

A POWERFUL DISTRIBUTED CYBERINFRASTRUCTURE TO SUPPORT
DATA-INTENSIVE SCIENTIFIC RESEARCH AND COLLABORATION
WWW.OPTIPUTER.NET



THE OPTIPUTER

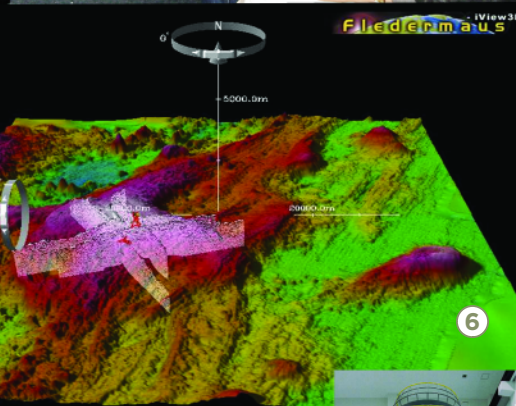
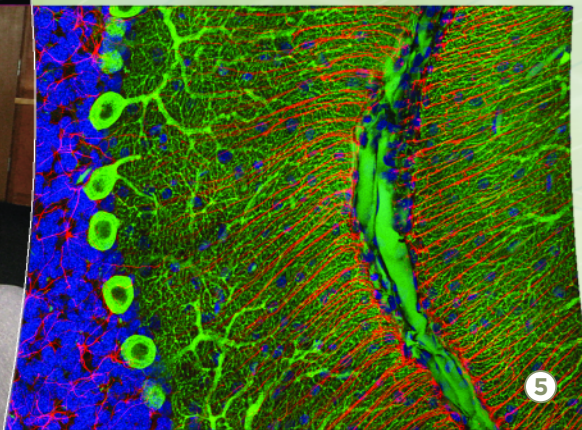
The OptIPuter, so named for its use of **Optical** networking, Internet **P**rotocol, and computer storage, processing, and visualization technologies, is an infrastructure that will tightly couple computational resources over parallel optical networks using the IP communication mechanism. The OptIPuter exploits a new world in which the central architectural element is optical networking, not computers—creating "supernetworks."

The goal of this architecture is to enable scientists generating terabytes and petabytes of data to interactively visualize, analyze, and correlate their data from multiple storage sites connected to optical networks. Specifically, the OptIPuter's broad multidisciplinary team is conducting experiments with two data-intensive e-science efforts to ensure a useful and usable OptIPuter design:

- EarthScope efforts at the UCSD Scripps Institution of Oceanography, funded by the National Science Foundation
- Biomedical Informatics Research Network (BIRN) efforts at the UCSD National Center for Microscopy and Imaging Research, funded by the National Institutes of Health

Other groups, notably the U.S. Geological Survey EROS Data Center and NASA, look to the OptIPuter project to provide leadership in developing and deploying next-generation affordable, interactive, large-scale display and Earth science analysis technologies.

The OptIPuter receives major funding from NSF ITR cooperative agreement SCI-0225642 to UCSD.



LEADERS

Principal Investigator

Larry Smarr, California Institute for Telecommunications and Information Technology [Cal-(IT)²], UCSD

Co-Principal Investigators

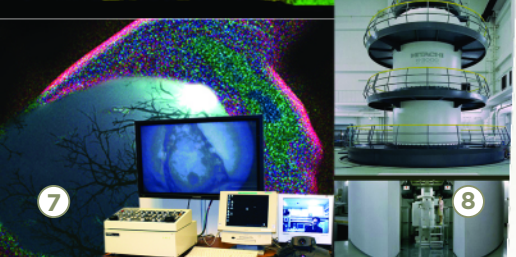
Tom DeFanti and Jason Leigh, University of Illinois at Chicago (UIC)
Mark Ellisman, John Orcutt, and Philip Papadopoulos, UCSD

Project Manager

Maxine Brown, UIC

System Software Architect

Andrew Chien, UCSD



Cover: Richat Structure. Image courtesy of NASA Landsat Project Science Office and USGS EROS Data Center.

1. SARA tiled display. Photo courtesy of SARA Computing and Networking Services, The Netherlands.

2. OptIPuter visualization cluster at SC 2003. Photo courtesy of EVL/UIC.

3. SCEC TeraShake: Supporting an Earthquake Storage Intensive Simulation, by the Southern California Earthquake Center Project. Visualization by USC Information Sciences Institute's Center for Grid Technologies.

PARTNERS

Academic Institutions

UCSD-Cal-(IT)², SDSC, SIO, NCMIR
University of Illinois at Chicago
Northwestern University
San Diego State University
Texas A&M University
UC Irvine
University of Illinois at Urbana-Champaign, National Center for Supercomputing Applications
University of Southern California, Information Sciences Institute

Affiliate Partners

USGS Earth Resources Observation Systems Data Center
University of Amsterdam
NASA (Ames Research Center, Goddard Space Flight Center, and Jet Propulsion Laboratory)

Industrial Partners

Big Bangwidth
Calient Networks
CANARIE
Chiaro Networks
Cisco
Glimmerglass Networks
HP
IBM
Level (3) Communications
Lucent Technologies
Sun Microsystems
Telcordia (SAIC)

FOR MORE INFORMATION

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OPTIPUTER ACTIVITIES @ SC04

PAPERS

Yunhong Gu, Xinwei Hong, and Robert L. Grossman (all of UIC)
"Experiences in Design and Implementation of a High-Performance Transport Protocol"
Tuesday, November 9, 3:30-4:00 P.M.

Xin Liu and Andrew Chien (both of UCSD)
"Realistic Large-Scale Online Network Simulation"
Wednesday, November 10, 10:30-11:00 A.M.

Oliver T. Yu and Thomas A. DeFanti (both of UIC)
"Collaborative User-Centric Lambda-Grid over Wavelength-Routed Network"
Wednesday, November 10, 11:00-11:30 A.M.

PANEL

"GLIF Infrastructure—Why Do We Need 10-Gbps Networks?"
Friday, November 12, 10:30 A.M.-12:00 P.M.

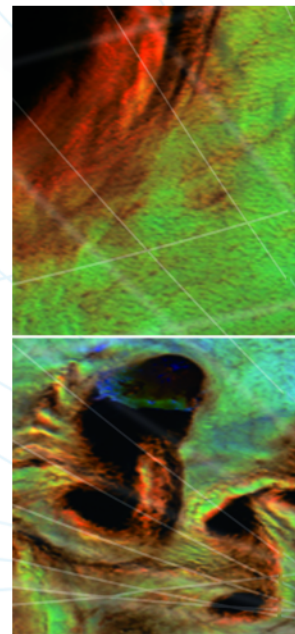
Speakers

Peter Clarke (Edinburgh University and University College London, UK)
Thomas A. DeFanti (UIC)
Jun Murai (Keio University, Japan)
Kees Neggers (SURFnet bv, The Netherlands)
Bill St. Arnaud (CANARIE, Canada)

Chair

Maxine Brown (UIC)

4. Graham Kent and Catherine Johnson, SIO, looking at a 3-D, interactive scene of the Lau Basin, highlighting the magma chamber structure. Cal-(IT)² is supporting Allison Jacobs, a student working on this project for her Ph.D. thesis.
5. Rat cerebellum cross-section montage. Image courtesy of UCSD National Center for Microscopy and Imaging Research (NCMIR).
6. Axial Seamount of the Juan de Fuca Ridge. Image courtesy of UCSD SIO.
7. Image courtesy of Northwestern University.
8. Ultra-high-voltage electron microscope at Osaka, Japan. Image courtesy of UCSD NCMIR.



MASTERWORKS

Philip Papadopoulos (UCSD/San Diego Supercomputer Center/Cal-(IT)²)

"The OptIPuter: Experimental Hybrid Network Structure and Emerging Software Services for Lambda-Enabled Computers"
Thursday, November 11, 10:30-11:15 A.M.

John Orcutt (UCSD Scripps Institution of Oceanography)

"Cyberinfrastructure in the Earth Sciences—A Necessary and Timely Collaboration"
Thursday, November 11, 11:15 A.M.-12:00 P.M.

SC GLOBAL

Keynote: Larry Smarr (California Institute for Telecommunications and Information Technology and Harry E. Gruber Professor, Department of Computer Science and Engineering, UCSD)

"Towards a Planetary Collaboratory"
Tuesday, November 9, 10:30 A.M.-12:00 P.M.

Allan Spale (UIC)

"ImmersaView Launcher: A Shared Access Grid Application"
Tuesday, November 9, 4:20-5:00 P.M.

Raj Singh (UIC)

"TeraVision: High-Bandwidth, Collaborative Video Streaming on the Access Grid"
Thursday, November 11, 11:30 A.M.-12:00 P.M.

CONFERENCE KEYNOTE

Tom West (President and CEO of the National LambdaRail)

"NLR: Providing the Nationwide Network Infrastructure for Network and 'Big Science' Research"
Tuesday, November 9, 8:30-9:30 A.M.

**NATIONAL LAMBDARAIL
BOOTH #1153**

Scalable Adaptive Graphics Environment
Luc Renambot, Electronic Visualization
Laboratory, UIC, luc@evl.uic.edu

OptIPuter Middleware: Terabyte Data Juggling
and DVC Framework
Ryan Wu, Concurrent Systems Architecture
Group, UCSD, xwu@cs.ucsd.edu

Trans-Pacific HDTV Feedback and Remote-
Control Scenarios of Remote Instrumentation
David Lee, National Center for Microscopy and
Imaging Research, UCSD, dlee@ncmir.ucsd.edu

UDT Fairness and Friendliness
Bob Grossman, National Center for Data Mining,
UIC, grossman@uic.edu

NASA High-Volume Data Displays
Horace Mitchell, Scientific Visualization Studio,
NASA Goddard Space Flight Center,
horace.mitchell@nasa.gov
Jason Leigh, Electronic Visualization Laboratory,
UIC, spiff@uic.edu

**USC/ISI
BOOTH #2649**

Grid-Based Visualization Framework
Marcus Thiebaut, Information Sciences Institute,
University of Southern California,
thiebaut@isi.edu

**DUTCH RESEARCH
BOOTH #2150**

High-Resolution, Grid-Enabled Visualization
for Life Sciences and Climate Modeling
Paul Wielinga, SARA, wielinga@sara.nl

**NCSA
BOOTH #548**

OptIPuter
Tom DeFanti, Electronic Visualization
Laboratory, UIC
Thursday, November 11, 10:30 A.M.

Stereo Visualization of Jet Instabilities in
Stratified Fluid
Donna Cox, National Center for Supercomputing
Applications, cox@ncsa.uiuc.edu

**NORTEL
BOOTH #1333**

DWDM: Data-Intensive Computational Grid
Services Enabled by Dynamic Switched Wavelengths
Joe Mambretti, International Center for Advanced
Internet Research (iCAIR), Northwestern
University, j-mambretti@northwestern.edu

International Wavelength/Lightpath Switching
Using Distributed Control Planes
Joe Mambretti, iCAIR, Northwestern University,
j-mambretti@northwestern.edu
Cees de Laat, University of Amsterdam,
delaat@science.uva.nl

**NATIONAL CENTER FOR DATA MINING
BOOTH #653**

Data Stream Merge
Bob Grossman, National Center for Data Mining,
UIC, grossman@uic.edu

Photonic Data Services
Bob Grossman, National Center for Data Mining,
UIC, grossman@uic.edu
Joe Mambretti, iCAIR, Northwestern University,
j-mambretti@northwestern.edu