



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

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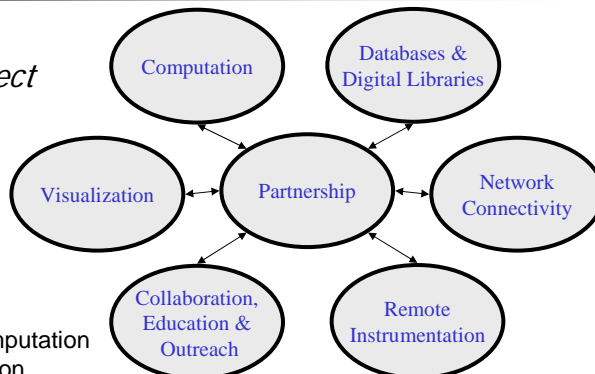
⁴ San Diego Supercomputer Center, University of California, San Diego

⁵ National Center for High Performance Computing, Taiwan, R.O.C.



Background

Telescience Project



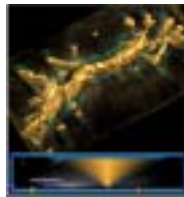
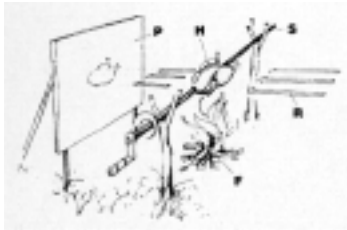
- Telemicroscopy
- Globus Enabled Computation
- Advanced Visualization
- Advanced Networking
- SRB Enabled Access to Distributed/Federated Databases
- Environment that Promotes Collaboration, Education and Outreach

Source: Steven Peltier



Ultra-High Voltage Electron Microscope

- 3MV Ultra-High Voltage
 - Thick specimen observation



Tomography technique enables detailed analysis



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Telemicroscopy

UHVEM

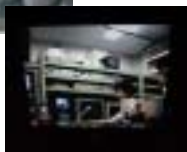


UHVEM:
strength of the beam
specimen angle
Camera:
position

Remote User



Current Specimen Image

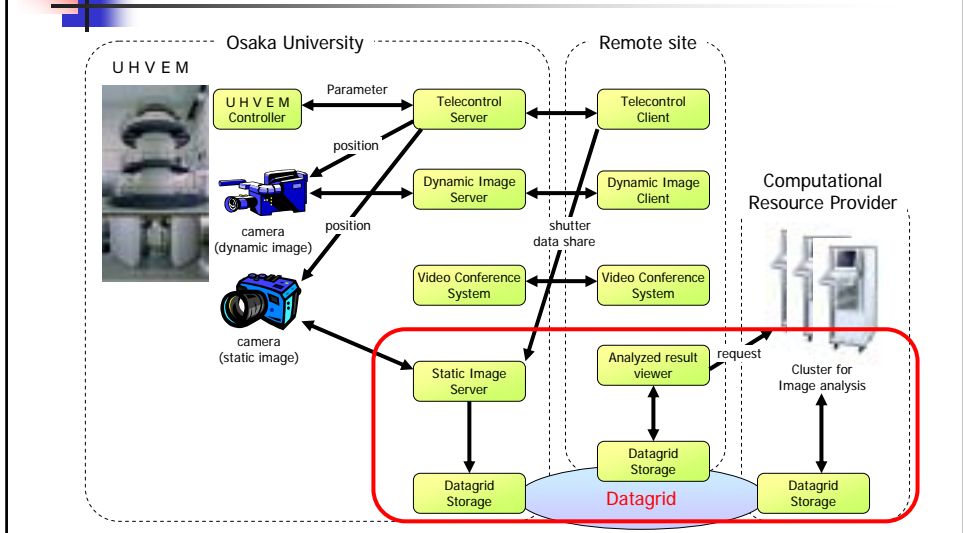


Local operator

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Telemicroscopy



Current status

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

iGrid2002

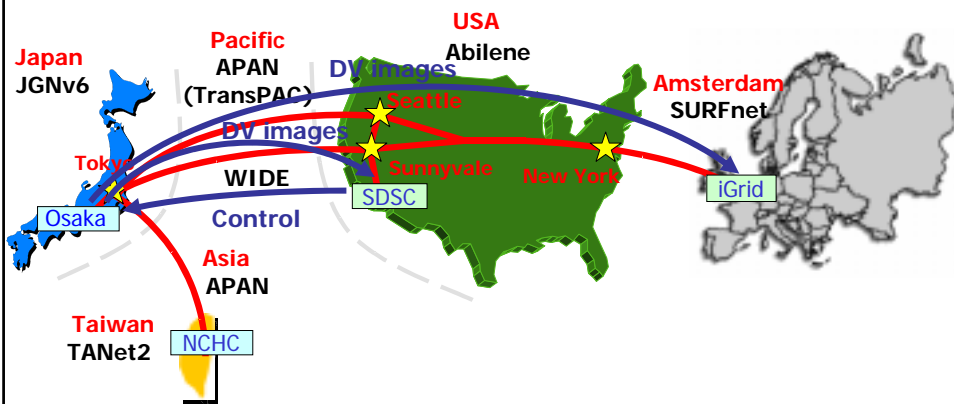
- Telecontrol from Amsterdam and SDSC over global IPv6 network.
- DVTS over IPv6
- Participants
 - NCMIR, SDSC(US)
 - NCHC(Taiwan)
 - Research Center for UHVEM, Cybermedia Center(Japan)



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Demonstration configuration

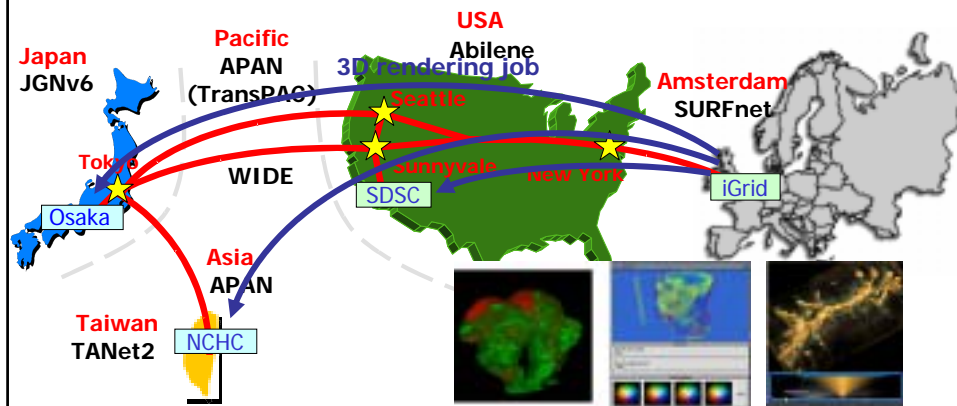


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Demonstration configuration



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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



KH-300N



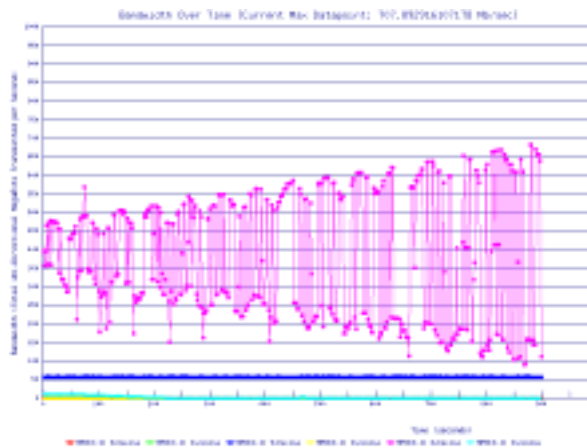
MPTS LINK

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

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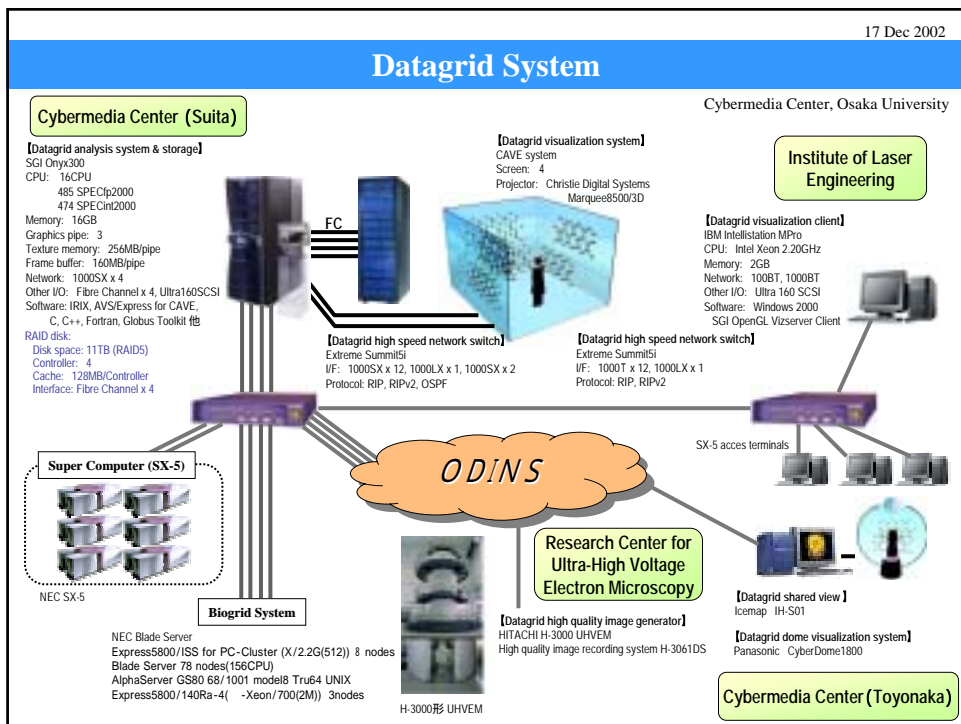
Bandwidth challenge results



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Datagrid System

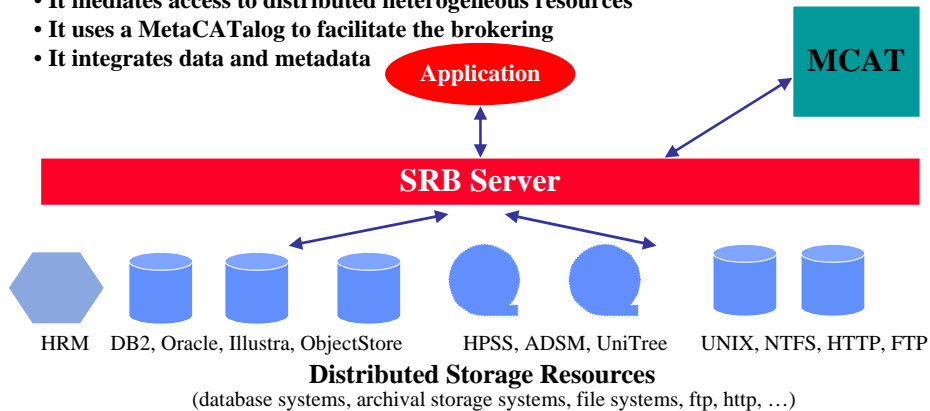


Data Grid Requirements

- 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

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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Future works (1)

- 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)

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