Optical Network Facilities for e-Science at CAS

Tieniu TAN
Deputy Secretary-General
Chinese Academy of Sciences (CAS)

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Outline

- The CAS
- The Present of Cyber-infrastructures/Optical networking facilities
- The Future
- Conclusions
CAS: History & Position

Founded on 1 Nov 1949

Highest academic institution in natural sciences in China

Most comprehensive R&D center in natural sciences and high-tech development

Highest national advisory body in S&T

1949  NOW
• 6 Academic Divisions
• 95 research institutes
• 75 national (state) laboratories
• 110 field research stations
• 435 spin-off companies (e.g., Lenovo)
• 1 university + 1 graduate school
• Total staff: 47,300
• PG students: 43,000
• 12 regional admin branches
CAS Position in China’s S & T System

Play a leading role in -

- national knowledge innovation
- fostering outstanding talents
- R & D of advanced technologies
- national S & T consultation
- scientific knowledge dissemination
International Collaboration

On an equal basis and for mutual benefits

- Cooperation between scientists
- Bilateral scientific agreements
- High-level bilateral workshops or N+N meetings
- Project-based partner groups
- Joint centers, labs, or institutes
- Partnership with industries
- From bilateral to multilateral cooperation
Key CAS Cyber-Infrastructures

e-CAS

- Internet Based Science Popularization Platform
- Information Dissimilation Platform
- VRP (Virtual Research, or e-Science) Platform
- e-Education and e-Training Platform
- ARP (Academy Resource Planning) Platform

Other Infrastructures

Info and Network Security

Supporting and Service

CAS Cyber-Infrastructures

Rules and Regulations
CAS
Computer Network Information Center (CNIC)

- e-Science Center
- Database Center
- Supercomputing Center
- Academy Resource Planning Center (ARP Center)
- CSTNet Operation Center
CSTNet

- CSTNet: China Science & Technology Network (http://www.cstnet.net.cn)
- The first research network in China
- The core network facility for the CAS
CSTNet Topology
CSTNet Connections
Gloriad DV-NOC

http://dev.gloriad.org:8080/viz/dvnoc/dvnoc.html
Light Paths for e-VLBI at CSTNet

CN-AU eVLBI
Jun. 2008

CN-EU eVLBI
Aug. 2007

CN-US Gloriad
May 2006

Gloriad-US
e-VLBI Participants
Real-time e-VLBI data demo

24th Xi’An APAN meeting  Aug 2007
AU light path application for e-VLBI

(Shanghai, June 2008)
Astronomy—Real-time VLBI

Real-time VLBI in the Chinese lunar “Chang E” project
Collaborative Research for HEP

- LHC – Institute of High Energy Physics joins CERN’s Grid as Tier2

- 20 Applications in 10 Areas
  - BEPC-2 / BES-3
  - YangBaJing Cosmic Ray Observatory
  - ...

-grid for a physics study group
-tier 3 physics department
-desktop
Some e-Science Applications

- Earthquake prediction
- Earthquake Pattern Analysis
- Disaster Atmosphere Prediction
- VLBI Application
- Global Climate Prediction
- 3D structure of Avian Influenza Virus
- Beijing Ecology Pattern and Urban Planning
New Requirements and New Challenges

- **Supercomputing grid: >200Tflops**
  - Main Center (CNIC): >130Tflop
  - Sub-centers: 10-20Tflops
  - Constructing a CAS grid through high speed network, as part of the national grid (CNGrid), as well as part of the international grid, ….

- **Data center: >6PB**
  - On-line services, mirroring, backup, ….
  - Mass data migrating on the high speed network
Large-scale scientific equipments: Shanghai Light Source, LAMOST, Tokamak device, ...

Need to expand connection with more heterogeneous, professional and research networks, i.e. Chinese medical and health network, Chinese environmental science network, ...

Networking of numerous field research stations

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All these call for significantly enhanced (optical) networking facilities
Multiple Light Paths for e-VLBI
CNC/CSTNET CNGI Backbone

Beijing

NW China

NE China

SW China

S China

E China
CSTNet Optical Rings

N China
- Beijing
- Shanghai
- Nanjing
- Hefei
- E China
- Shanghai
- Hefei

W China
- Lanzhou
- Xi’an
- Urumuqi
- Beijing

S China
- Chengdu
- Wuhan
- Guangzhou

E China
- Shanghai
- Hefei
- Nanjing
- Changcun

N China
- Beijing
- Shanghai
- Nanjing
- Hefei

W China
- Lanzhou
- Xi’an
- Urumuqi

S China
- Chengdu
- Wuhan
- Guangzhou
CSTNet Topology: Star + Rings
Chinese Scientific Computing Grid (CSCG)

United Supporting and Service

Open connection with external grids

United Security

Tight connection with CAS IT infrastructure

United Rules and Regulations
Access CSCG

Windows / Linux Client  Computing  Data
User  Administrator

Web Portal  Computing  Monitoring
Statistics  Application Bind  ...

(Middleware of Grid System)

Top Tier  Middle Tier  Bottom Tier

Integrated Management, Scheduling and Service
Scientific Data Grid

Scientific Databases

Scientific Data Grid Middleware

Scientific Data Grid Applications

Avian Flu Alert System

Virtual Observatory Grid

High Energy Physics Grid

Other Grids
Conclusions

- High-end science calls for reliable and easily accessible cyber-infrastructures
- Network facilities are the infrastructure of the cyber-infrastructures
- Great efforts are being made in China to improve such facilities
- CSTNET (CAS) is spearheading such efforts
- International collaboration is a MUST in such efforts
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