High Performance Cyberinfrastructure Discovery Tools for Data Intensive Research



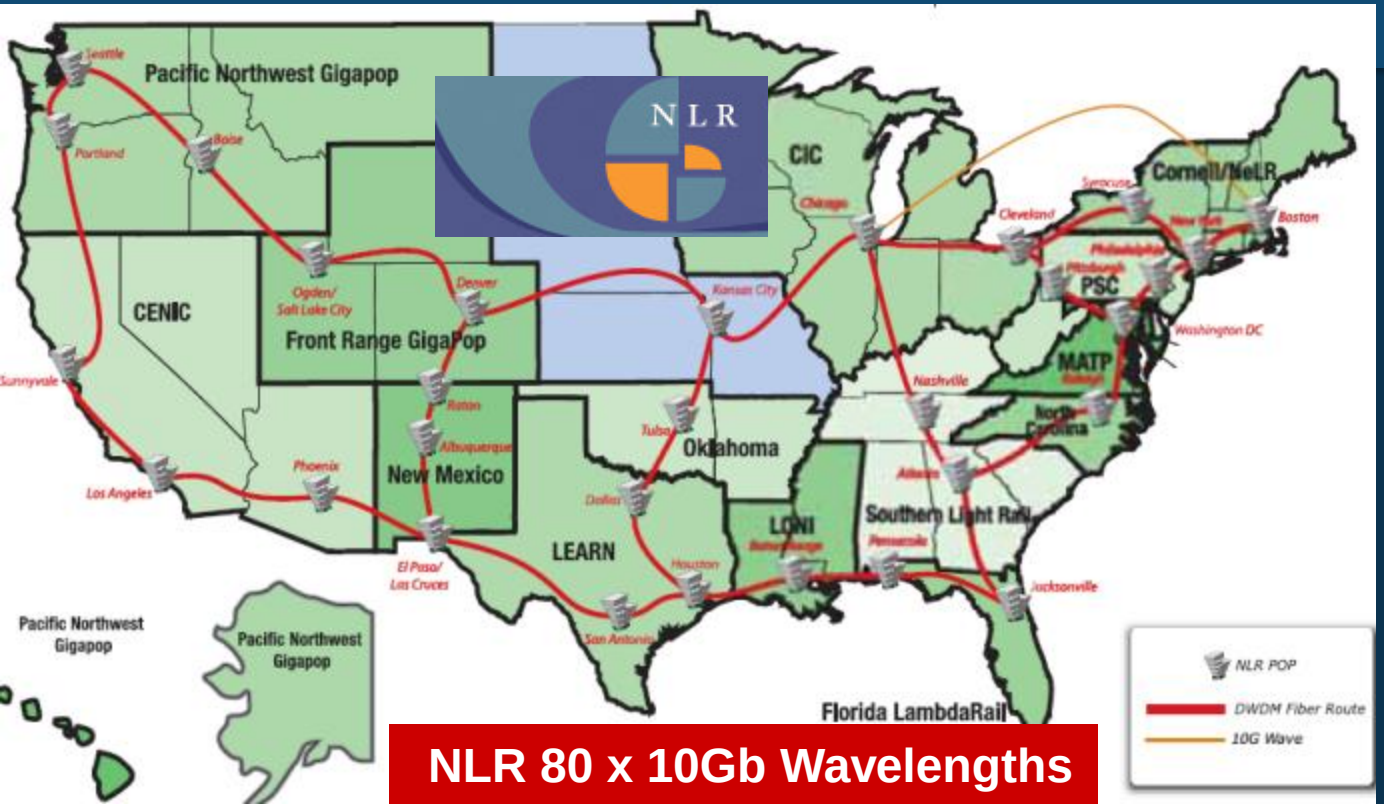


Larry Smarr
Prof. Computer Science and Engineering
Director, Calit2 (UC San Diego/UC Irvine)

Abstract

High performance cyberinfrastructure (10Gbps dedicated optical channels end-to-end) enable new levels of discovery for data-intensive research projects—such as cosmological simulations, ocean observing, and microbial metagenomics. In addition to the national optical fiber infrastructure provided by National LamdbaRail, we need local campus high performance research cyberinfrastructure to provide “on-ramps,” as well as compute and storage clouds, to augment the emerging remote commercial clouds.

Dedicated 10,000Mbps (10Gbps) Supernetworks Enable Remote Visual Analysis of Big Data



NLR 80 x 10Gb Wavelengths

National LambdaRail Interconnects Two Dozen State and Regional Optical Networks

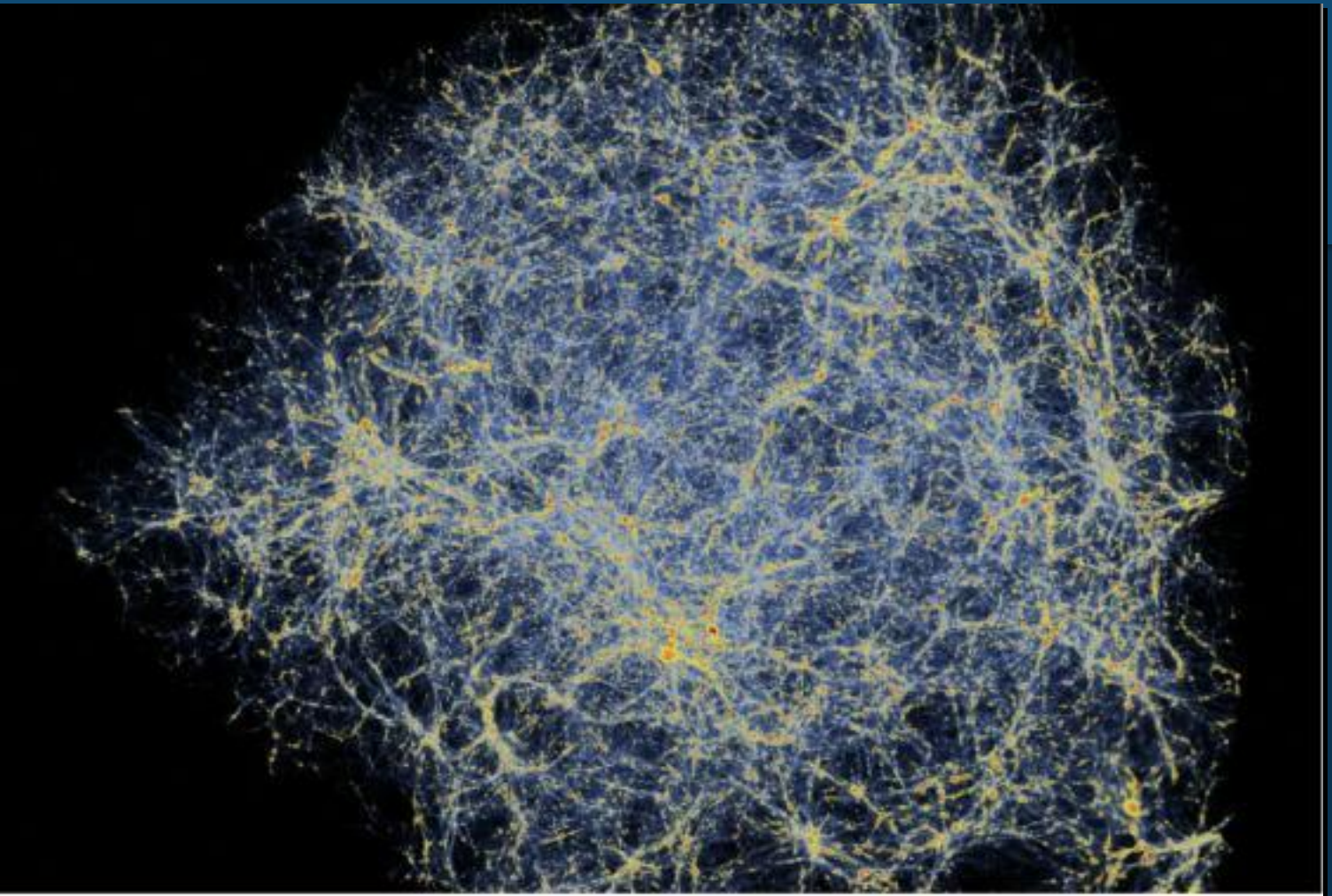
Also Internet2 Dynamic Circuit Network Is Now Available

NSF's OptIPuter Project: Using Supernetworks to Meet the Needs of Data-Intensive Researchers



OptIPortal– Termination Device for the OptIPuter 10Gbps Backplane

Intergalactic Medium on 2 Billion Light Year Scale

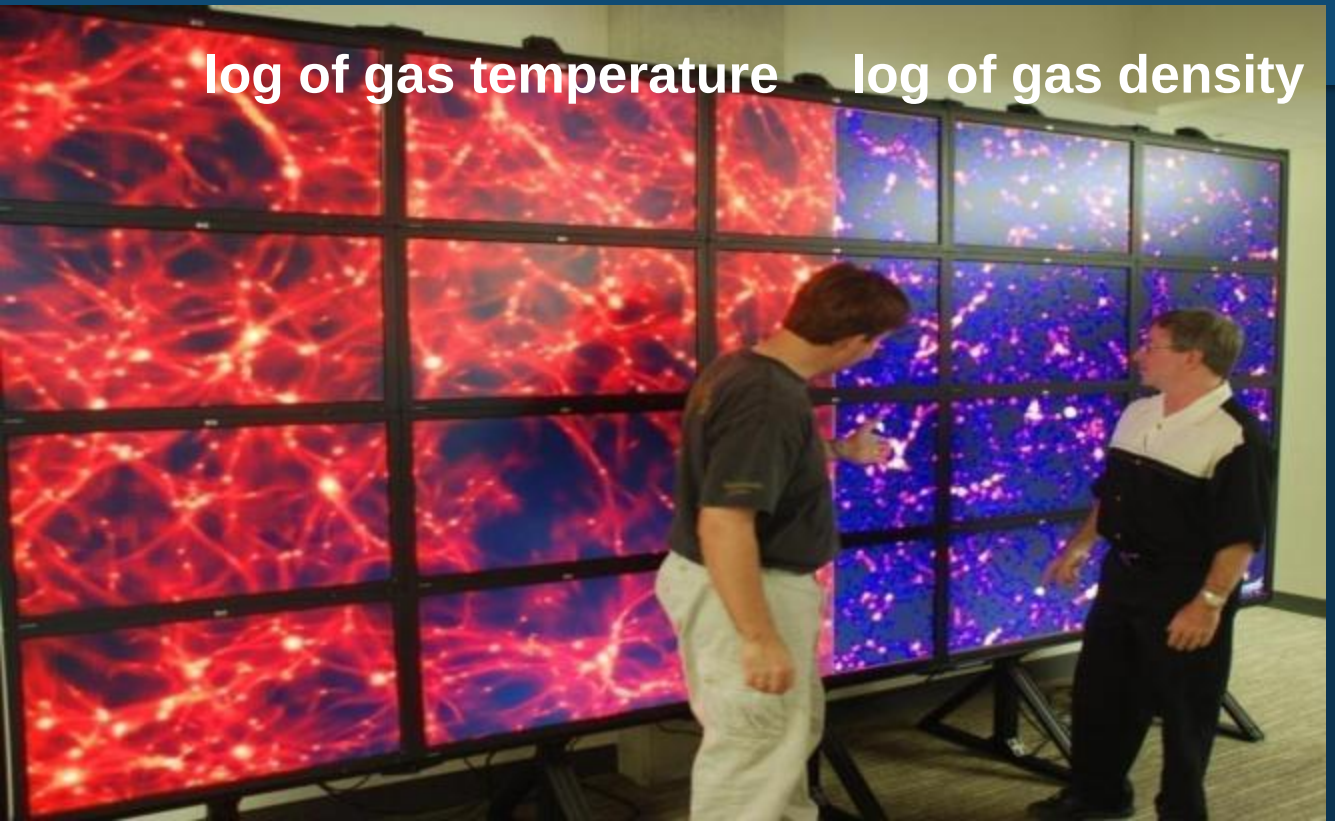


Science:
Norman, Harkness, Paschos, SDSC

Visualization:
Insley, ANL; Wagner SDSC

SDSC

End-to-End 10Gbps Cyberinfrastructure for Petascale High Performance Computing End Users



Mike Norman, SDSC
Using OptIPortal to Analyze Petascale Cosmological Big Data

SDSC

Calit2 Microbial Metagenomics Cluster-Users Can Connect by Shared Internet or 10Gbps Optical Paths



Source: Phil Papadopoulos, SDSC, Calit2

SDSC

GORDON AND BETTY MOORE FOUNDATION

camera
Marine Microbial Ecology

Using 10 Gbps Big Data Access and Analysis- Collaboration Between Calit2 and U Washington



Photo Credit: Alan Decker

Feb. 29, 2008

Ginger Armbrust's Diatom Chromosomes

iHDTV: 1500 Mbits/sec Calit2 to UW Over NLR

GORDON AND BETTY MOORE FOUNDATION

camera Marine Microbial Ecology

UW Research Channel

MIT Using OptIPortal to Analyze 10km Coupled Ocean Microbial Simulation



GORDON AND BETTY MOORE FOUNDATION

camera
Marine Microbial Ecology

MIT's Ed DeLong & Darwin Project Team

The NSF-Funded Ocean Observatory Initiative– a Complex System of Systems Cyberinfrastructure



Source: Matthew Arrott, Calit2 Program Manager for OOI CI

OCEAN OBSERVATORIES INITIATIVE

Taking Sensornets to the Ocean Floor: Remote Interactive HD Imaging of Deep Sea Vent

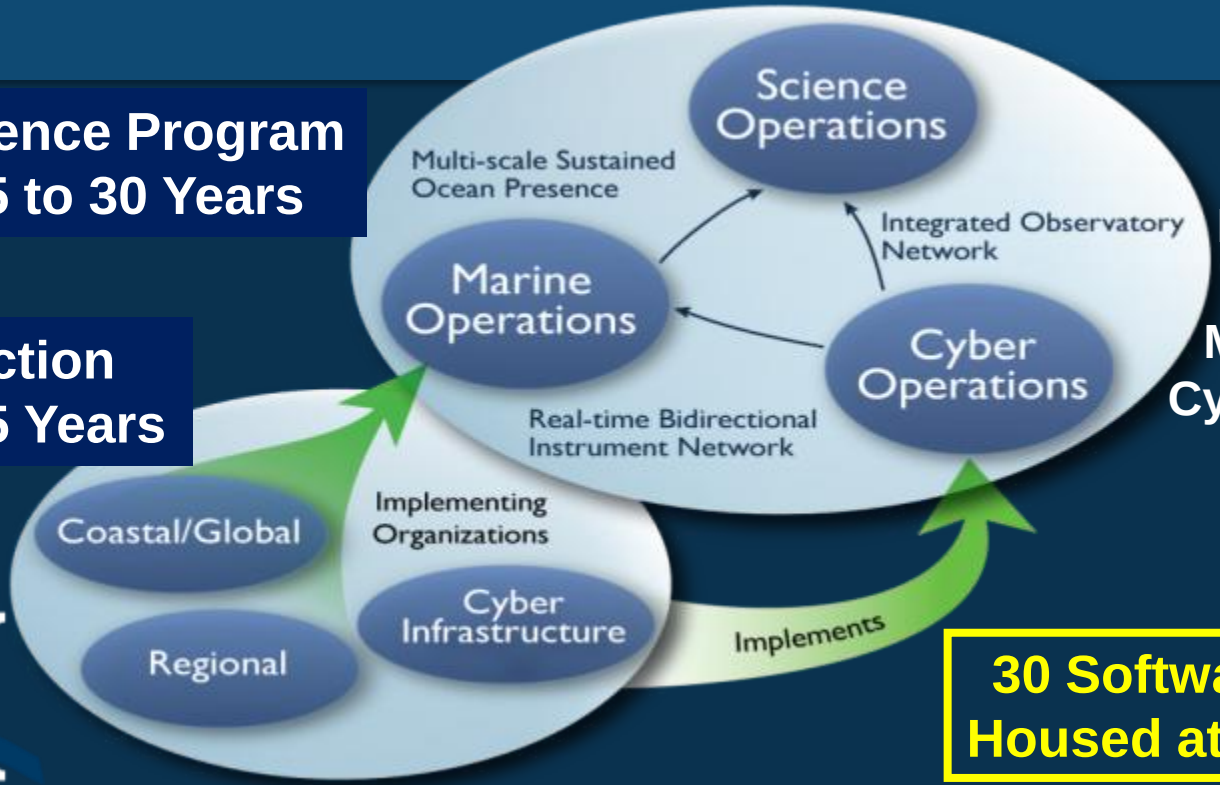


Source: John Delaney and Research Channel, University of Washington

NSF OOI is a $400M Program
-OOI CI is $34M Part of OOI

Science Program
25 to 30 Years

Construction
Program 5 Years

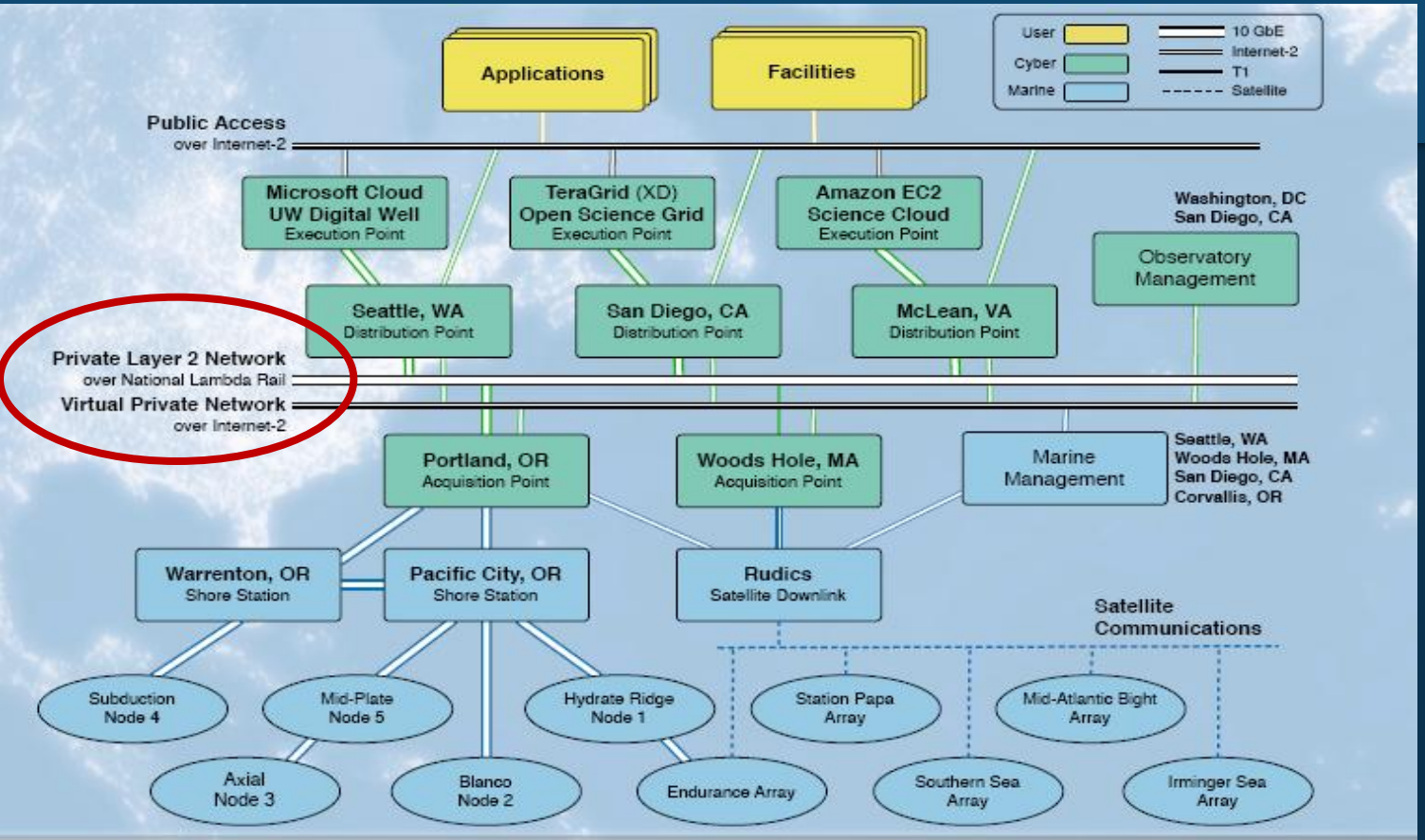


Source:
Matthew Arrott, Calit2 Program Manager for OOI Cyberinfrastructure

30 Software Engineers
Housed at Calit2@UCSD

OCEAN OBSERVATORIES INITIATIVE

OOI CI is Built on National LambdaRail's and Internet2's DCN Optical Infrastructure



Source: John Orcutt, Matthew Arrott, SIO/Calit2

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



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

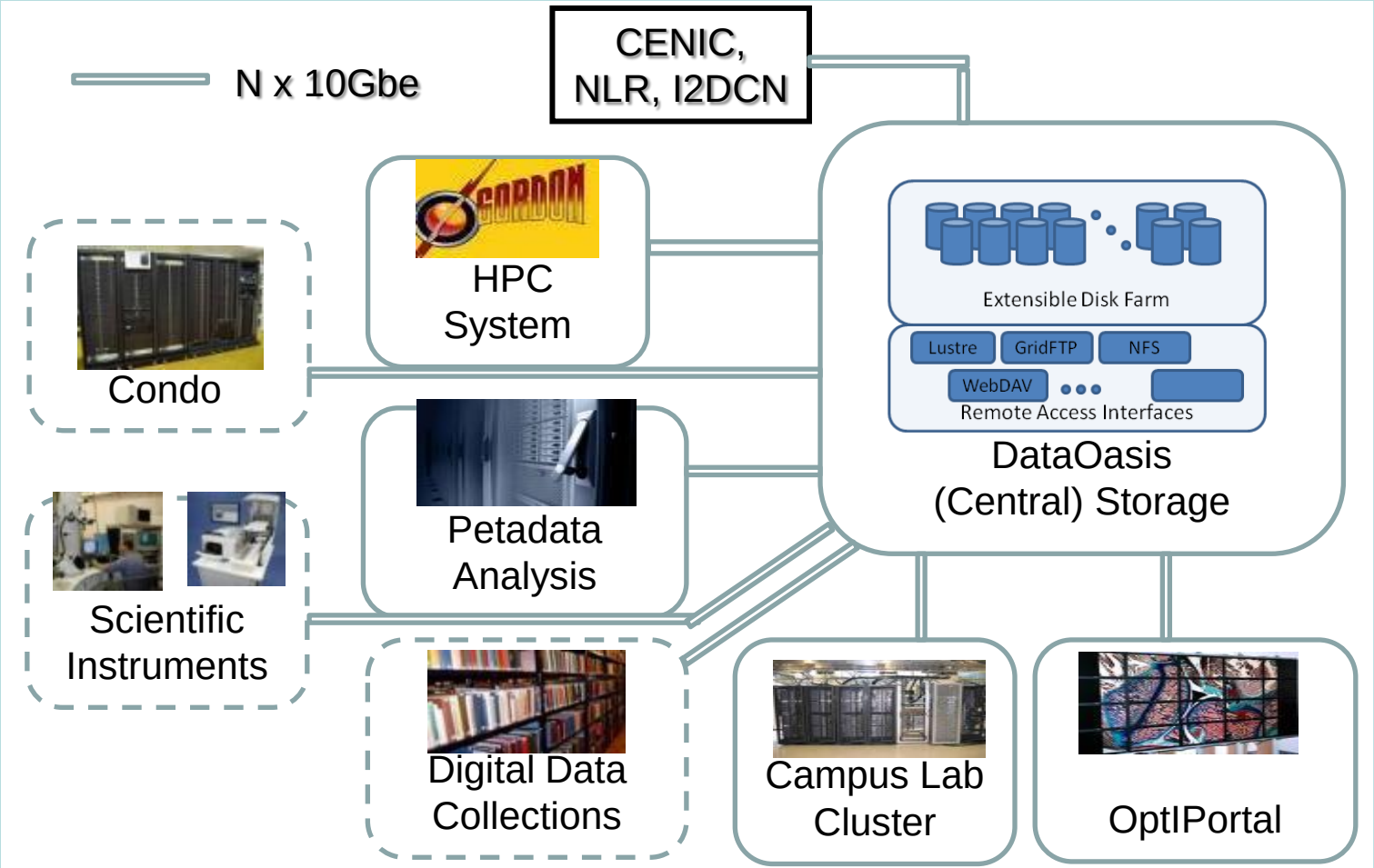
Analyzing Big Data in 3D Stereo: The NexCAVE OptIPortal



Source: Tom DeFanti, Calit2@UCSD

Array of JVC HDTV 3D LCD Screens

Calit2's KAUST NexCAVE = 22.5MPixels



Source: Philip Papadopoulos, SDSC, Calit2 UCSD

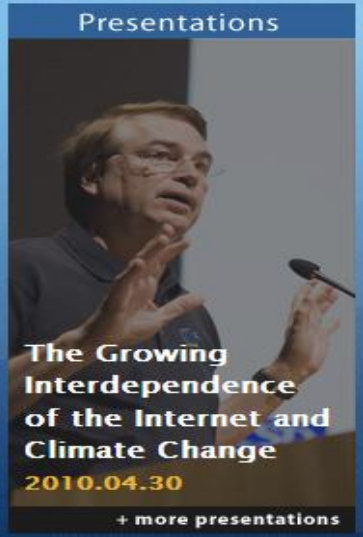
California and Washington Universities Are Testing a 10Gbps Connected Commercial Data Cloud

- Amazon Experiment for Big Data
  - Only Available Through CENIC and Pacific NW GigaPOP
    - Private 10Gbps Peering Paths
  - Includes Amazon EC2 Computing and S3 Storage Services

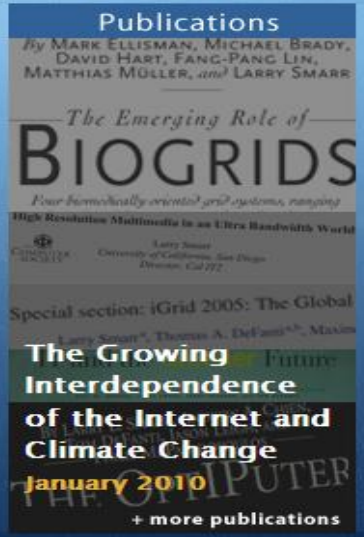
face the challenge

Larry Smarr











ABOUT LARRY SMARR

Larry Smarr is the founding Director of the California Institute for Telecommunications and Information Technology (Calit2), a UC San Diego/UC Irvine partnership, and holds the Harry E. Gruber professorship in Computer Science and Engineering (CSE) at UCSD's Jacobs School. At Calit2, Smarr has continued to drive major developments in information

WHAT I'M READING

Complete List of Larry's Recommendations

American College and University Presidents' Climate Commitment

A Doctor's Vision of the Future of Medicine

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