Integration of an Asian NGI with European counterparts

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Outline

- ASGC: from NGI toward regional and global collaboration
  - Collaboration Model
- APROC and Regional Federation
  - EGEE Asia Federation -- The Summary Report
  - EUAsiaGrid
- Summary
ASGC Introduction

Large Hadron Collider (LHC)

Avian Flu Drug Discovery

Grid Application Platform

A Worldwide Grid Infrastructure

Asia Pacific Regional Operation Center

1. Most Reliable T1: 98.83%

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A Worldwide Grid Infrastructure
>250 sites, 48 countries
>68,000 CPUs, >25 Petabytes
>10,000 users, >200 VOs
>150,000 jobs/day

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Max CERN/T1-ASGC
Point2Point Inbound: 7.3 Gbps

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2. Very Highly Performing and most Stable Site in CCRC08

Max from Core SW to TWBR1: 3703.4 Mb/s (37.0%)
Average from Core SW to TWBR1: 1300.1 Mb/s (13.0%)
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Best Demo Award of EGEE’07
Avian Flu Drug Discovery

Large Hadron Collider (LHC)
What Do We Deliver?

- **e-Infrastructure Operation**
  - 23 sites across 10 countries in Asia Pacific Region
    - > 3,000 Cores and >1.5 PB storages
    - Continuous monitoring of grid services & automated site configuration management

- **Middleware R&D**
  - Production quality MW distributed under friendly open source license model
  - Application integration
  - Toolkits: GStat, DIANE, GANGA, AMS, OTRS, etc

- **User Support: Managed process from first contact to production usage**
  - Training
  - Expertise in grid-enabling applications
  - online helpdesk
  - Dissemination: attracting more collaborations

- **Interoperability: expanding geographical reach and interoperability with collaborating e-infrastructures**
- New STM-16 link for Taiwan – Hong Kong on June 1.
  - CERNET
  - CSTNET
  - HKIX
  - KREONET2
  - HARNET
  - CUHK
- Upgrade Taiwan – Japan link to STM-16 on June 1.
- Welcome for peering
TWGrid Introduction

• Consortium Initiated and hosted by ASGC in 2002

• Objectives
  • Gateway to the Global e-Infrastructure & e-Science Applications
  • Providing Asia Pacific Regional Operation Services
  • Fostering e-Science Applications collaboratively in AP
  • Dissemination & Outreach
  • Taiwan Grid/e-Science portal
    • Providing the access point to the services and demonstrate the activities and achievements
    • Integration of Grid Resources of Taiwan
    • VO of general Grid applications in Taiwan
e-Science Applications in Taiwan

- High Energy Physics: WLCG, CDF, Belle
- Bioinformatics: mpiBLAST-g2
- Biomedicine: Drug discovery with AutoDock
- Digital Archive: Data Grid for Taiwan’s National Digital Archives Program (NDAP) Long-term preservation
- Atmospheric Science
- Earth Sciences: SeisGrid, GeoGrid for data management and hazards mitigation
- Ecology Research and Monitoring: Carbon Flux Monitoring, EcoGrid
- BioPortal
- Humanity and Social Sciences
- General HPC Services
- Agriculture
- e-Science Application Development Platform (GAP)
Collaboration Model in TWGrid

- **Resource Sharing Benefits**
  - Obtain platform for international e-Science collaboration
  - Increase your computing capacity beyond local resources
  - Gain grid operations experience by joining EGEE production infrastructure

- **Resource**
  - ASGC to provides:
    - 600 cores: 2.66 Ghz, Dual Core, 1GB/core
    - 50 TB storage space
  - Partners to provide at least 64 cores

- **Policy**
  - Local site jobs has priority over external jobs
Implementations

- **Managed services**
  - ASGC manages Grid services
  - Partner manages local batch

- **Federated Grid site support**
  - ASGC provides training, deployment and operation support
  - Partner prepares hardware and HR to operate site
  - Service currently provided to 23 sites in 10 countries
Application Support & Collaboration

• Application Profiles Supported
  • Large, highly scalable parallel applications requiring exceptional computational resources
  • Data intensive applications requiring access to distributed data repositories
  • Distributed applications that need to run on more than one resource center.
  • Workflow Simulations: managing simulation chains that access more than one computing platform

• General Model of Application Support
  • Porting and CLI/web tools
  • Training and documentation

• Case Study: Avian Flu Drug Discovery, HPC
• Current EGEE Applications and VOs
In the end, a general application porting and supporting methodology and framework would be established, to benefit future and more complicated applications.

**Grid Application Platform (GAP)**

- Virtual Queueing System
- Virtual Job Scheduler & Wrapper
- Metadata Services
- Data Management Tools
- Data Grid Services
- Workflow Management

**High Level Graphical User Interface**

- WS_PGRADE portal
- Generic Grid Portal Development
General Model of Application Support (III)

HTC Support

- Grid can support HTC applications without major difficulty
  - Single serial batch jobs
  - Job with memory requirement within 2GB
  - A perfect solution for high throughput computing project

- ASGC Environment
  - 50 nodes (100 CPU, 200GB RAM) with Infiniband Interfaces
  - Pre-process Procedure
    - Obtain CA, Join VO, Get UI account, Environment setting
  - Job Submission
    - Grid proxy initialization
    - Submission Methods: Use EDG command or Automatic Job Submission (HPC submit)
  - Parallel Computing Support
    - Hybrid Parallel model: MPI task per node, then two OpenMP threads in a node
    - Maximum number of CPUs for a job is 48.
  - File System: both Local and Global FS
Experiences in Taiwan

• Application Push + Technology Pull
  • LHC Computing is a terrific driver

• Fail to reach critical mass in the absence of adequate networking and collaboration
  • Support of user community is critical

• Clear Technology Roadmap
  • Leverage the achievements of WLCG/EGEE
  • Don’t re-invent the wheel. Only that reaching critical mass will prevail

• Data as part of the infrastructure --> Infrastructure design must take into account of data deluge at first

• Building common e-Infrastructure to support all kind of science
  • Effective collaboration model
  • Operation Technology --> sustainable & reliable Grid services
  • Application Porting/Development Capability
  • Collaboration with regional and global partners (VO)
Asia Pacific Regional Operations Center

- **Mission**
  - Provide deployment support facilitating Grid expansion
  - Maximize the availability of Grid services

- **Supports EGEE sites in Asia Pacific since April 2005**
  - 23 production sites in 10 countries
  - Over 3,600 CPU Cores and >1.2 PB now --> >5,000 Cores, > 2PB by end 2008

- **Runs ASGCCA Certification Authority since 2003**
- **Middleware installation support**
- **Production resource center certification**
- **Operations Support**
  - Monitoring
  - Diagnosis and troubleshooting
  - Problem tracking
  - Security
Asia Federation Report

- To provide summary of developments in Asia Pacific region from ISGC annually
  - Site/Country updates
  - Status update of EGEE activities
  - Networking (NREN) Status
  - Discussion and Minute of Federation Meeting
- 946 KSI2K-Yrs (Oct’07-Sep’08)
- Service availability much improved to ~ 80% in average (23 sites)
- HEP, Biomedicine, and Earth Science are the major applications
24x7: Current Coverage

- Grid Administrators
  - Handling of complex Grid services
  - Best effort basis on nights and weekends

- Network Administrators
  - Handling of network faults, coordination of recovery, notification of affected parties
  - On-site 24x7: network administrators

- Facility Operators
  - Handling of power, cooling, security and environment issues
  - On-site 24x7: technicians

- 2007 Plans: Extend Grid Service coverage
  - Start rotation for 24x7 on-call Grid administrator coverage
  - Hire operators to extend on-site coverage to 16x7
24x7 OP (I)

Nagios
Facility Control System
Data Center Survey

Front Line Support
Fault Detection
Documentation and Tracking
Coordination
Escalation

24x7 On Call
Take on OSE off hours
Advance Support
Weekly Rotation

OSE
On Site Engineer

OCE
On Call Engineer

SM
Service Managers

EC
Emergency Contacts

MS
Monitoring Systems
Data Center Surveys

Data Center Survey
Escalate: Immediate

Non Standard Faults
Escalate: <30 mins

Advanced Faults
Escalate: <1hr

Emergency: Major outage, Damage, Disaster, Injury
From MS & OSE
Escalate: Immediate

Final Line of Support
SM for each service

Contacted when:
Major outage
Damage to Facility/Hardware
Disaster or Injury

Academia Sinica Grid Computing
Long Term Operations

- Establish domestic CA if none exists
- Increase availability and resource levels
- Establish domestic operations structure
  - Operations procedures
  - Tools: monitoring and notification, ticketing system
  - User and administrator support
- Training for administrators and users
- Collaborate with APROC in Regional operations
- Support VOs of application development and production service separately
e-Science in Asia

- Diversity:
  - Geographically large and culturally diverse in nature
  - Level of scientific collaboration is reflected by the networking connectivity
  - The region as a whole traditionally inexperienced in regional cooperation

- Grids in Asia
  - Inhomogeneous Grids with limited operations experience, making collaboration difficult.

- Why e-Science in Asia?
  - The global infrastructure is establishing quickly
  - Take advantage of sharing and collaboration to bridge the gap between Asia and the world
  - To address the challenge of regional cooperation

- EGEE Asia Federation and EUAsiaGrid
  - EGEE AF is growing with EGEE, and will focus on regional scientific collaborations
  - EUAsiaGrid is to empower scientific collaboration throughout Asia
  - Demonstrate vigorous synergy with 23 EGEE sites and >5,000 CPU Cores and > 3 Peta Bytes disk space for 12 VOs by end 2008.
NGI and Regional/Global Collaboration

- **Worldwide efforts**
  - Building critical mass
  - QA with SLA
  - Resource integration and interoperation
  - Standardization and Best Practice
  - Supporting mechanism for operation, application and users

- **NGI**
  - Find the best business model while pertaining ROI
  - Taking care of local user communities
  - Facilitate int’l collaboration on e-Science
  - Maintain a sustainable e-Infrastructure and e-Science applications
  - Must have seed money for early industry adoption
  - Need incentive program to encourage universities participation
Summary

• e-Science envisages a whole new way of doing collaborative science
• For the sustainable Grid e-Infrastructure, we have to focus more on community building rather than just offering technologies.
• Asia Pacific Region has great potential to adopt the e-Infrastructure:
  • More and more Asia countries will deploy Grid system and take part in the e-Science world
  • However, applications of and for the Asia Pacific scientists are largely in lack which is crucial!!
• Extending from EGEE Asia Federation to EUAsiaGrid, we are widening the uptake of e-Science, by the close collaboration regionally and internationally
Backup Slides
Challenges

• Fail to reach critical mass in the absence of adequate networking and collaboration
• Develop a long-term strategy to
  • Manage changes
  • Assimilate new ideas, such as Web 2.0, Community intelligence, etc.
  • Education, training, and outreach
• Provenance not only of data but of intellectual property (IP)
• Security: both technical and social impacts
• Application Driven := Pull of User Requirements + Push of Technology
• Collection-based science is emerging but the culture and infrastructure is not ready in Asia
More on e-Science Applications

- Adopt a support (and service) model consistent with a sustainable grid infrastructure.
  - Provide user/community support services.
  - Interact with and take advantage of VO efforts.
  - Provide coordination between actors.
  - Application Porting Support

- Community Building: Discipline-specific coordination
  - Discipline specific (common data, tools, etc.) support: requirement, service and dissemination
  - Highlight tools/techniques to address those needs

- Application Specific Services
  - Mechanism to highlight useful products that will work with e-Infrastructure
  - Ensure “external” software provides support to user community
New Applications in Taiwan

- Carbon Flux is for ITER as well?
e-Science grid perspective
e-Science grid perspective

Grid infrastructure in Baltic region, making gLite, UNICORE and ARC resources interoperable
e-Science grid perspective

Grid infrastructure in Baltic region, making gLite, UNICORE and ARC resources interoperable

High capacity, production-quality, scalable e-Science grid facility for Europe and Latin American
e-Science grid perspective

Grid infrastructure in Baltic region, making gLite, UNICORE and ARC resources interoperable

High capacity, production-quality, scalable e-Science grid facility for Europe and Latin American

Disseminate/train EGEE middleware in Asia, support scientific applications and creation of VOs
e-Science grid perspective
e-Science grid perspective

VOs on seismology, meteorology and environment, supported by south-eastern Europe grids
e-Science grid perspective

VOs on seismology, meteorology and environment, supported by south-eastern Europe grids

Grid for European neuroscientists working in the field of imaging of Alzheimer’s disease
e-Science grid perspective

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Modelling capabilities for ITER and future fusion devices using parallel Grid computing and HPC
e-Science grid perspective
Remote instrumentation infrastructure for various communities (earthquake, environment,...)
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Expand availability, flexibility and efficiency of services for grid and distributed software quality
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Expand availability, flexibility and efficiency of services for grid and distributed software quality

Integrate Service and Desktop grids, identify new users/resource providers, favour collaborations
e-Science grid perspective
Foster Grid adoption (science and enterprise), articulate European requirements towards standards
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Report success stories to policy makers in government/business, to scientific community/public
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Establish long-term sustainability of grid infrastructures in Europe (new organisational model)
Summary

Grids are all about sharing

- they are a means whereby groups distributed around the world can pool their computing resources
- large centres and small centres can all contribute
- users everywhere can get equal access to data and computation
- without having to spend all of their time seeking out the resources

Grids also allow the flexibility to place the computing facilities in the most effective and efficient places –

- exploiting funding wherever it is provided,
- piggy-backing on existing computing centres,
- or exploiting cheap and renewable energy sources

The LHC provides a pilot application –

- with massive computing requirements, world-wide collaborations
- that is already demonstrating that grids can deliver in production

and the scientific success of LHC will depend on the grid from day 1