8th Global LambdaGrid Workshop

Optical Network Facilities for e-Science at CAS

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Chinese Academy of Sciences (CAS)

1 Oct 2008 , Seattle

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

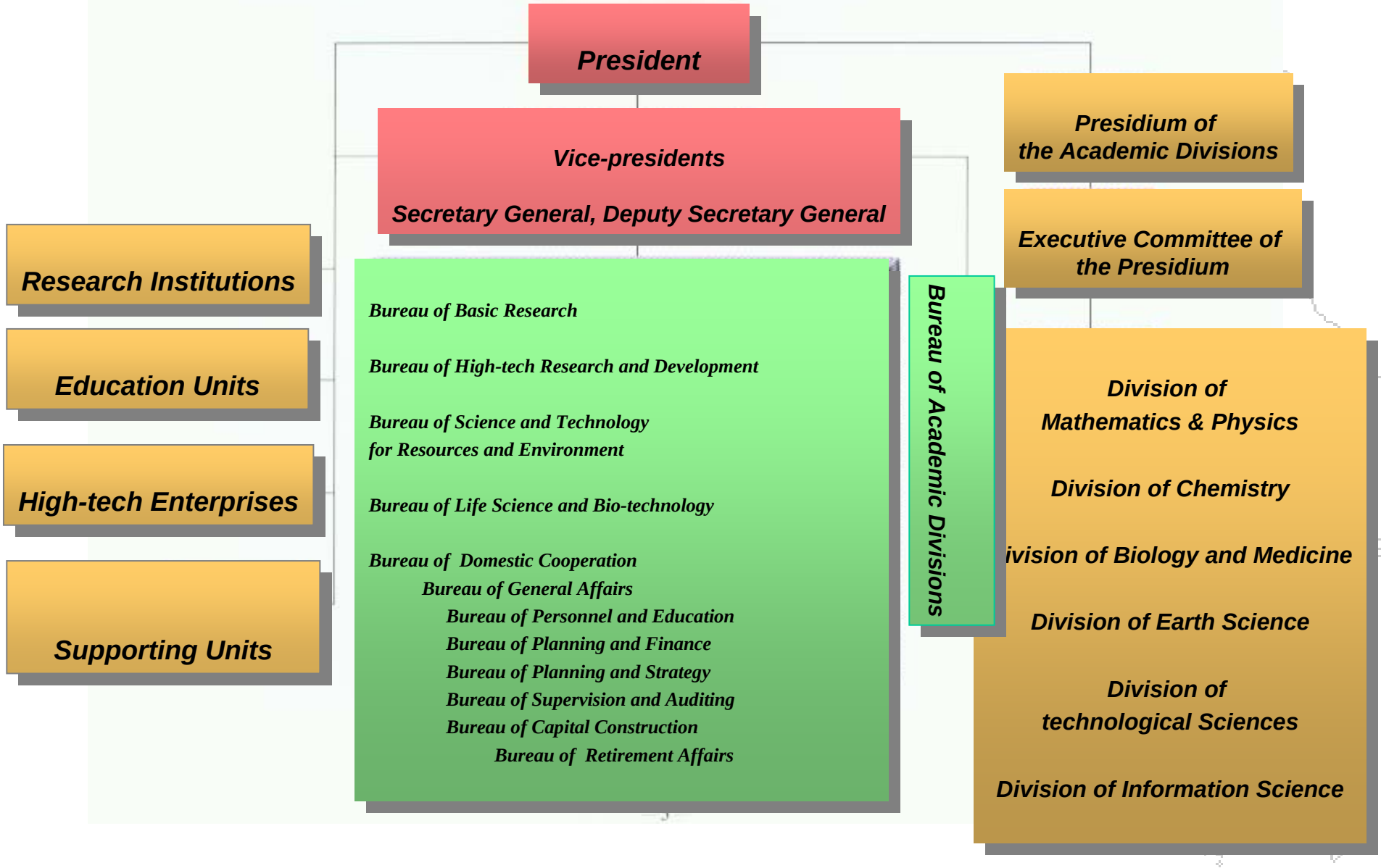
Most comprehensive R&D center in natural sciences and high-tech development

Highest national advisory body in S&T

1949

NOW

Organizational Structure



Facts & Figures

- 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

12 CAS Regional Branches

中国科学院
CHINESE ACADEMY OF SCIENCES

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

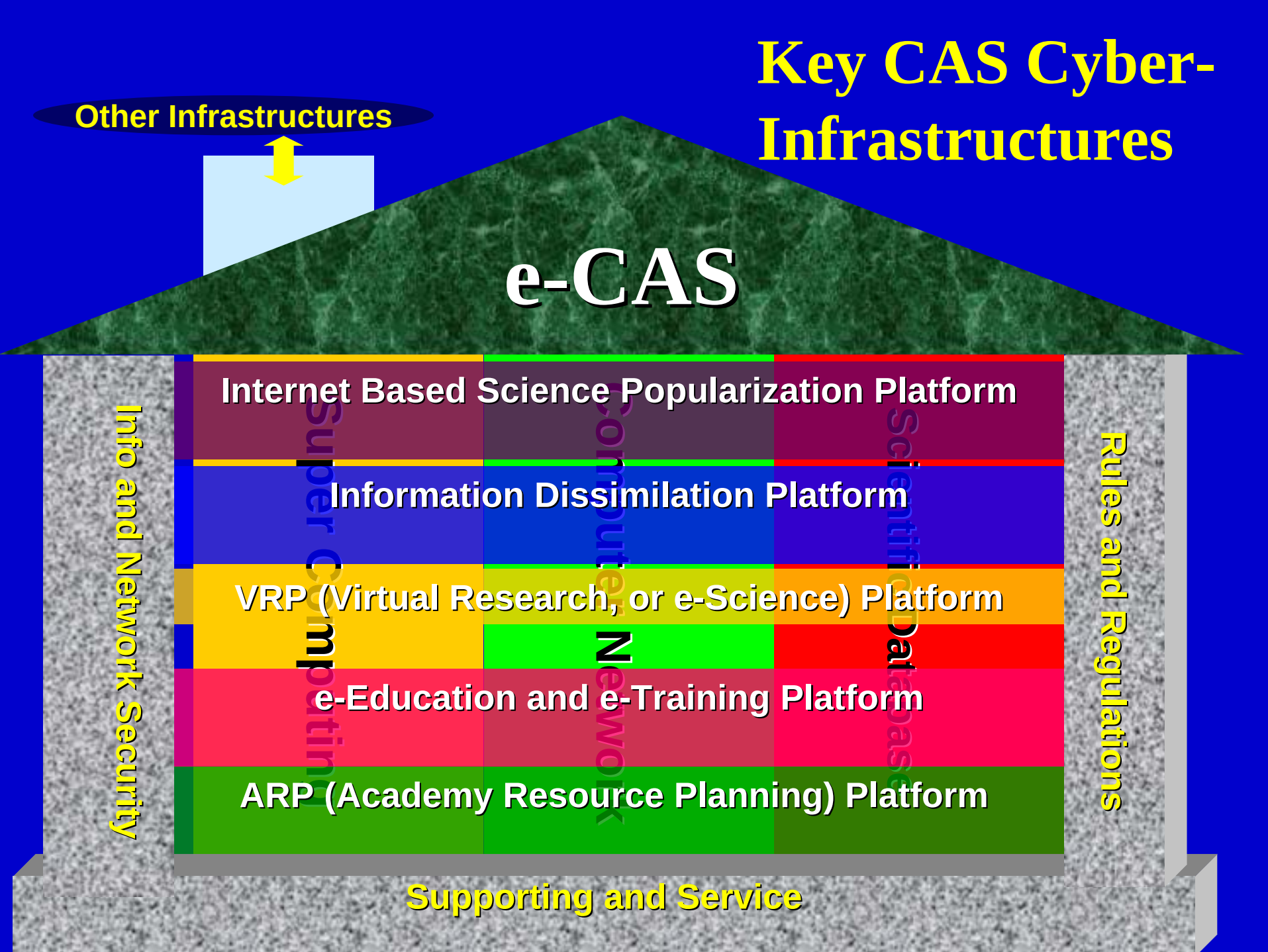
International Collaboration

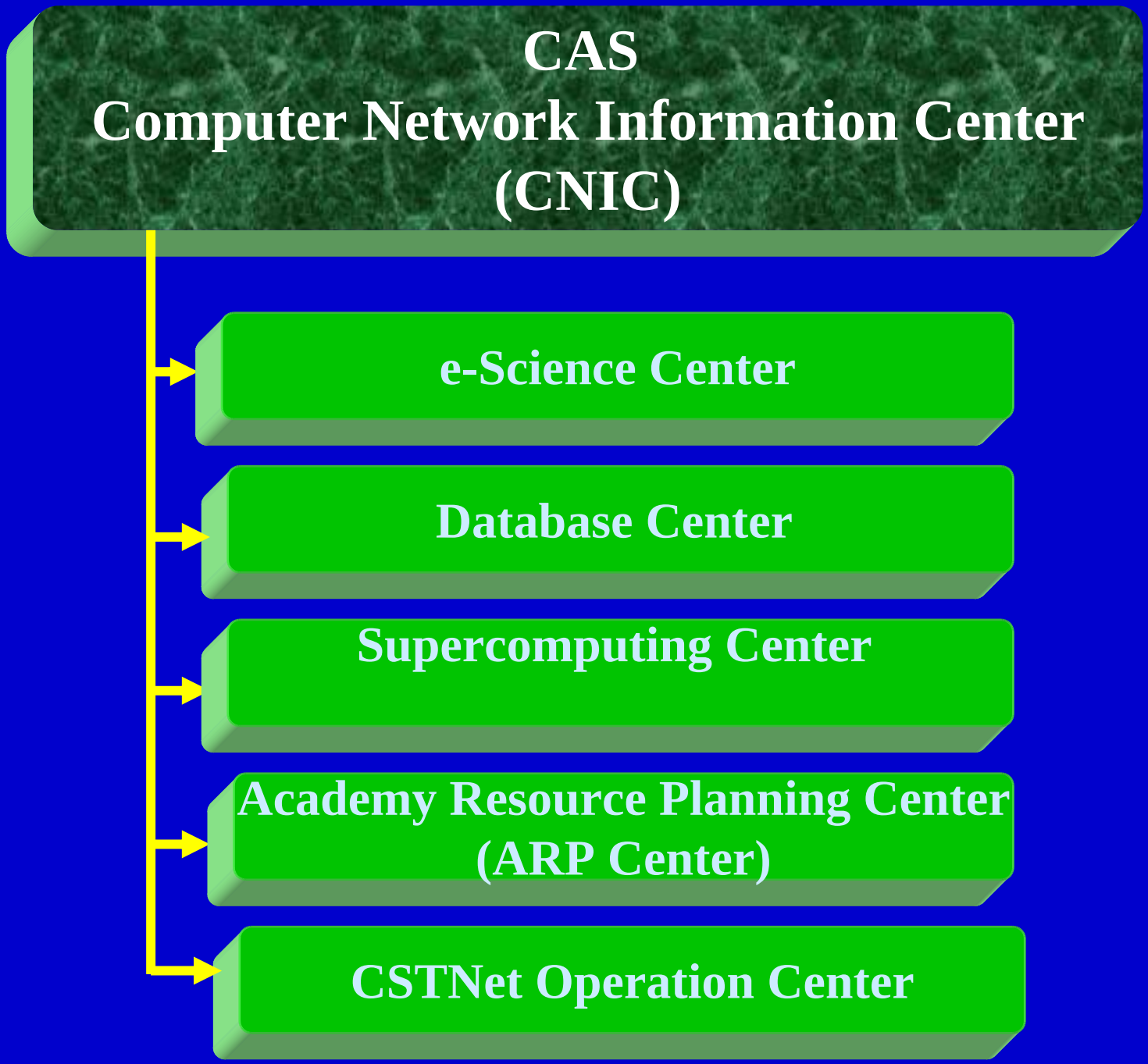
中国科学院
CHINESE ACADEMY OF SCIENCES

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



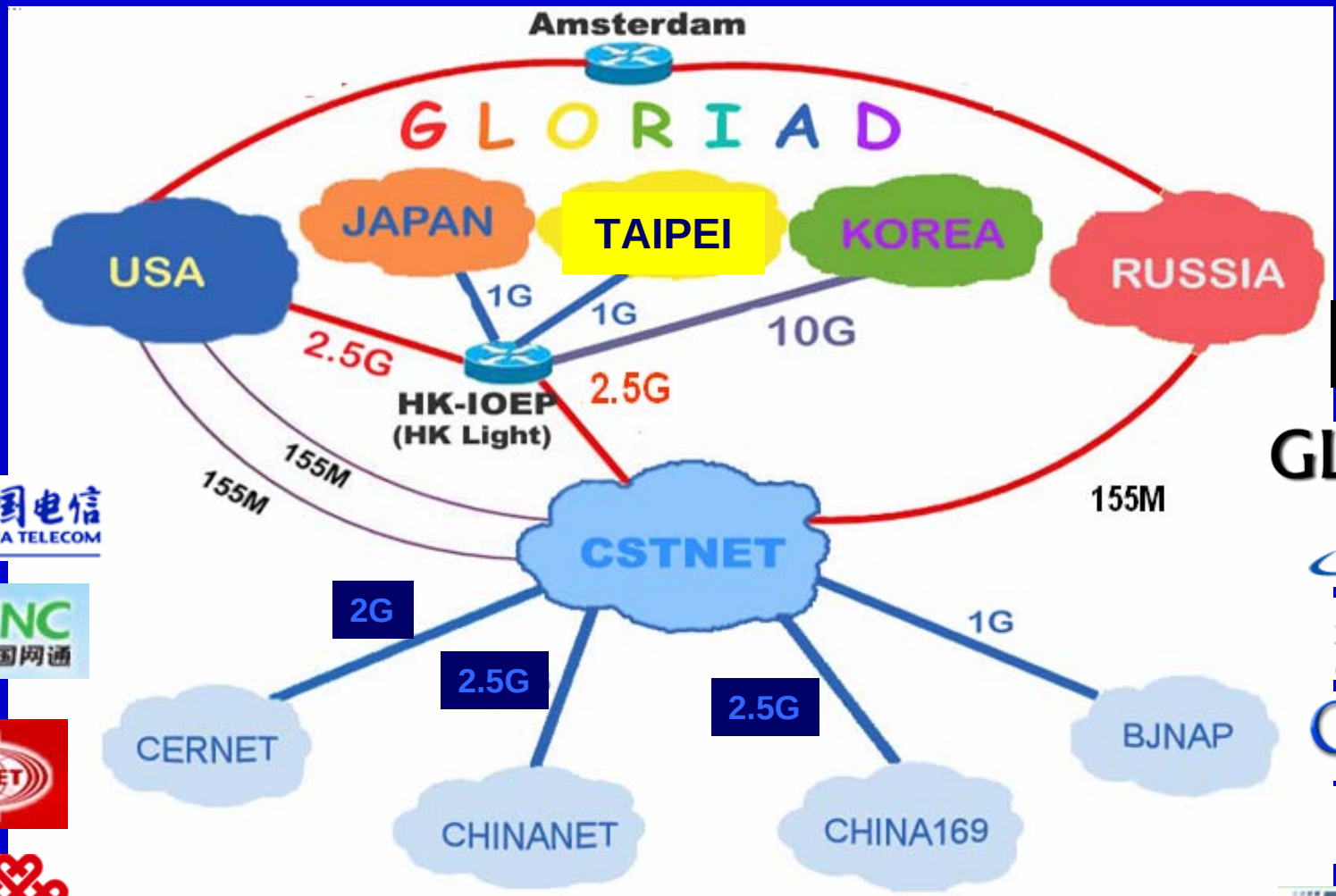

CAS
Computer Network Information Center
(CNIC)
e-Science Center
Database Center
Supercomputing Center
Academy Resource Planning Center
(ARP Center)
CSTNet Operation Center

CSTNet

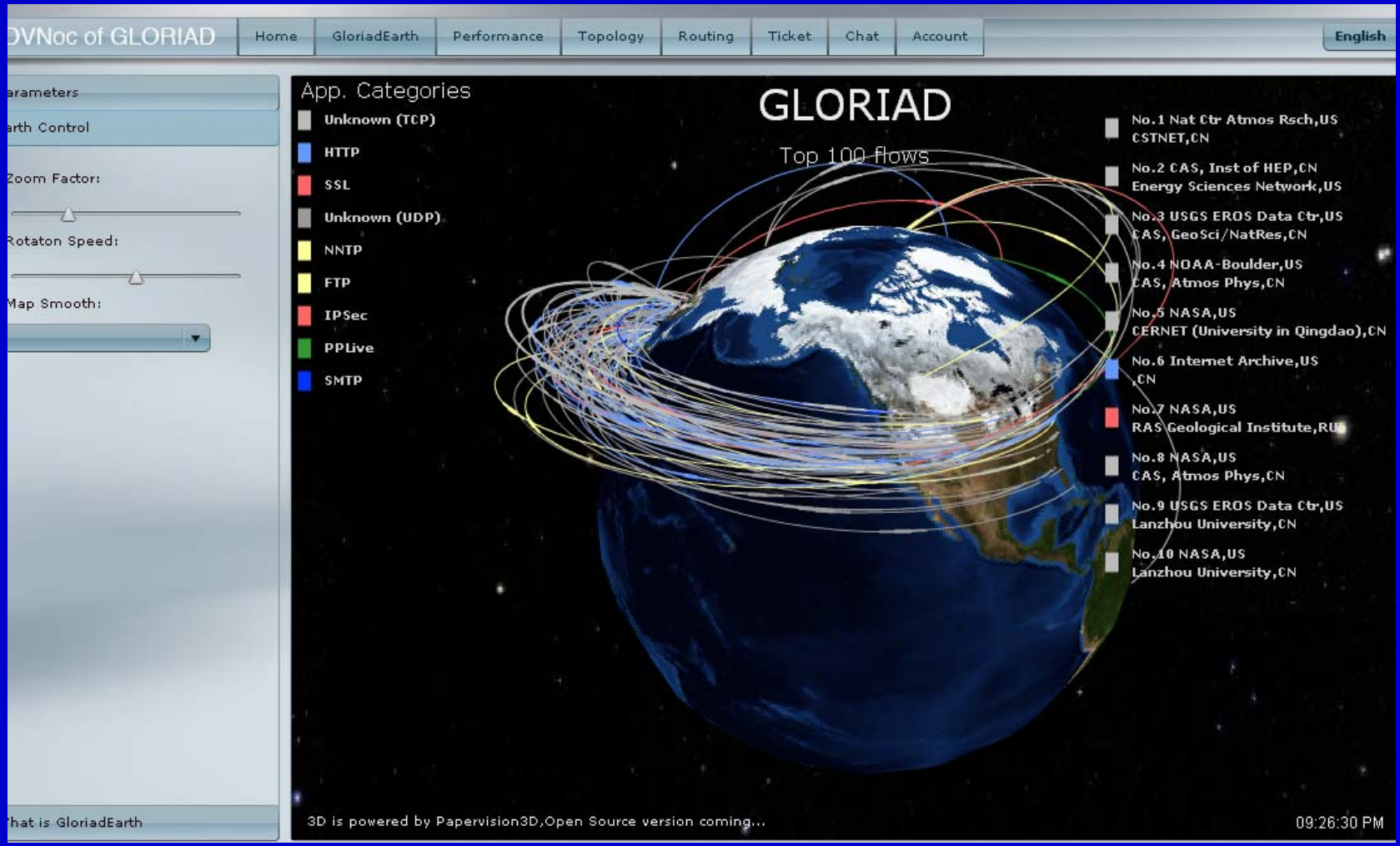
- **CSTNet: China Science & Technology Network (http://www.cstnet.net.cn)**
- **The first research network in China**
- **The core network facility for the CAS**

CSTNet Topology

CSTNet Connections

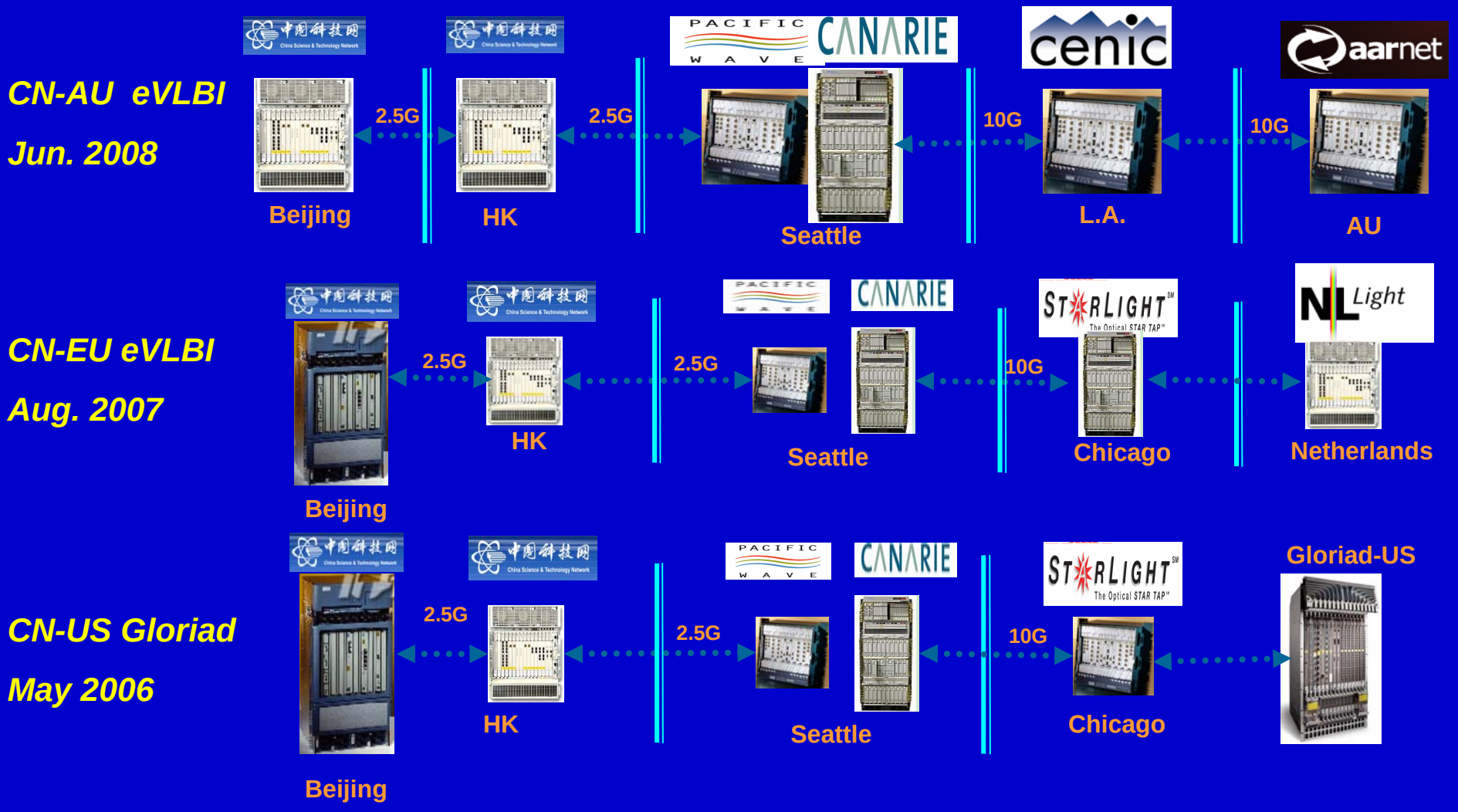


Gloriad DV-NOC



- http://dev.gloriad.org:8080/viz/dvnoc/dvnoc.html

Light Paths for e-VLBI at CSTNet



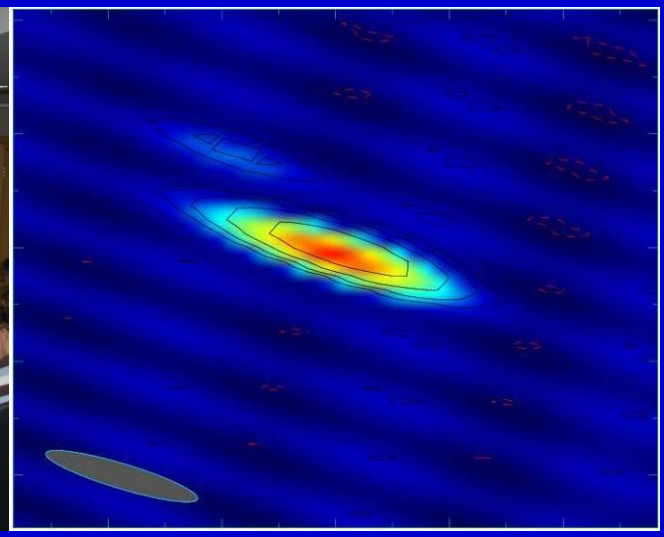
e-VLBI Participants

Real-time e-VLBI data demo

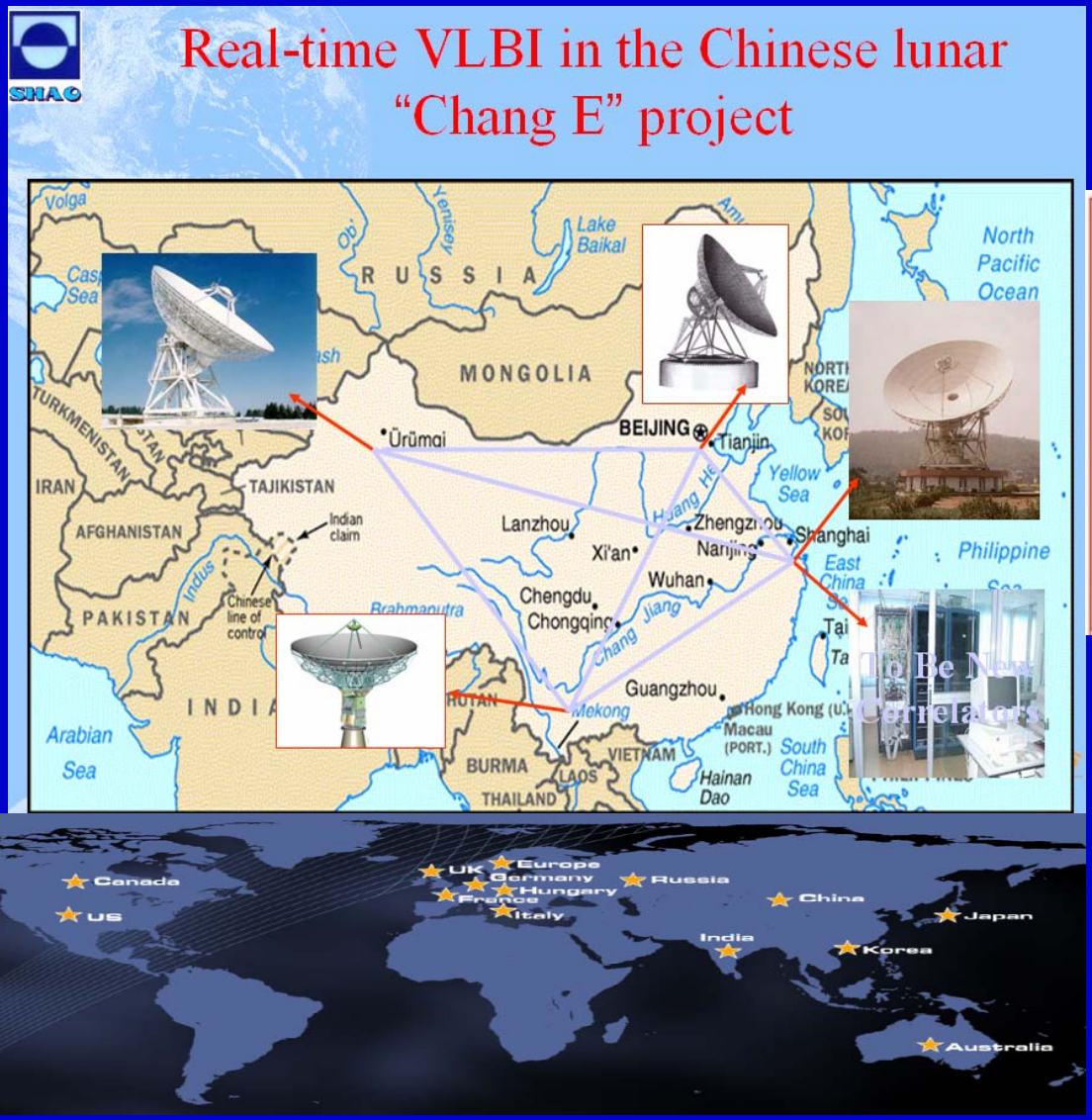
24th Xi'An APAN meeting Aug 2007

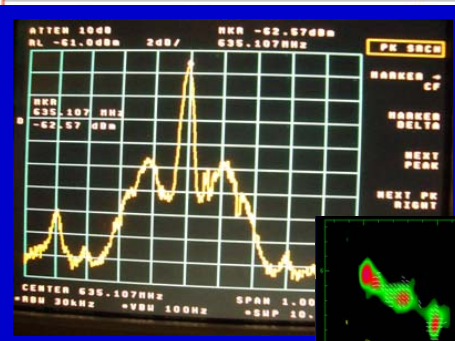
AU light path application for e-VLBI

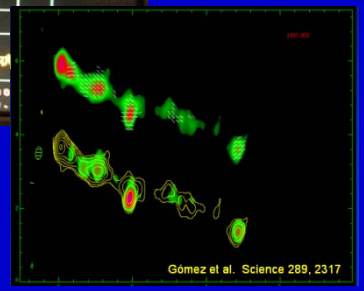
(Shanghai, June 2008)



Astronomy— Real-time VLBI

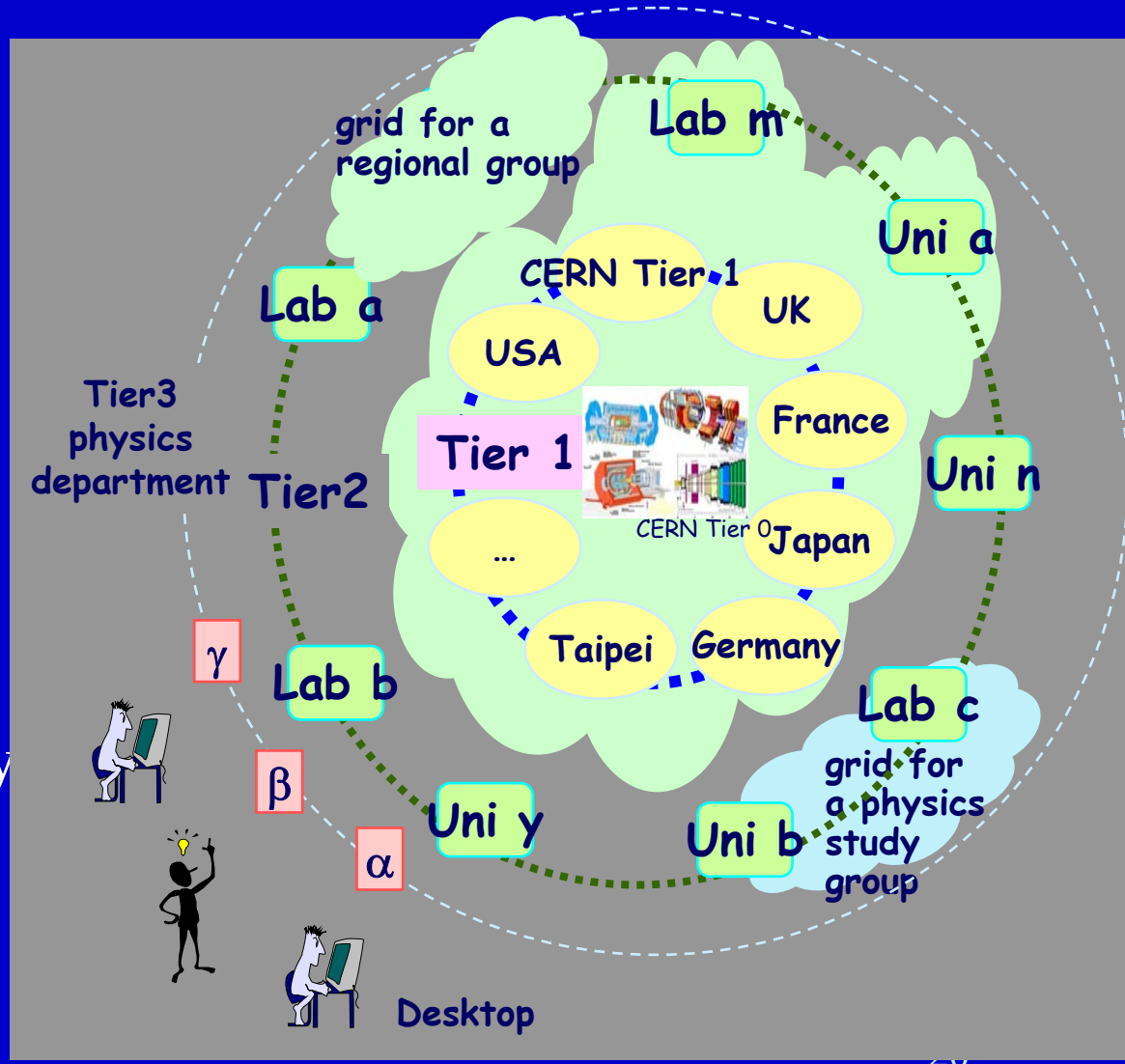




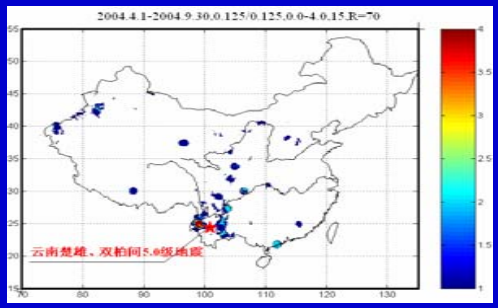


Collaborative Research for HEP

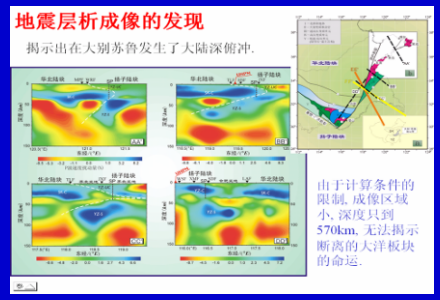
- LHC – Institute of High Energy Physics joins CERN's Grid as Tier2
- 20 Applications in 10 Areas
  - –BEPC-2 / BES-3
  - –YangBaJing Cosmic Ray Observatory
  - –…



Some e-Science Applications



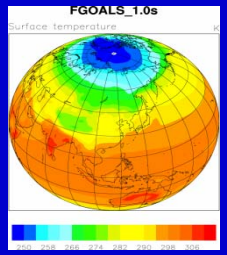
Earthquake prediction

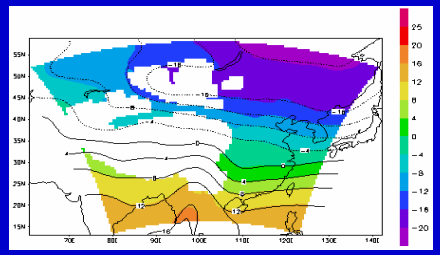


Earthquake Pattern Analysis

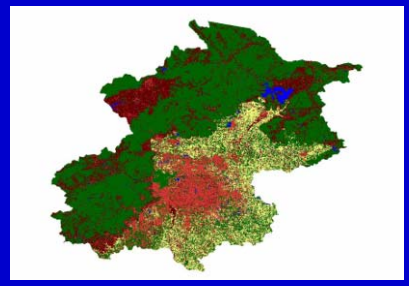
Disaster Atmosphere Prediction

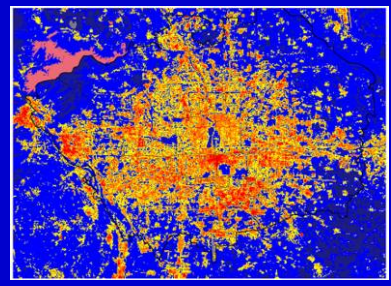
VLBI Application





Global Climate Prediction





Beijing Ecology Pattern and Urban Planning

3D structure of Avian Influenza Virus

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

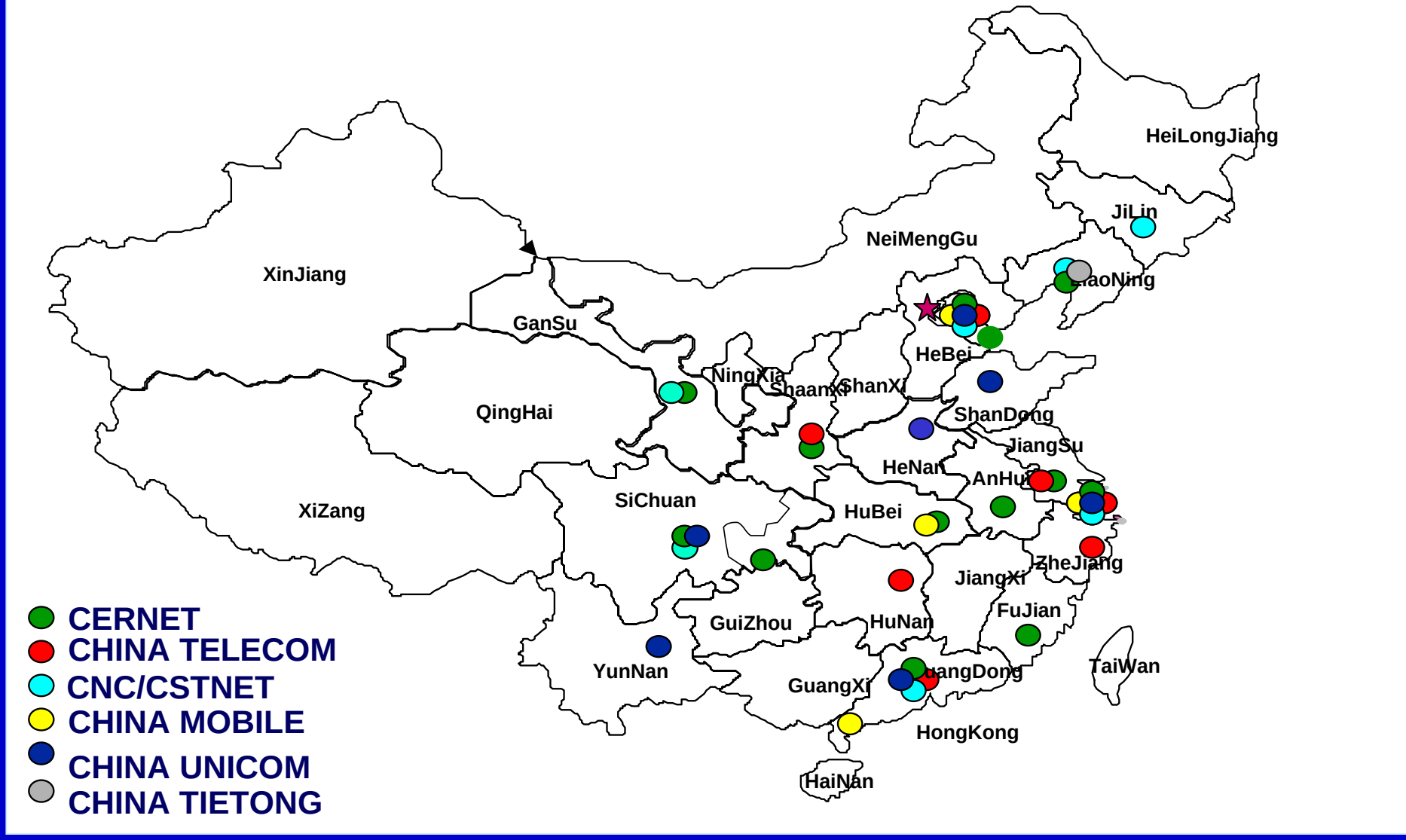
- Large-scale scientific equipments: Shanghai Light Source, LAMOST, Tokamak device, …
- Need to expand connection with more heterogeneous, professional and research networks, i.e. Chinese medical and health network, Chinese environmental science network, …
- Networking of numerous field research stations
- ……

Field Stations for Geo-science Domain of CAS
Distributed in China (> 100)

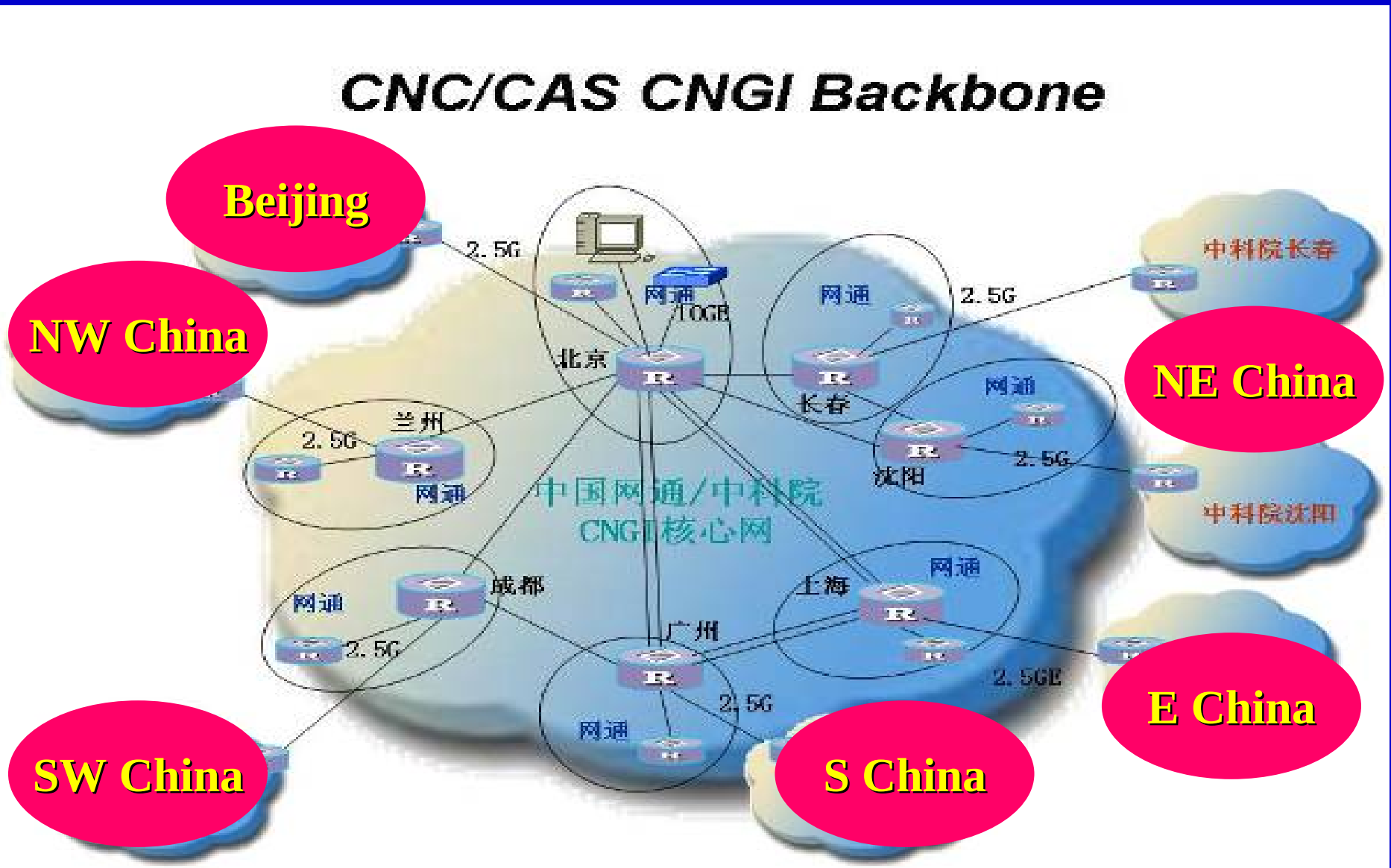
All these call for significantly enhanced (optical) networking facilities

Multiple Light Paths for e-VLBI

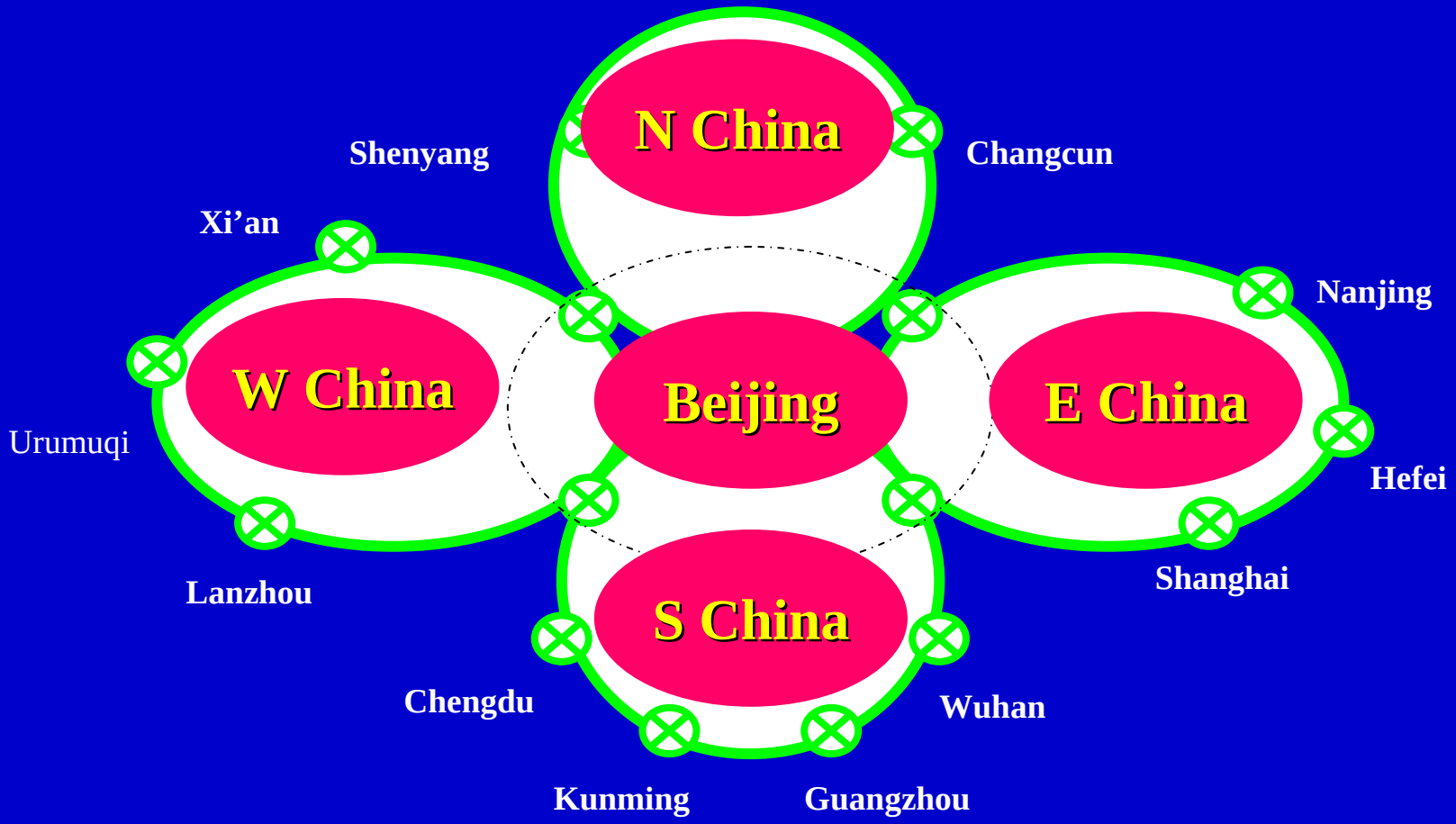
National Project - CNGI GigaPoPs



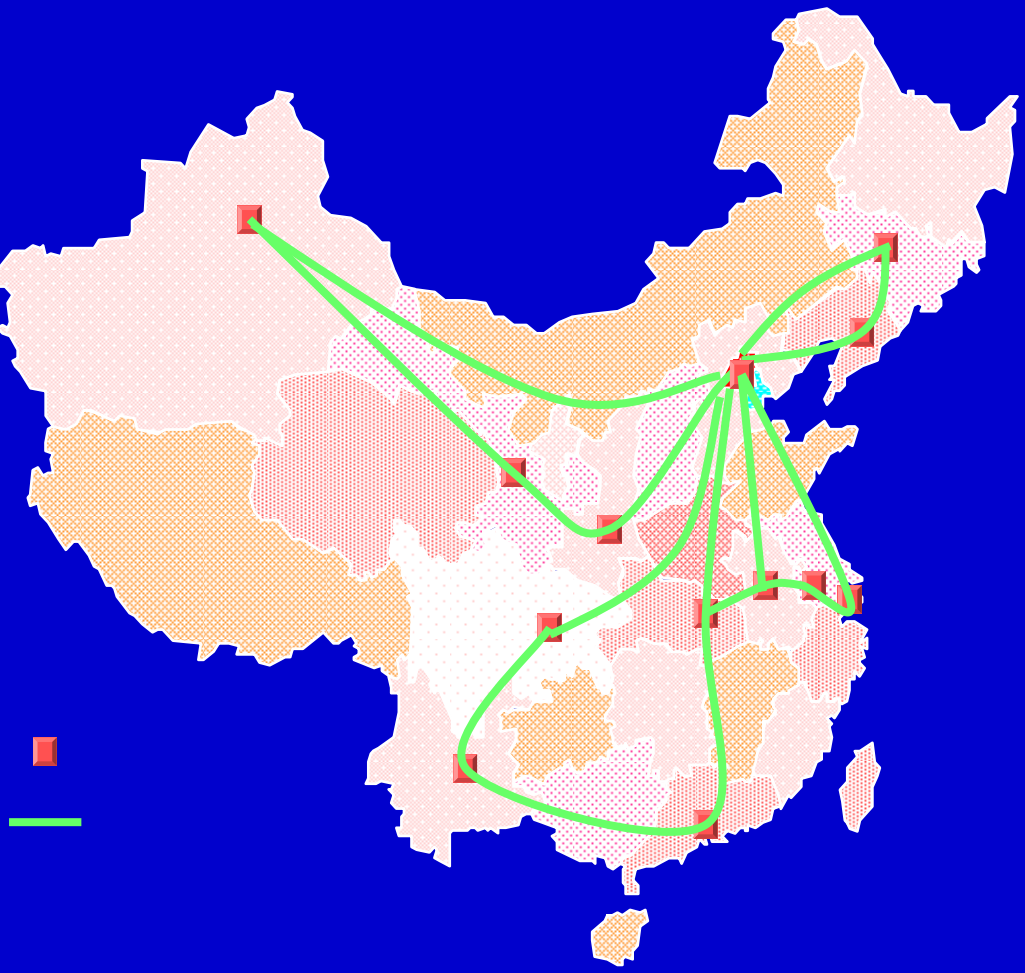
CNC/CSTNET CNGI Backbone



CSTNet Optical Rings



CSTNet Topology: Star + Rings



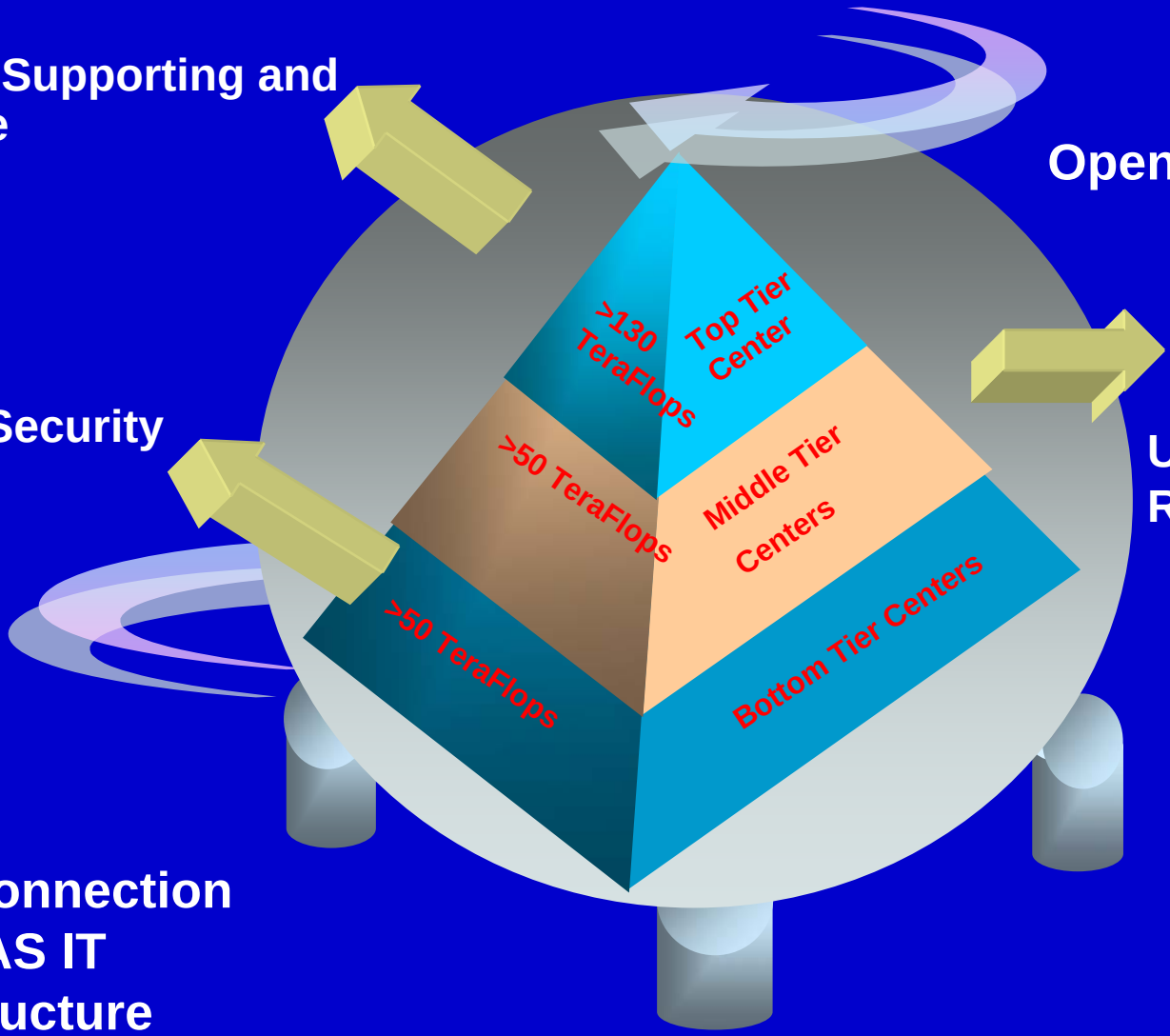
Chinese Scientific Computing Grid (CSCG)

United Supporting and Service

Open connection with external grids

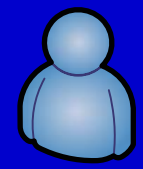
United Security

United Rules and Regulations



Tight connection with CAS IT infrastructure

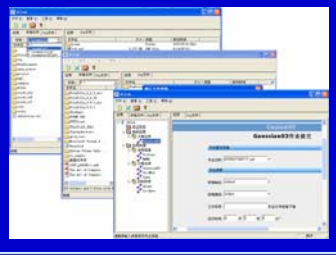
Access CSCG

Windows / Linux Client Computing Data

User Administrator

Web Portal Computing Monitoring
Statistics Application Bind ...

(Middleware of Grid System)

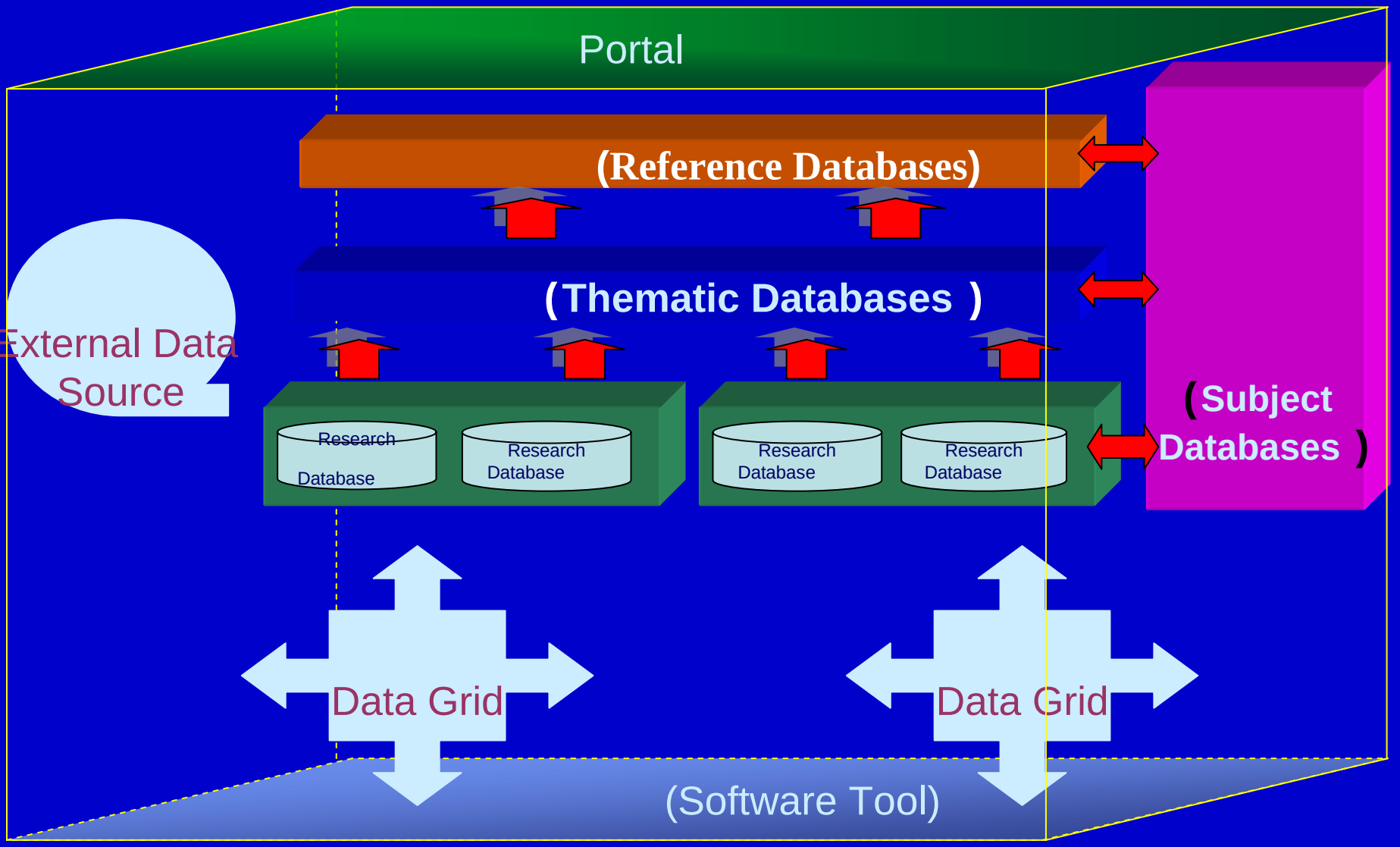

Top Tier

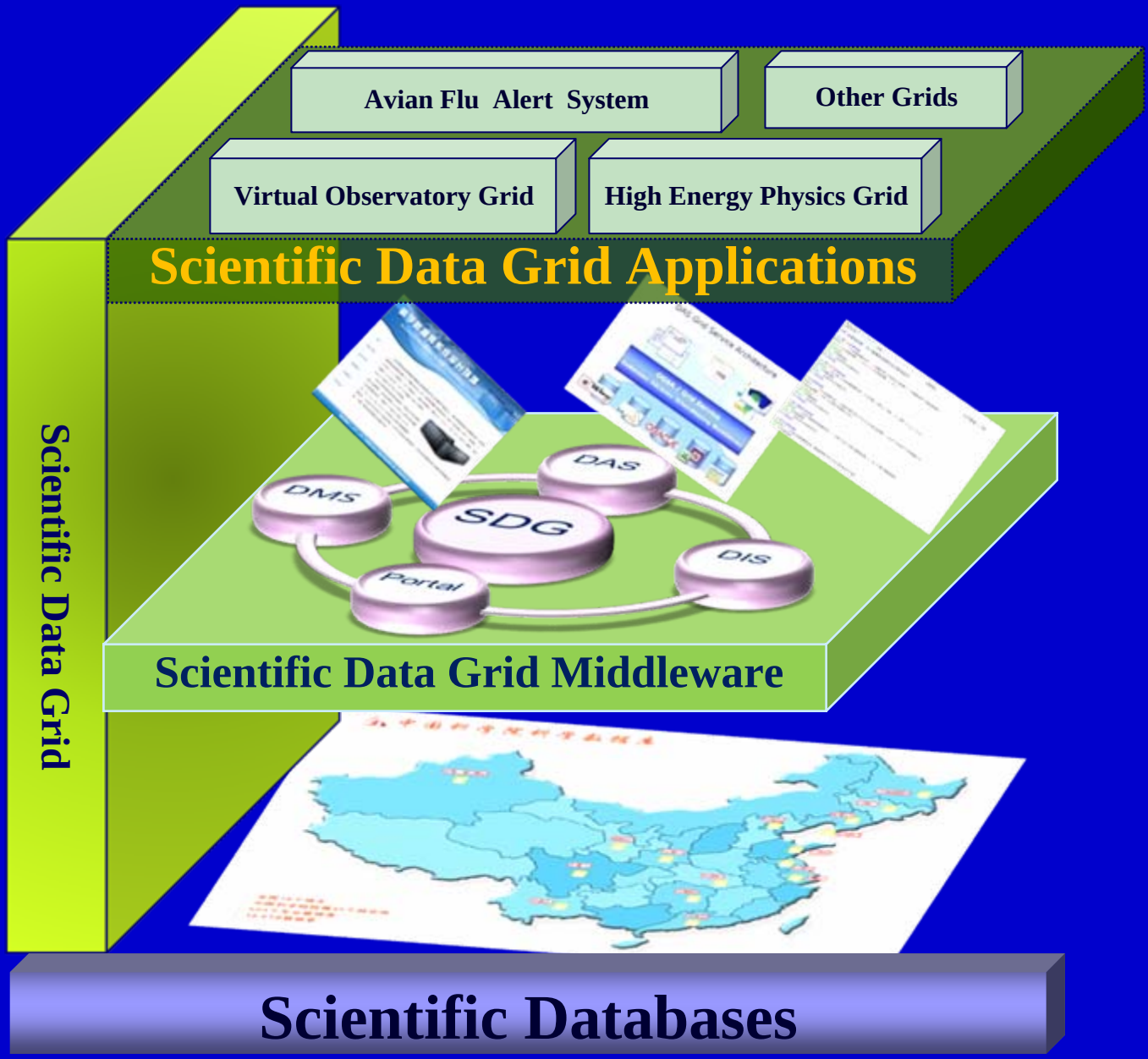
Middle Tier

Bottom Tier

Integrated Management, Scheduling and Service

Access Scientific Databases




Avian Flu Alert System
Other Grids
Virtual Observatory Grid
High Energy Physics Grid
Scientific Data Grid Applications
Scientific Data Grid
DMS
DAS
SDG
DIS
Portal
Scientific Data Grid Middleware
Scientific Databases

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

Thanks

AARnet *Greg Wickham, Ivan Philips*

CANARIE *Eric Bernier Thomas Tam*

CENIC *Darrell Newcomb*

GLORIAD *Greg Cole*

Pacific Wave *Jacqueline Brown*

SURFnet *Kees Neggers, Erik-Jan Bos*

Wouter Huisman

StarLight **Joe J Mambretti,** *Linda Winkler , Alan Verlo*

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xywp.yeah.net
Thank you