ONE OF THE LEADING RESOURCES IN THE WORLD FOR NETWORK KNOW-HOW

PSC's Advanced Networking group is one of the leading resources in the world for knowledge about networking. Through 3ROX (Three Rivers Optical Exchange), a high-speed network hub, they provide high-performance networking for research and education. Their research on network performance and analysis — in previous projects such as Web100 and the NPAD diagnostic server — has created valuable tools for improving network performance nationally.

MORE INFORMATION
www.psc.edu/networking/

FROM PITTSBURGH TO ABU DHABI: FIRST INTERNATIONAL TELEPRESENCE SESSION VIA NLR

PSC this year played a lead role in demonstrating "TelePresence," a video teleconferencing capability, developed by Cisco Systems. In April, PSC coordinated the first international TelePresence session over research and education networks via National LambdaRail (NLR), a major initiative of U.S. universities and the private sector to provide networking infrastructure for research and education. NLR and ANKABUT, a science initiative of the United Arab Emirates, arranged a TelePresence link between PSC and the campus of Khalifa University of Science, Technology and Research in Abu Dhabi.

In May, NLR demonstrated multi-point TelePresence, with a session linking the Renaissance Computing Institute (RENCI) of Chapel Hill, North Carolina and Pennsylvania State University's College of Information Sciences and Technology with PSC. "The demonstration of multi-point TelePresence reinforces that TelePresence is the leading-edge in live video tele-conferencing," said Wendy Huntoon, PSC director of networking. "For PSC, this extends our ongoing productive collaboration with Cisco and close partnership with NLR.

PSC network engineer Steve Cunningham (left in photo) was "in the room" in Abu Dhabi via TelePresence.

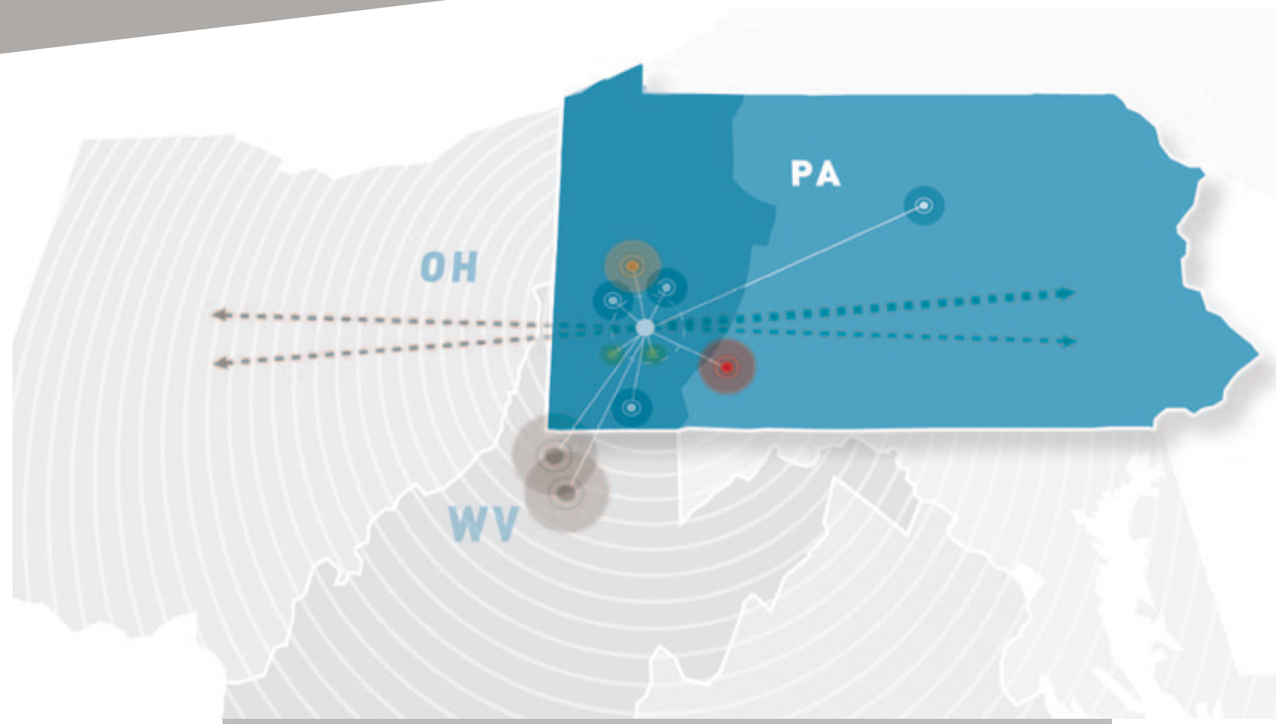
3ROX PLANS FOR STATEWIDE BROADBAND

Through 3ROX, the Three Rivers Optical Exchange, PSC connects universities and public schools in Pennsylvania and West Virginia to high-performance networks, such as Internet2, which links leading U.S. universities, corporations, government research agencies, and not-for-profit networking organizations.

This year 3ROX joined with a coalition of Pennsylvania colleges and universities, heathcare and economic development organizations to form the Pennsylvania Research and Education Network (PennREN). PennREN applied for $100 million in federal stimulus money through the American Recovery and Revitalization Act and $29 million in private funds to build and maintain a broadband network for expanded educational opportunity and healthcare services across the Commonwealth of Pennsylvania. The proposed network would reach every region of the state, providing access to more than two-million households and 200,000 businesses. "The system would rival any in the United States," says Huntoon, "and would provide the capability to connect regional networks across the Commonwealth."

NETWORK RESEARCH: MEASUREMENT LAB

In January, Google launched its new network measurement tool, M-Lab, which includes the PSC-NCAR developed Network Path Diagnostics tool (NPAD) as one of four key network measurement instruments. A web-based deployment of servers and tools for study of broadband networks, M-Lab includes PSC senior network engineer Matt Mathis on its steering committee.



3ROX MEMBERS

Universities
Carnegie Mellon University, Pennsylvania State University, University of Pittsburgh, Waynesburg University, West Virginia University

NLR Member Institutions
3ROX (PSC), Carnegie Mellon University, Case Western Reserve University, OneCommunity, University of Pittsburgh, Pennsylvania State University, Indiana University.

K-12 Institutions
Allegheny Intermediate Unit (AIU3), Arin Intermediate Unit (IU28), Beaver Valley Intermediate Unit (IU27), Intermediate Unit One, Northwest Tri-County Intermediate Unit (IU5), Riverview Intermediate Unit (IU6), City of Pittsburgh School District (IU2), Woodland Hills School District

Government Laboratory
The National Energy Technology Laboratory

Business
Comcast, Westinghouse Electric Co.

Other
Computer Emergency Response Team

NETWORK CONNECTIONS

National Research Networks
Internet2 — 1 Gbps, ESnet — 1 Gbps, National LambdaRail PacketNet — 10 Gbps, TeraGrid Extensible Backplane Network — 30 Gbps

Other Network Connections
Southern Crossroads (SOX) — 1Gbps, TransitRail — 1Gbps, OARnet — 1 Gbps, FrameNet — 10 Gbps

National Commodity Internet Networks
Global Crossing — 1 Gbps; Sprint — 1 Gbps

Pittsburgh Local Exchange Networks
Comcast

Note: Gbps: a billion (Giga) bits per second

NOTES & HIGHLIGHTS

THE NATIONAL RESOURCE FOR BIOMEDICAL SUPERCOMPUTING

NATIONAL LEADERSHIP IN HIGH-PERFORMANCE COMPUTING FOR BIOMEDICAL RESEARCH

Established in 1987, PSC's National Resource for Biomedical Supercomputing (NRBSC) was the first external biomedical supercomputing program funded by the National Institutes of Health (NIH). Along with core research at the interface of supercomputing and the life sciences, NRBSC scientists develop collaborations with biomedical researchers around the country, fostering exchange among experts in computational science and biomedicine and providing computational resources, outreach and training. In October 2006, NRBSC received $8.5 million from NIH's National Center for Research Resources (NCRR) to renew its work for five years. This September NCRR awarded just under $800,000 as a supplemental grant for 2009-10, part of which supports storage and analysis of massive brain-imaging data from NRBSC's collaboration with Harvard (p. 20).

"Over the past decade, computing has become essential to almost all aspects of biomedicine," says PSC's Joel Stiles, director of NRBSC. "Here at NRBSC, we're developing and distributing computational tools in simulation, visualization, and education that are helping to transform our understanding of life and disease."

In September, the National Institute of General Medical Sciences (NIGMS), part of NIH, awarded $2.7 million over two years to the NRBSC to support a partnership with D. E. Shaw Research to make an innovative new computing system available to U.S. biomedical scientists (see p. 4).

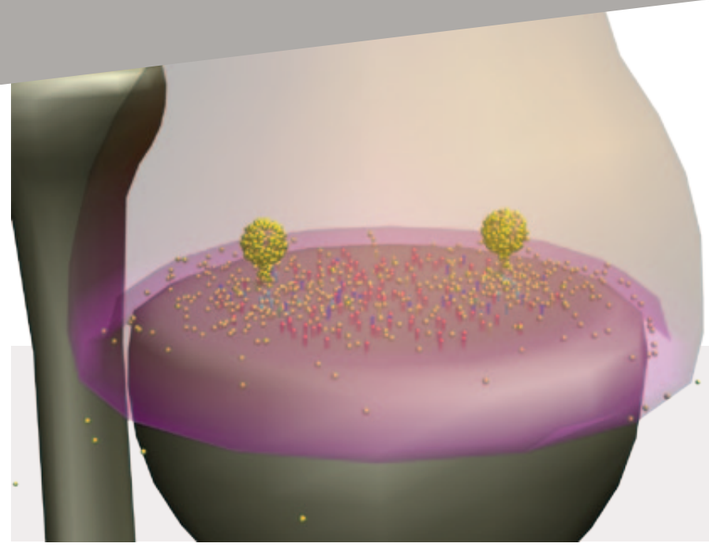
The NRBSC and PSC have developed educational programs, CMIST and BEST (see pp. 9-11), for high school and undergraduate biology, chemistry, physics, computer science and math that have provided training to students and educators in the Pittsburgh region and nationally.

MORE INFORMATION
www.nrbsc.org

NRBSC Biomedical Collaborations

Albert Einstein College of Medicine
Carnegie Mellon University
Cornell University
Duke University
Harvard University
Howard University
Janelia Farm, Howard Hughes Medical Institute
Marine Biological Laboratory, Woods Hole
Morgan State University
North Carolina Central University
Rockefeller University
The Salk Institute
The Scripps Research Institute
University of California at Davis
University of California at San Diego
University of Kansas
University of North Carolina, Chapel Hill
University of Pittsburgh
University of Pittsburgh School of Medicine
University of Puerto Rico, Medical Sciences Campus

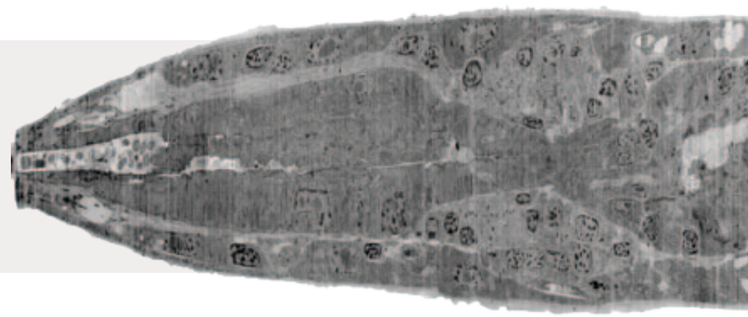
The NRBSC team: (seated, l to r) Boris Kaminsky, Pallavi Ishwad, Jenda Domaracki, (standing) Art Wetzel, James Keener, Jack Chang, Markus Dittrich, Aji Janis, Troy Wymore, Jun Ma, Christal Banks, Alex Ropelewski, Joel Stiles, Hugh Nicholas, Adam Kraut, Greg Hood, Gary Blumenthal. Not pictured: Jacob Czech



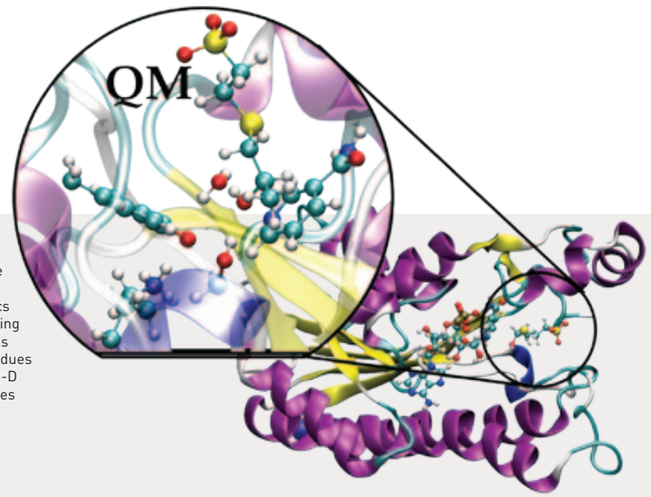
RESEARCH

NRBSC research focuses on three areas of biomedicine that span many scales of space and time: spatially realistic cell modeling, large-scale volumetric visualization and analysis, and computational structural biology.

SPATIALLY REALISTIC CELL MODELING centers on realistic 3-D simulations of movements and reactions of molecules within and between cells, to better understand physiological function and disease. MCell, DReAMM and PSC_DX software is developed at the NRBSC and used to model and visualize events such as this image, which represents neurotransmitter release in one dendritic spine.



VOLUMETRIC VISUALIZATION using the NRBSC's PSC_VB software enables multiple users to share, view and analyze extremely large datasets and time series obtained from light and electron microscopes, CAT and MRI scanners, etc. This transverse section (from a dataset captured by Richard Fetter in Cori Bargmann's laboratory) of C. elegans, a roundworm much studied as a model organism, was aligned with programs developed by Greg Hood at NRBSC.



NRBSC STRUCTURAL BIOLOGY focuses on developing software for quantitatively accurate enzyme reaction simulations and integrating the results with sequence-based bioinformatics studies. This PSC-developed software is enabling more accurate simulations of enzyme reactions and insight into the function of amino acid residues outside the active site. This image shows the 3-D structure of R-HPCDH, an enzyme that catalyzes a coupled proton/hydride transfer.