



# NAREGI The Japanese National Research Grid & Networking Infrastructure

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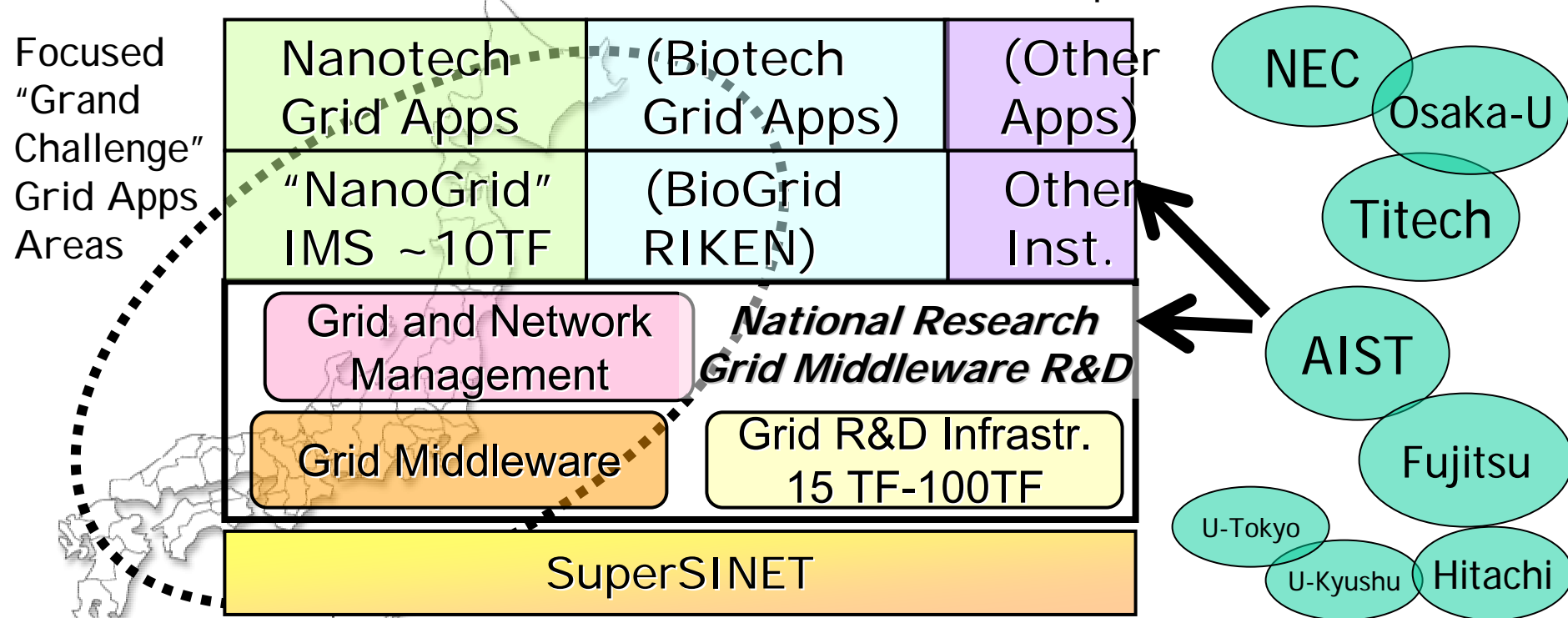
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# National Research Grid Infrastructure (NAREGI) 2003-2007

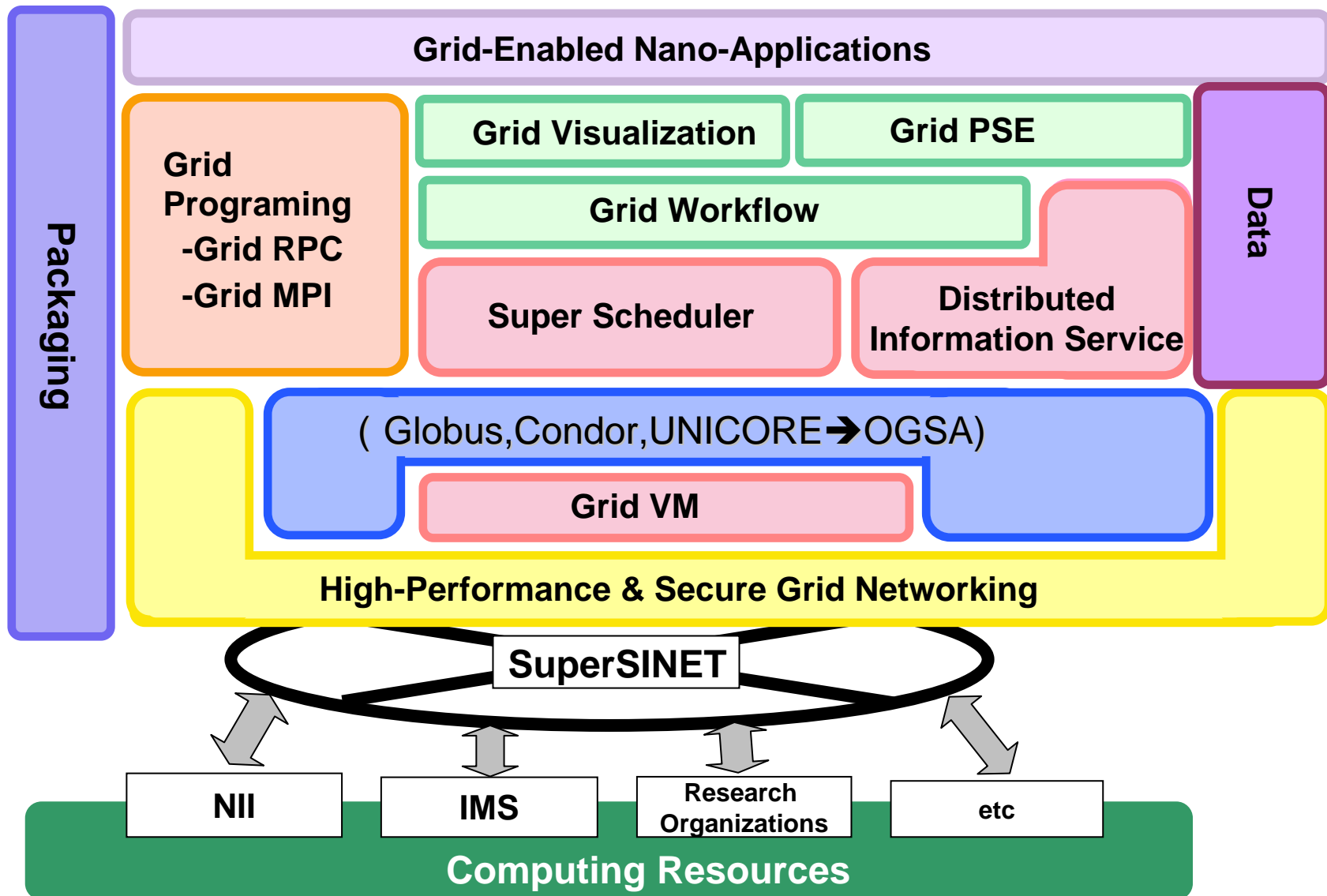
- Petascale Grid Infrastructure R&D for Future Deployment
  - \$45 mil (US) + \$16 mil x 5 (2003-2007) = \$125 mil total
  - Hosted by National Institute of Informatics (NII) and Institute of Molecular Science (IMS)
  - PL: Ken Miura (Fujitsu → NII)
    - Sekiguchi(AIST), Matsuoka(Titech), Shimojo(Osaka-U), Aoyagi (Kyushu-U)...
  - Participation by multiple (>= 3) vendors, Fujitsu, NEC, Hitachi, NTT, etc.
  - Follow and contribute to GGF Standardization, esp. OGSA



# More Details...

- My Keynote talk tomorrow morning (9:00-10:30 Jan 23, second talk)
  - "Towards a Petascale Research Grid Infrastructure in 2010 "
- My Grid Workshop talk tomorrow (14:00-14:30 Jan23)
  - "Overview of the NAREGI Resource Management Middleware - An Incarnation of the GGF OGSA-EMS Architecture "
  - <http://www.naregi.org>

# NAREGI Software Stack (Beta Ver. 2006)

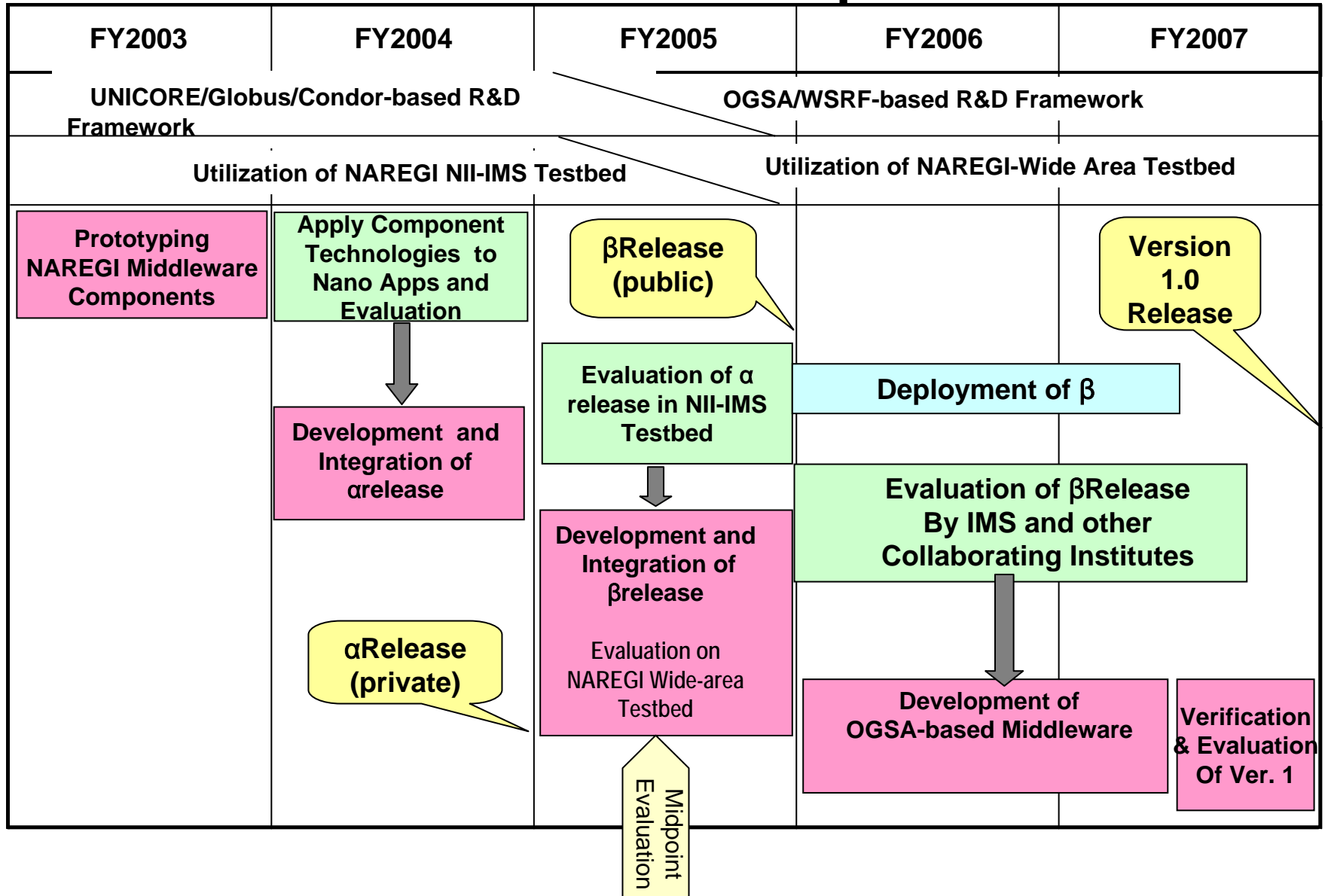


# R&D in Grid Software and Networking Area (Work Packages)

- Work Package Structure (~150 FTEs):
  - Universities and National Labs: technology leadership
  - Vendors (Fujitsu, NEC, Hitachi, etc.): professional development
- WP-1: Resource Management:
  - **Matsuoka**(Titech), Nakada(AI ST/Titech)
- WP-2: Programming Middleware:
  - **Sekiguchi**(AI ST), Ishikawa(U-Tokyo), Tanaka(AI ST)
- WP-3: Application Grid Tools:
  - **Usami** (new FY2005, NII), Kawata(Utsunomiya-u)
- WP-4: Data Management (new FY 2005, Beta):
  - **Matsuda** (Osaka-U)
- WP-5: Networking & Security
  - **Shimojo**(Osaka-u), Oie( Kyushu Tech.)
- WP-6: Grid-enabling Nanoscience Appls
  - **Aoyagi**(Kyushu-u)



# NAREGI Middleware Roadmap





# NAREGI is/has/will...

- Is THE National Research Grid in Japan
  - Part of CSI and future Petascale initiatives
  - METI "Business Grid" counterpart 2003-2005
- Has extensive commitment to WS/GGF-OGSA
  - Entirely WS/Service Oriented Architecture
  - Set industry standards e.g. 1st impl. of OGSA-EMS
- Will work with EU/US/AP counterparts to realize a "global research grid"
  - Various talks have started, incl. SC05 interoperability meeting
- Will deliver first OS public beta in May 2006
  - To be distributed @ GGF17/GridWorld in Tokyo

# NAREGI is not/doesn't/won't...

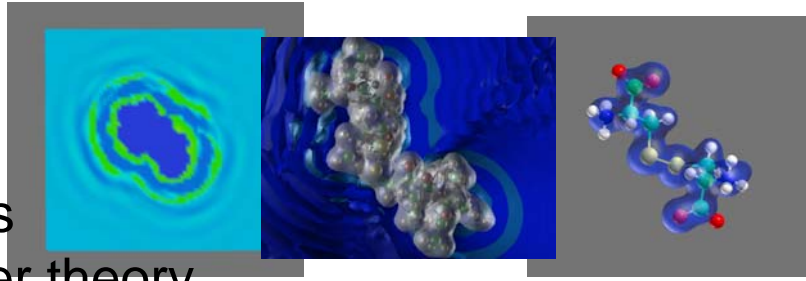
- Is NOT an academic research project
  - All professional developers from Fujitsu, NEC, Hitachi, NTT, ...
  - No students involved in development
- Will NOT develop all software by itself
  - Will rely on external components in some cases
  - Must be WS and other industry standards compliant
- Will NOT deploy its own production Grid
  - Although there is a 3000-CPU testbed
  - Work with National Centers for CSI deployment
- Will NOT hinder industry adoption at all costs
  - Intricate open source copyright and IP policies
  - We want people to save/make money using NAREGI MW

# Nano-Science : coupled simulations on the Grid as the sole future for true scalability ... between Continuum & Quanta.

Material physics

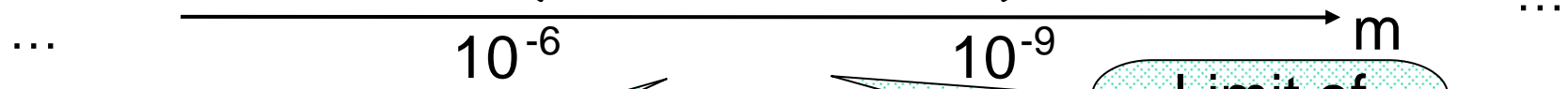
(Infinite system)

- Fluid dynamics
- Statistical physics
- Condensed matter theory



Molecular Science

- Quantum chemistry
- Molecular Orbital methods
- Molecular Dynamics



Limit of Idealization

Multi-Physics

Limit of Computing Capability

Old HPC environment:

- decoupled resources,
- limited users,
- special software, ...

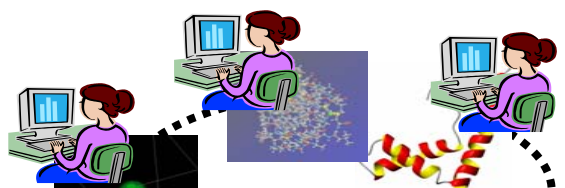
Coordinates decoupled resources;

Meta-computing,  
High throughput computing,  
Multi-Physics simulation

w/ components and data from different groups within VO composed in real-time



The only way to achieve true scalability!



# LifeCycle of Grid Apps and Infrastructure

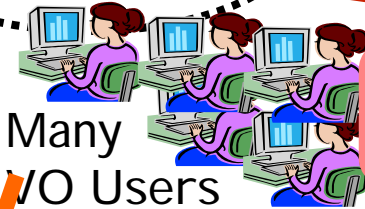
Application Contents Service

HL Workflow  
NAREGI WFML

SuperScheduler

Grid Info Service

VO Application Developers & Mgrs  
Workflows and Coupled Apps / User



Many VO Users

Place & register data on the Grid

Assign metadata to data

MetaComputing

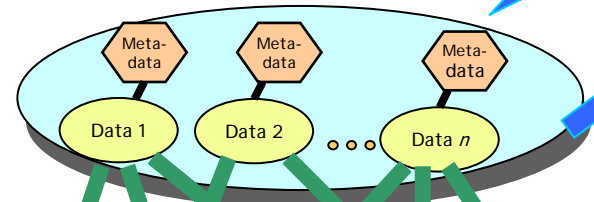
GridRPC/Grid MPI

GridVM

Distributed Servers

GridVM

GridVM



Grid-wide Data Management Service (GridFS, Metadata, Staging, etc.)

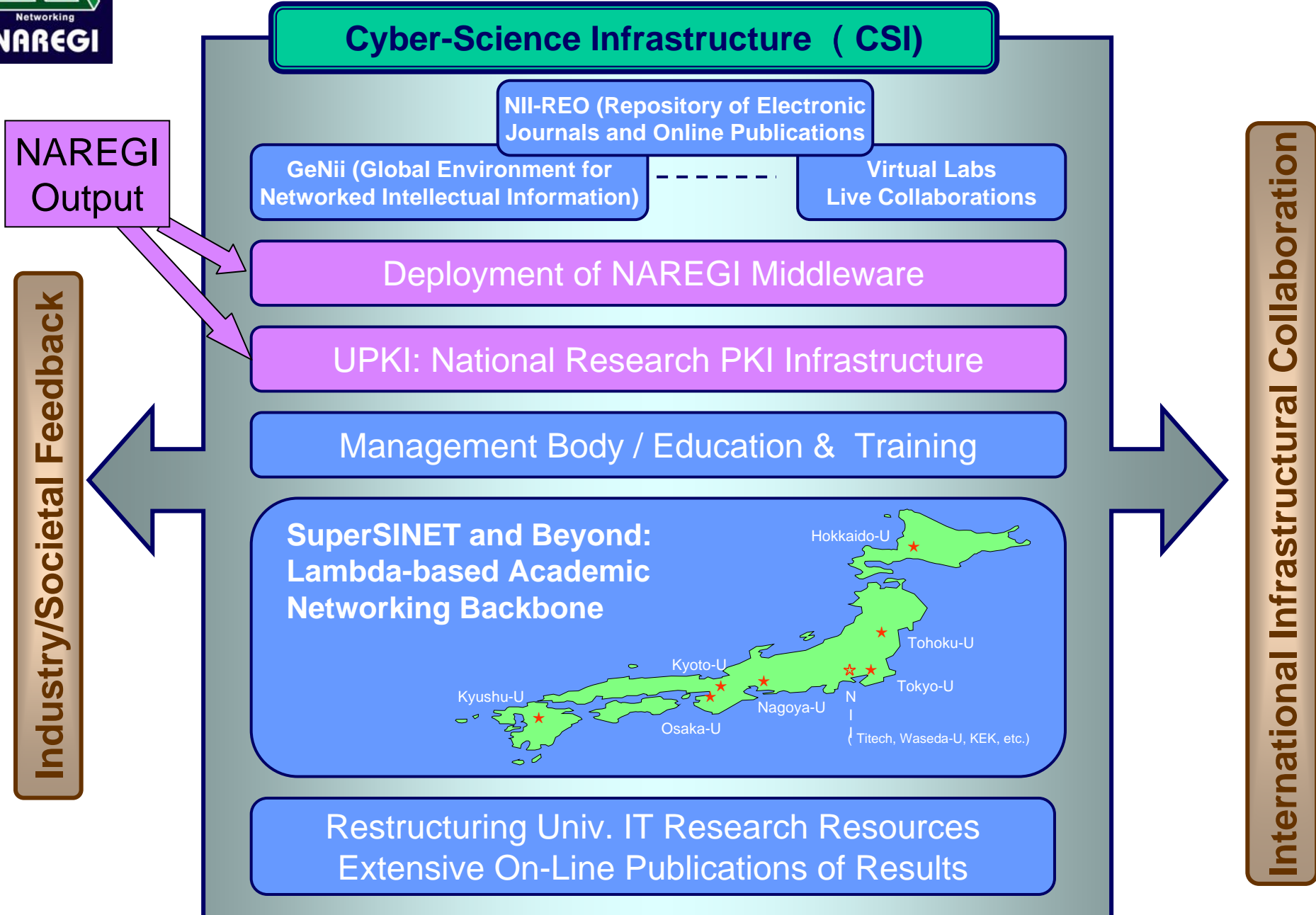
Implementation of OGSA-EMS Standard



# Highlights of NAREGI Beta (May 2006, GGF17/GridWorld)

- Professionally developed and tested
- “Full” OGSA-EMS incarnation
  - Full C-based WSRF engine (Java -> Globus 4)
  - OGSA-EMS/RSS WSRF components
  - Full WS-Agreement brokering and co-allocation
  - GGF JSDL1.0-based job submission, authorization, etc.
  - Support for more OSES (AIX, Solaris, etc.) and BQs
- Sophisticated VO support for identity/security/monitoring/accounting (extensions of VOMS/MyProxy, WS-\* adoption)
- WS- Application Deployment Support via GGF-ACS
- Comprehensive Data management w/Grid-wide FS
- Complex workflow (NAREGI-WFML) for various coupled simulations
- Overall stability/speed/functional improvements
- To be interoperable with EGEE, TeraGrid, etc. (beta2)

# Towards a Cyber-Science Infrastructure for R & D



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