
BOREAS-Net: **Regional Broadband Network** **Support for Research Computing**

Jim Davis
Chief Information Officer
Iowa State University

Topics

- Cyberinfrastructure
- BOREAS regional optical network
- Big pipes = interesting research collaborations

Cyberinfrastructure

“Cyberinfrastructure is the coordinated aggregate of software, hardware and other technologies, as well as human expertise, required to support current and future discoveries in science and engineering. The challenge of Cyberinfrastructure is to integrate relevant and often disparate resources to provide a useful, usable, and enabling framework for research and discovery characterized by broad access and “end-to-end” coordination.”

Source:

SBE/CISE Workshop on Cyberinfrastructure for the Social Sciences, Fran Berman, San Diego Supercomputer Center and UC San Diego

Cyberinfrastructure Components

- Connectivity
- Support for virtual organizations
- High performance computing
- Large storage capabilities
- Visualization
- Security and data management
- Physical & logistical support; education and training
- Shared data centers

“Final Report: A Workshop on Effective Approaches to Campus Research Computing Cyberinfrastructure”
Ken Klingenstein, Internet2; Kevin Morooney, Penn State University; Steve Olshansky, Internet2
Sponsored by the National Science Foundation - Grant No. OCI-0627970, Pennsylvania State University,
and Internet2; April 25, 2006 (<http://middleware.internet2.edu/crcc/docs/internet2-crcc-report-200607.html>)

Cyberinfrastructure: The Second Revolution



“We are entering a second revolution in information technology, one that may well usher in a new technological age that will dwarf, in sheer transformational scope and power, anything we have yet experienced in the current information age.”

Arden L. Bement, Director, National Science Foundation
Chronicle of Higher Education, January 5, 2007

“... leadership in cyberinfrastructure may well become the major determinant in measuring pre-eminence in higher education among nations.”

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- Cyberinfrastructure in its role of supporting (in some cases *enabling*) forward-looking research is a key issue for university IT groups as well as funding agencies
 - High capacity networks are a major component of cyberinfrastructure
 - Onward to BOREAS-Net....

BOREAS-Net:

Broadband Optical Research, Education, and Science Network

Participating Institutions:

Iowa State University
University of Minnesota – Twin Cities
University of Iowa
University of Wisconsin – Madison

Services Available:

10G Ethernet Wave Transport
1G Ethernet Sub-Wave Transport
10G SONET Wave Transport
SONET Sub-Wave Transport

Network Description:

DWDM Digital Optical Network Transport, with GMPLS based path reroute capability, operating over 1500+ miles of University owned Dark Fiber IRUs

Operational:

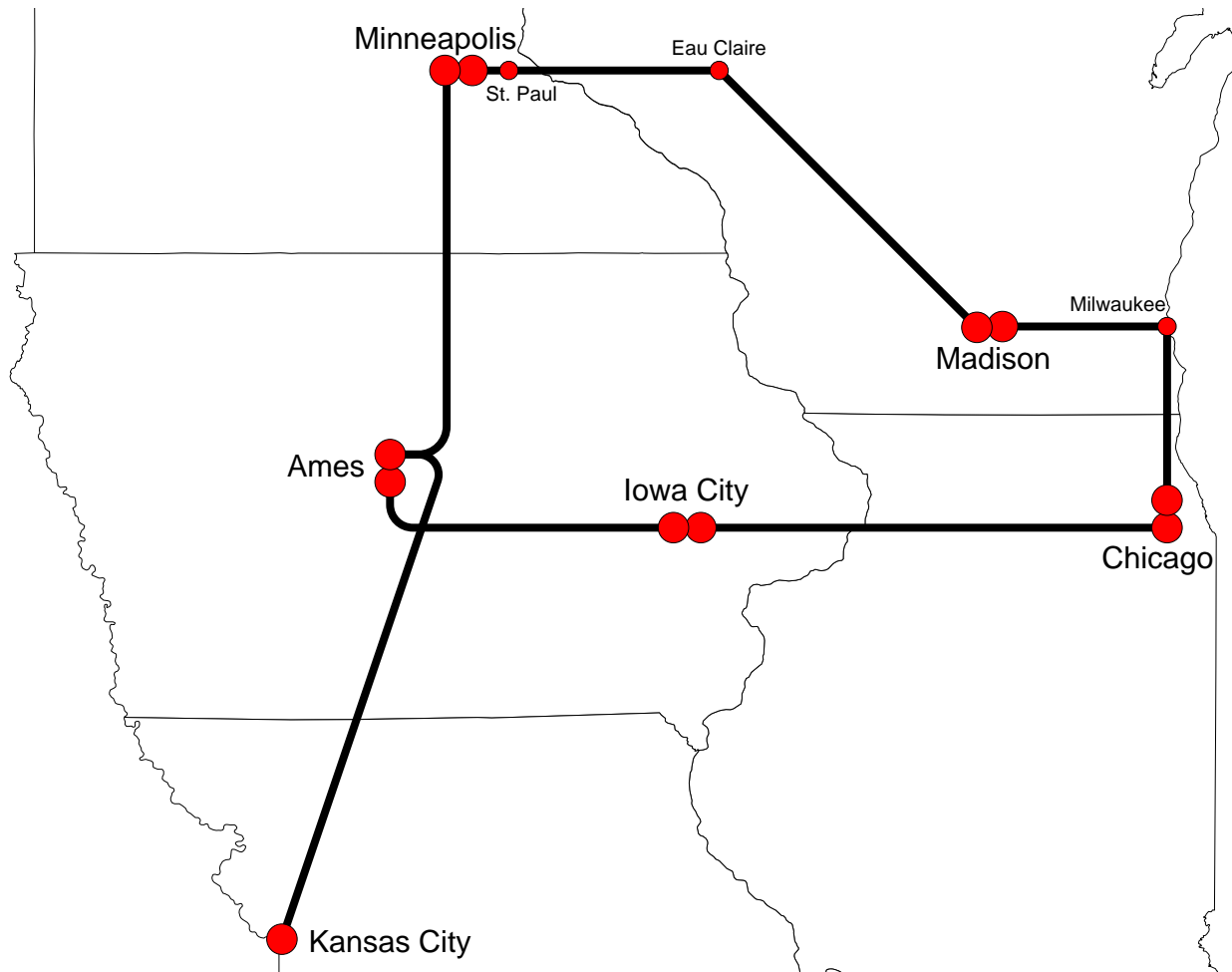
February 2007



BOREAS-Net

www.boreas.net

BOREAS-Net Topology



- Provisioned initially with ten 10 gigabit waves
- Current optronics capable of 80 10 gigabit waves
- \$6.3M investment; \$1M annual operation
- Infinera optronics

Service Access Details

Chicago, IL

Location 1:

Northwestern University
Abbott Hall
710 N Lake Shore Dr

Internet2 and NLR
StarLight
CIC OmniPOP

Location 2:

Level3
900 N Kingsbury St
(AKA 600 W Chicago Ave)

Internet2

Other Chicago buildings reachable via CIC Fiber Rings:

111 N Canal St
350 E Cermak Rd
427 S La Salle St
151/155 N Michigan Ave
600 S Federal St

NLR and Level3
Carrier Hotel and Equinix
Carrier Hotel
Carrier Hotel
Carrier Hotel

Kansas City, MO

Location:

Level3
1100 Walnut St

Internet2 and NLR

Other Kansas City buildings reachable via BOREAS-Net fiber:

1102 Grand Blvd

Carrier Hotel



National LambdaRail™ Infrastructure



New Internet2 Network



National Lambda Rail and BOREAS-Net



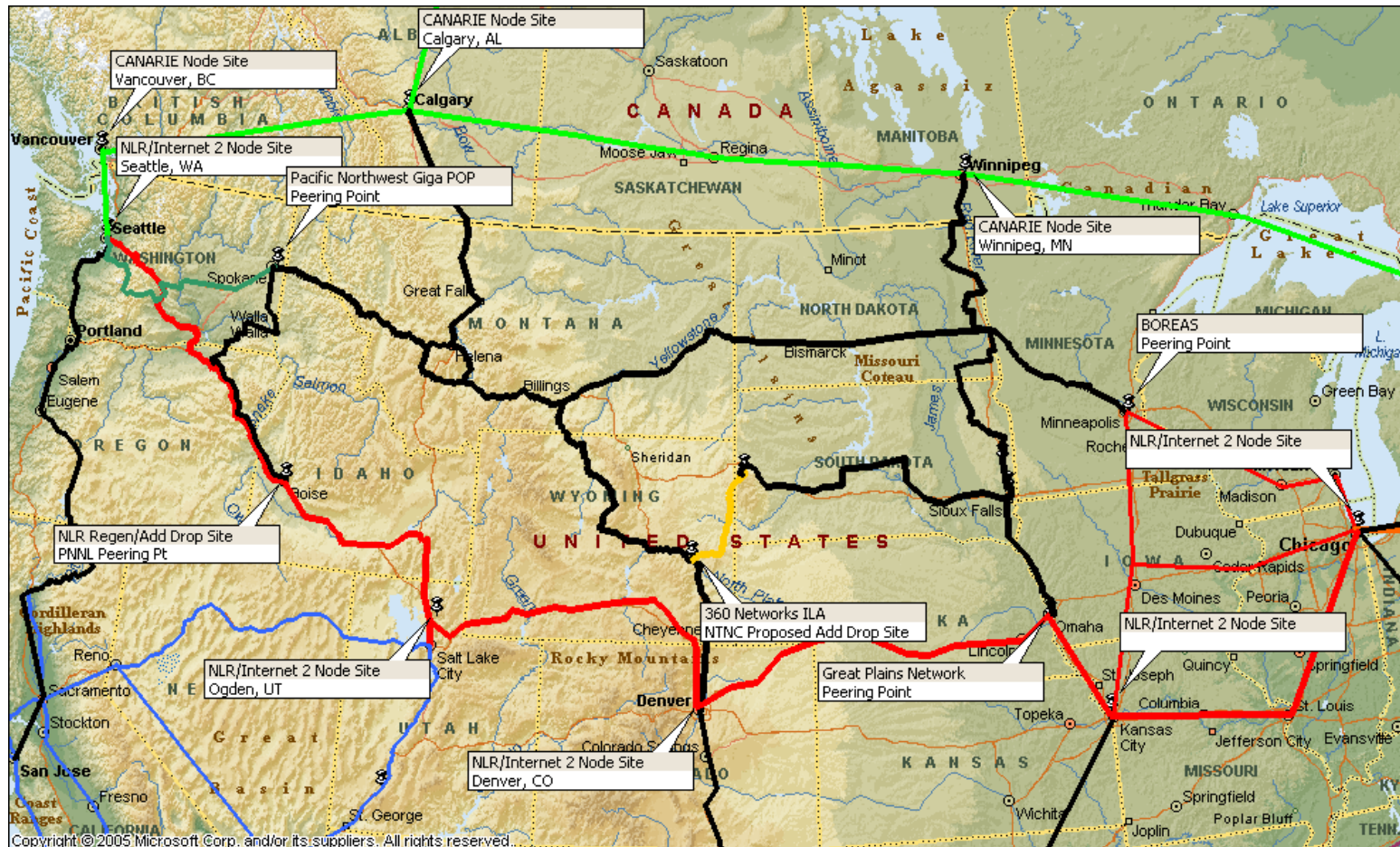
National RON Map



http://paintsquirl.ucs.indiana.edu/fiber_map.pdf

Northern Tier Network Consortium

“Sacajawea Portage”



Source: Neas, Ford, Hughett, Wilson: “Final Report for NSF Planning Grant”, www.ntnc.org



BOREAS Uses:

- Low cost commodity Internet bandwidth
- Dedicated 1G and 10G circuits for campus researchers, with ample ability to expand
- Potential platform for network experiments

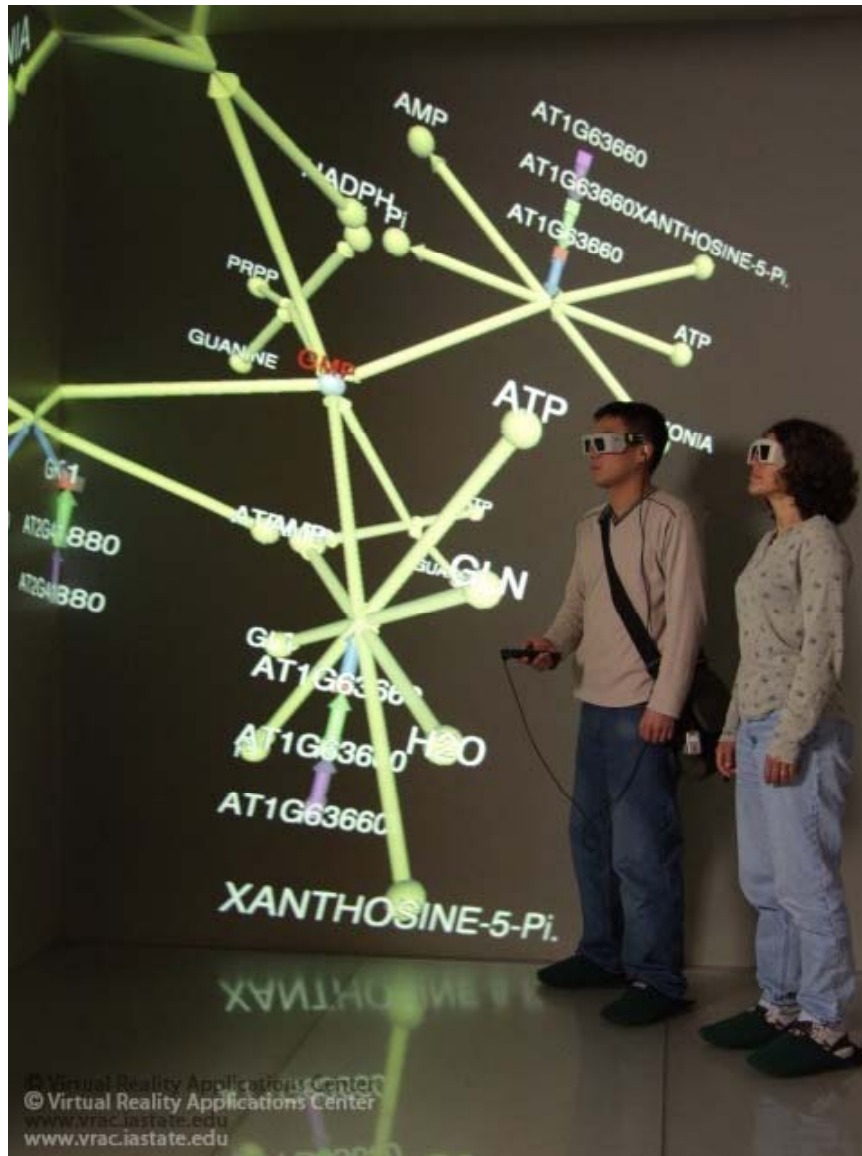
Virtual Reality Applications Center



2000 – first six-sided VR environment in US

2007 – projects twice the resolution of any VR environment in the world

www.vrac.iastate.edu



Faculty campus-wide work at VRAC on VR environments and visualization of research data

BOREAS will connect the C6 with dedicated circuits to national research networks and then on to data-generating experiments all over the world

High Performance Computing



Petascale Computing

- Great Lakes Consortium for Petascale Computing
- National Center for Supercomputing Applications, University of Illinois at Urbana-Champaign
- ISU role:
 - Visualization of large data sets
 - Expertise in HPC methods
 - Expertise in candidate application areas
- Role of BOREAS

Wrap-Up

- BOREAS is an example regional optical network (RON) built out of necessity by collaborating universities
- It's major contribution is in supporting research collaborations at a distance with cost-effective high bandwidth connectivity for data and video applications