

THE POSSIBILITIES ARE INFINITE FUITSU

Japanese Grid Initiatives and Future Directions

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Hiro Kishimoto, Ph.D.

Senior Research Fellow, Fujitsu Laboratories Ltd. Visiting Professor, National Institute of Informatics Member of the Board, Open Grid Forum

Outline





National Research Grid Initiative: NAREGI



Open Grid Services Architecture



Grid Computing for Financial Services



National Research Grid Initiative: NAREGI



National Research Grid Initiative



NAREGI Project Overview



- R&D project funded by Ministry of Education, Culture, Sports, Science and Technology (MEXT)
 - FY2003 ~ FY2007
 - 2 B Yen(~17M US\$) budget in FY2003
- Collaboration of National Labs., Universities and Industry in the R&D activities
 - IT and Nano-science Applications
- Merged into the Next Generation Supercomputer Project: Petascale computing
 - FY2006 ~



NAREGI Project Goals



- Develop a Grid Software System as the prototype of future Grid Infrastructure in scientific research in Japan
 - R&D in Grid Middleware and Upper Layer
- Provide a Testbed to prove that the High-end Grid Computing Environment can be practically utilized by the nano-science research community over the SINET3
- Participate in International collaboration/Interoperability among U.S., Europe, and Asian Pacific
 - Grid Interoperation Now Community Group (GIN-CG) in OGF
 - Contribute to Standardization Activities
 - Open Grid Forum, OGSA-WG, JSDL-WG, GFS-WG, GLUE-WG, ACS-WG...



NAREGI Grid Middleware









Grid PSE and Workflow Tool



- Grid Problem Solving Environment (PSE)
 - Support for compilation and deployment
 - Execution support
- Grid Workflow Tool



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Nano-science App: Electronic Structure in Solution



RISM <u>R</u>eference <u>Interaction</u> <u>Site</u> <u>M</u>odel

Fragment Molecular Orbital method

FMO

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source: Prof. Aoyagi (Kyushu Univ.)



Timeline of NAREGI Grid Middleware







Grid Operation Center







Cyber Science Infrastructure Plan







- Access to Petascale computing
- National SC Grid by Cyber Science Infrastructure
- Laboratory Level by E-Science Grid project

e-Science Grid Project



Share and collaborate among National Infrastructure Systems and Laboratory Level Systems to form research VOs





Open Grid Services Architecture



OGSA Based Open Source Grids



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Numerous grid projects are implementing OGSA components

The Open Grid Services Architecture



- An open, service-oriented architecture (SOA)
 - Resources as first-class entities
 - Dynamic service/resource creation and destruction
- Built on a Web services infrastructure
- Resource virtualization to hide complexities
- Build grids from small number of standards-based components
 - Replaceable, coarse-grained
 - e.g. brokers, scheduler
- Customizable
 - Support for dynamic, domain-specific content...
 - ...within the same standardized framework

SOA & Web Services: Key Benefits





Virtualizing Resources



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OGSA Capabilities





OGSA Document Structure





Phase #1 of OGSA-WG Activities



- Gather key GRID usecases and develop high level architecture
- Too abstract, no interoperability among implementations



Phase #2 of OGSA-WG Activities



- Develop multiple basic & tangible component specifications in parallel
- Value of specs is not visible to end users



Phase #3 of OGSA-WG Activities



- Describe how to use OGSA specs by Independent Software Vendors (ISV)
- Promote OGSA specs adoption by Grid middleware Projects



ISV Remote Computing Usage Primer



- Core set of established interoperable specs.
- Allows ISVs to build applications that:
 - Can connect to any 'standard' infrastructure
 - Run from mobile clients in network environments





Grid Computing for Financial Services



🗩 Grid Consortium Japan



- Promoting GRID technologies in Japan
 - Research results and industrial best practices
 - International GRID standards
- Established <u>2002</u>, operational managed by AIST
 - President
 - Satoshi Sekiguchi, Director, Information Technology Research Institute, AIST
 - Vice President
 - Dr. Hiro Kishimoto, Fujitsu and Dr. Shinichi Mineo, RIKEN
 - OGF <u>regional affiliate</u> <u>organization</u>
 - 41 corporate members (venders and users) and 104 individual members (academic)
 - 4 workshops and 6 technical tutorials per year + Working group activity



AIST: Advanced Industrial Science and Technology

Financial Services Group



Background

- Most of FS firms in London & New York already deployed large Grid platforms and are in production
- FS firms in Tokyo have very few GRID deployments
- In order to gain world-class competitive edges and create business opportunities, Japanese FS firms come to Grid technologies

Purpose

- Help Japanese FS firms to <u>advance their IT systems</u> by sharing best practices of grid technologies in US and UK
- Gather user requirements and develop generic reference model architecture of Grid for FS
- Share case studies and hardware / software products/solution information

Group Activities



Group member

- Mega banks, Major securities companies, …
- System vendors, Slers, ISVs, ...

Topics

- Users show their IT system architecture (GRID and non-GRID)
- Target application identification
 - Benchmark program development
- Technology/solution workshop by vendors
- Parallelization / Gridification of Applications
- F2F meeting
 - Once or twice per month
 - More than 30 attendees

Target Application Identification





- 1^{₅t} Target ■ Risk an
 - Risk analysis application
- 2nd Target 🛛 💻 Market date feed
 - Retail transaction: Net trading & on-line banking
 - Insurance rate making

Benchmark Program Development

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- Risk analysis application
 - Define common application architecture
 - List up key parameters which determine output accuracy and execution performance
- Community Source Software
 - Java program
 - Grid Middleware
 - Scheduler: SGE+Condor, Platform Symphony, Data Synapses GridServer
 - Data services: Oracle Coherence, GigaSpaces
 - Run on real grid servers (400 core)



Conclusion





NAREGI middleware v1.0 is avalilable and it will expand to reach Petascale, CSI, and LLS



OGSA and OGF define multiple key specifications and **OGF** they are implemented by major Grid Projects world-wide



FS group is collaboratively developing cook-book and benchmark programs to promote GRID adoption in Japan

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