



## Telecontrol of Ultra-High Voltage Electron Microscope over Global IPv6 Network

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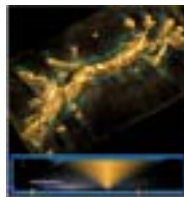
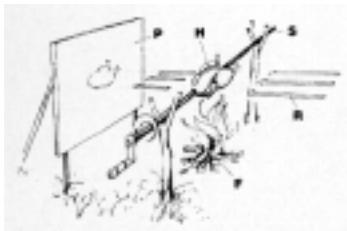
<sup>4</sup> San Diego Supercomputer Center, University of California, San Diego

<sup>5</sup> National Center for High Performance Computing, Taiwan, R.O.C.



## Ultra-High Voltage Electron Microscope

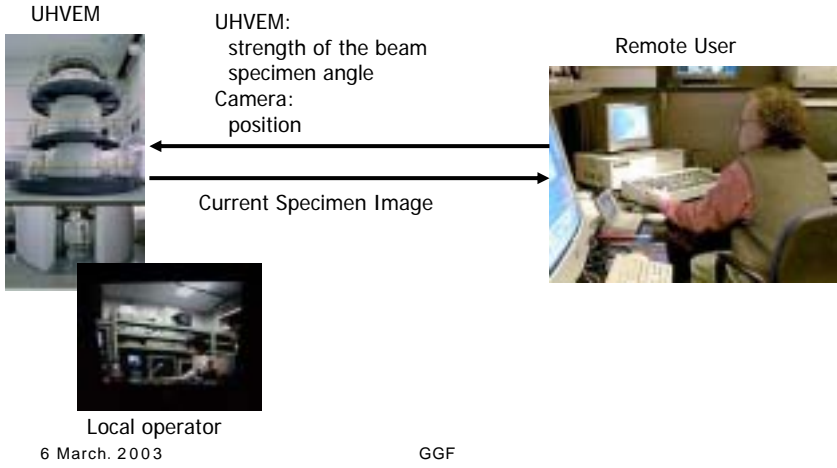
- 3MV Ultra-High Voltage
- Thick specimen observation



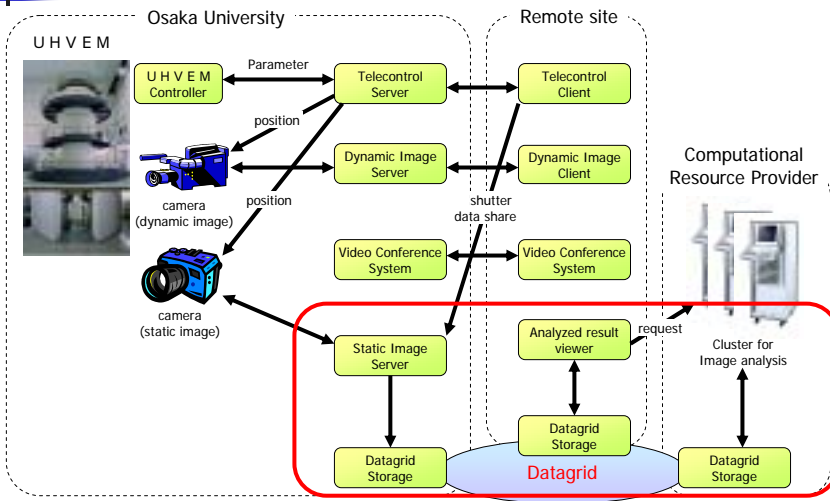
Tomography technique enables detailed analysis



# Telemicroscopy



# Telemicroscopy





## Current status

- Challenges on dynamic image transfer
  - iGrid2002
  - SC2002
- New equipments installation
  - Datagrid System
- Telescience Portal

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## iGrid2002

- Telecontrol from Amsterdam and SDSC over global IPv6 network.
- DVTS over IPv6
- Participants
  - NCMIR, SDSC(US)
  - NCHC(Taiwan)
  - Research Center for UHVEM, Cybermedia Center(Japan)



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## SC2002

- Telecontrol from Baltimore
- HDTV over IPv6
- Bandwidth Challenge
- Participants
  - NCMIR, SDSC
  - KDDI R&D Laboratories Inc.
  - Research Center for UHVEM, Cybermedia Center



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## HDTV Codec & Network Adapter

**KDDI**



KH-300N



MPTS LINK

- HDTV over IPv6 requirements
  - 1 . 100Mbps bandwidth ( including 4ch sound )
  - 2 . Under  $10^{-5}$  error rate ( for business use spec )

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## Experiments ( 1 / 2 )

- Requirements for HDTV over IPv6
  - 1 . Bandwidth 100Mbps (including 4ch sounds)
  - 2 . Less than  $10^{-5}$  error rate
- It was OK over IPv4 .
- It could not run on IPv6 because of 2.  
Encoder should support change of this requirements

Neuroscientists was satisfied with the quality of images.

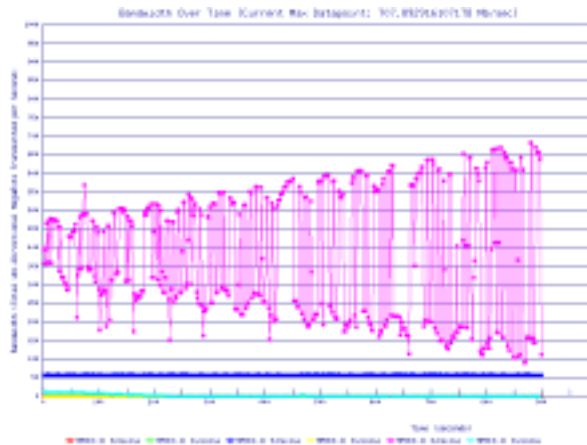


## Experiments ( 2 / 2 )

- There are packet losses in Abilene
- We also found some bottleneck in Osaka because of misconfiguration.
- QoS is definitely required for International connection.



## Bandwidth challenge results



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## Data Grid Requirements

- Seamless access to data and information stored at local and remote sites
- Virtualization of data, collection and meta information
- Handle Dataset Scaling – size & number
- Integrate Data Collections & Associated Metadata
- Handle Multiplicity of Platforms, Resource & Data Types
- Handle Seamless Authentication
- Handle Access Control
- Provide Auditing Facilities
- Handle Legacy Data & Methods

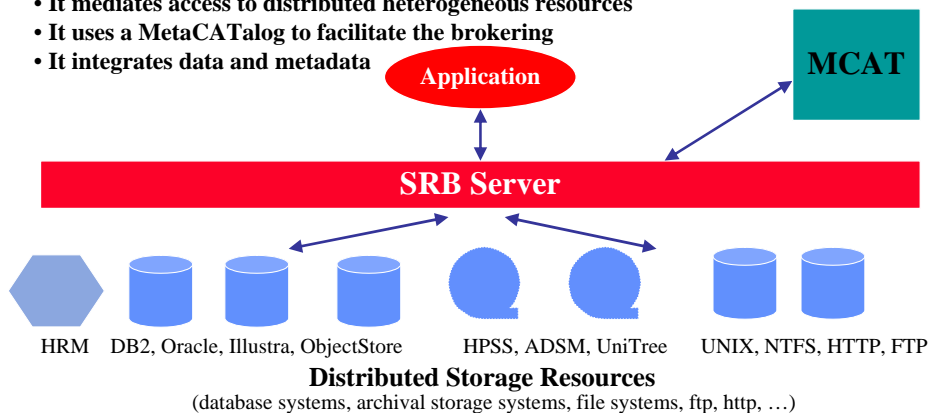
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## Storage Resource Broker

- The Storage Resource Broker is a middleware
- It virtualizes resource access
- It mediates access to distributed heterogeneous resources
- It uses a MetaCATalog to facilitate the brokering
- It integrates data and metadata



## Telescience Portal ( 1 )

### ■ Tomography workflow

Sequence of steps required to acquire, process, visualize, and extract useful information from a 3D volume.

Problems with non-Portal "traditional" workflow:

- (~20) heterogeneous and platform specific tools:
  - Simple shell scripts
  - Parallel Grid enabled software
  - Commercial software
- Administration is responsibility of the user
- Manual tracking, handling of data

Advantages of workflow managed by Telescience Portal:

- Progress through the workflow can be organized and tracked
- Automated and transparent mechanisms for the flow of data
- Centralize tools and enhance operations with uniform GUIs to improve usability





## Telescience Portal ( 2 )



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## Summary

- Introduction of Telescience Project
  - Telemicroscopy
    - Dynamic image transfer challenges
    - New equipments (Datagrid system)
    - Telescience Portal

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## Questions to be answered

1. brief introduction to the application (area)
2. for which reasons are you using Grids?
  - harnessing CPU cycles?
  - accessing remote data repositories?
  - interaction between human collaborators (and applications)?
  - some of those combined / something else?
1. What are your most important problems?
  - building a testbed/production grid
  - writing/running your applications

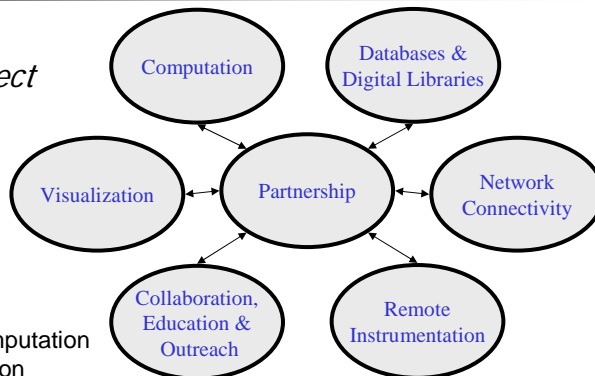
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## Background

### *Telescience Project*



- Telemicroscopy
- Globus Enabled Computation
- Advanced Visualization
- Advanced Networking
- SRB Enabled Access to Distributed/Federated Databases
- Environment that Promotes Collaboration, Education and Outreach

*Source: Steven Peltier*

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# Remote Instrumentations

- UHVEM
- MEG
- SPring-8



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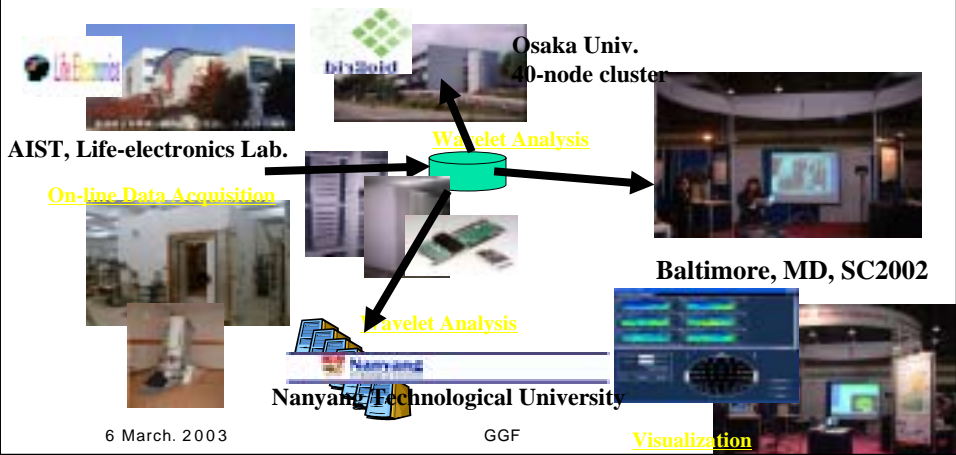


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## World-wide Research Activity

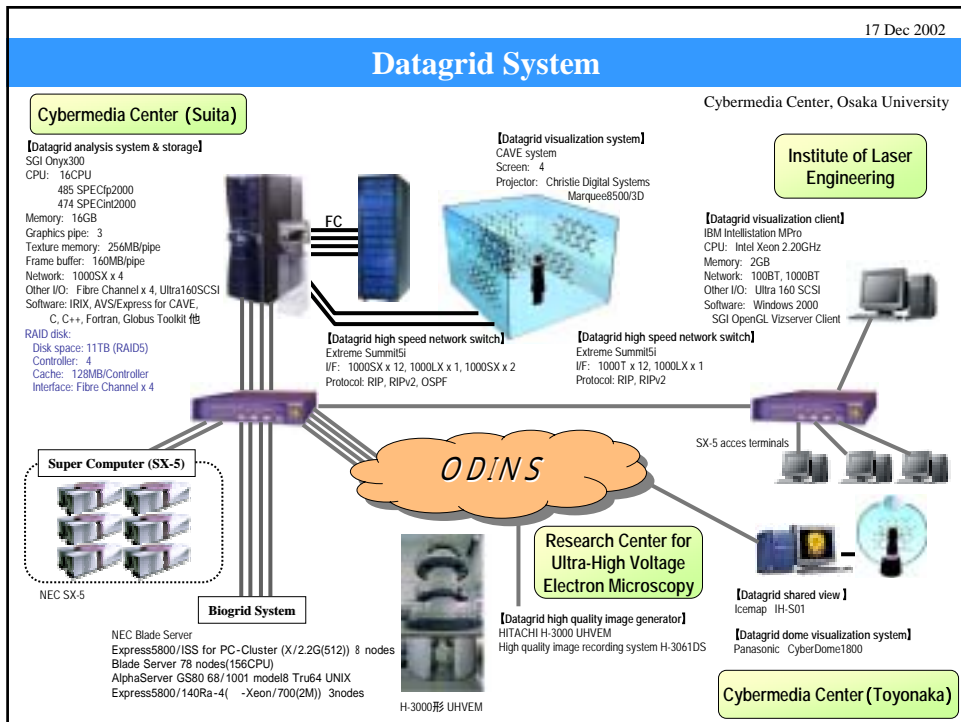
- GGF6 Chicago, Life-Science Workshopにおいてプロジェクト  
Susumu Date, "Biogrid project in Japan ~ For accelerating Science and Industry ~", GGF6 The 1<sup>st</sup> Life-science workshop, Chicago (2002).
- SC2002 Research ExhibitionにおけるMEGridデモンストレーション  
Baltimore-Osaka-Singaporeを結ぶグリッド環境上で脳機能解析を行う。



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## Datagrid System



## EcoGrid: Cyber-infrastructure for Ecological Research

- From the Electronic Microscope to sensors: Adopt the model of Telescience and apply to Ecology.
- Construct a Grid environment to support ecological research.
- Requirements of the Grid is based on domain experts.
- Basic infrastructure includes **sensor nets**, **research network** and **computing resources**.
- Integrate people first....

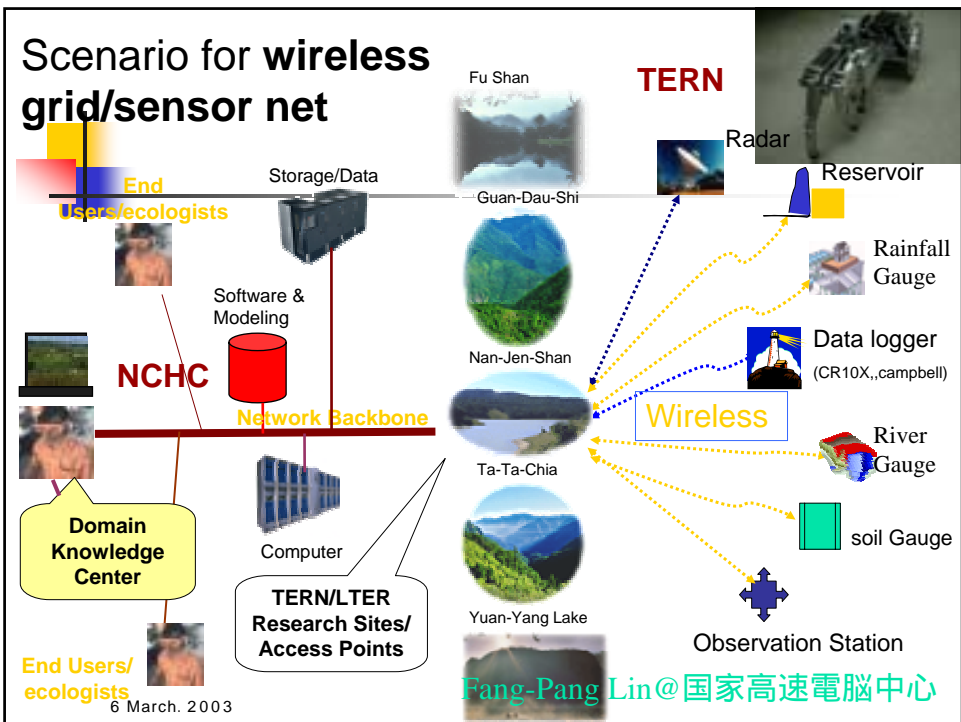
# The Plan for Grid-based TERN applications on TWRAN (Taiwan Advanced Research and Educational Network)

The screenshot shows the TERN Research Sites website. On the left, there is a navigation menu with links for Introduction, Research, Conference, News, and Related Web. The main content features a map of Taiwan with several research sites marked: NCHC-HU, NCHC-CENTRAL, NCHC-SOUTH, and NJUST. A yellow line connects these sites, and a red circle highlights the NJUST site. To the right of the map, there is a list of natural resources of Taiwan, including:
 

- Evergreen broadleaf forest
- Temperate wetland and lake ecosystems
- Subtropical montane evergreen hardwood forest
- Temperate evergreen hardwood forest
- Subtropical evergreen hardwood forest
- Temperate evergreen hardwood forest
- Temperate evergreen hardwood forest

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## Future works ( 1 )

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- IPv6 enabled grid environment
  - IPv6 enabled Globus ( <http://www.biogrid.jp/> )
  - Globus Toolkit 3
- Security for grid resources
  - Usability <-> Security
    - Firewall filter
      - Not peer-to-peer
    - IPsec
      - Management



## Future Works ( 2 )

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- Development of data sharing and visualization environment
- Integration of telemicroscopy system
  - Telescience portal
- Development of QoS enabled environment



## Thanks to ...

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- Seiichi Kato
- Hirotaro Mori
- Kiyokazu Yoshida
- Ohtsuka
- Atsushi Koike
- Shuuichi Murakami
- David Lee
- Naoko Yamada
- Yoshinori Kitatsuji
- Hiroyuki Hakozaiki
- Transpac, Abline, Startap, ...
- JGN, WIDE project