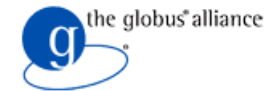




UNICORE



omii europe
open middleware infrastructure institute

Towards Interoperability with OMII - Europe

Morris Riedel, Forschungszentrum Juelich (FZJ). Germany

Leader Infrastructure Integration (Interoperability) on behalf of JRA3/1 TEAMS

OMII – Europe Training, Edinburgh, 11th July 2007

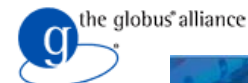


Forschungszentrum Jülich
in der Helmholtz-Gemeinschaft

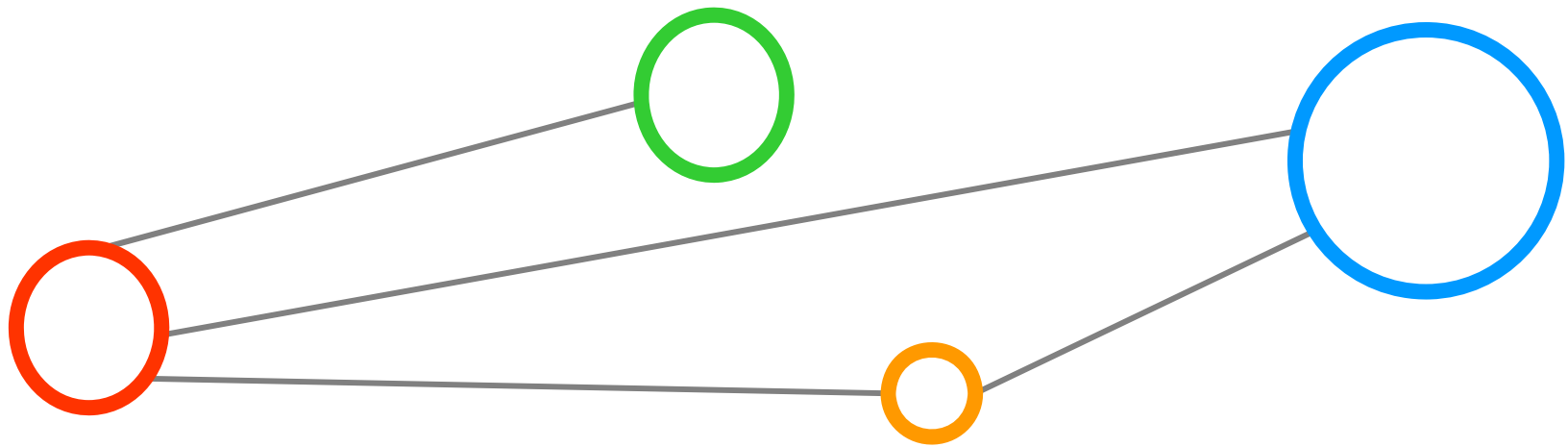


Outline

- **Motivation: Grid Islands**
- **Examples of Interoperation**
- **Future: Interoperability Highway**
- **Lessons Learned from Interoperability**
- **One OMII – Europe „Success Story“**
- **Conclusions**



Motivation: Grid Islands



Grid Islands: DEISA and EGEE

- **DEISA Grid (Supercomputing community)**

- Uses non WS-based UNICORE 5 in production
- No Virtual Organization Membership Service (VOMS)
- Suitable for massively parallel scientific jobs



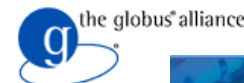
- **EGEE Grid (mainly HEP community + others)**

- Uses non WS-based gLite in production
- (Only) proxy-based X.509 security, but VOMS support
- Suitable for embarrassingly parallel scientific jobs

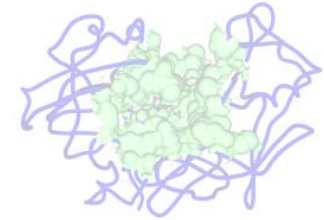


- **Both Grids are currently not technical interoperable**

- A scientist cannot use one middleware to access both
- UNICORE 5 and gLite are currently not interoperable



Cross-Grid use case example



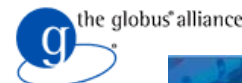
- **WISDOM (Wide In Silicio Docking on Malaria)**

- WISDOM aims at developing new drugs for Malaria
- WISDOM uses EGEE for large scale in silicio docking
 - A computational method for prediction of whether one molecule will bind to another
 - using AutoDock and FlexX software
- AutoDock and FlexX as software provided via gLite in EGEE
- Output is a list of chemical compounds (potential drugs)

- **Refine best compound list via molecular dynamics(MD)**

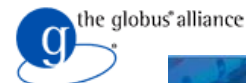
- Fast MD computations use highly scalable AMBER in DEISA
 - AMBER (Assisted Model Building with Energy Refinement)

- **Goal: Accelerate drug discovery using EGEE + DEISA**

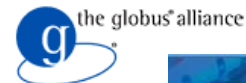
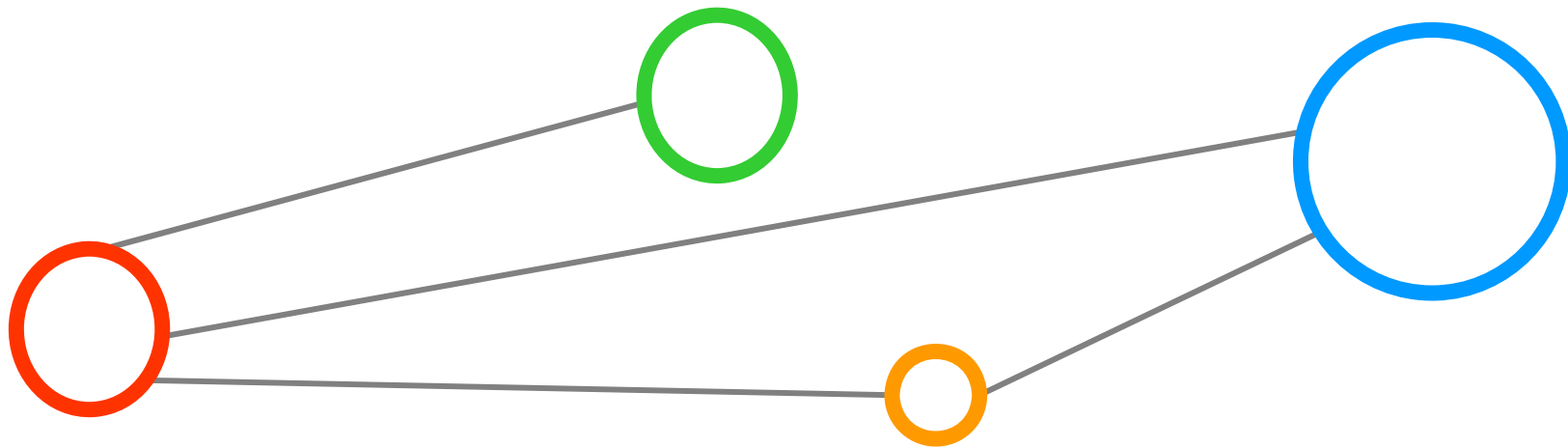


Different strategies to solve Grid islands

- **Interoperation (aka „short-term achievement“)**
 - Work performed in OGF Grid Interoperation Now group (GIN-CG)
 - Bilateral efforts in many other projects, e.g. EGEE and DEISA
 - What needs to be done to get interacting production Grids
 - Hacks, workarounds, short-term achievements, adapters, ...
 - Commonly found in production Grid interoperations
- **Interoperability (aka „long-term achievement“)**
 - Work performed in OMII – Europe
 - Native standards support from middlewares (no hacks)
 - Many interoperable components work together to achieve a goal
 - Interoperability through open standards from OGF, OASIS, ...



Examples of Interoperation



EU project: RIO31844-OMII-EUROPE

Grid Interoperation Now (GIN) Community Group

- **GIN goals**
 - What needs to be done to get different Grids talking together
 - Short-term achievements, using what is available today
- **GIN in 2006...**
 - Many interoperability demonstrations at Supercomputing 2006
 - Data area: Interoperation between different data islands
 - **Storage Resource Broker (SRB) & Storage Resource Manager (SRM)**
 - Info area: Interoperation of information services and models
- **GIN in 2007...**
 - Two kinds of demos: Production and Future Production
 - Many demonstrations planned for SC2007: **Participate!**

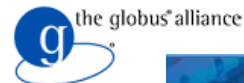


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UNICORE



EU project: RIO31844-OMII-EUROPE

gLite & UNICORE 5 Interoperation (EGEE-II)

- **EGEE Phase II (EGEE-II)**

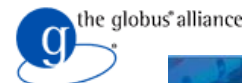


- **gLite and UNICORE 5 interoperation development**

- Interoperation scenario for scientific job submissions
- UNICORE → gLite
 - using a VOMS UNICORE plugin + gLite TSI
 - VOMS UADB and VOMS Plugin in development
- gLite → UNICORE: using CONDOR-U + Trusted Agent

- **Goal: interoperation on a technical level between DEISA (HPC) and EGEE (HEP+ some others)**

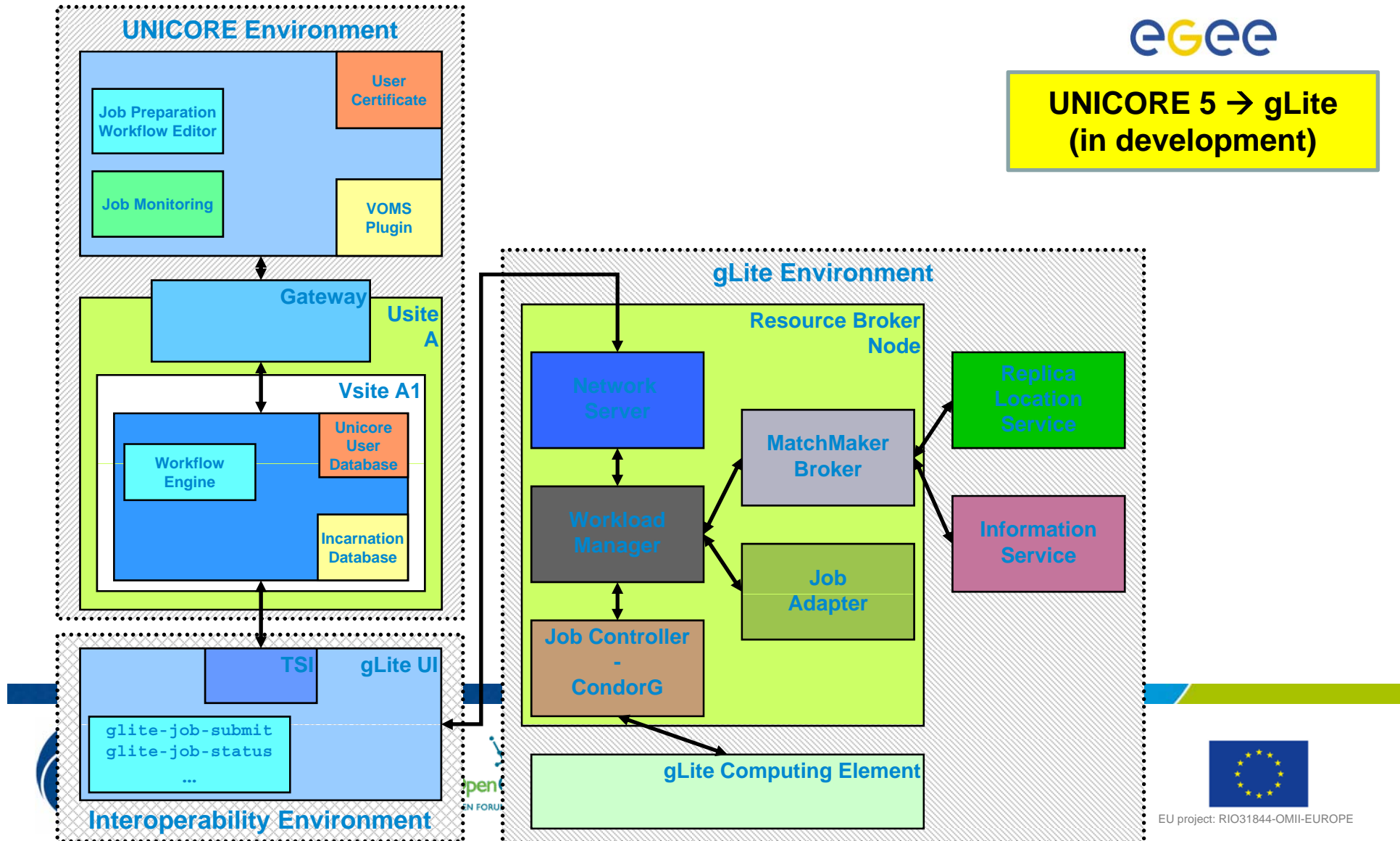
- **Sustainability of this interoperation via future interoperability through common open standards**



UNICORE → gLite Interoperation (EGEE-II)

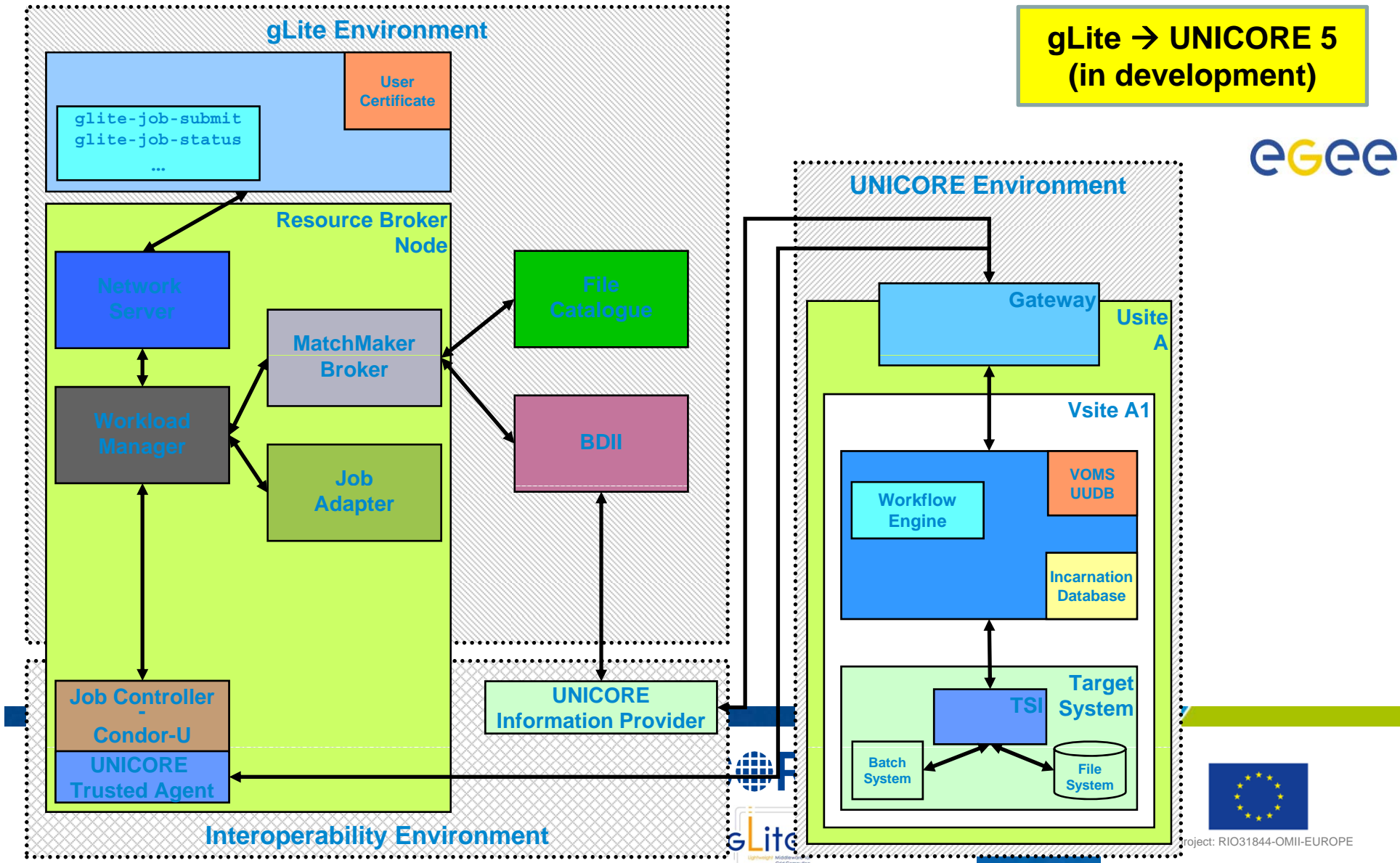
EGEE

UNICORE 5 → gLite
(in development)

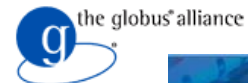
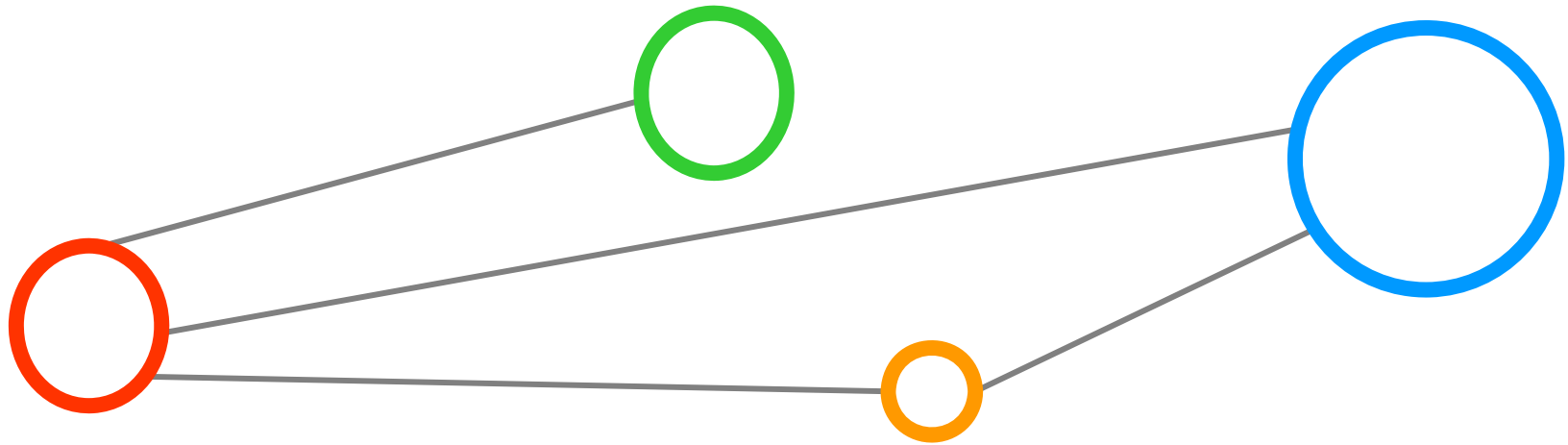


gLite → UNICORE 5 Interoperation (EGEE-II)

gLite → UNICORE 5
(in development)



Future: Interoperability Highway



EU project: RIO31844-OMII-EUROPE

Future: Interoperability Highway

End-users
via clients
& portals



**GOAL: Transparency
of Grids for end-users**

Emerging
Open
Standards



**„Interoperability highway“
based on open standards**

Grid
Middlewares



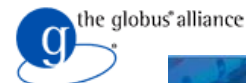
Grid
Resources



- **Work: emerging standards are not directly interoperable**

Standard Compliance & Interoperability

- **Both are different targets, but towards same direction**
 - Standard Compliance is a prerequisite for interoperability
 - Standard Compliance does not implies interoperability
 - **Interoperability is much more than standard compliance**
- **Interoperability: use components together “scenario”**
 - e.g. job submission via information service based on model (GLUE)
- **E.g. OGSA - Basic Execution Services (OGSA-BES)**
 - In real deployments is not the ‘vanilla OGSA-BES interface’ available
 - Same exact “client” works not directly with gLite & UNICORE
 - **UNICORE Gateway has another WS-Addressing EPR part**
 - **Different security models: X.509 Proxies vs. full X.509 certificates**
 - Different infrastructures (WS-I & WS-RF)... etc.



114 person years over 2 years, 5 million Euro, 4 major Grid infrastructures

OMII-UK

University of Southampton UK (**coordinator**)

University of Chicago **USA**

Globus

Fujitsu Laboratories Europe **UK**

NCSA, University of Illinois **USA**

MyProxy

UNICORE

Forschungszentrum Juelich **Germany**

University of Southern California **Los Angeles USA**

Kungl Tekniska Högskolan **Sweden**

Security

University of Wisconsin-Madison **USA**

Condor

Istituto Nazionale di Fisica Nucleare **Italy**

VOMS

Beihang University **China**

CROWN

Poznan Supercomputing & Networking Center **Poland**

GridSphere

China Institute of Computing Technology **Beijing China**

University of Edinburgh **UK**

OGSA-DAI

Computer Network Information Centre **Beijing China**

CROWN

CERN, European Organisation for Nuclear Research **Switzerland**

gLite

Tsinghua University **China**

OMII-Europe
Components
Developments:
VOMS,
OGSA-BES,
OGSA-DAI,
OGSA-RUS,
GridSphere

OMII-
Europe
Repository

Evaluation
Infrastructure

USERS



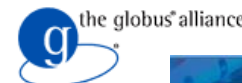
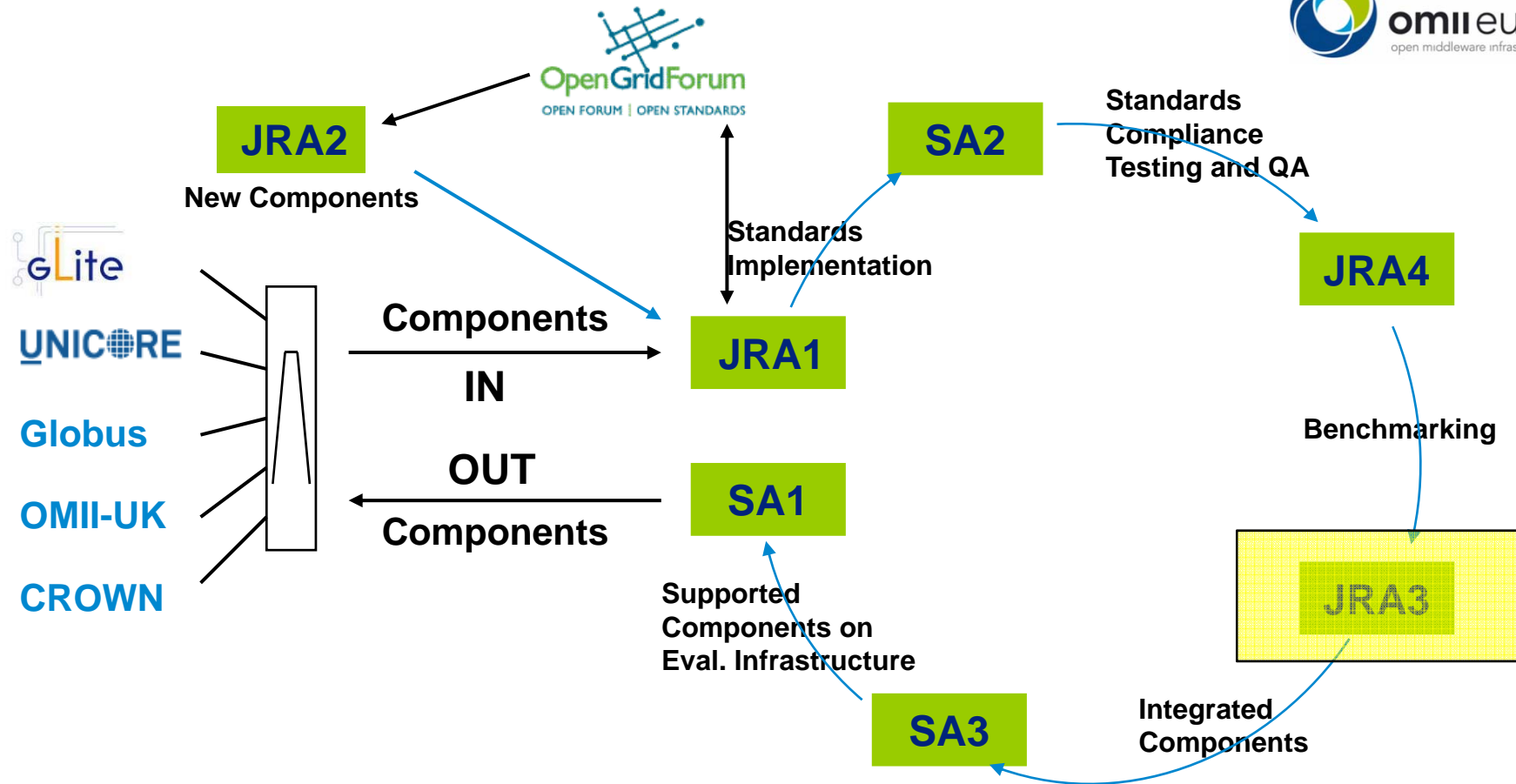
Interoperability Tests: Integrate and use OMII-Europe components with each other:
e.g. VOMS & OGSA-BES & GridSphere
building the “interoperability highway...”

Quality Assurance &
Compliance Testing of Grid middleware

e.g. Compliance with one specific specification: e.g. OGSA-BES



The Virtuous Cycle - Technology transfer with grid infrastructure projects and standards organisations



Requirement Analysis and Different Phases

- **Requirement Analysis for a multi-platform Grid infrastructure**

- Knowledge exchange with the broader Grid community

- **Participation in Grid Interoperation Now (GIN) OGF group (Secretary role)**

- Identified 6 Integration Phases that address the requirements

- **Phase 1: Information Foundation necessary for gLite job submit + 5 others**



- **First prototype of the multi-platform Grid infrastructure** **Active**

- Phase 1 “Information Foundation” → *interop. information* **Active**

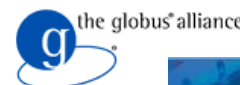
- Phase 2 “Job Management” → *OGSA-BES interoperability* **Active**

- Phase 3 “VOM” → *VOMS-based gLite/UNICORE access* **Active**

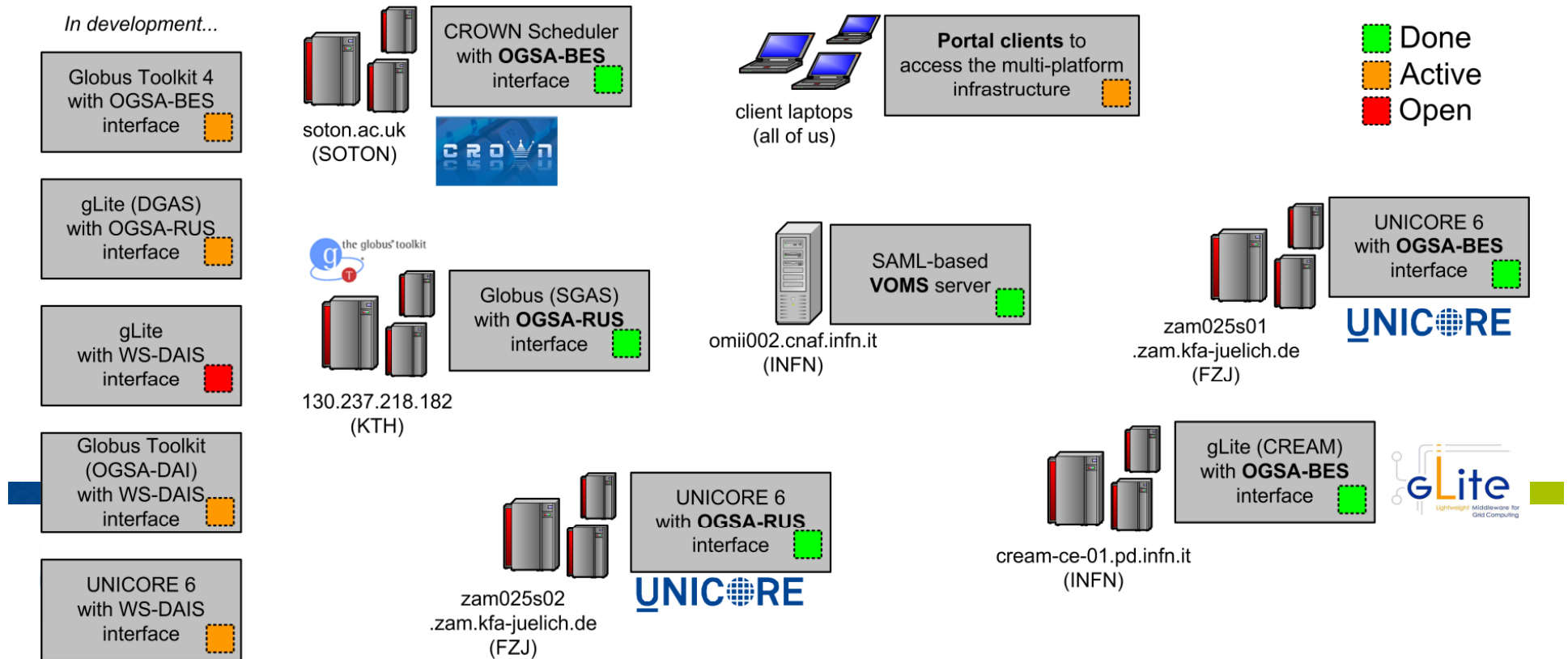
- Phase 4 “Portals” → *Cross-middleware client libraries* **Active**

- Phase 5 “Database Access” → *OGSA-DAI in mid 2007* **Delayed**

- Phase 6 “Accounting” → *interop. resource usage info.* **Active**

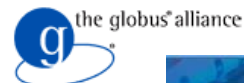


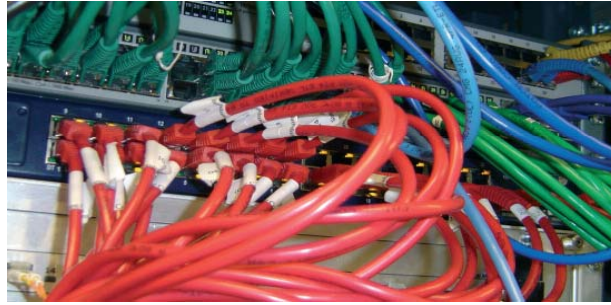
- **JRA3-T2: Integration of components in OMII – Europe**
 - OGSA-BES, OGSA-RUS, OGSA-DAI, VOMS, GridSphere
 - Middleware: UNICORE, gLite, Globus Toolkits, and CROWN
- **Goal: Test and establish interoperability of components**



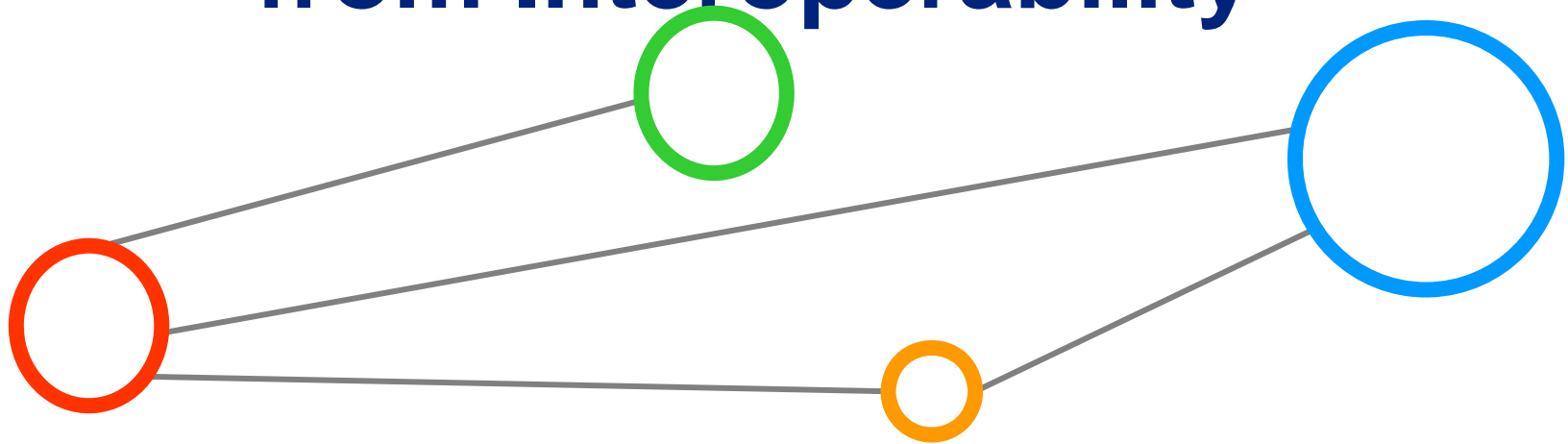
Interoperability Scenarios & Plans

- **Towards e-Infrastructure interoperability**
 - Idea: Using components from different phases together
 - OGSA-BES&VOMS jobs for gLite, UNICORE and Globus Toolkits
 - OGSA-BES&VOMS-based job submit using information services
 - OGSA-DAI managed data used during OGSA-BES job submits
 - OGSA-RUS example application LLview on top of all middlewares
 - Others...
- **Phases updates during the second year, new component versions**
 - E.g. OGSA-DAI integration into the multi-platform infrastructure
- **Participation in Supercomputing 2007 Demonstrations**
 - E.g. Improved OGSA-BES endpoints interoperability



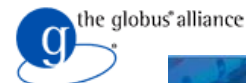


Lessons Learned from Interoperability



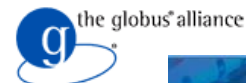
Lessons Learned from Interoperability (1)

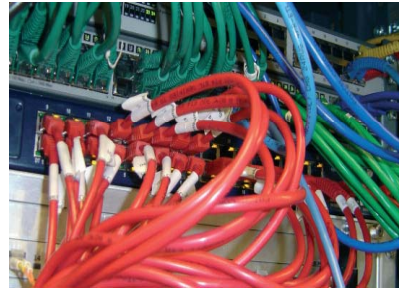
- **Missing components/functionality in Grid platforms**
 - UNICORE not relies on Info-Service, but demand for gLite
- **Different standard specification versions are implemented in the Grid middleware platforms**
 - e.g. OGSA-BES v.26 (SC 2006) and v.34 public comment
- **Different technologies for WS-* infrastructures adopted**
 - WS-RF, WS-I, WS-ResourceTransfer, → what's next?
 - E.g. GetResourceProperty operation of WS-I compliant
 - UNICORE & Globus Toolkit are WS-RF compliant, gLite not
- **Different versions of the WS-* infrastructures**
 - UNICORE is WS-RF 1.2 compliant, Globus uses WS-RF 1.0



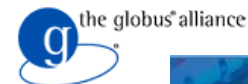
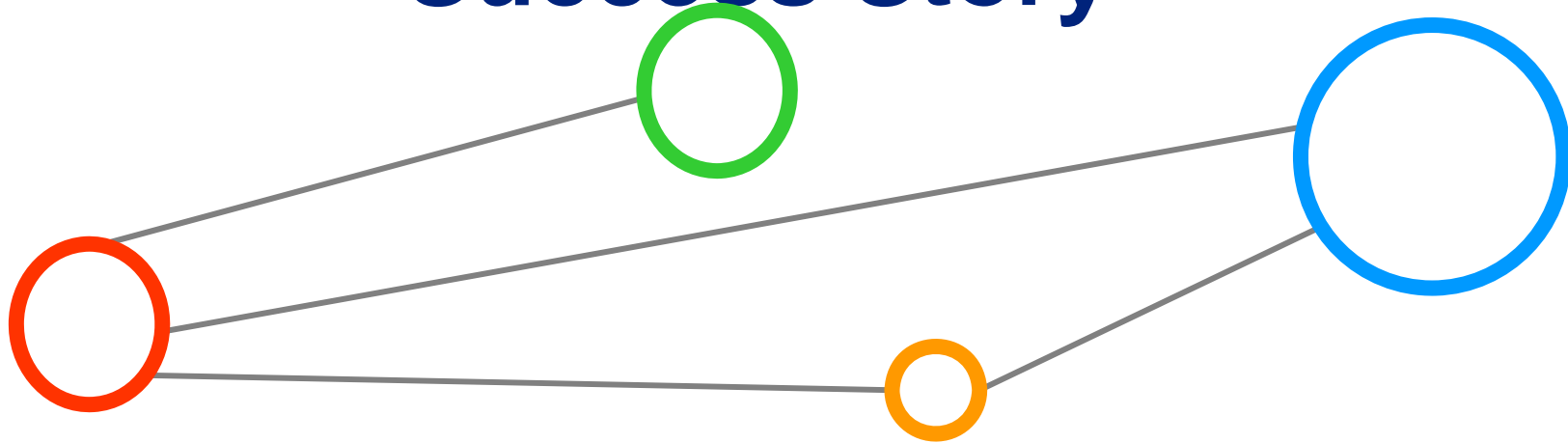
Lessons Learned from Interoperability (2)

- **Challenges in security are major show stoppers**
 - Standards specification compliance is only a precondition
- **Absence of a widely accepted common security profile**
 - OMII-EU (JRA3T1: Common Security Profile) works on that
 - Several specifications of OGF (Secure Channel etc.) used
 - Only several specifications of OASIS (SAML etc.) are used
 - Only several specifications of IETF (X.509 etc.) are used
- **Different strategies and adoption status in Middlewares**
 - E.g. Delegation Mechanisms are extremely different
 - Proxies: Globus, gLite – Only initial support by UNICORE
 - Explicit Trust Delegation: UNICORE – Not by gLite & Globus





One OMII – Europe “Success Story”

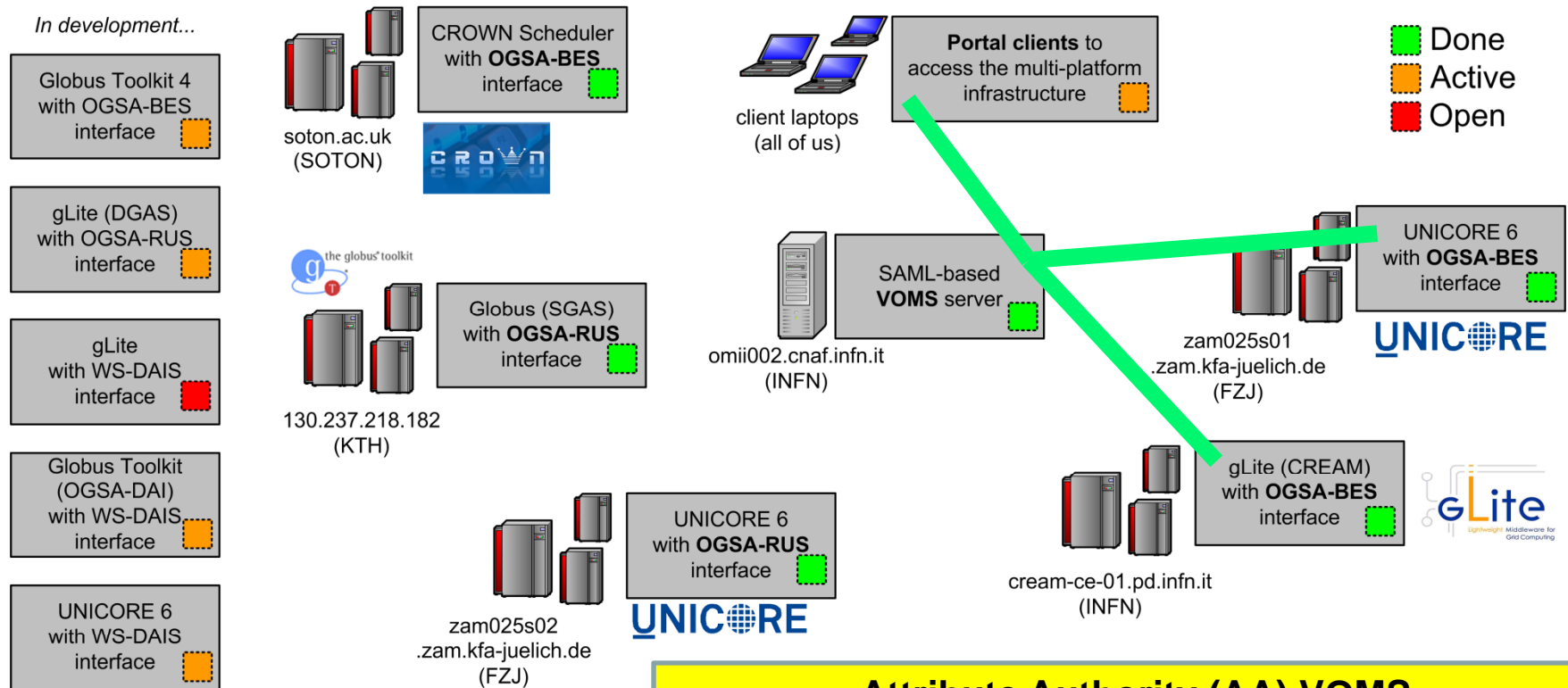


EU project: RIO31844-OMII-EUROPE

One OMII-Europe „Success Story“ (1)

- One Interoperability scenario within OMII – Europe

In development...



**Attribute Authority (AA) VOMS
gets central role & middleware independent**

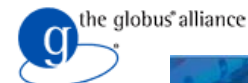
One OMII-Europe „Success Story“ (2)

- **OASIS Security Assertion Markup Language (SAML)**
 - SAML signed assertions can contain trustful information
 - New WS-based VOMS is SAML compliant
- **SAML-based interoperability: UNICORE 6 and VOMS**
 - New WS-based VOMS is interoperable with UNICORE 6
 - VOMS releases (user) attributes as signed SAML assertions
 - **Attributes contain roles and Virtual Organization/Project membership**
 - VOMS can act as a Attribute Authority (AA) for UNICORE 6
- **Working interoperability between gLite and UNICORE 6**
 - Scenario with job submission including VOMS assertions
- **Important cornerstone of the “Interoperability Highway”**

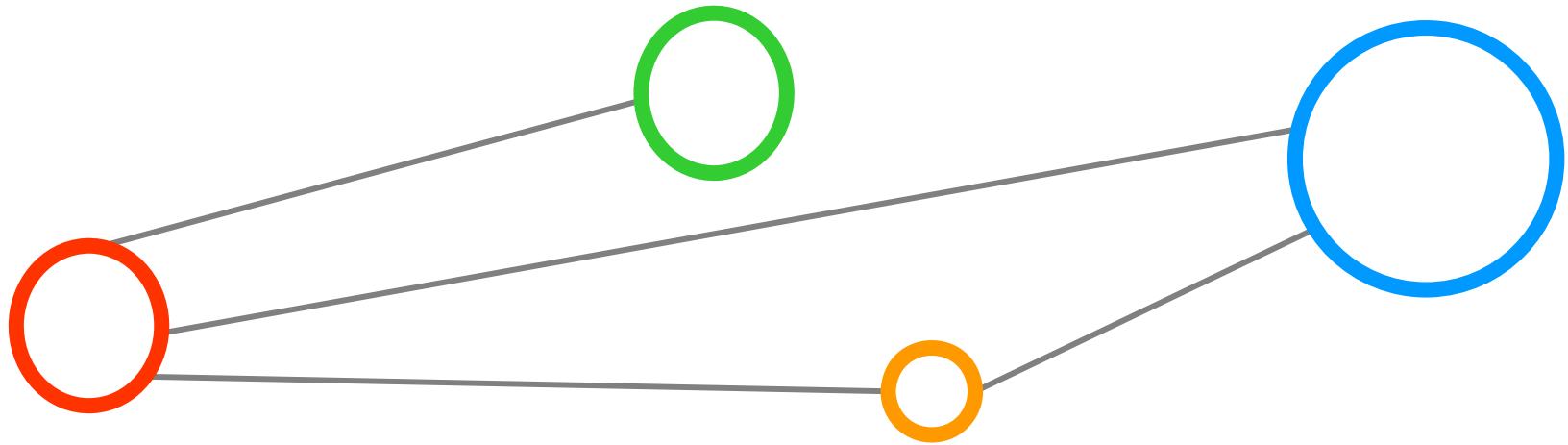
OASIS 



UNICORE

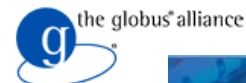


Conclusions



Summary

- **Standard compliance (via ETICS, Metronome, etc.)**
 - One Component follow specification X (e.g. OGSA-BES v.34)
- **Interoperation (work performed in OGF GIN-CG group)**
 - What needs to be done to get interacting production Grids
 - Hacks, workarounds, short-term achievements, adapters
 - Commonly found in production Grid interoperations
- **Interoperability (work performed in OMII – Europe)**
 - Many components work together to achieve a goal
 - Native standards support from middlewares (no hacks)
- **Continuing work in the open standards working groups!**
 - „Interoperability highway...“ realize the „true global Grid vision“



IGIIW @ e-Science 2007

International Grid Interoperability & Interoperation Workshop

in conjunction with

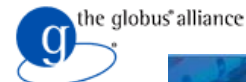
e-Science 2007, Garuda, India

Call for paper published at

<http://www.omii-europe.org/OMII-Europe/igiiw2007.html>



UNICORE



Questions for JRA3 – Task 2

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