GRID Middleware

Dr. Thierry Priol
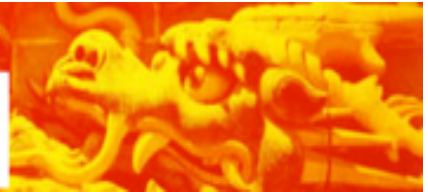## INRIA Senior Scientist
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Advanced Grid Research Workshops through European and Asian Co-operation

Current state of Grid Middleware

- ● **Definition**
  - ❑ **A mediator layer that provide a consistent and homogeneous access to resources managed locally with different syntax and access methods**
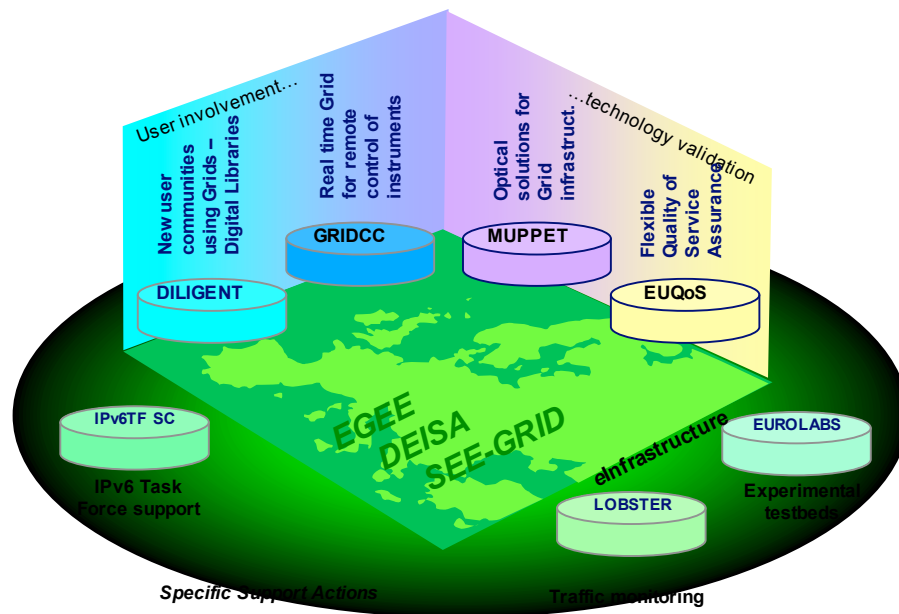- ● **What have been achieved so far**
  - ❑ **Several implementation/architectures of Grid middleware**
  - ❑ **Well identified basic services**
  - ❑ **From proprietary/ad-hoc solutions to standard based solutions**
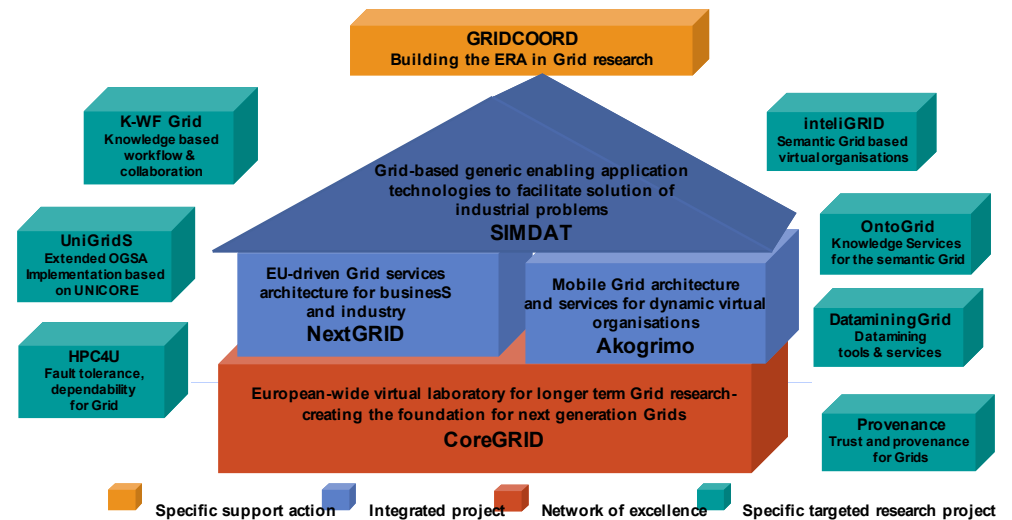   - ❖ **Lot of effort is going to the development of standards**

Grid Middleware initiatives

User involvement…

…technology validation

New user communities using Grids – Digital Libraries

Real time Grid for remote control of instruments

Optical solutions for Grid infrastruct.

Flexible Quality of Service Assurance

GRIDCC

MUPPET

DILIGENT

EUQoS

IPv6TF SC

IPv6 Task Force support

EGEE
DEISA
SEE-GRID

eInfrastructure

EUROLABS

Experimental testbeds

LOBSTER

Specific Support Actions

Traffic monitoring

EU Unit F3 - Research Infrastructure

GRIDCOORD
Building the ERA in Grid research

K-WF Grid
Knowledge based workflow & collaboration

inteliGRID
Semantic Grid based virtual organisations

Grid-based generic enabling application technologies to facilitate solution of industrial problems
SIMDAT

UniGridS
Extended OGSA Implementation based on UNICORE

OntoGrid
Knowledge Services for the semantic Grid

EU-driven Grid services architecture for businesS and industry
NextGRID

Mobile Grid architecture and services for dynamic virtual organisations
Akogrimo

DataminingGrid
Datamining tools & services

HPC4U
Fault tolerance, dependability for Grid

European-wide virtual laboratory for longer term Grid research-creating the foundation for next generation Grids
CoreGRID

Provenance
Trust and provenance for Grids

Specific support action | Integrated project | Network of excellence | Specific targeted research project

EU Unit F2 - Grid Technologies

HTRDP
中国国家网格
China National Grid
863

CROWN

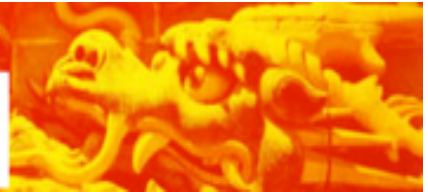*SHANGHAI GRID*

China main initiatives

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Next Generation Grid Middleware what to do to make them better ?

- **Transparency and robustness**
  - ❑ **Self-organizing components**
- **Security and trust**
  - ❑ **Need common largely accepted security framework**
- **Persistency**
  - ❑ **Managing states and keep track of them**
- **Scalability**
  - ❑ **Need to bring more P2P techniques instead of client/server approach**
- **Easy to use/program**
  - ❑ **Hide complexity by raising the abstraction level**
- **Based on open and mature standards/protocols**
  - ❑ **Stabilized the standards, make them mature !**
- **...**

The importance of Grid Middleware Repositories

- **Several initiatives at the European and National levels**
  - ❑ **France: ObjectWeb - Open Source Middleware**
    - ❖ **http://www.objectweb.org/**
  - ❑ **UK : Open Middleware Infrastructure Institute**
    - ❖ **http://www.omii.ac.uk/**

- **Europe**
  - ❑ **Each FP6 Grid project is committed to participate to a repository of reference implementations and Grid middleware**

To learn more about the European Vision on Grid Middleware

Next Generation Grid(s)

European Grid Research 2005 - 2010

Expert Group Report

Monday, 16th June 2003

Commission Disclaimer

This document contains information provided by a group of independent experts convened by the European Commission with the objective to identify potential European Research priorities for Next Generation Grid(s) 2005 – 2010. The document does not necessarily reflect the view of the European Commission.

Authors' Institutional Disclaimer

The views represented here are those of the individuals forming the group and do not necessarily represent those of the organizations to which the individuals belong.

NGG2 final report

Next Generation Grids 2
Requirements and Options for European Grids
Research 2005-2010 and Beyond

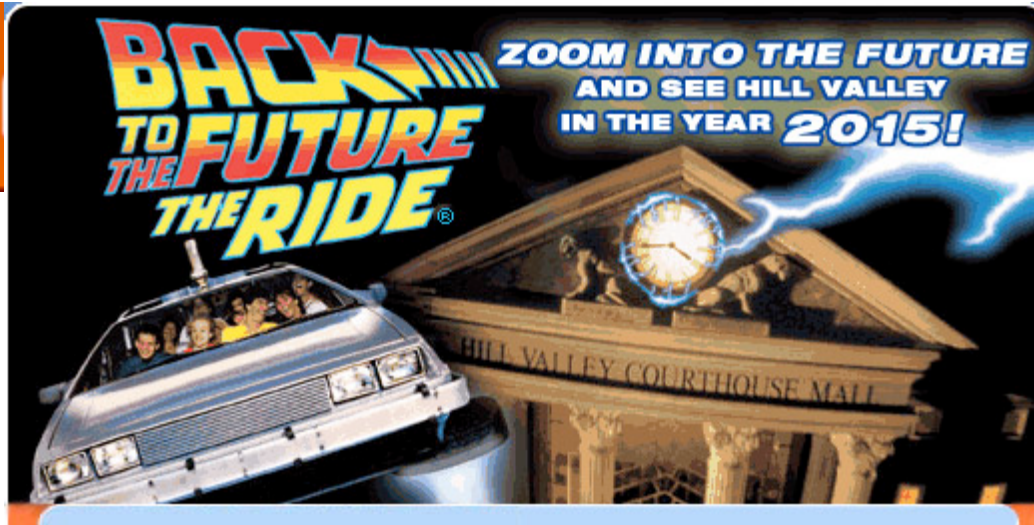**Expert Group Report**
July 2004

© NGG2 Group   1

ftp://ftp.cordis.lu/pub/ist/docs/ngg_eg_final.pdf

ftp://ftp.cordis.lu/pub/ist/docs/ngg2_eg_final.pdf

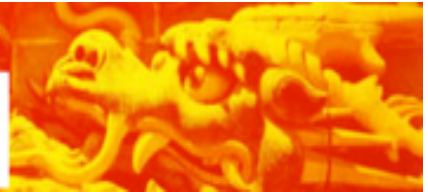# Looking into the Future

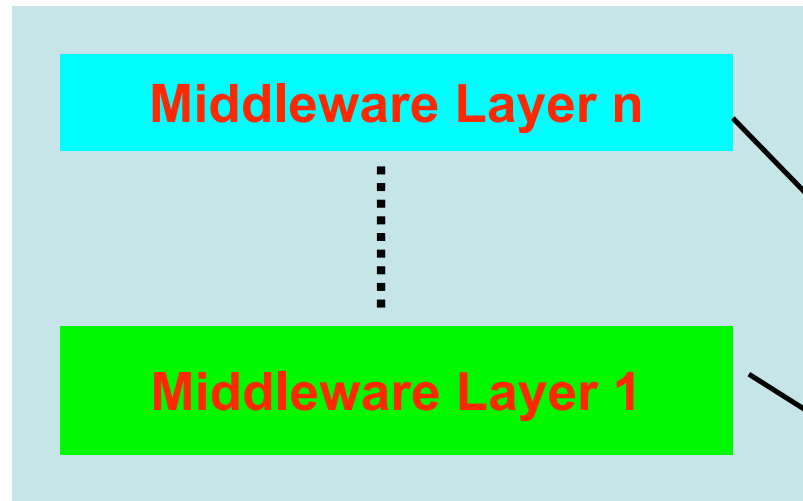# From Middleware to Operating Systems…

- **Is a Middleware the right approach to Grid ?**
  - ❑ **Make the API not very stable…**
  - ❑ **Some behaviors that may conflict with the OS (security, scheduling, …)**
- **What about a Network-centric Grid operating system ?**
  - ❑ **OS was designed to manage hardware resources**
  - ❑ **NGG2 recommendations**
    - ❖ **development of a design for a new operating system that providesa fault-tolerant, scalable, self-healing, self-managing environment upon which Grids service middleware may 'sit';**
    - ❖ **development of Grids foundations middleware suitable both for enhancing existing operating systems and for inclusion within (a);**

http://www.cordis.lu/ist/grids/pub-report.htm
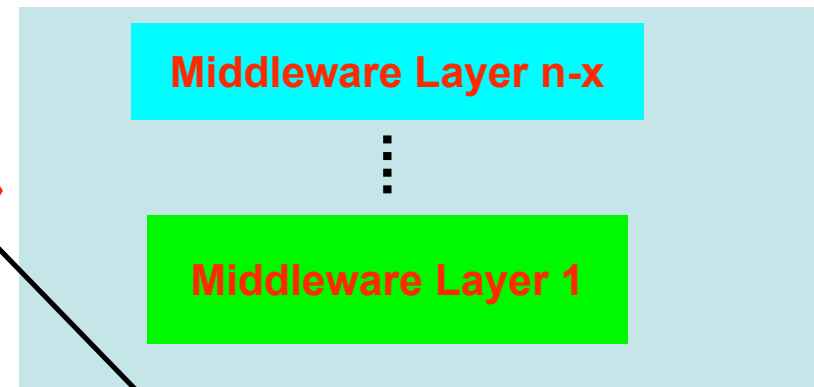
Approach 1 - a la Globus

Approach 2 -a la GridOS

Applications

Applications

Middleware Layer n

Middleware Layer n-x
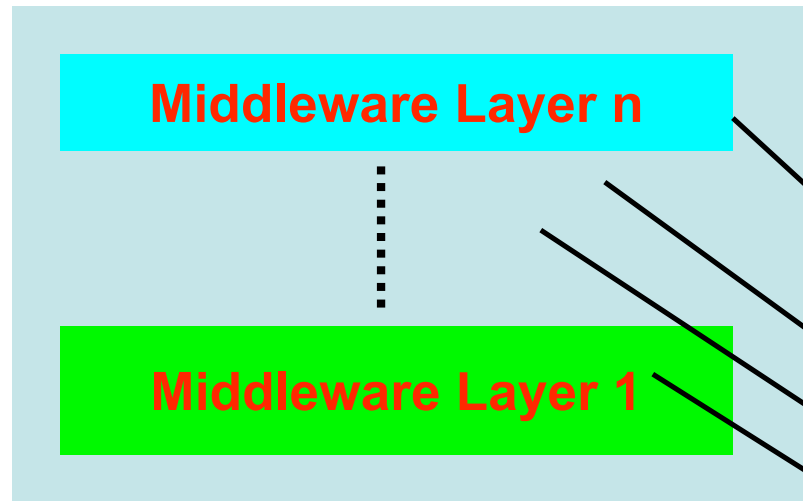
Middleware Layer 1

Middleware Layer 1

Operating System

Kernel

Operating System

Approach 1 - a la Globus

Applications

Approach 3 -a la (?)

Applications

Middleware Layer n
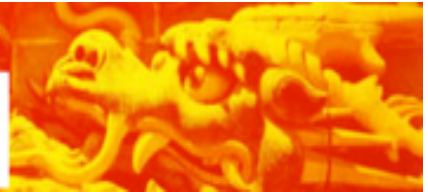
Middleware Layer 1

MIDDLEWARE
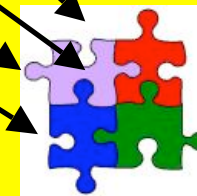
Operating System

Kernel

Operating System

Middleware session - Agenda

- **CNGrid Software Progress**
  - ❑ **Prof. Zhiwei Xu, ICT, CAS, China**
- **AKOGRIMO - Access to knowledge through the Grid in a mobile world**
  - ❑ **Dr. Julian R.Gallop, CCLRC RAL, UK**
- **Middleware Research in the 863 High-tech Program**
  - ❑ **Prof. Hong Mei, Peking University, China**
- **NEXTGRID - The next generation Grid**
  - ❑ **Dr. Konstantinos Tserpes, NTUA, Greece**
- **The Shanghai Grid**
  - ❑ **Prof. Minglu Li, Shanghai Jiaotong University**