

NAREGI Grid Middleware and the Operational Issues

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Outline

■ introduction

■ NAREGI grid middleware

- overview
- lessons learned from beta version (through NAREGI-EGEE interoperation)
- standards in the middleware

■ deployment

- Cyber Science Infrastructure (CSI)
- deployment plans
- Grid Operation

NAREGI Project Overview

- R&D project for grid middleware
 - funded by MEXT (Ministry of Education, Culture, Sports, Science and Technology)
FY2003 – FY2007
- collaboration of national labs, universities and industry in the R&D activities (IT and Nano-science Apps.)
- the Grid layer in the Cyber Science Infrastructure (CSI)

Project Goals

■ middleware development

- R&D in Grid Middleware and Upper Layer
- a prototype of future Grid Infrastructure for scientific research in Japan

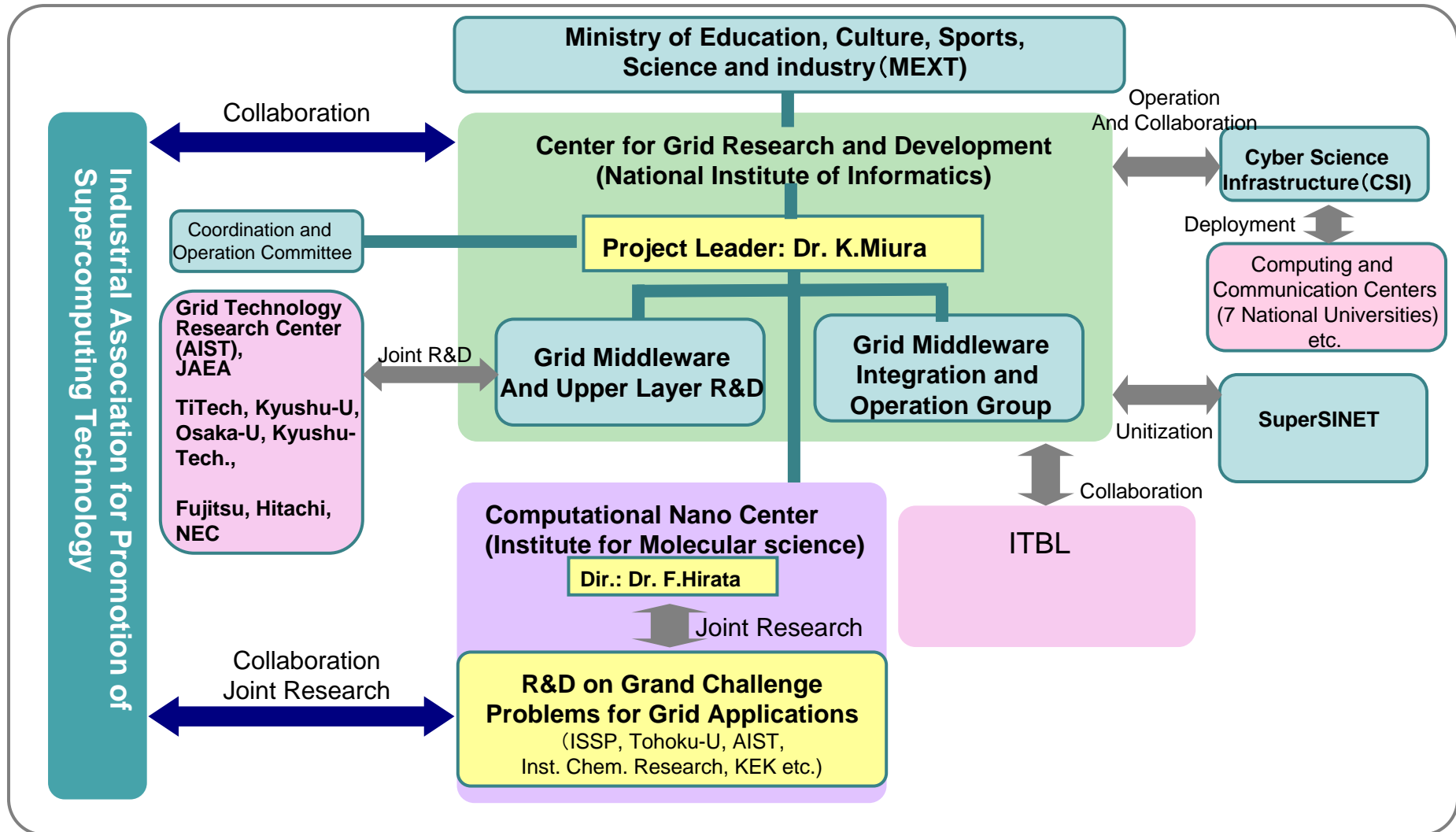
■ testbed

- grid computing testbed for nano-science application

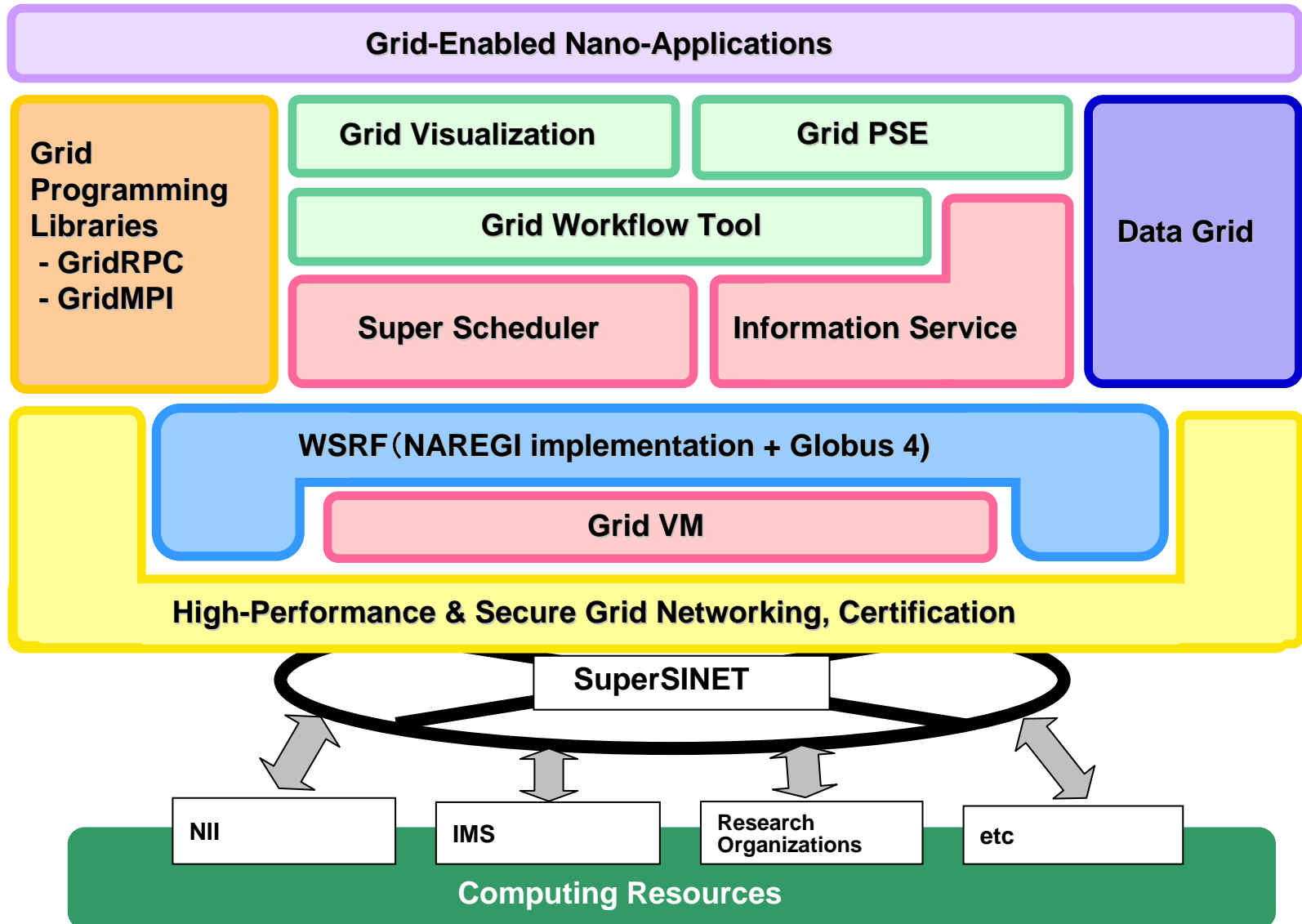
■ international collaboration

- OGF
- EGEE

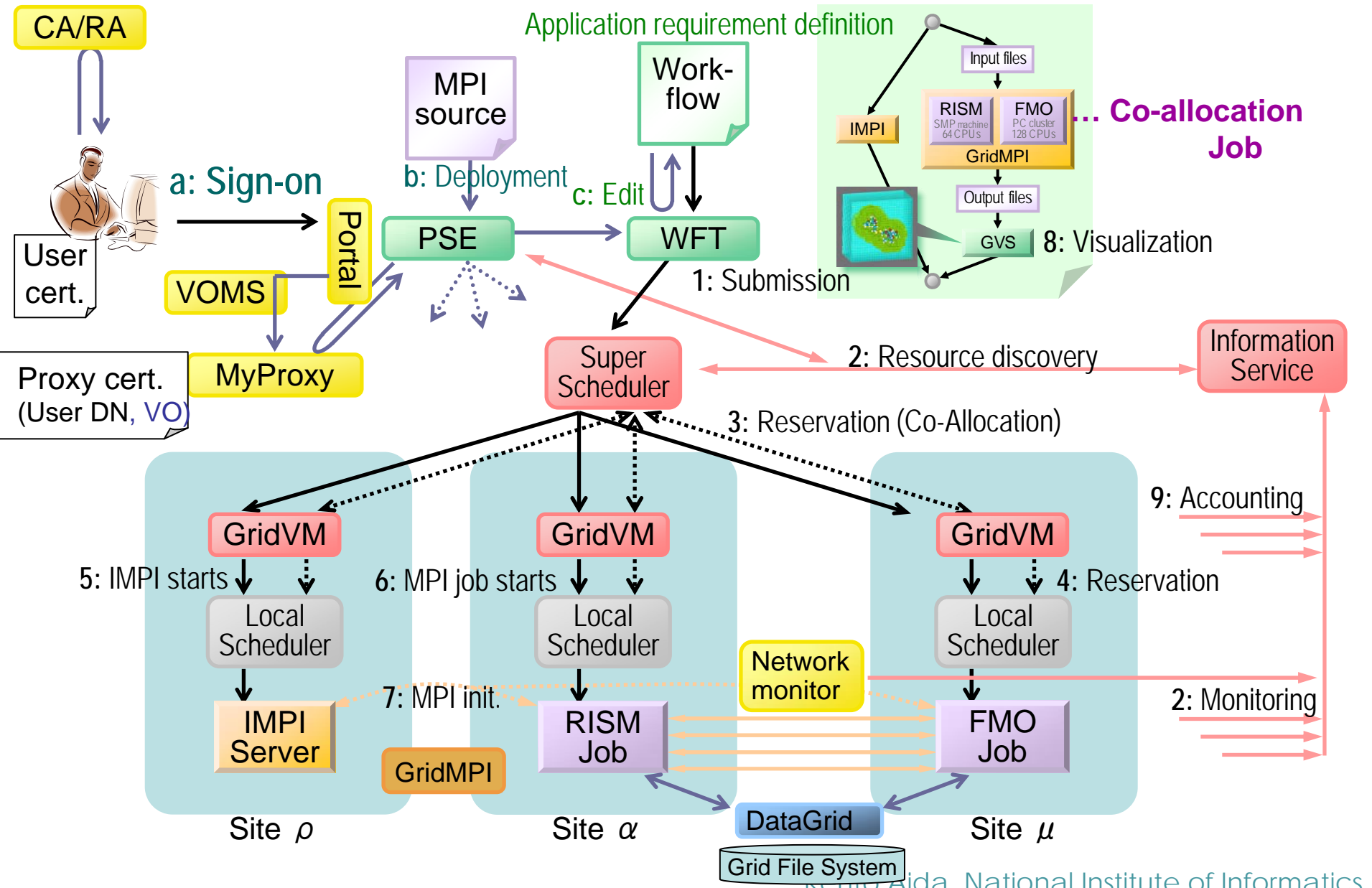
Organization



NAREGI Software Stack



Job Execution Scenario



Programming

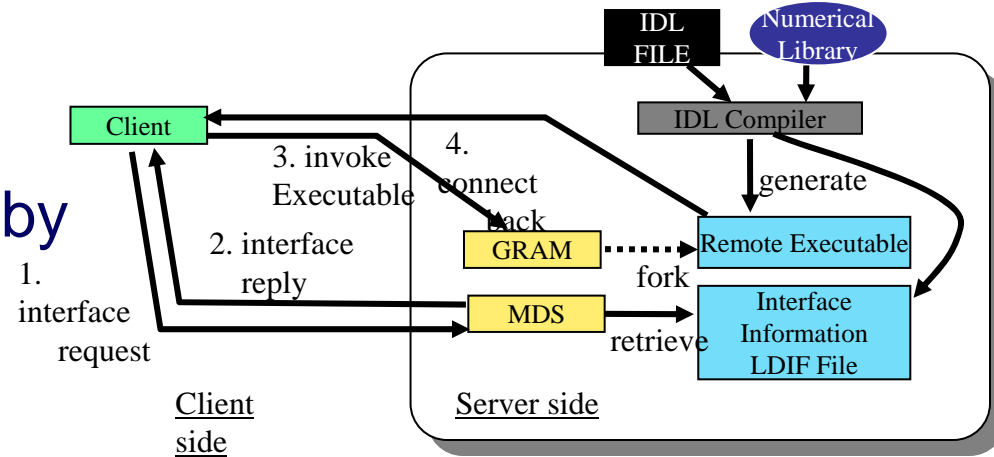
■ GridRPC

➤ RPC on the grid

- ✓ API standardization by OGF

➤ Ninf-G

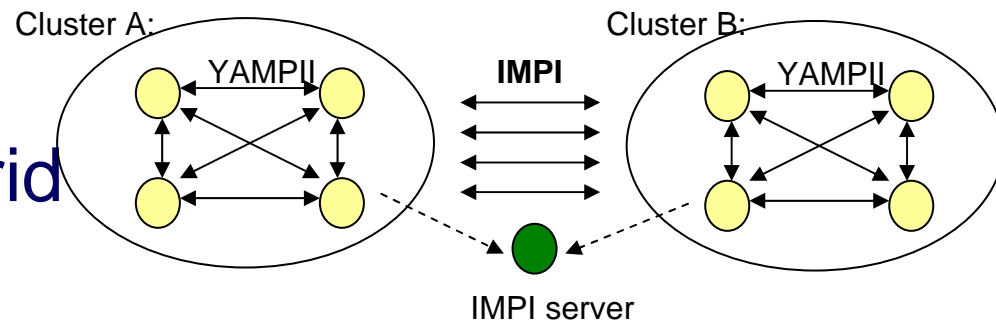
- ✓ a reference implementation of GridRPC API



■ GridMPI

➤ MPI library on the grid

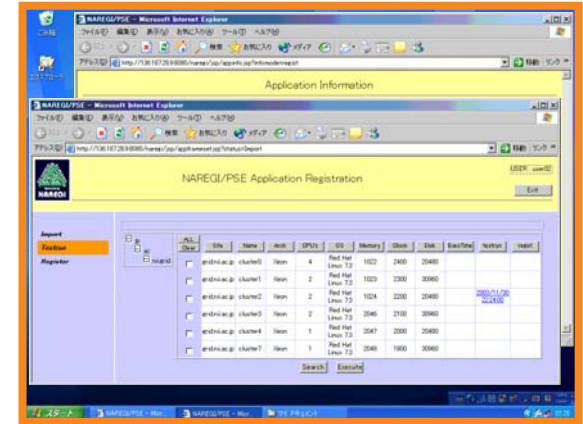
- ✓ MPI communication between parallel systems on the grid



User-Level Grid Tools & PSE

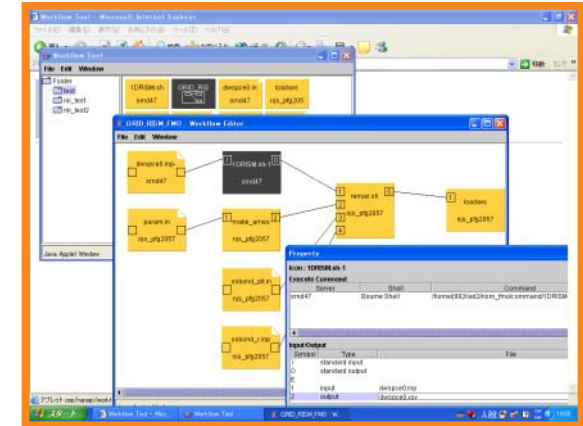
■ Grid PSE

- support for compilation and deployment
- execution support



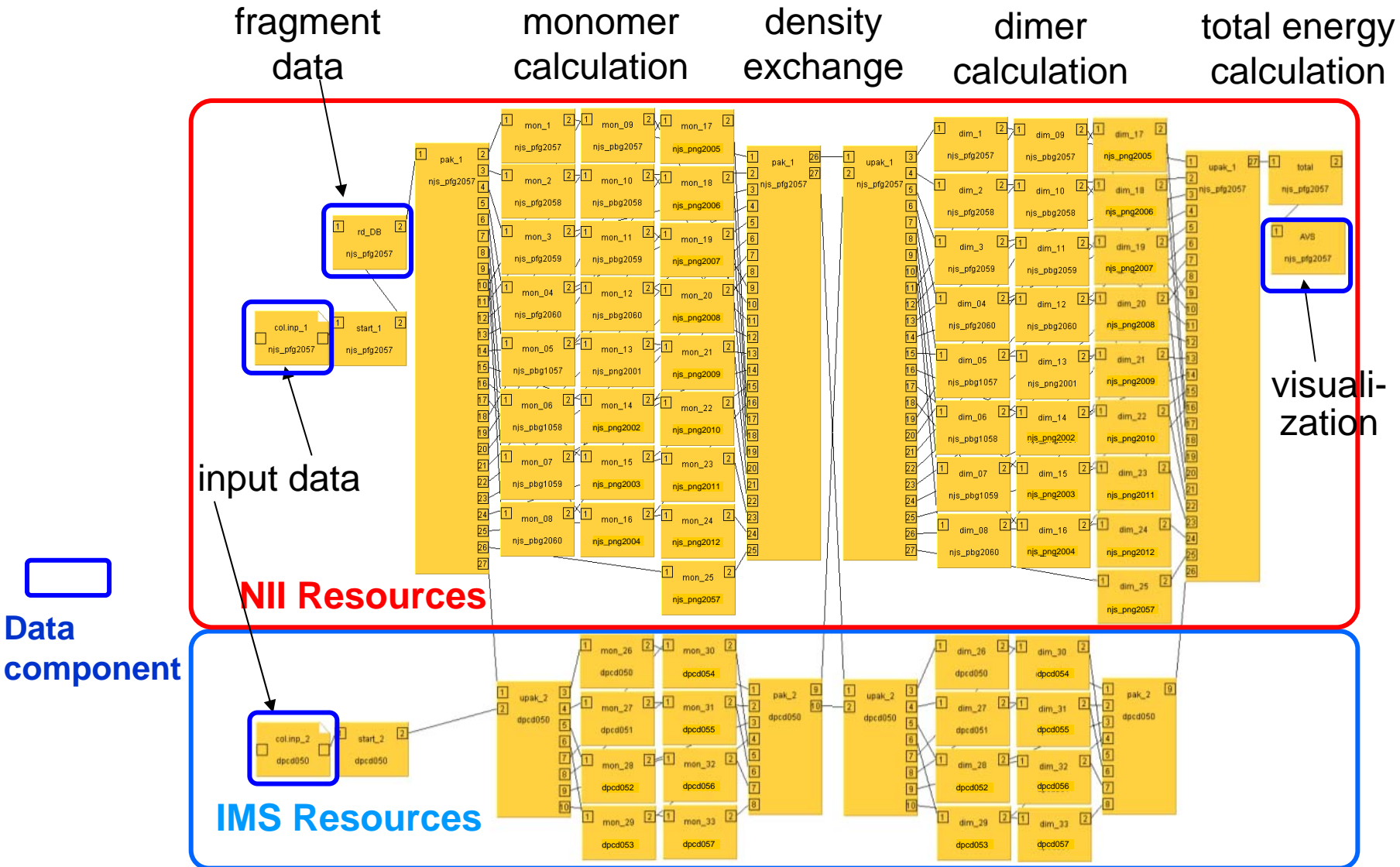
■ Grid Workflow

- workflow language
- GUI

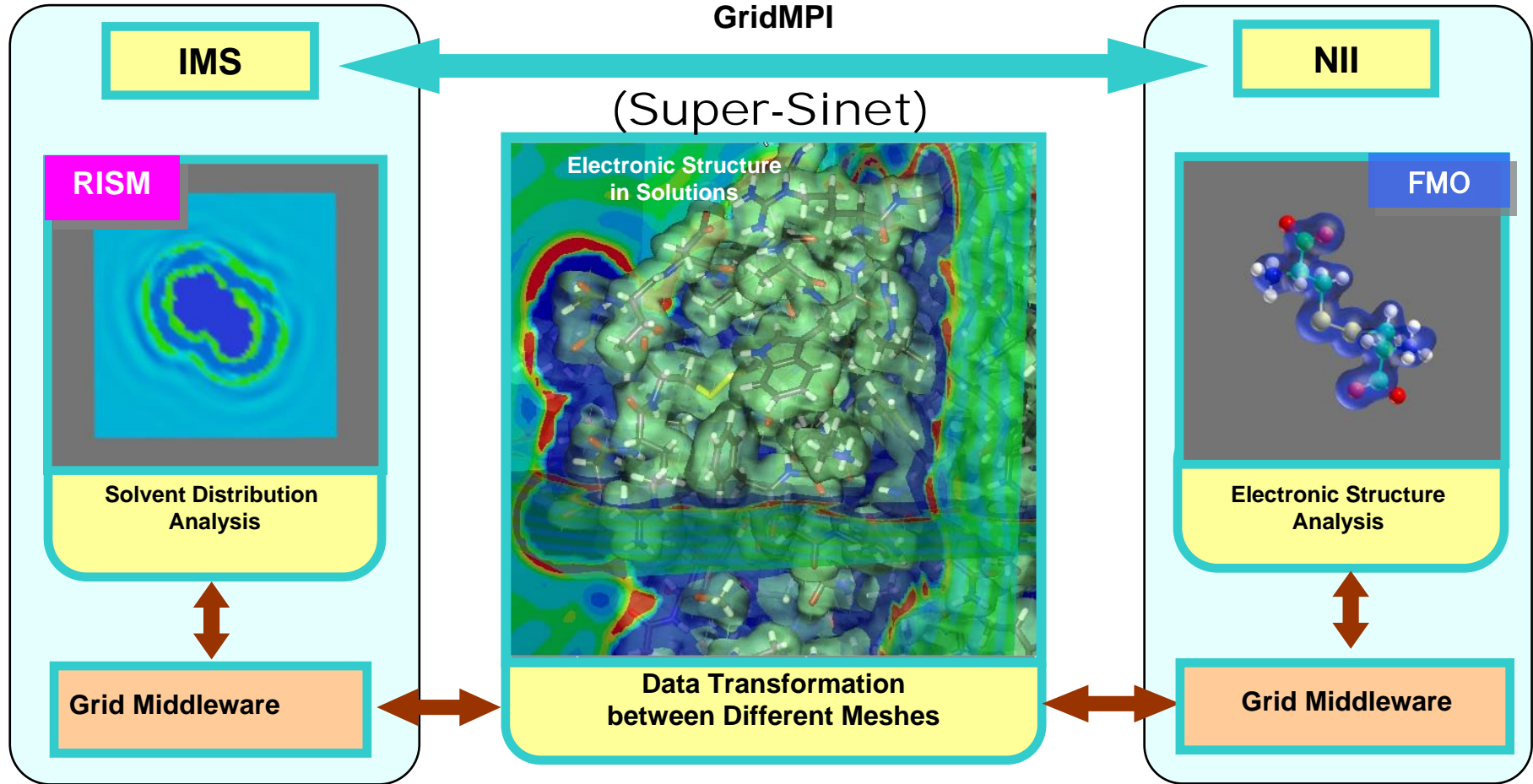


Workflow based Grid FMO

Simulations of Proteins



Adaptation of Nano-science Applications to Grid Environment



RISM

Reference Interaction Site Model

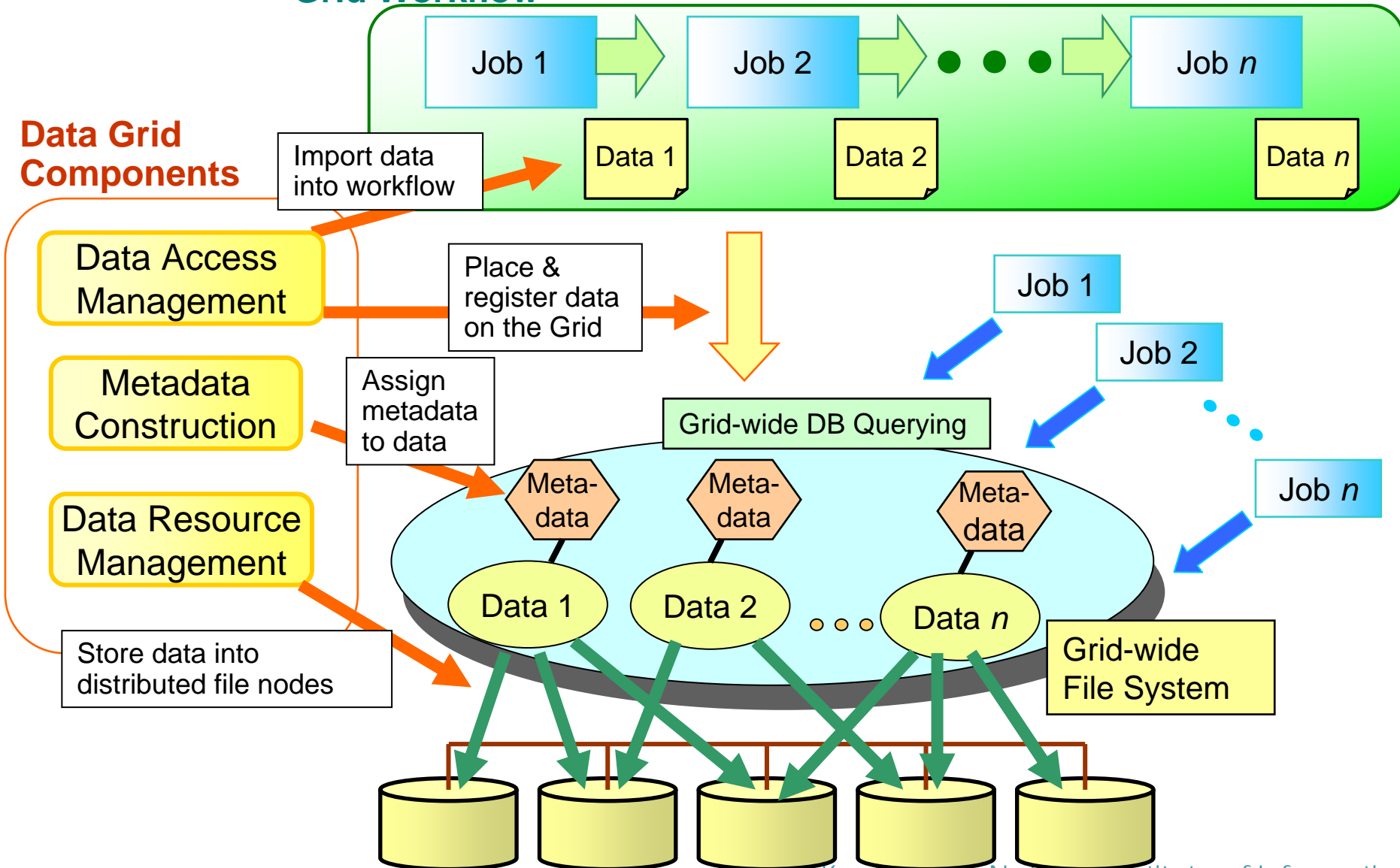
FMO

Fragment Molecular Orbital method

NAREGI Data Grid Environment

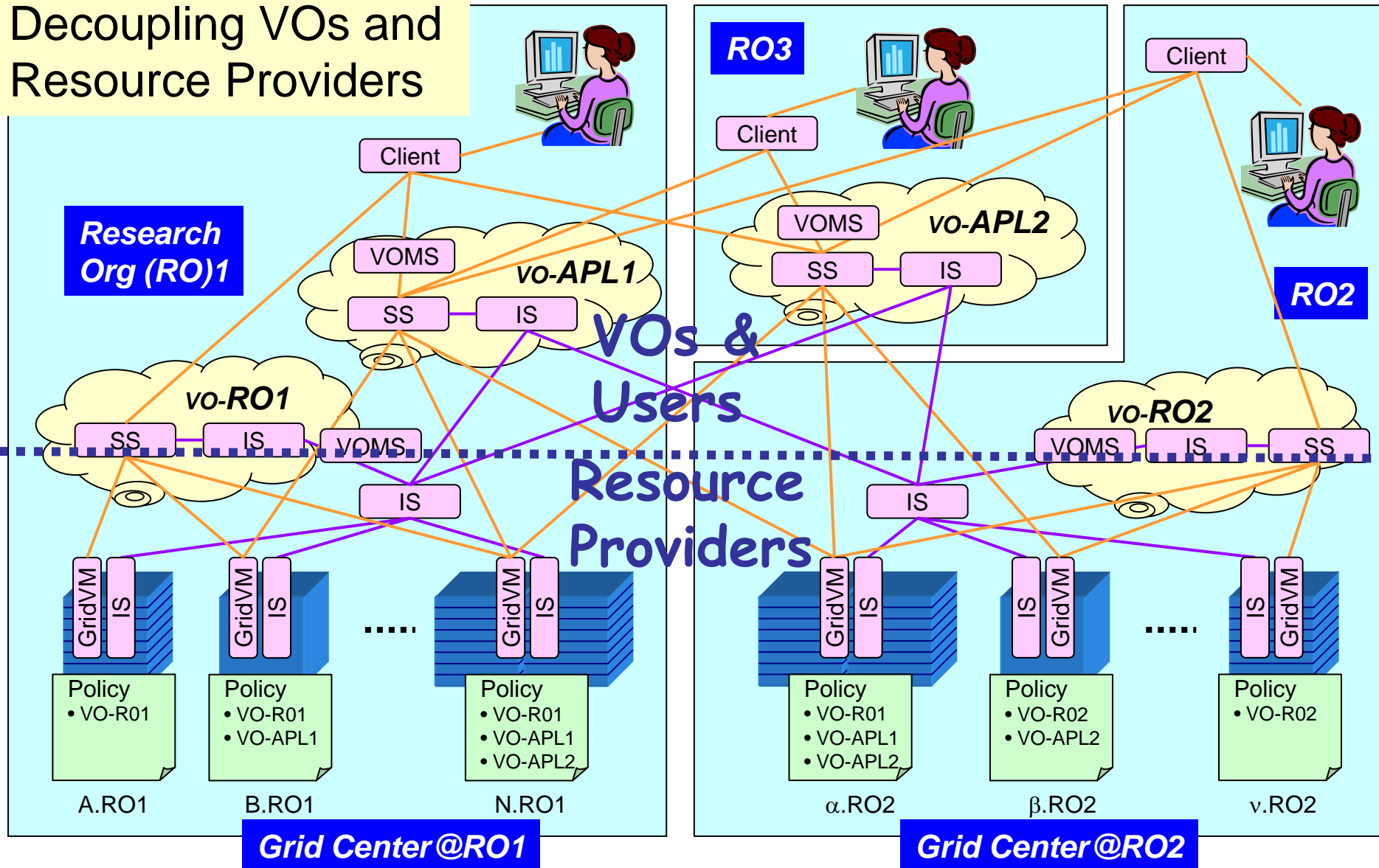
Grid Workflow

Data Grid Components

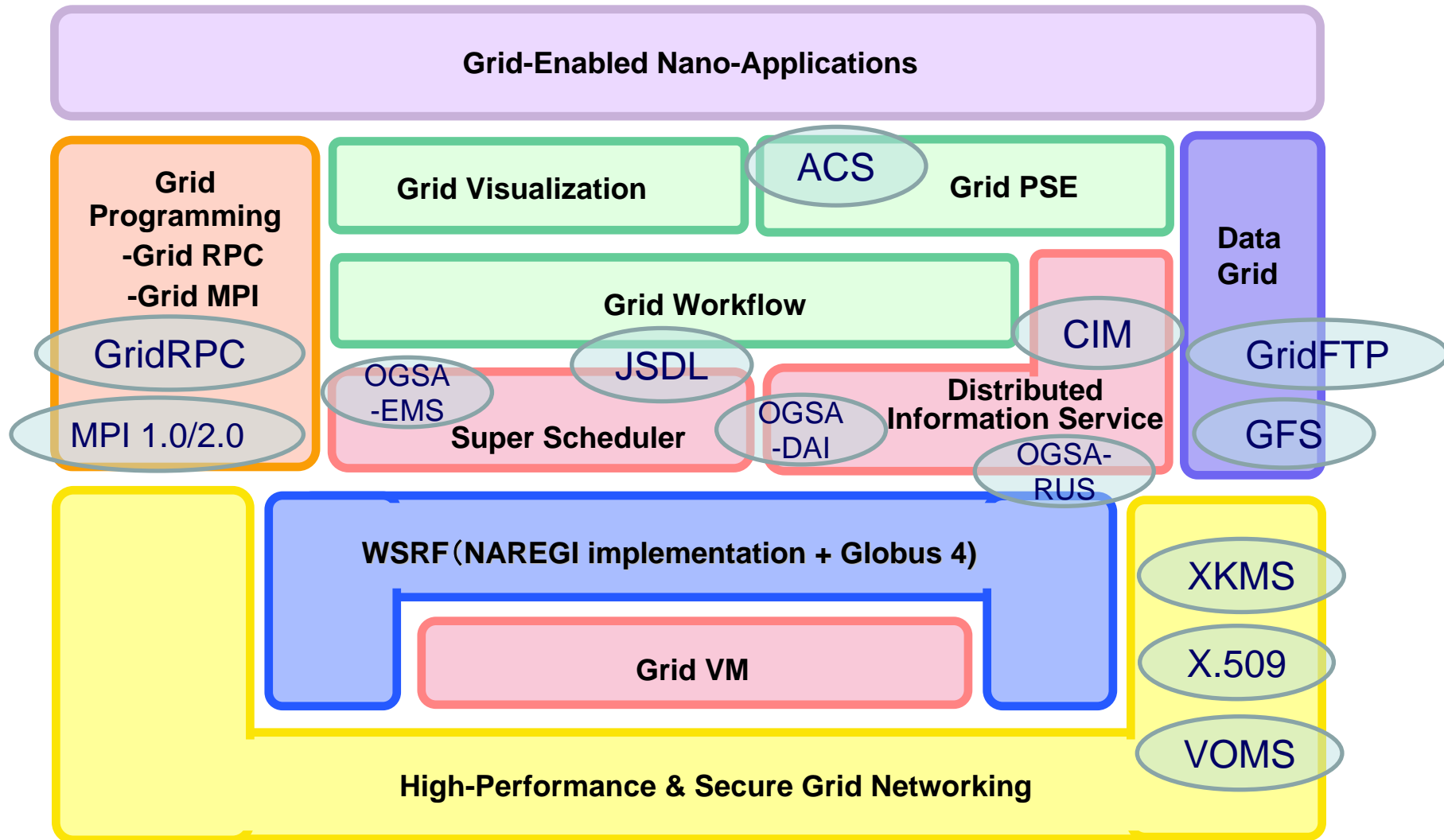


VO Service

Decoupling VOs and Resource Providers

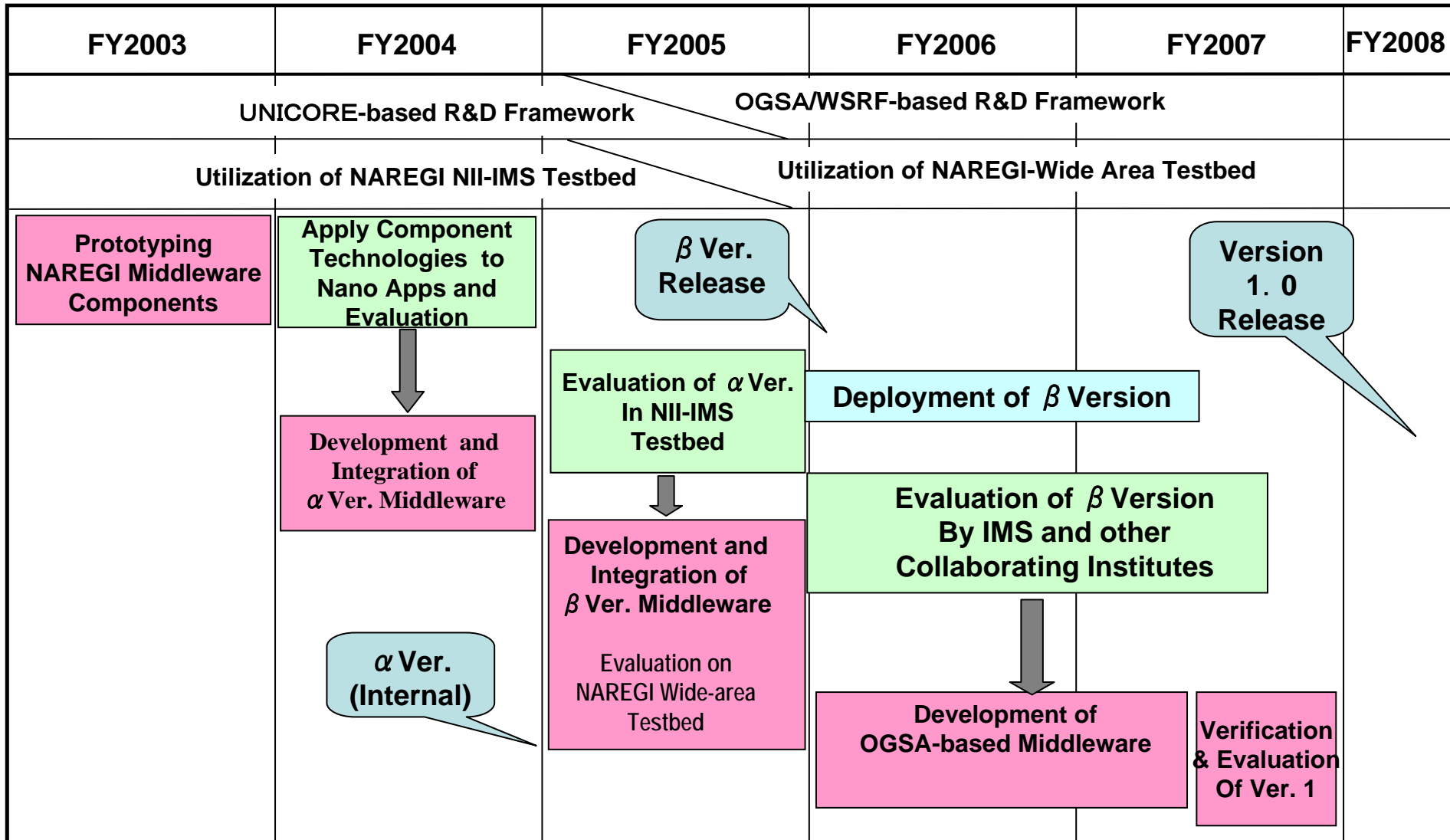


Standards in NAREGI



WSRF : web service modules

Roadmap of NAREGI Grid Middleware



Lessons Learned from NAREGI Beta

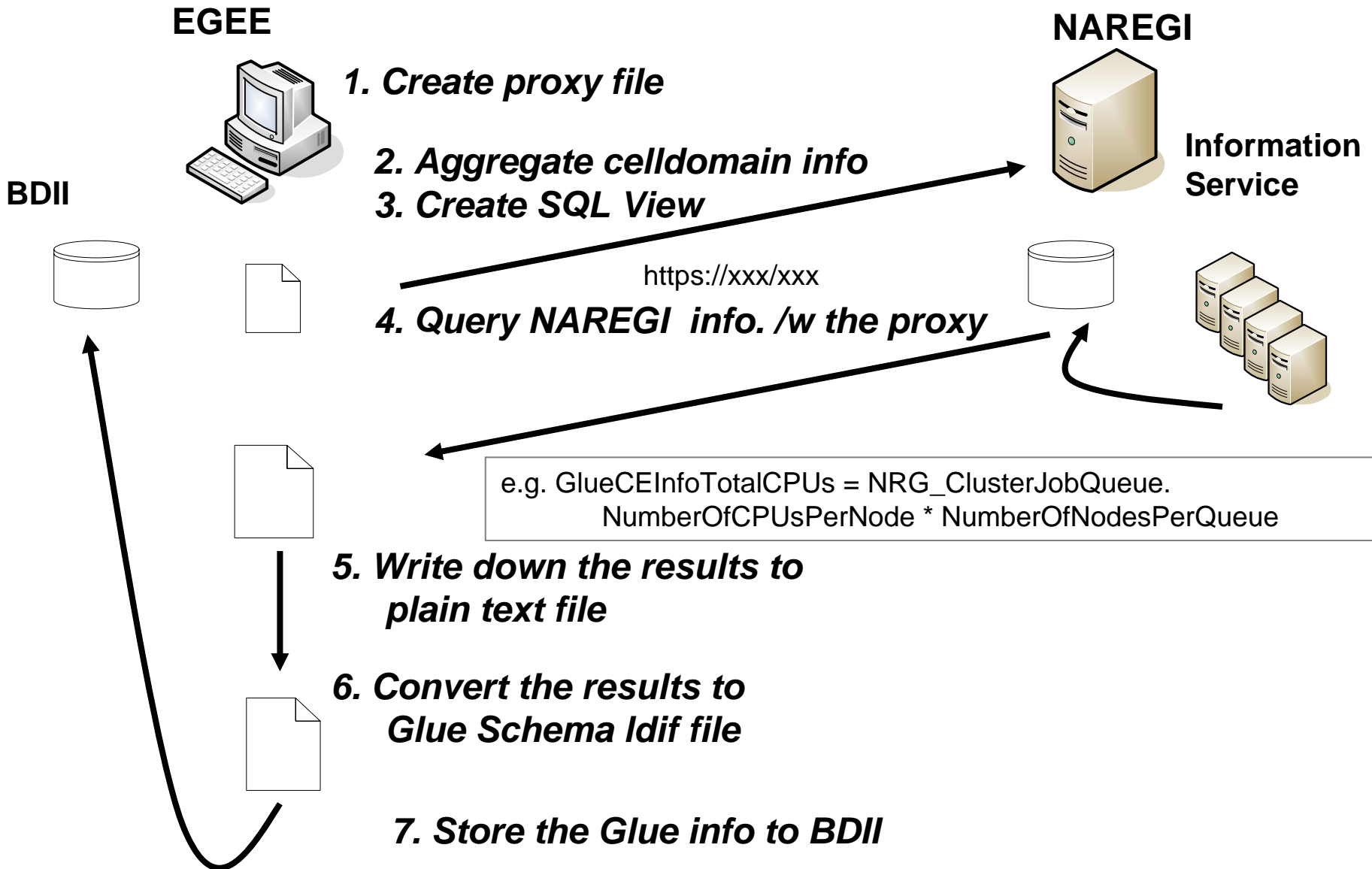
■ interoperability

- NAREGI developed EGEE-NAREGI island as an activity of GIN
 - ✓ Bilateral information exchange
 - ✓ Bilateral job submission
 - ✓ Bilateral file exchange
 - ✓ Interoperable security properties

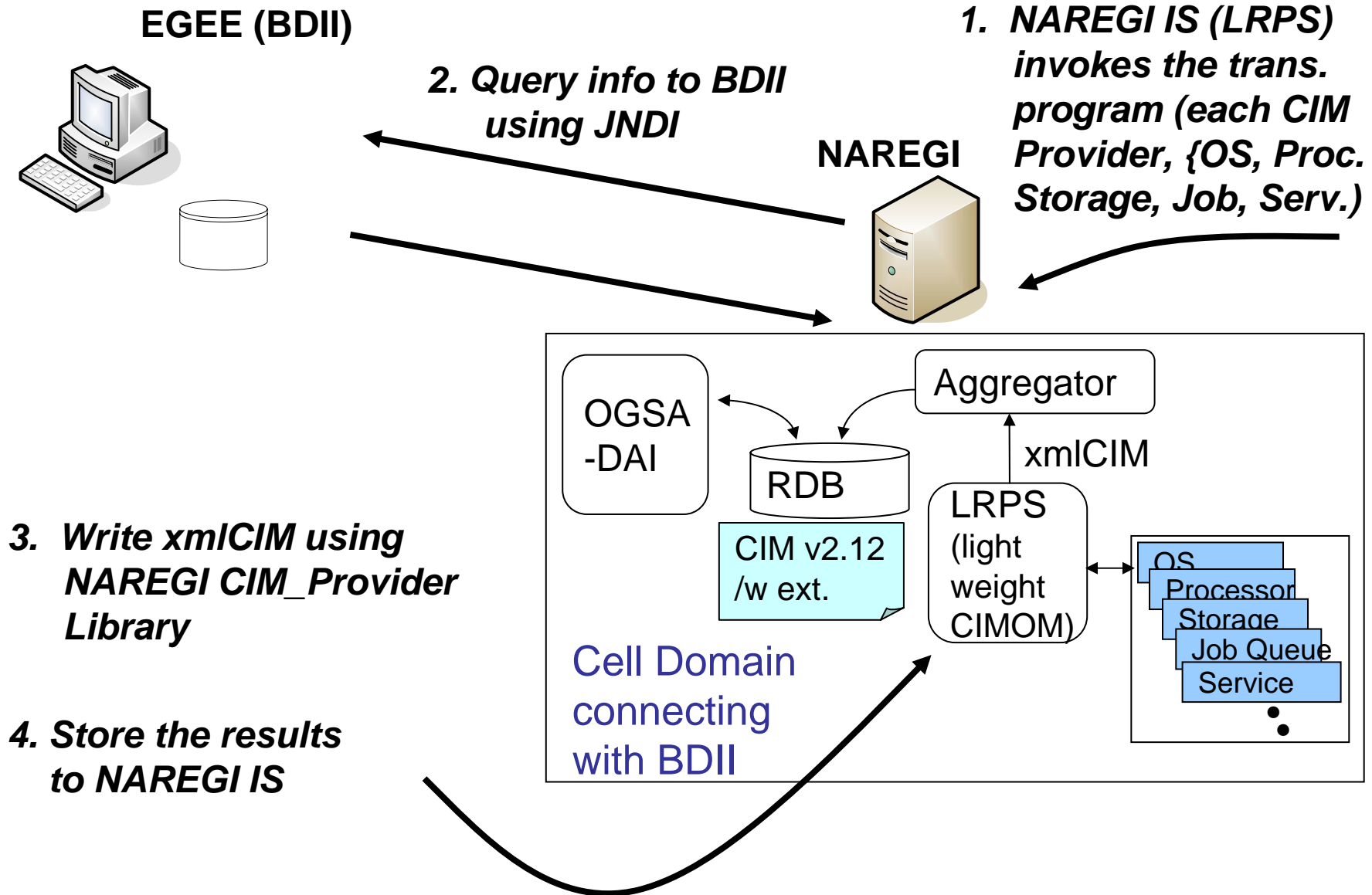
■ toward production use

- coexistence of multi-type jobs
 - ✓ reservation/non-reservation/local batch jobs
 - ✓ bulk jobs
- ease of installation
- stability...

GIN-info: NAREGI → EGEE

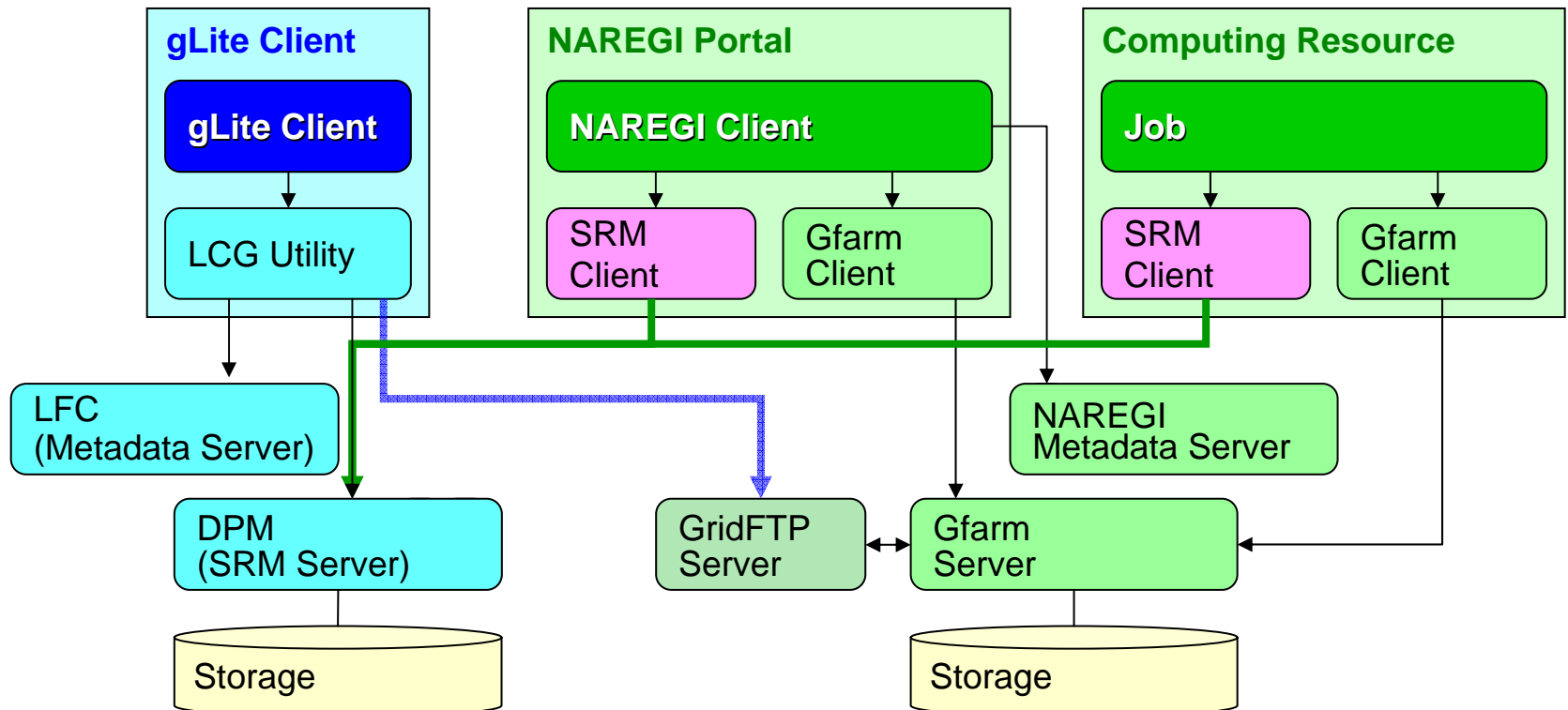


GIN-info: EGEE → NAREGI



GIN-data: Architecture

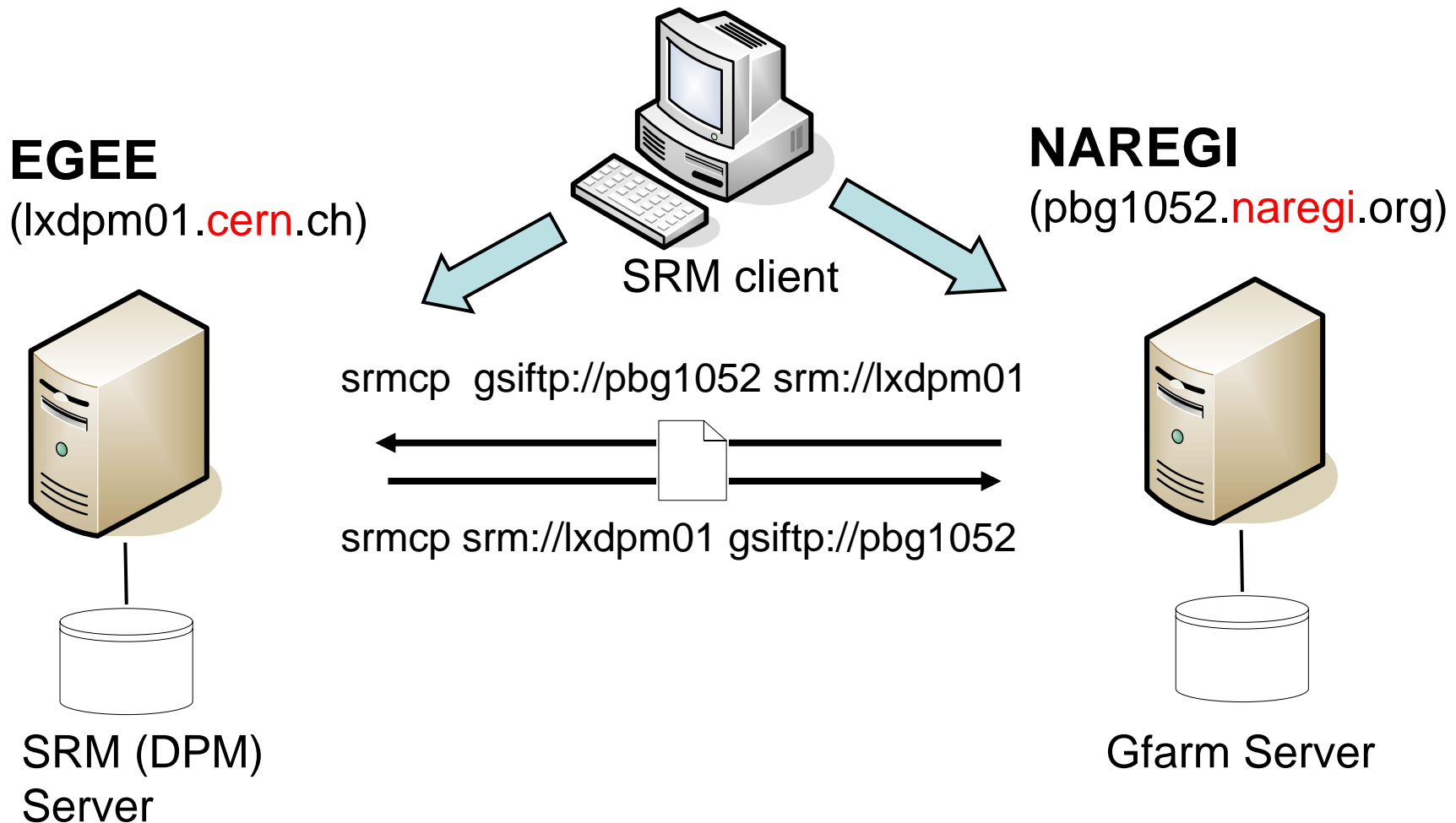
- NAREGI and EGEE gLite clients can access to both data resources (e.g., bi-directional file copy) using SRM interface.
- GridFTP is used as its underlying file transfer protocol.
- File catalog (metadata) exchange is planned.



GIN-data: SC06 Demonstration

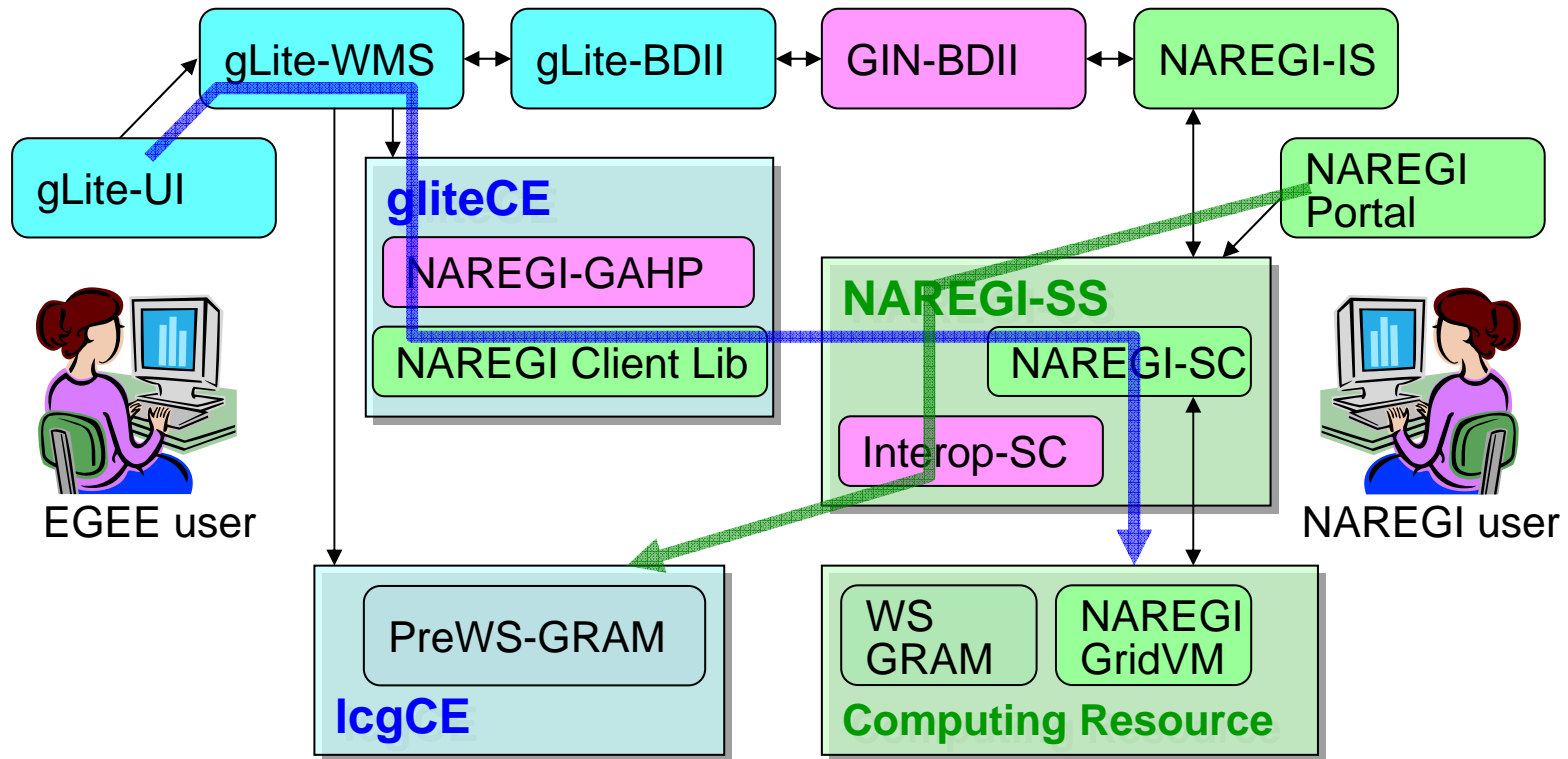
(NAREGI → EGEE and EGEE → NAREGI File Copy)

SRM copy (srmcp) command was ported in NAREGI.
Bi-directional file copy can be performed by srmcp.



GIN-jobs: NAREGI-EGEE Job Submission

Architecture



Demo

- NAREGI → EGEE: using NAREGI Workflow
- EGEE → NAREGI: using glite WMS commands

Cyber-Science Infrastructure for R & D

Cyber-Science Infrastructure (CSI)

NAREGI
Outputs

NII-REO (Repository of Electronic Journals and Online Publications)

GeNii (Global Environment for Networked Intellectual Information)

Virtual Labs
Live Collaborations

Deployment of NAREGI Middleware

UPKI: National Research PKI Infrastructure

**SuperSINET and Beyond:
Lambda-based Academic
Networking Backbone**

Restructuring Univ. IT Research Resources
Extensive On-Line Publications of Results

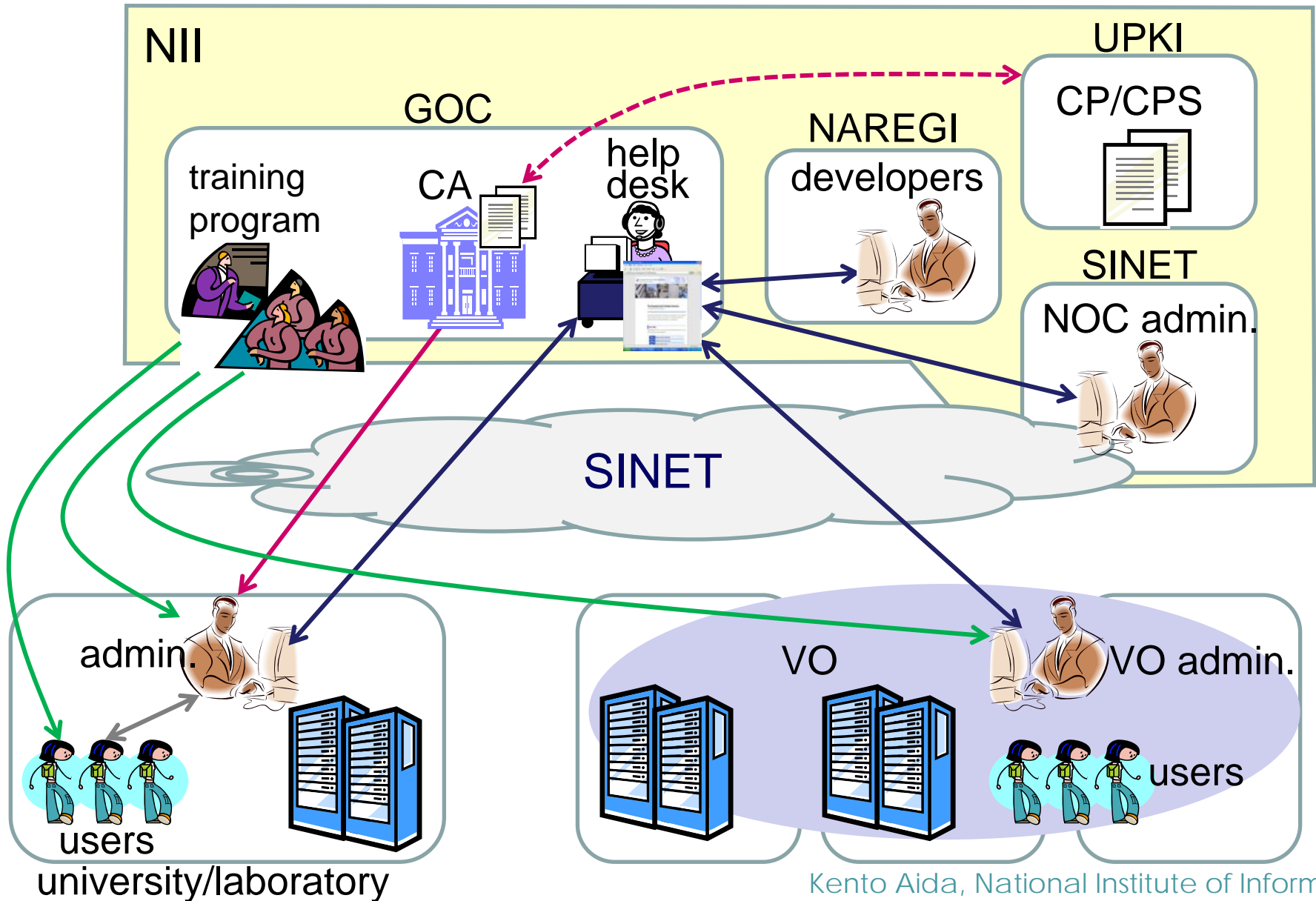
Industry/Societal Feedback

International Infrastructural Collaboration

Deployment Plan

- High Energy Accelerator Research Organization (KEK)
 - HEP application
- National Astronomical Observatory of Japan
 - virtual observatory
- Institute for Molecular Science
 - nano-science application
- Osaka University
 - computing service, certificate authority
- Tokyo Institute of Technology
 - computing service on TSUBAME

Grid Operation Center (plan)



Summary

■ NAREGI

- NAREGI middleware realizes to built a virtual single computing environment on geographically distributed and storage resources.
- NAREGI middleware ver.1 will be released in 2008 (2Q).

■ next step

- The NAREGI deployment phase is starting in 2008.
- NII plans to operate GOC.