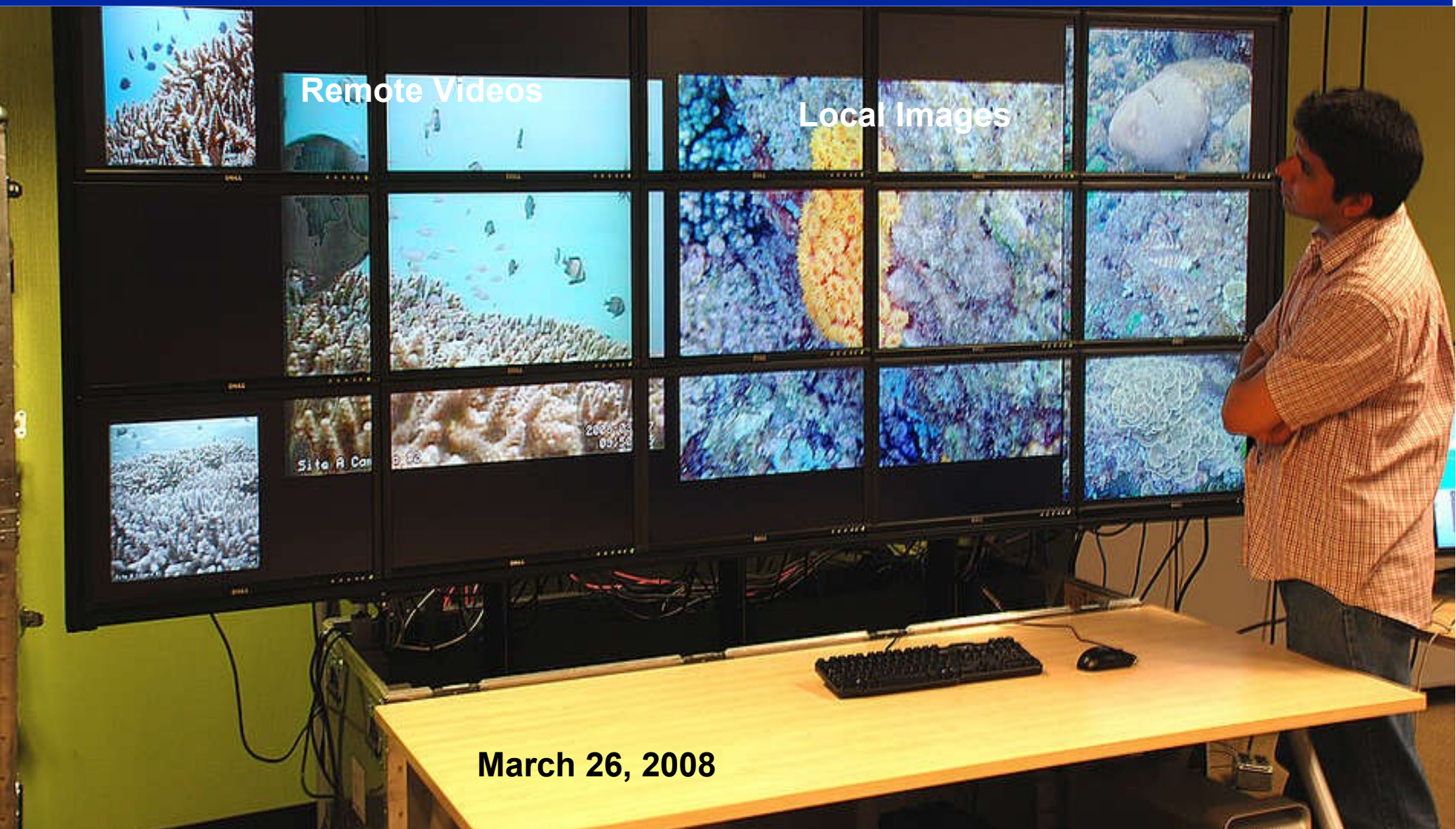
Picture Source: Mark Ellisman, David Lee, Jason Leigh

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Calit2 (UCSD, UCI), SDSC, and UIC Leads—Larry Smarr PI
Univ. Partners: NCSA, USC, SDSU, NW, TA&M, UvA, SARA, KISTI, AIST
Industry: IBM, Sun, Telcordia, Chiaro, Calient, Glimmerglass, Lucent

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New Year's Challenge: Streaming Underwater Video From Taiwan's Kenting Reef to Calit2's OptIPortal



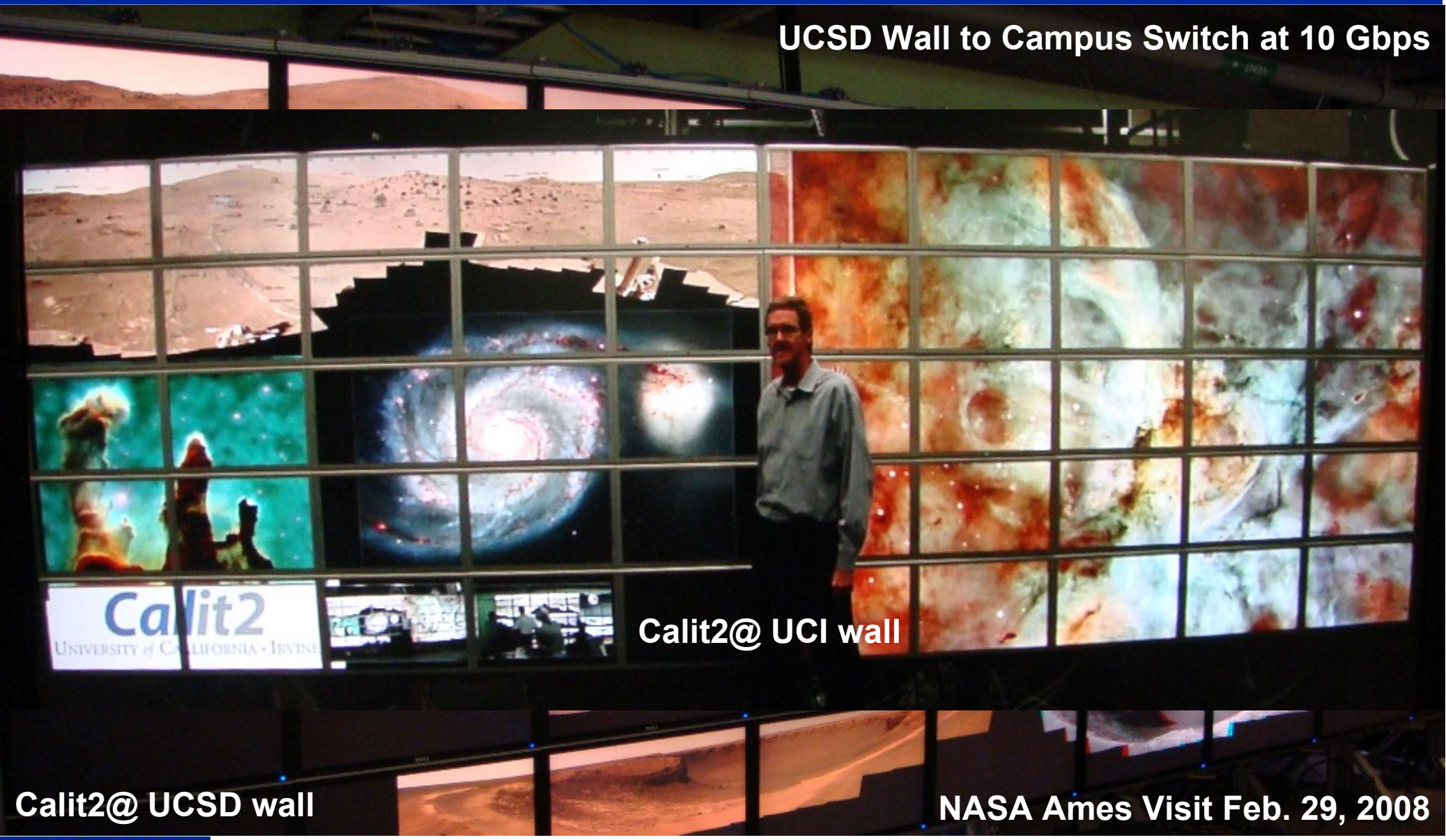
OPEN SOURCE DATA TURBINE INITIATIVE
Empowering the Scientific Community with Streaming Data Middleware

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UCSD: Rajvikram Singh, Sameer Tilak, Jurgen Schulze, Tony Fountain, Peter Arzberger
NCHC : Ebbe Strandell, Sun-In Lin, Yao-Tsung Wang, Fang-Pang Lin

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The Calit2 1/4 Gigapixel OptIPortals at UCSD and UCI Are Joined to Form a Gbit/s HD Collaboratory



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UCSD cluster: 15 x Quad core Dell XPS with Dual nVIDIA 5600s
UCI cluster: 25 x Dual Core Apple G5

Beyond the OptIPortal: LambdaTable, StarCAVE, and Varrier



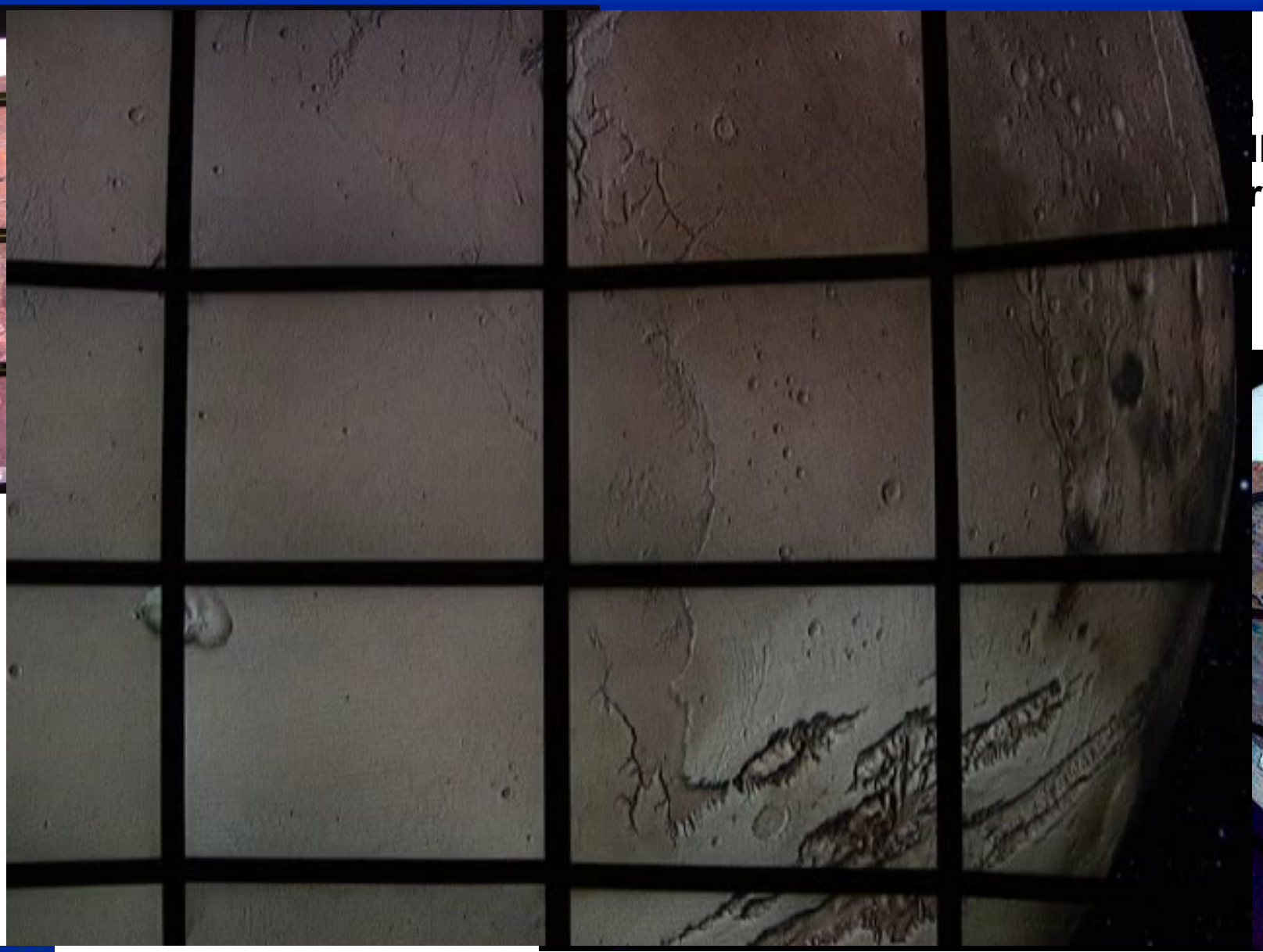
electronic visualization laboratory

Five Sided StarCAVE with Floor Illuminated



Towards The OptIPlanet Planetary Collaboratory: Exploring Mars with Autostereo OptIPortals (Varrier)







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Varrier: Dan Sandin, EVL/ Calit2
Rover Data Courtesy of Michael Sims,
NASA Ames Research Center

OptIPuter

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Towards a Green Cyberinfrastructure: Optically Connected "Green" Modular Datacenters

UCSD Structural Engineering Dept.

Conducted Tests



7 Racks plus Network



Takes up 2 Parking Spaces



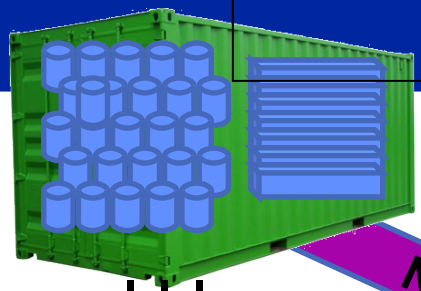
Data Power Cooling

- **Measure and Control Energy Usage:**
  - **Sun Has Shown up to 40% Reduction in Energy**
  - **Active Management of Disks, CPUs, etc.**
  - **Measures Temperature at 40 Points (5 Spots in 8 Racks)**
  - **Power Utilization in Each of the 8 Racks**

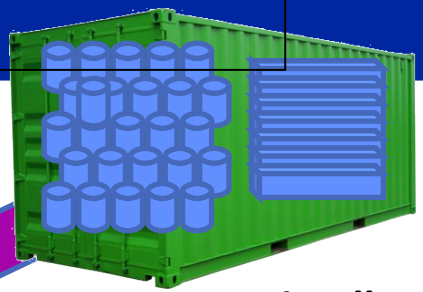
UCSD (Calit2 & School of Medicine) Bought Two Sun Boxes May 2008



Planned UCSD Energy Instrumented Cyberinfrastructure



Active Data Replication



N x 10 Gbit

N x 10 Gbit

Eco-Friendly
Storage and Compute

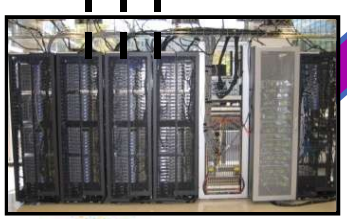
"Network in a box"
- > 200 Connections
- DWDM or Gray Optics



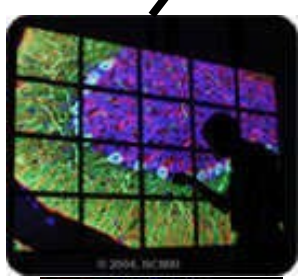
10 Gigabit L2/
L3 Switch

Wide-Area 10G
- Cenic/HPR
- NLR Cavewave
- Cinegrid
- …

On-Demand Physical
Connections



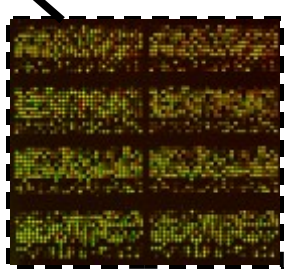
camera



NCMIR
NATIONAL CENTER for MICROSCOPY and IMAGING RESEARCH



NBCR



Microarray

Your
Lab
Here

OptIPuter

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ROCKS

Source:Phil Papadopoulos, SDSC/Calit2

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NSF Major Research Instrumentation (MRI) Grants: Femtosecond Scattering Scanning Near-field Infrared Microscope

- **Multidisciplinary Team**
  - UCSD professors Mookherjea (Electrical and Computer Engineering) and Basov (Physics), Along with the Leaders and Students of Nine Other Research Groups
- **Ultrafast Infrared Spectroscopy Combines:**
  - Ability of a Cryogenic Atomic-Field Microscope to See Nanometer-Sized Features
  - Ultrafast Heterodyne Spectroscopy Using Femtosecond Laser Derived Frequency Combs
- **Application Areas**
  - National Security, Forensics, Natural Sciences, Art History, Materials Sci. & Eng.
  - Will Enable a Nearly Universal Means for Detecting and Identifying Molecular Constituents of Organic and Inorganic Materials Including:
    - Ferromagnetic Semiconductors, Molecular Magnet Systems, Correlated Electron Systems, Negative Index Meta-materials, Cometary/Interstellar Dust
  - Provides a Unique Capability of Measuring or Modifying Their Surface Properties with Nanometer and Femtosecond Precision
- **Public/Private Partnership**
  - Development is Supported by the National Science Foundation, Calit2@UCSD, Agilent Technologies, and Coherent Inc.

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