Promoting Global Collaborations through Cyberinfrastructure

Pacific Rim Application and Grid Middleware Assembly

Peter Arzberger
Philip Papadopoulos

Chinese American Networking Symposium
1 December 2004

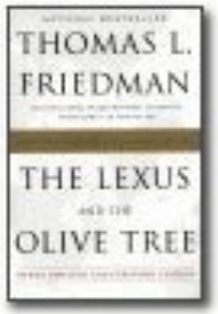
PRAGMA's Founding Motivations

- Science is an intrinsically global activity

NATIONAL VIRTUAL OBSERVATORY

IVOA

- The grid is transforming computing and collaboration



e-Science Core Programme

The UK Research Councils

- The problem remains that the grid is too hard to use

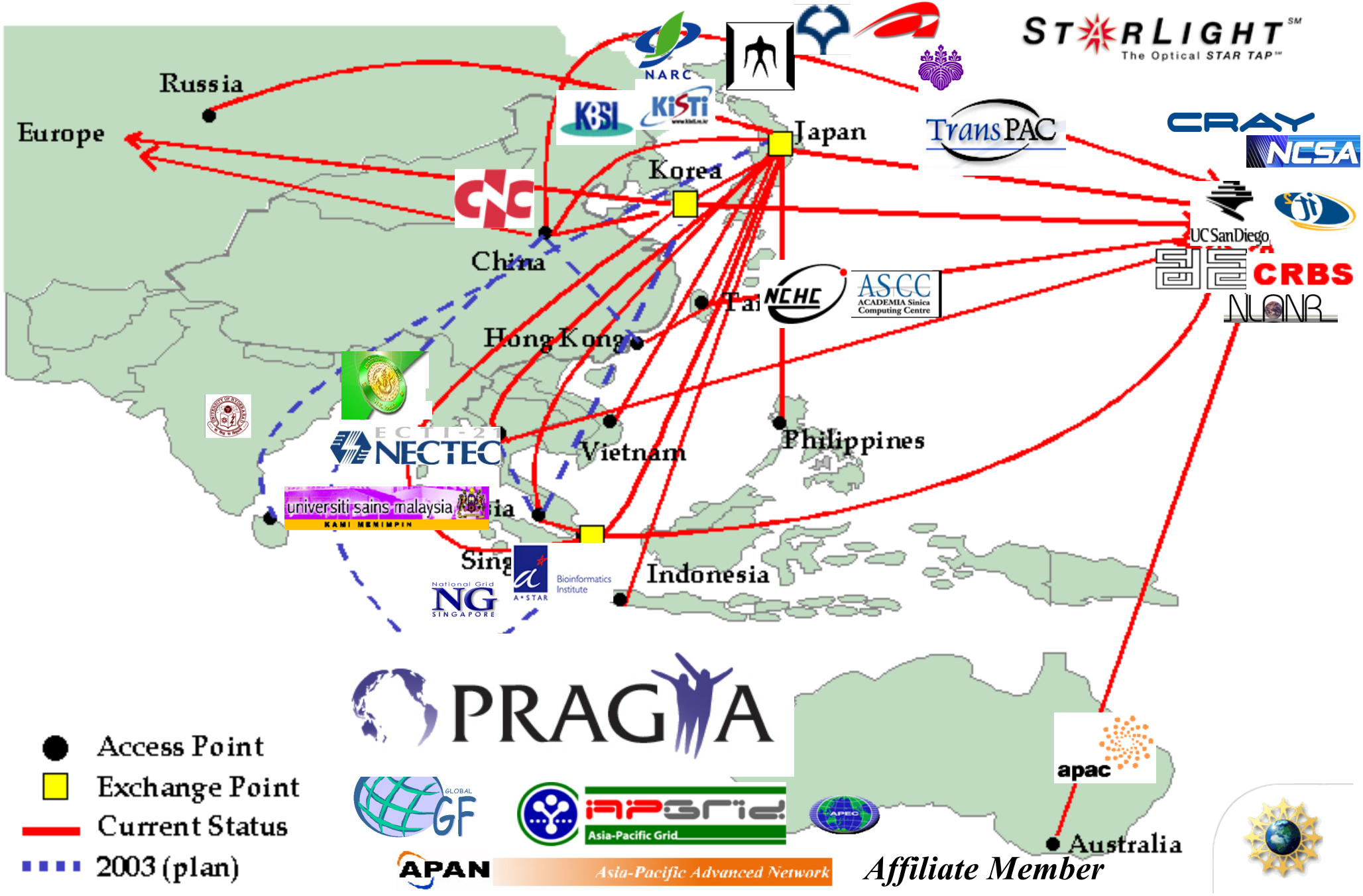
TransPAC

- Middleware software needs to interoperate

NSF MIDDLEWARE INITIATIVE

GLOBAL GF

PRAGMA PARTNERS



PRAGMA

Overarching Goals

Establish sustained collaborations

and

Advance the use of the grid technologies for applications

among a community of investigators working with leading institutions around the Pacific Rim

Working closely with established activities
that promote grid activities or the underlying infrastructure,
both in the Pacific Rim and globally.

PACIFIC RIM APPLICATIONS AND
GRID MIDDLEWARE ASSEMBLY

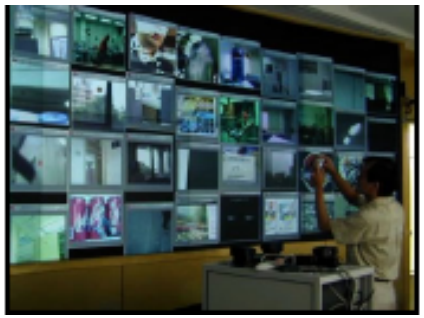
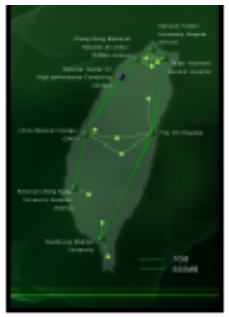
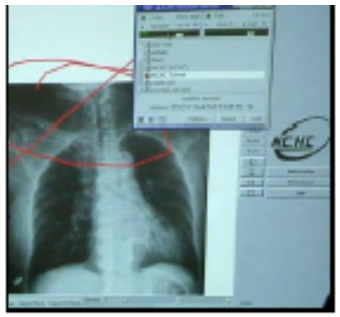
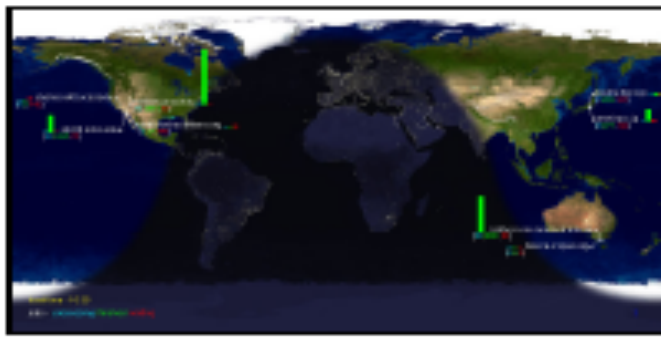
PACIFIC RIM APPLICATIONS AND GRID MIDDLEWARE ASSEMBLY
PRAGMA

Sixth PRAGMA Workshop

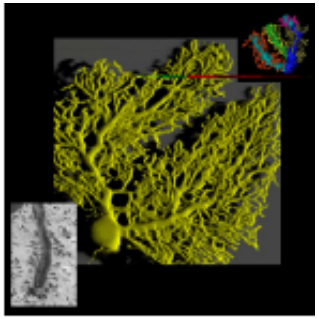
CNIC, Beijing China

PRAGMA Success Stories: 2003

- Grid Community Pulls together to Battle SARS

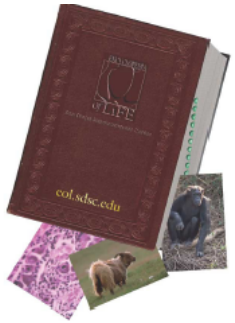





- Merging Grid Technology and Computational Chemistry
- Telescience Marshals Rich Network of Technologies at iGRID2002



SC03 BWC App Award

- Grid Demo Sets US to Japan Data Speed Records
- EcoGrid
- Encyclopedia of Life



http://www.pragma-grid.net/

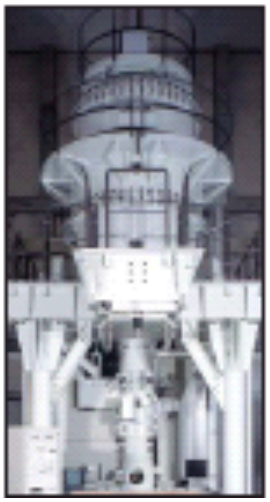
Contents: 2004-2005

- Overview
- Accomplishments
- PRIME
- Working Groups
- Institutions
- References
- Opportunities
- Sponsors

http://www.pragma-grid.net

Accomplishments:

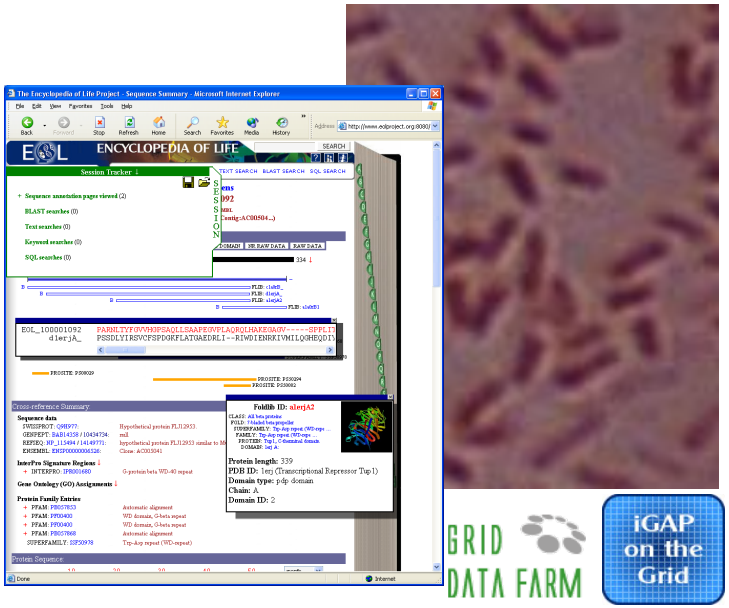
Achieving Success through Partnership



- Telescience: KBSI, Software for camera
- Computational Chemistry: Nimrod/GAMESS- APBS/Kepler (ligand protein docking)
- EcoGrid and Lake Metabolism
  - Prototype International Lake Observatory
  - Coral Reef Sensing
  - Meeting on 20 -21 September 2004 (plan global lake observatory network; link coral reef experts)
  - Follow-on meeting March 2005
- Gfarm and iGAP
  - Middleware Integration
  - Proteome Analysis
- Bandwidth Challenge Awards from SC03
  - Distributed Infrastructure (Gfarm)
  - Application (Telescience)
- Middleware Interoperability
  - Rock Rolls, Ninf-G, Gfarm
  - KRocks krocks.cluster.or.kr

KROCK 3.3.0
22 Nov 04

A collaborative effort in the fight against bio-terrorism



- Gfarm makes it possible to use iGAP to analyze the complete proteome (available 9/28/04) of the bacteria, *Burkholderia mallei*, a known biothreat agent, on distributed international resources.
- This is a collaboration under PRAGMA and the data is available through http://eol.sdsc.edu.

National Institute of Advanced Industrial Science and Technology AIST
Bioinformatics Institute A*STAR
KISTI Korea Institute of Science and Technology Information
KMU 국민대학교 KOOKMIN UNIVERSITY
KONKUK UNIVERSITY
San Diego Supercomputer Center
OSAKA UNIVE
OptIPuter
NBCR
UCSD

PRIME:

Preparing Undergraduates for the Global Workforce

Gabriele Wienhausen, Linda Feldman, Peter Arzberger

Monash University - Australia
Osaka University - Japan
NCHC and NCREE - Taiwan

Expanding PRAGMA Collaborations, Applications, and Successes

Distance Training – Project Based

- First activity with CNIC and UCSD
- Topic: Web Services – focused on climate data
- Language: Chinese
- 20 Researchers in CNIC
- http://www.cnic.ac.cn/news/fresh/200403250006.html
- http://www.cas.ac.cn/html/Dir/2004/03/25/6019.htm

Working Groups: Integrating PRAGMA's Diversity

- Telescience – including Ecogrid
- Biological Sciences:
  - Proteome Analysis using iGAP in Gfarm
- Data Computing
  - Online Data Processing of KEKB/Belle Experimentation in Gfarm
- Resources
  - Grid Operations center

TAIPEI TIMES

Published on TaipeiTimes
http://www.taipeitimes.com/News/taiwan/archives/2004/10/25/2003208322

Nanwan eco-grid monitors undersea activity

By Chiu Yu-tzu
STAFF REPORTER , IN PINGTUNG
Monday, Oct 25, 2004,Page 2

Taiwan's eco-grid system has successfully extended its coverage from the land to the sea, further facilitating the sharing of the data contained in ecological studies with local scientists' counterparts in the rest of the world.

In Nanwan, a small bay north of the resort town of Kenting in southern Pingtung County, about 7m to 8m underneath a set of buoyant balls floating beside the Third Nuclear Power Plant's cold seawater intake system, a real-time set of monitors using nine sensitive cameras monitors marine ecological systems.

All data collected by the cameras is first digitized and then transmitted wirelessly to receivers in a control room at the power plant, through which it is then distributed via ADSL to the National Center for High-Performance Computing (NCHC).

Tourists at the National Museum of Marine Biology and Aquarium listen to an interpreter, who explains the habits of a 4.2m female whaleshark. The whaleshark is thus

PACIFIC RIM APPLICATIONS AND GRID MIDDLEWARE ASSEMBLY
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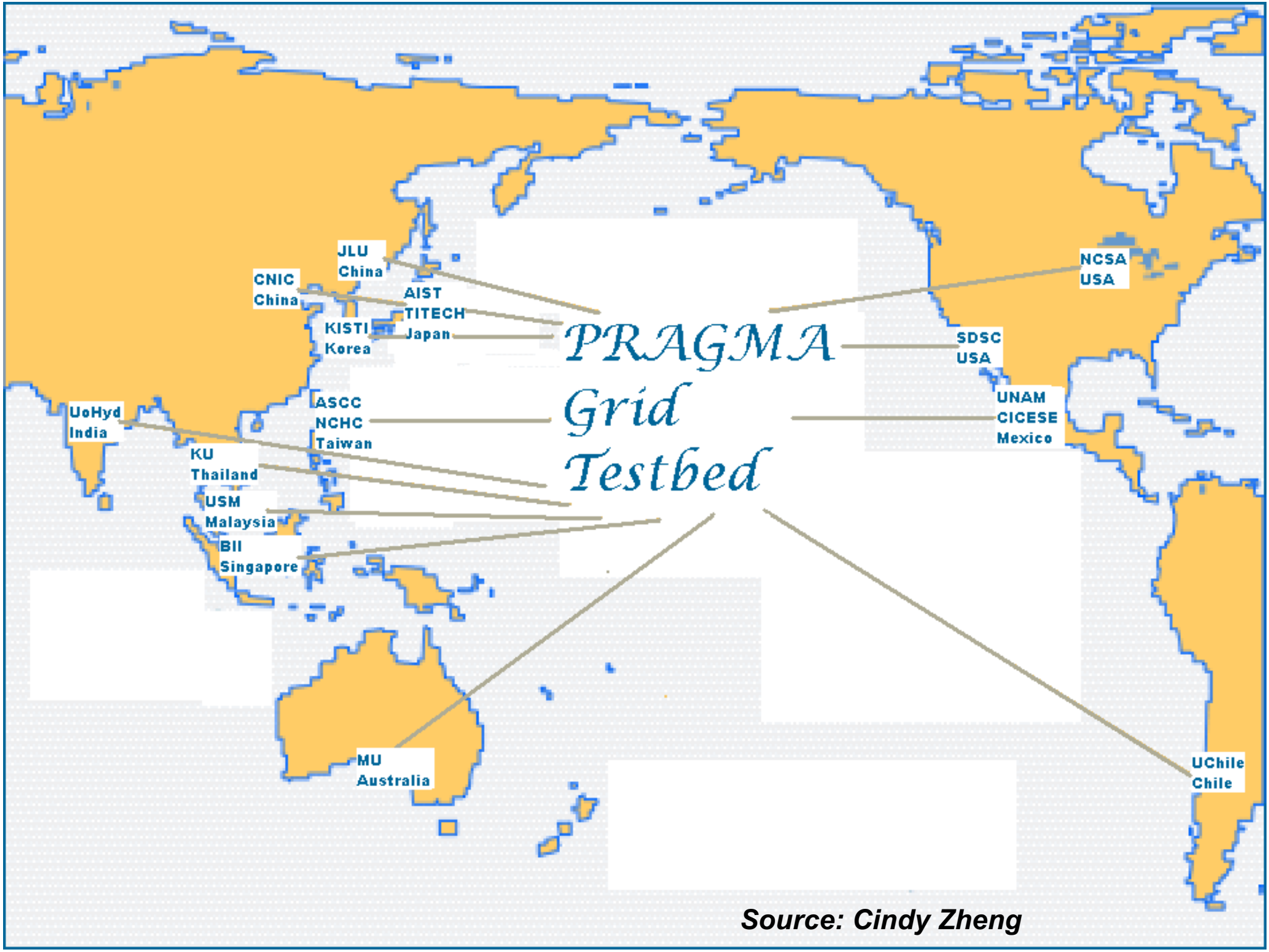


Source: Cindy Zheng

Building a Production Grid Thru Running Applications

- Routine-basis experiments
  - Ninf-G based TDDFT, http://pragma-goc.rocksclusters.org/tddft/default.html
  - BioGrid, http://pragma-goc.rocksclusters.org/biogrid/default.html
  - iGAP over Gfarm
- Learn requirements/issues
- Research/implement solutions
- Improve middleware integrations

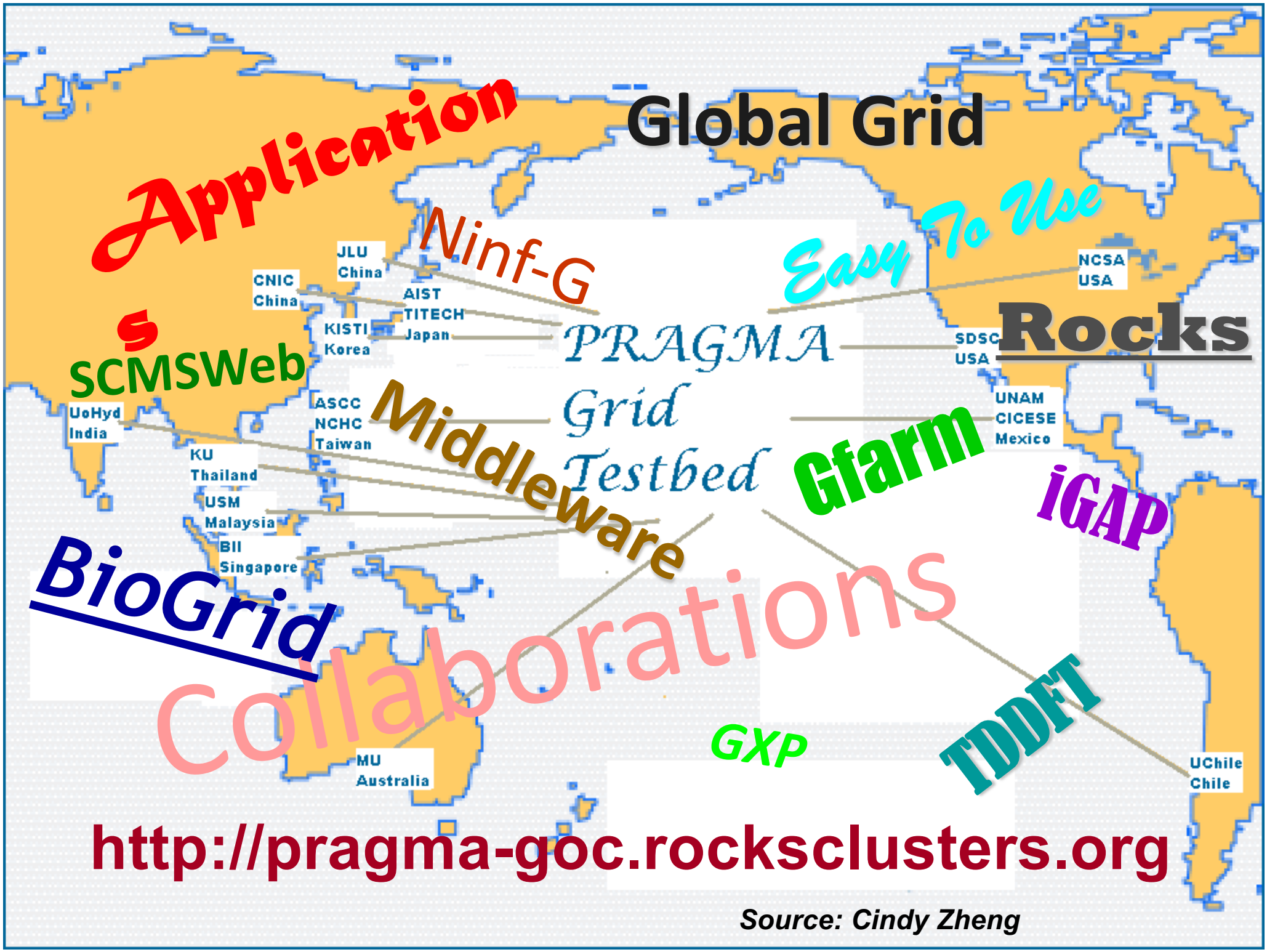
Source: Cindy Zheng

Lessons Learned

- Information sharing
- Trust and access
- Resource requirements
- User/application environment
- Job submission
- Resource/job monitoring
- Resource/job accounting
- Fault tolerance

PACIFIC RIM APPLICATIONS AND GRID MIDDLEWARE ASSEMBLY
PRAGMA

Source: Cindy Zheng


Global Grid
Application
Ninf-G
Easy To Use
Rocks
SCMSWeb
Middleware
Gfarm
iGAP
BioGrid
Collaborations
GXP
TDDFT
PRAGMA
Grid
Testbed
JLU China
CNIC China
AIST
TITECH Japan
KISTI Korea
NCSA USA
SDSC USA
UoHyd India
ASCC
NCHC Taiwan
UNAM
CICESE Mexico
KU Thailand
USM Malaysia
BII Singapore
MU Australia
UChile Chile
http://pragma-goc.rocksclusters.org
Source: Cindy Zheng

The PRAGMA Steering Committee

http://www.pragma-grid.net/steering_committee.htm

The Central Issue

Collaborations -

The foundation for global Grid

Source: Cindy Zheng

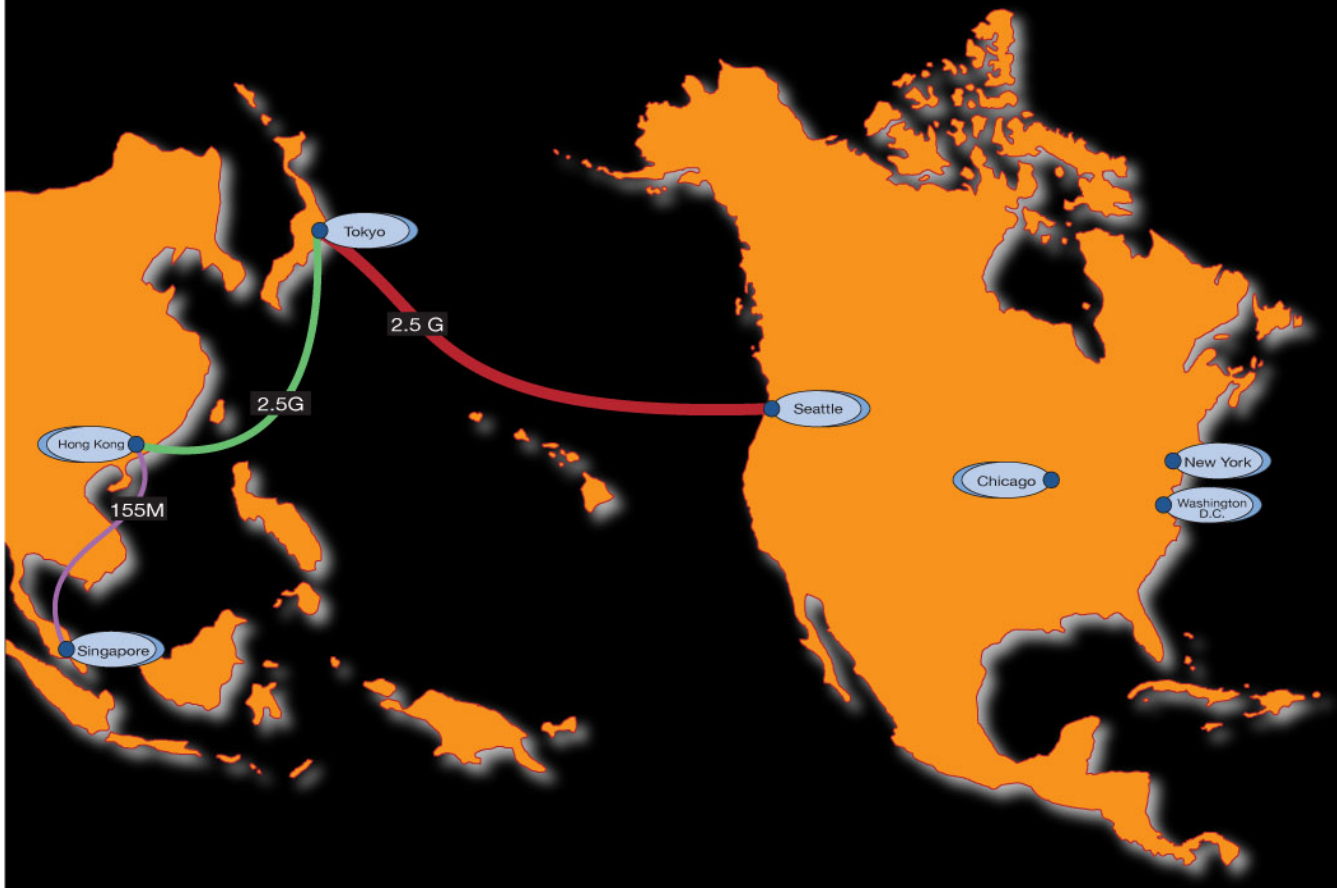
Interoperability -

Involves people – starts with trust

INDIANA UNIVERSITY

For more information, visit: *www.transpac.org*

TransPAC



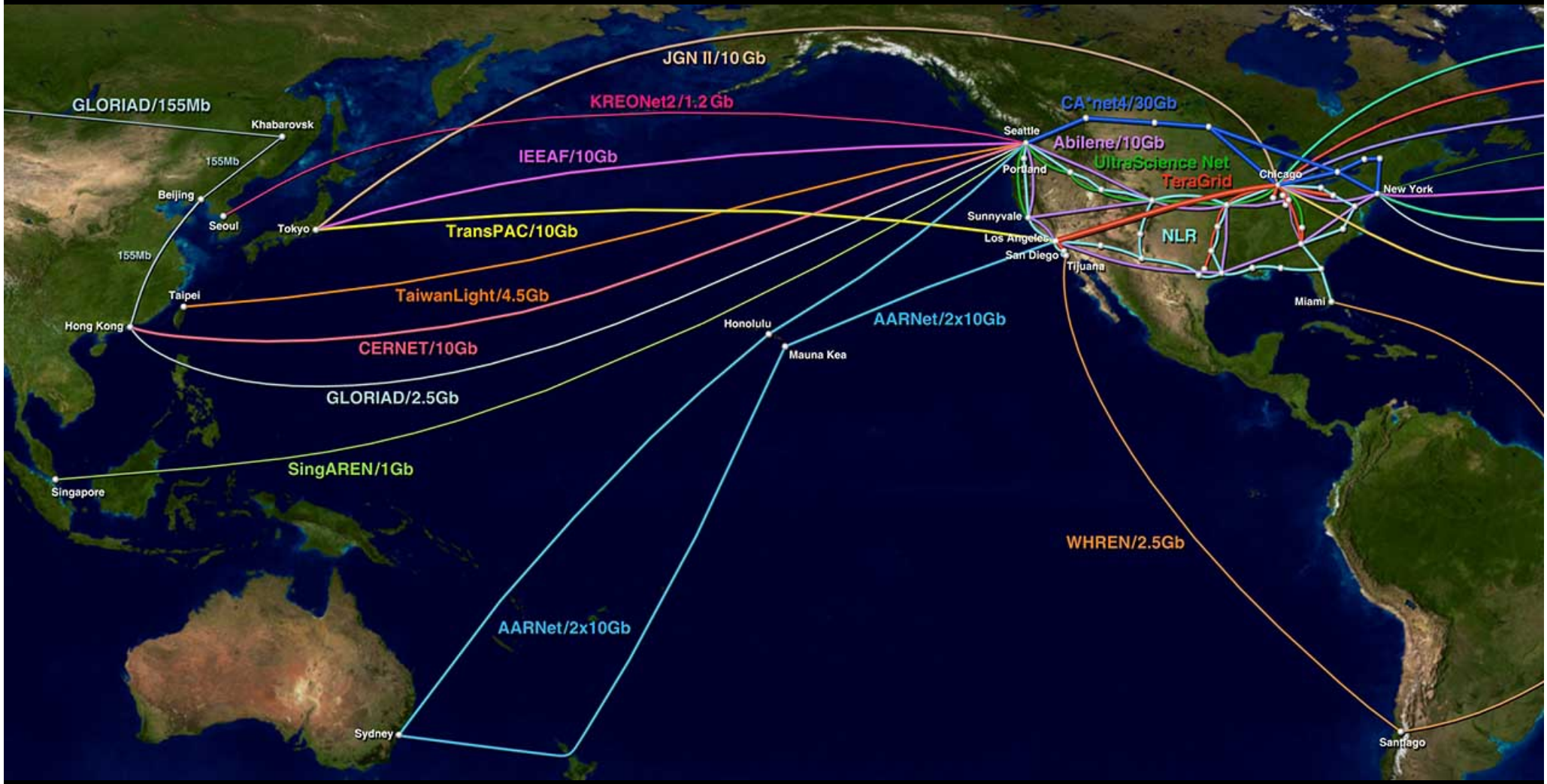
TransPAC2

Building on the success of TransPAC, TransPAC2 will further expand research and education access to high-performance connectivity between the US and Asia. In partnership with our friends in Asia, TransPAC2 will make possible an intra-Asia network backbone from Tokyo to Hong Kong to Singapore. Not only supporting research and education collaborations between Asia and the US, TransPAC2 will also focus on such network research challenges as end-to-end performance measurement and security.

Source: Jim Williams

Global Lambda Integrated Facility

Predicted Bandwidth for Scheduled Experiments, December 2004



www.glif.is

Visualization courtesy of
Bob Patterson, NCSA.

Source: Maxine Brown

National Laboratory for Applied Network Research

- **NLANR Measurement and Network Analysis Group**
  - Passive Measurement and Analysis (PMA):
    - Passive header trace data to study workload profiles
  - Active Measurement Project (AMP):
    - Full mesh (each monitor testing to all the others) between the approximately 150 active monitors
    - Across all sites, round trip time (RTT), packet loss, topology, and throughput (user/event driven) are currently measured.
- **CNIC hosts monitor**
- **Upcoming release of new AMP software**
- **Contact Ronn Ritke, rritke@nlanr.net**

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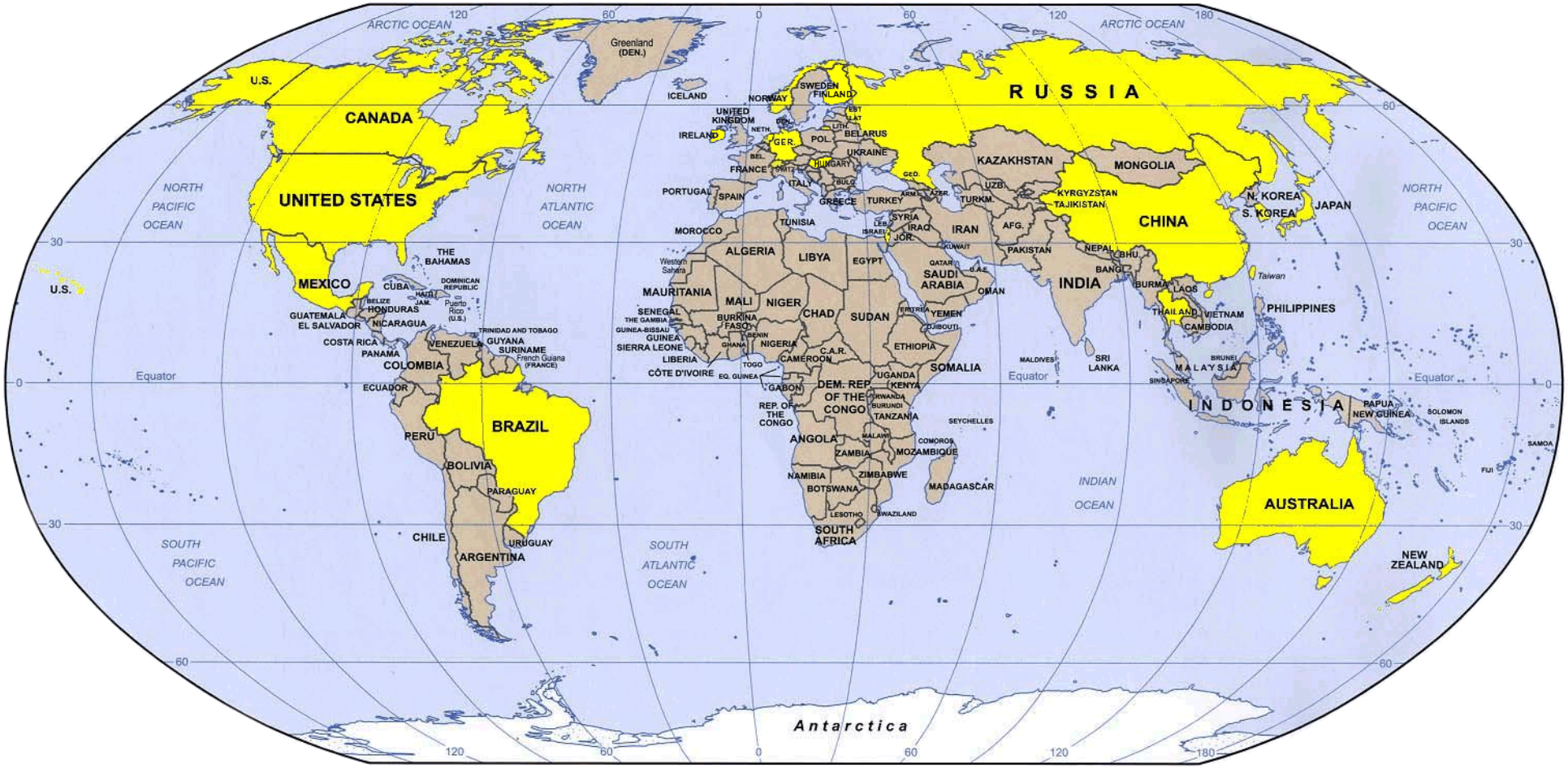
PRAGMA

http://mna.nlanr.net/

Location of Measure Collaborations Groups

NLANR
MEASUREMENT & NETWORK ANALYSIS



AMP now in China
Hosted by CNIC

EcoGrid: Fushan

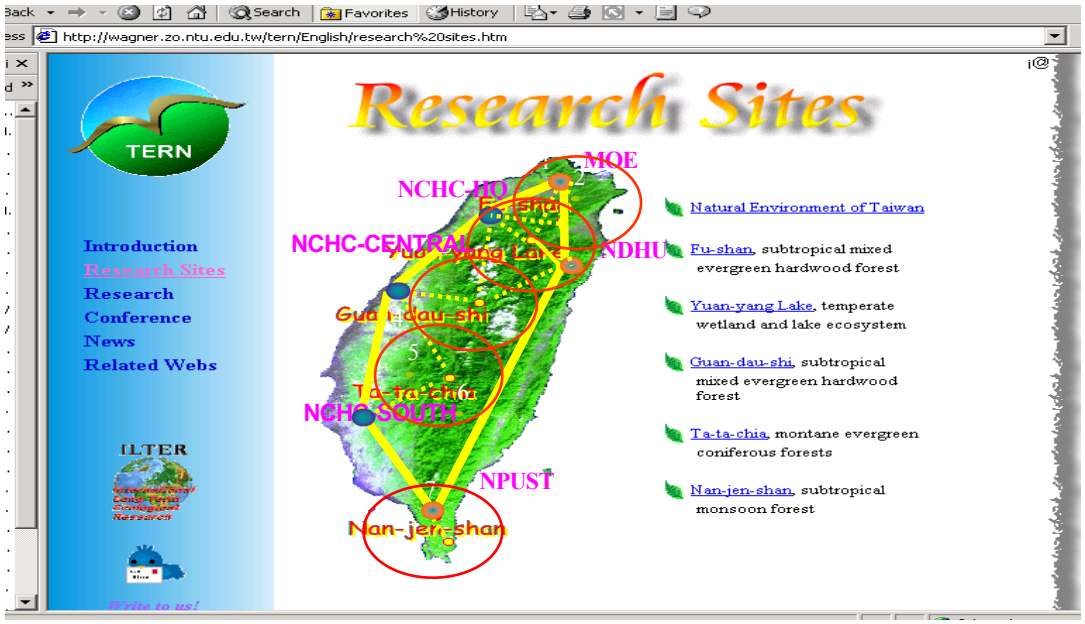
聯合報
UNITED DAILY NEWS
兩岸包機 交部建議取消降停
官員主張包機不限特定期間或人員 僅須透過第三地飛航情報區交接
動植物生長 全世界看得見
加入香登美語數位 創造另一個事

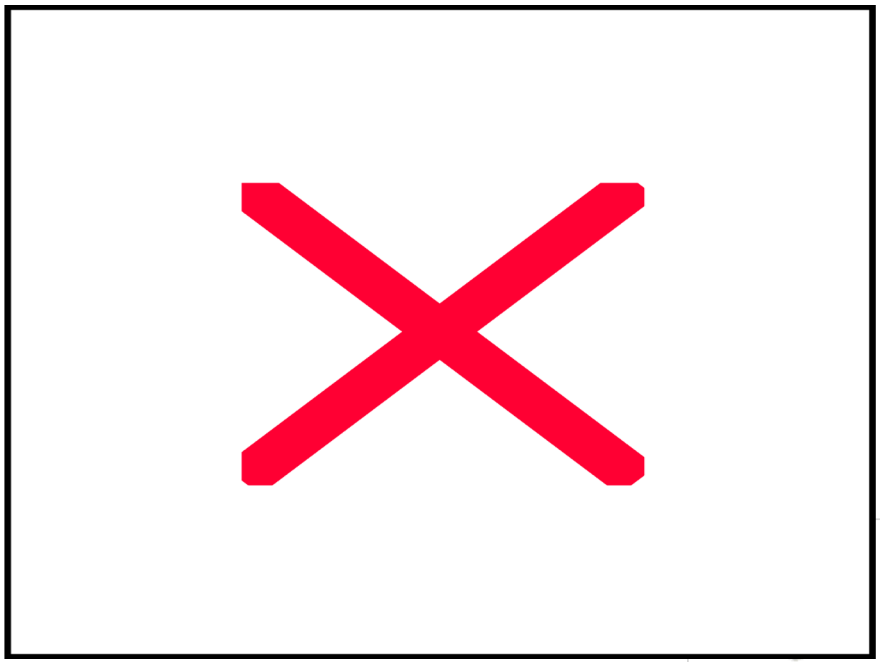
United Daily 2003 March 09

台灣生態 全球可見
盜獵橫行 福山野生動物銳減

Liberty Time 2003 March 09

Source and Inspiration: FP Lin





Lake Metabolism: Aug 03 to Oct 04, March 05

- Aug 03: La Jolla, Sensor Network Meeting
- Sep 03: Seattle, LTER meeting
- Oct 03: PRAGMA 5, trip to YYL
- Nov 03: Supplement to NSF
- Jan 04: Hawaii
- Feb 04: San Diego Workshop, Travel to NTL, Start VTC's
- Apr 04: YYL Buoy
- Jul 04: Students in Taiwan, DC
- Aug 04: Typhoon in Taiwan!
- Sep 04: Environmental Sensor net
- Oct 04: New sensors, in Typhoon
- Mar 05: International Meeting to expand global network

中文版

Collaborative Lake Metabolism Project

About the Project

Proposal

People

Data (near real time)

Workshops to Build Capacity for Observatories

Presentations

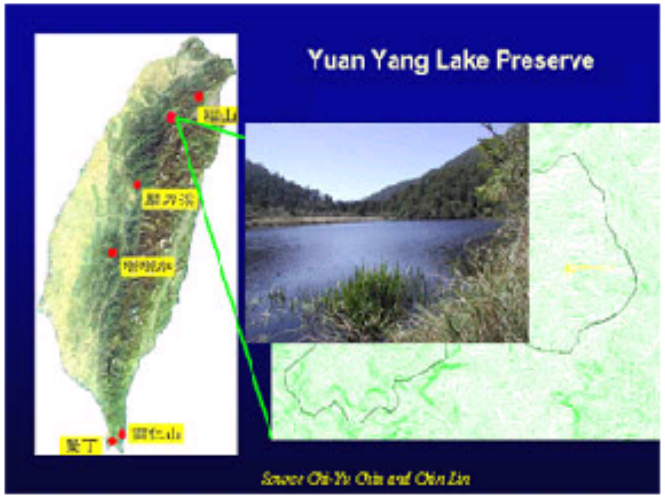
Opportunities for Students & Post-Docs

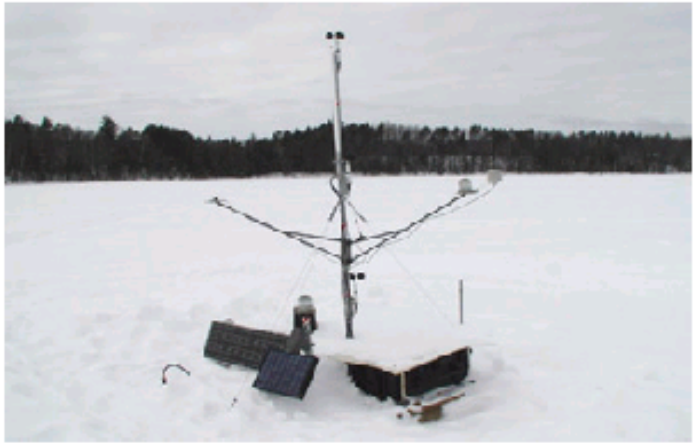
Meeting Notes

Upcoming Events

Gallery

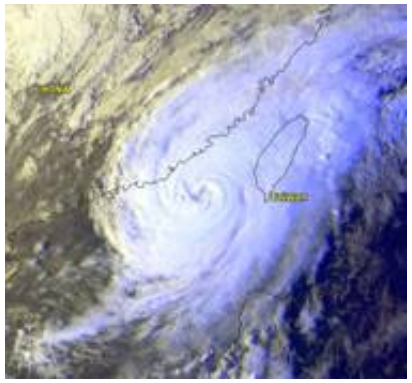
Links





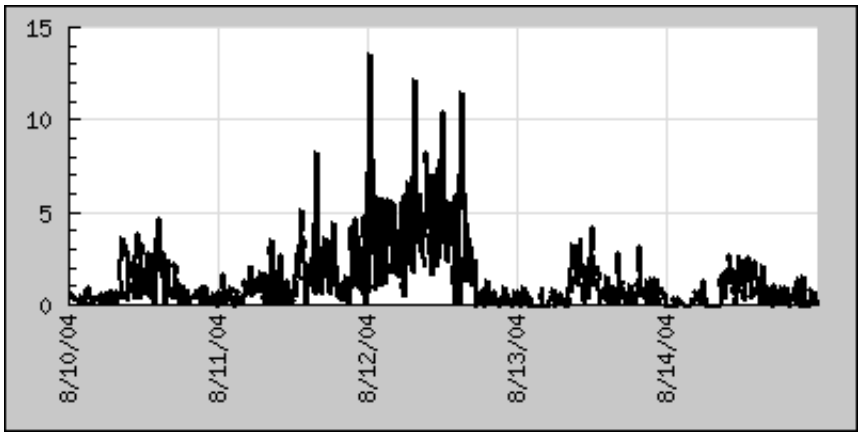
PACIFIC RIM APPLICATIONS

Yuan-Yang Lake and Typhoons

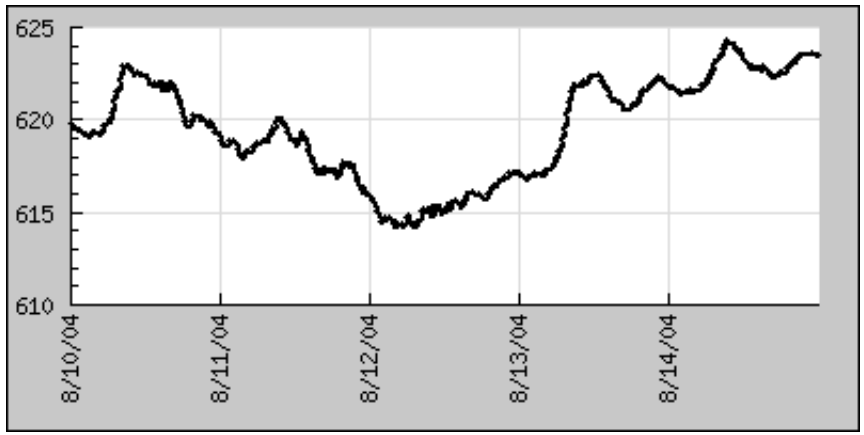


Source: http://sensor.nchc.org.tw/ecogrid/typhoon_idx.php

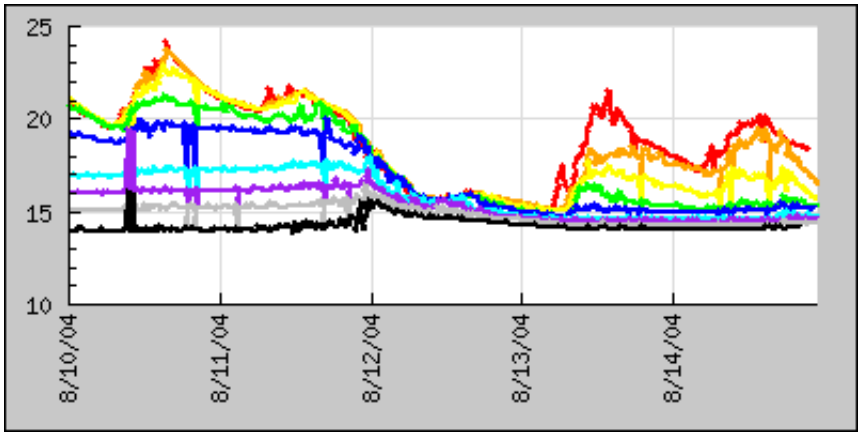
Wind Speed (m/s)



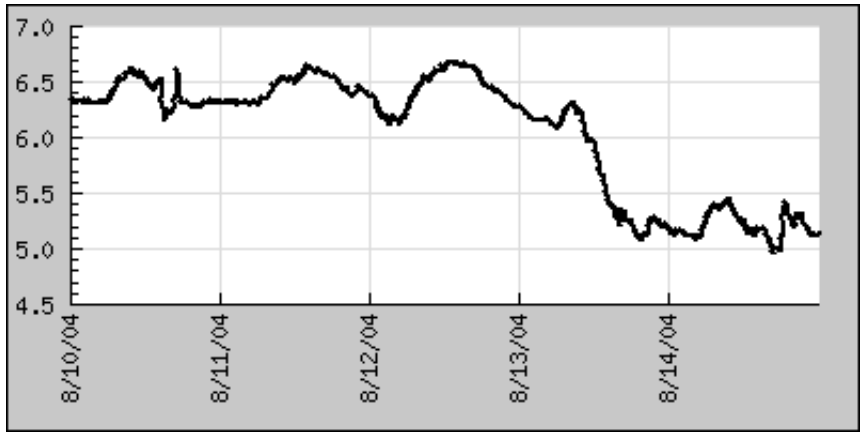
Barometric Pressure (mmHg)



Water Temperature (C)



Dissolved Oxygen



Source: Tim Kratz

Virtual Observatories: Potential Collaboration

- Interest in US and China (CAS)
- SC'04: Demonstration: Sent 1.5 Tb of release three of Sloan Digital Sky Survey
  - First time data NOT shipped on disks.
  - Bob Grossman, UIC
- There needs to be
  - Researchers working together with networking folks
  - Persistent infrastructure to change way of research

Geosciences Network: Potential Collaboration

- Mission: prototype cyberinfrastructure for the Earth Sciences, based on close collaboration among IT and Earth Science researchers
- Linking models with data using data integration techniques
- Interested in creating an iGEON: China, Mexico, Australia, Canada, …
- PRIME Contributors

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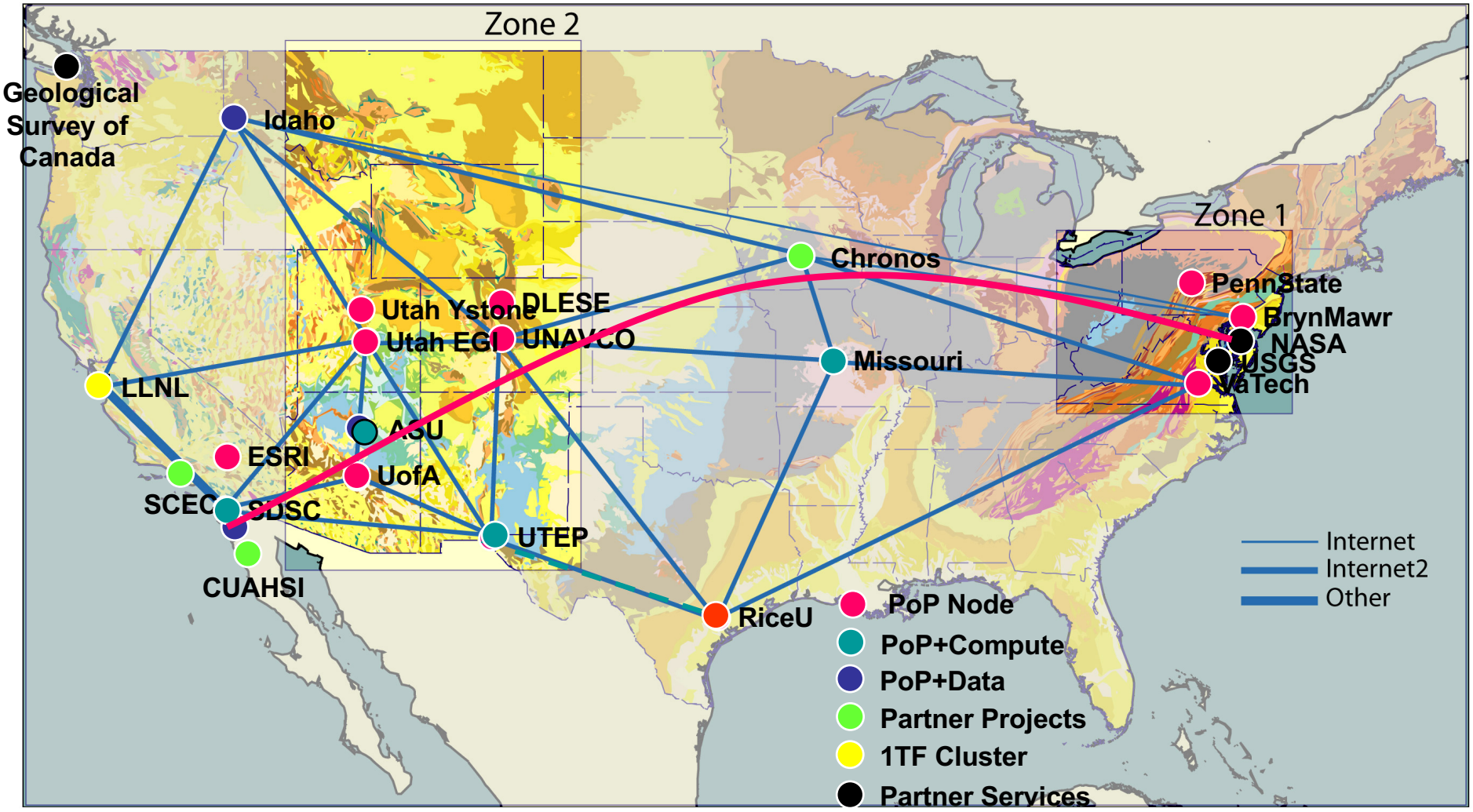
GEON
The Geosciences Network

The GEONgrid



Driven by Two Testbeds

Source: Chaitan Baru

Opportunities Postdocs and Graduate Student

- National Science Foundation (NSF)
  - International Research Fellowship Program (IRFP)
  - East Asia Pacific Summer Institute (EAPSI)
- Japan Society for the Promotion of Science (JSPS)
  - JSPS Postdoctoral Fellowship
- Korean Science and Engineering Foundation (KOSEF)
  - APEC Post-doctoral Fellowship in Science and Engineering

www.pragma-grid.net/students_postdocs.htm

Summary

- Dream big – build the imagination of those involved
- Start small - build trust
- Stay concrete – build infrastructure
- Focus on people – build community

- Opportunities:
  - Networking and Measurements
  - Testbed: Mutual learning
  - Applications: Geosciences, Astronomy, Ecology, Biomedicine, …
  - Exchange: Undergraduates and Graduates
  - Participate in Meetings and between meetings

Future Workshops

- PRAGMA 8
  - BII and NGO
    - Chair: Larry Ang,
    - Co-Chair Arun Agarwal
    - Dates: **2 May 2005 – Reception**
      - **Meeting 3, 4 May 2005**
    - Grid Asia 2005 (2 – 6 May)

- PRAGMA 9
  - University Hyderabad
    - Chair: Arun Agarwal
    - Dates: **20 October 2005** – Reception
      - **Meeting 21-22 October 2005**

Thank you

Office of International Science and Engineering
Division of Shared Cyberinfrastructure
Division of Biological Infrastructure

http://www.pragma-grid.net