



NATIONAL LABORATORY FOR APPLIED NETWORK RESEARCH

# **TeraGrid and International Applications**

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**TERAGRID**

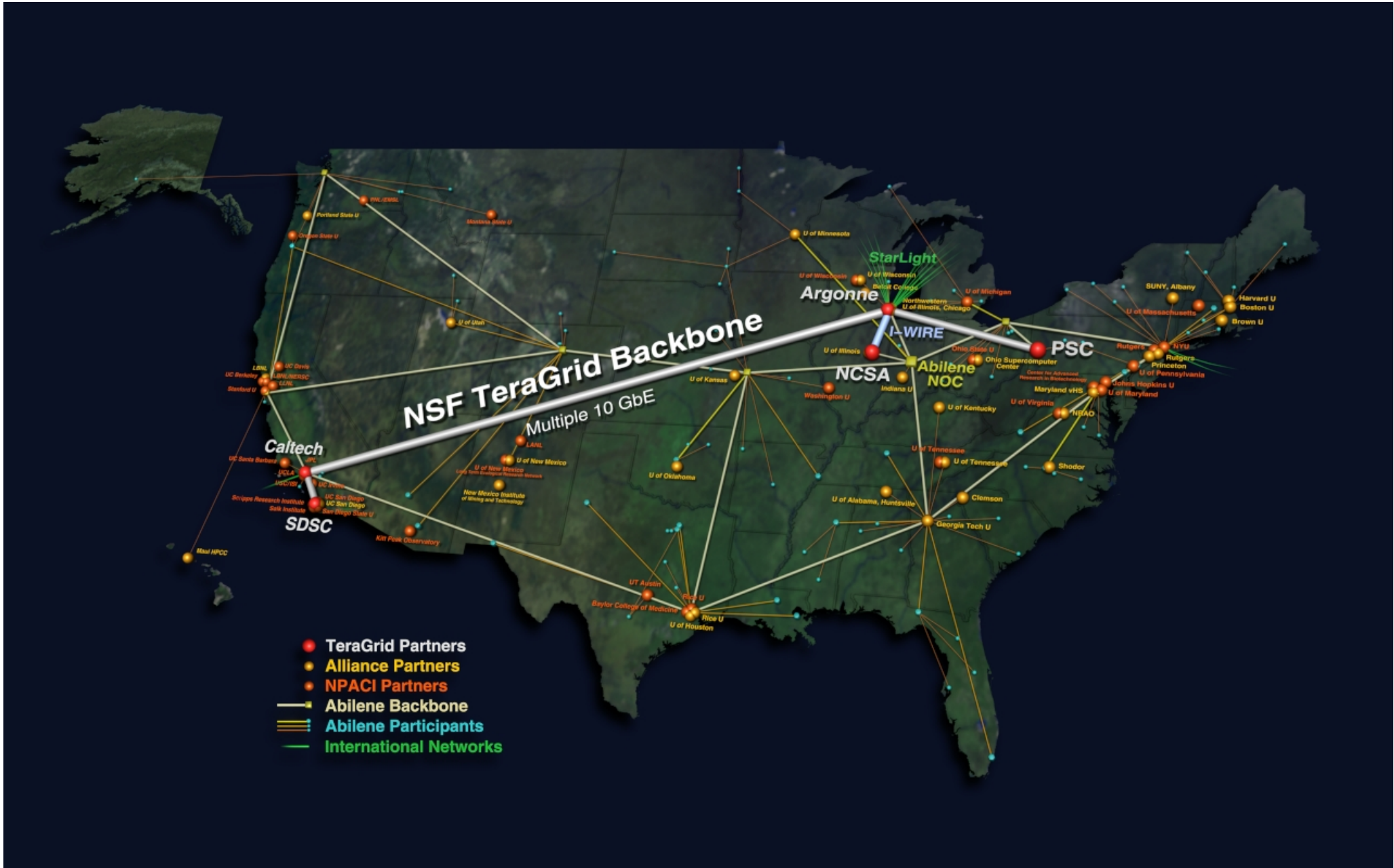
- **Originally, the NCSA, SDSC, Argonne, Caltech response to the DTF solicitation**

- \$53M award
  - US NSF funded; 3 year award
- build and deploy the world's largest, fastest, most comprehensive, distributed infrastructure for open scientific research
  - 11.7 TF of Linux cluster computing capability
  - 450 TB data management capability
  - 40 Gb/s backplane network

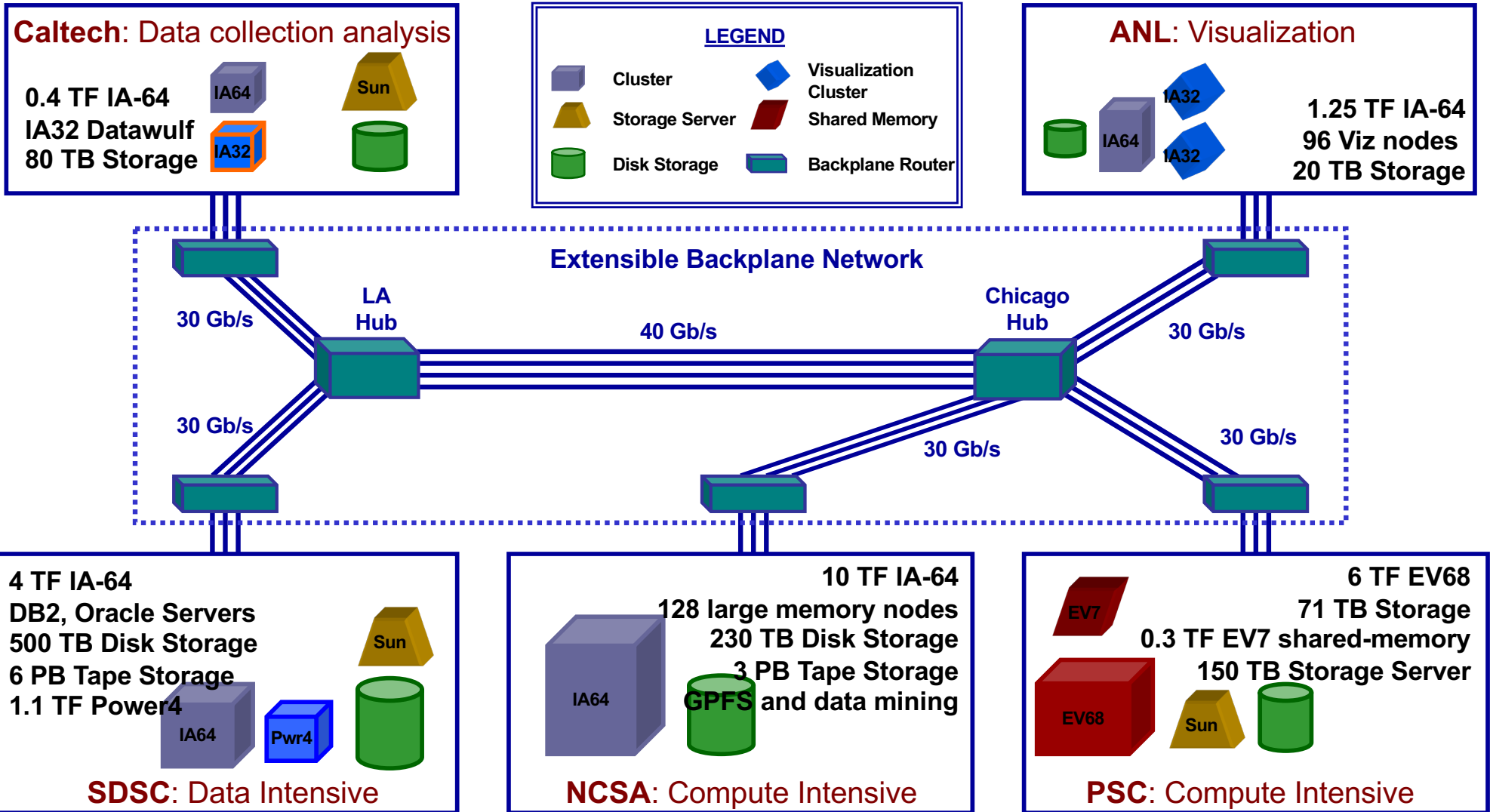
## What is TeraGrid?

- **Now an overloaded term encompassing:**
  - Terascale Computing System (TCS) at PSC
    - \$45M computational resource
  - Distributed Terascale Facility (DTF) project
    - NCSA, SDSC, Argonne, Caltech
  - Extensible Terascale Facility
    - \$35M in upgrades to and integration of TCS and DTF facilities
  - ETF2 and beyond...
    - funding for connectivity (and perhaps more) to add sites to the distributed TeraGrid environment

# Network Infrastructure



# TeraGrid Resources (ETF)



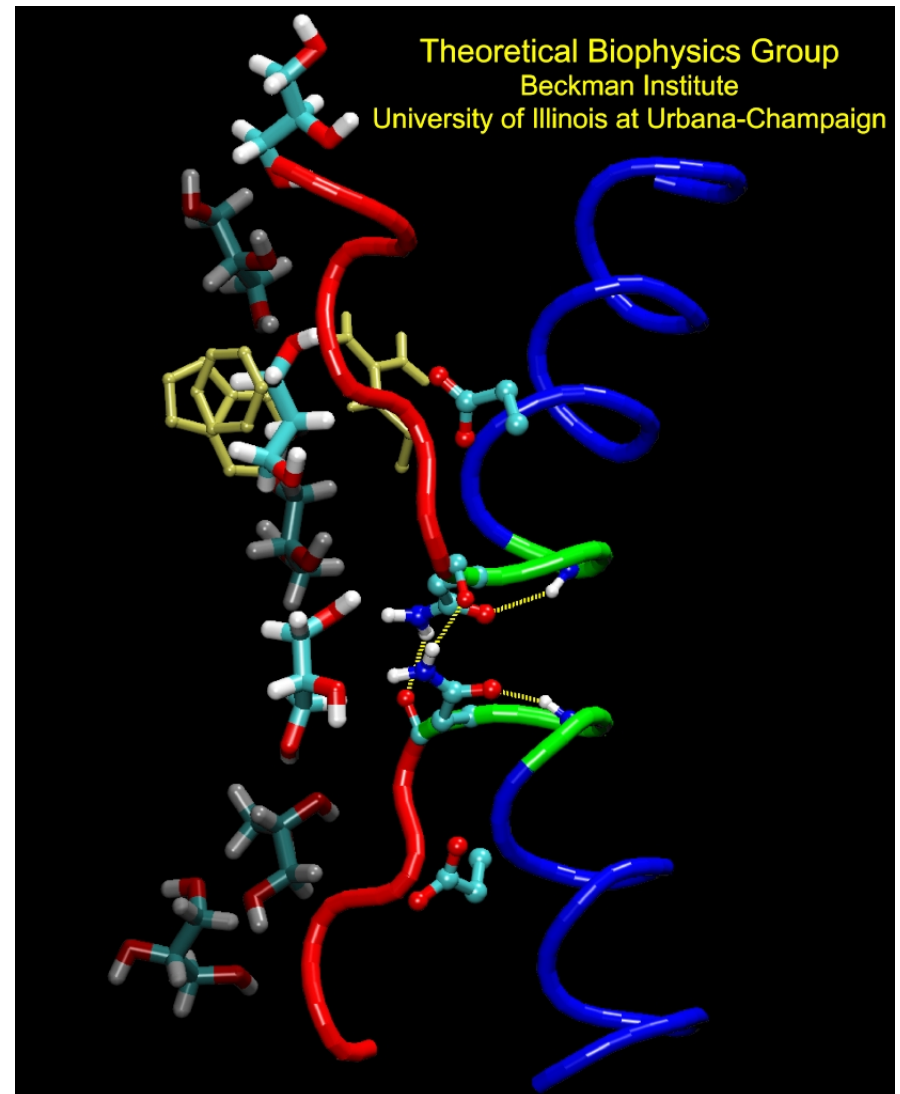
PSC integrated Q3 03

30 January 2003

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- **NAMD – Molecular Dynamics**
  - highly scalable application for biomolecular systems
  - community of users via BioCoRE
    - collaborative work environment for biomedical research, research management and training
    - 192 organizations throughout the world (65 in the United States)

<http://www.ks.uiuc.edu/Research/namd/>

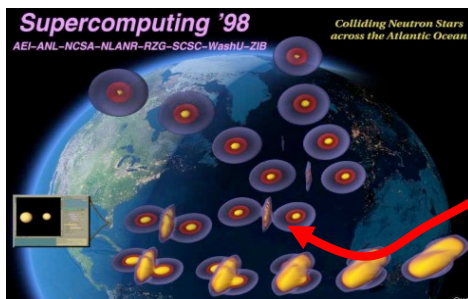


# Cactus

- **Cactus**

- an open source problem solving environment designed for scientists and engineers
- framework for grid-enabling applications
  - many projects to support use of distributed resources
- SC02 demonstration
  - seven sites: United States, Netherlands, Poland and Czech Republic
  - 16.8 Gb/s bandwidth sustained

<http://www.cactuscode.org/>



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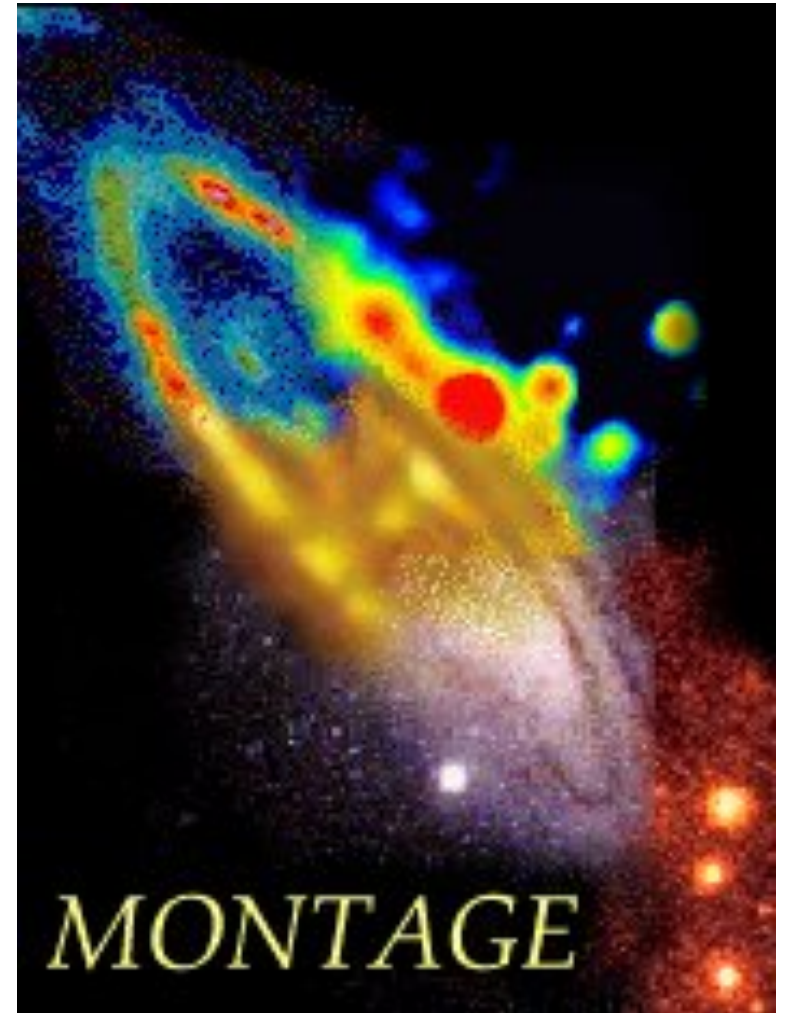
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TEA

# Montage

- **Montage – astronomical image mosaic service for the National Virtual Observatory (NVO)**
  - science-grade, custom image mosaics
  - compute intensive assembly
  - 2MASS, SDSS and DPOSS image data sets

<http://montage.ipac.caltech.edu/>



NOTE: logo is a montage of data on M31. Shown from left-top to right-bottom, Mid-IR (IRAS), Radio (Effelsberg), Far IR (ISO), Optical (DSS), and X-ray (ROSAT)

30 January 2003

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TERAGRID

AMPATH – Jan 2003

- **LIGO – Laser Interferometer Gravitational Wave Observatory**
  - LIGO Data Analysis System (LDAS), for developing and
    - end-to-end models and simulation engines
    - general computing infrastructure support
  - on demand computing when ”interesting” event detected in data
    - large amounts of data needing 100s-1000s of processors



<http://www.ligo.caltech.edu/>

- **LIGO Scientific Collaboration (LSC)**
  - international forum for organizing technical and scientific research in LIGO

<http://www.ligo.org/>



# TeraGrid Network Demands

- **Common themes in applications**
  - large computational component
  - large data transfer component
    - bulk data transfers (FTP and the like)
    - communications intensive distributed simulation
  - large amounts of data
    - frequently experimental/observational/instrument data
  - international collaborations
- **TeraGrid network**
  - private network dedicated to TeraGrid
  - 30Gb/s connectivity into each site
  - 40Gb/s backplane

# Why Optical Nets?

- **Optical networks**
  - support bandwidth requirements
  - ... working on the latency issue
  - the only option available for the near future!!
- **TeraGrid network is private**
  - ... but need to get data to/from TeraGrid resources
- **But where is the demand?**
  - ...delayed by human nature
    - folks will not work hard at pushing data until it is necessary
    - instruments and other infrastructure not on-line or fully functional
    - software infrastructure, tools and applications just reaching maturity