

4th e-Infrastructure Concertation Meeting
ETSI, Sophia Antipolis, 5 – 6 December 2007



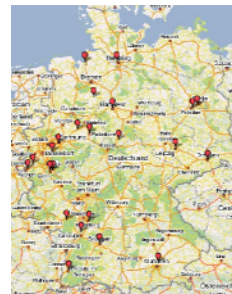
Grid Infrastructures and Standards

Example: D-Grid

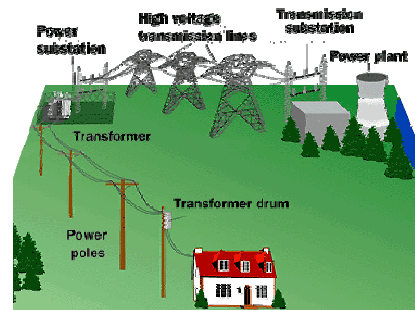
Wolfgang Gentzsch



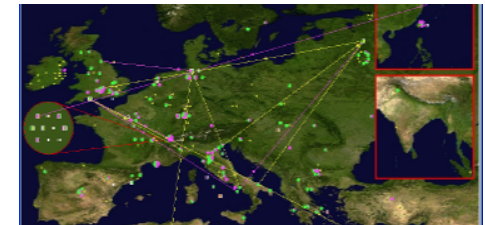
Water



Roads



Power



Knowledge



Motivation: Towards a Global Society

Old World

Static

Silo

Physical

Manual

Application



New World

Dynamic

Shared

Virtual

Automated

Service

From **Silo** Oriented **Architectures** to

Service Oriented **Architectures**

Three Generations of Grid

1

- Local “metacomputers“
 - Distributed file systems
 - Site-wide single sign-on
- "Metacenters" explore inter-organizational integration
- Totally custom-made, top-to-bottom: proofs-of-concept

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- Utilize software services and communications protocols developed by grid projects:
 - *Condor, Globus, UNICORE, Legion, g-Lite, etc.*
- Need significant customization to deliver complete solution
- Interoperability is still very difficult!

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- **Competition and interoperability** among **applications, toolkits, and** implementations of **key services**

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Standardization is key for third-generation grids!

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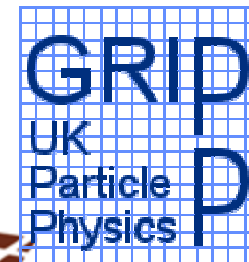
We are here!

Standardization is key for third-generation grids!

Many Grid Projects:



Distributed
European
Infrastructure for
Supercomputing
Applications



openlab for DataGrid applications
Developing Solutions for the Data-Intensive Science of the Large Hadron Collider



Grid5000

WestGrid



GridCat

- tota la informació sobre el projecte
- presentació
- descripció tècnica
- els serveis oferts
- participants
- documentació pública
- com puc participar?
- accés al Portal
- Intranet per a investigadors
- estat dels serveis actius



Asia-Pacific Grid



Enabling Grids for E-science in Europe

NAREGI
超高速コンピュータ網形成プロジェクト
National Research Grid Initiative
国立情報学研究所グリッド研究開発推進拠点 NII -The National Institute of Informatics

Grid Applications
Grid Middleware
Networking



e-Infrastructures are complex !

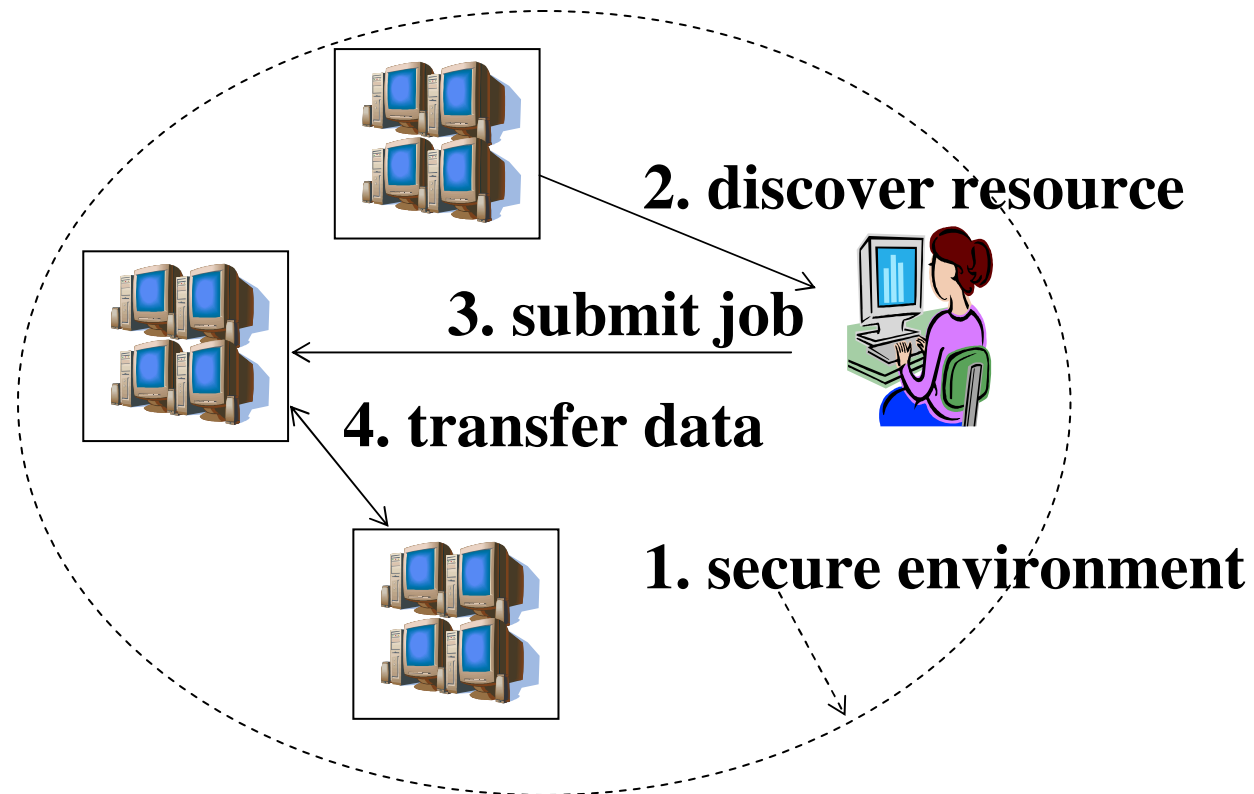
1. Resources: **Networks** with computing and data nodes
2. Development/support of standard **middleware** & grid svcs
3. Internationally agreed **AAA** infrastructure
4. **Discovery services** and collaborative tools
5. **Data** provenance, curation and preservation
6. Open **access** to data and publications via interoperable **repositories**
7. Remote access to **large-scale facilities**: Telescopes, LHC, ITER, ..
8. Application- and community-specific **portals** and workflows
9. **Industrial** collaboration
10. **Service Centers**: maintenance, support, training, utility, apps

Standards, Standards, Standards !!!

Courtesy Tony Hey



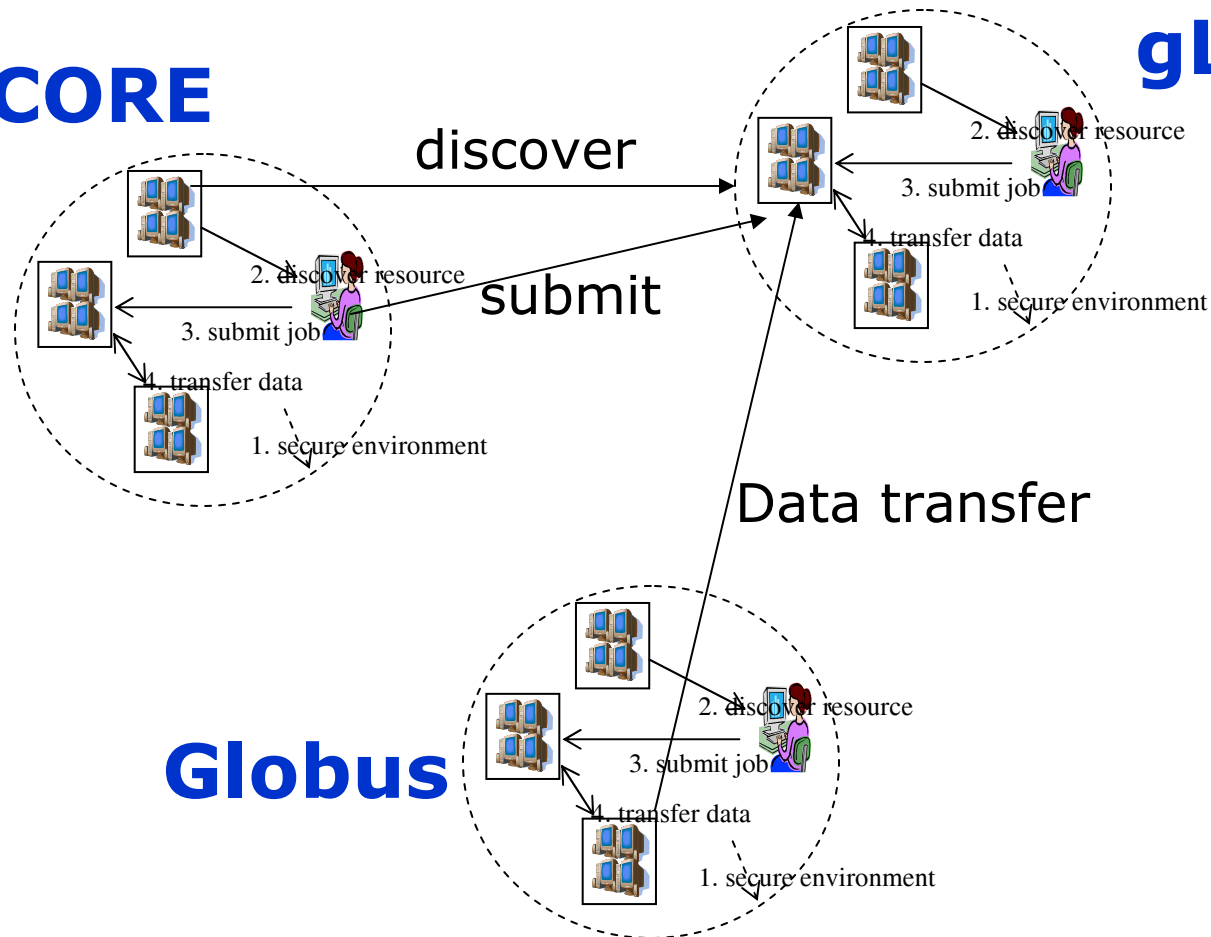
Analysing Basic Grid Services



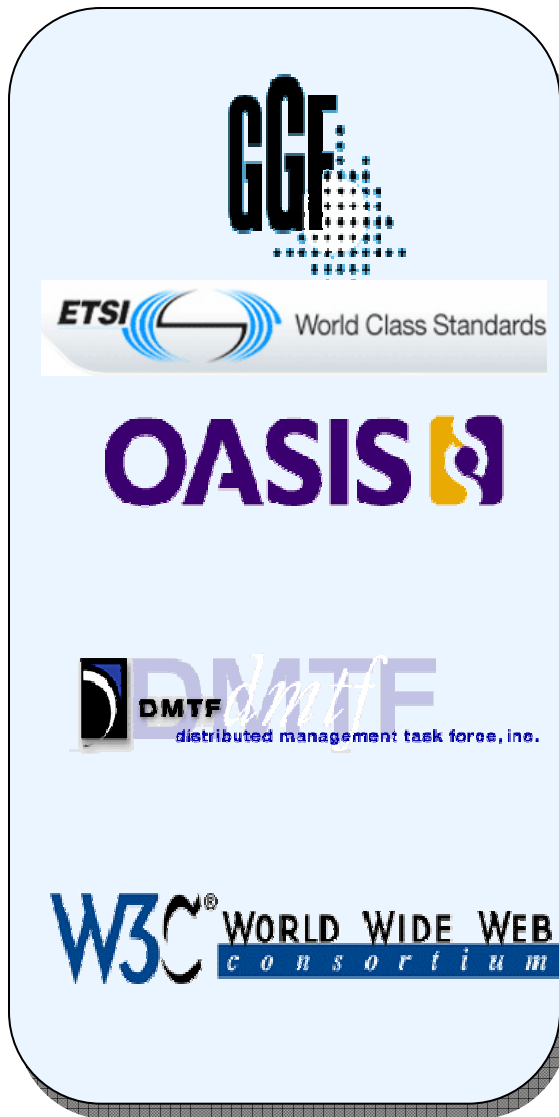
Analysing Basic Grid Services

UNICORE

gLite



Standards Bodies



- **GGF** (Global Grid Forum, 2000) => **OGF**
 - Grid Architecture: OGSA, CDDLM, WS-Agreement, ...
- **ETSI** (European Telecom. Standards Institute, 1988)
 - Standardization of ICT in Europe
 - 2006: ICT GRID Interoperability Testing Framework
 - ETSI series of GRID Plugtests
- **OASIS** (Organization for the Advancement of Structured Information Standards, 1993)
 - Middleware/Web services focused
 - WSRF, WS-Notification, WSDM, WS-Security...
- **DMTF** (Distributed Management Task Force, 1992)
 - Management and Information models (CIM)
 - Server management
 - WS-CIM
- **W3C** (WWW Consortium, 1994)
 - WS-Addressing
- And **IETF, Liberty Alliance, WS-I, EGA**

Not a complete list!

Case Study: D-Grid e-Infrastructure *)

Building a National e-Infrastructure for Research and Industry

- 01/2003: Pre-D-Grid Working Groups → Recommendation to Government
 - 09/2005: D-Grid-1: early adopters, 'Services for Science'
 - 07/2007: D-Grid-2: new communities, 'Service Grids'
 - .../2008 ? D-Grid-3: Service Grids for research and industry
-
- D-Grid-1: 25 MEuro > 100 Orgs > 200 researchers
 - D-Grid-2: 40 MEuro > 100 addl Orgs > 200 addl researchers and industry

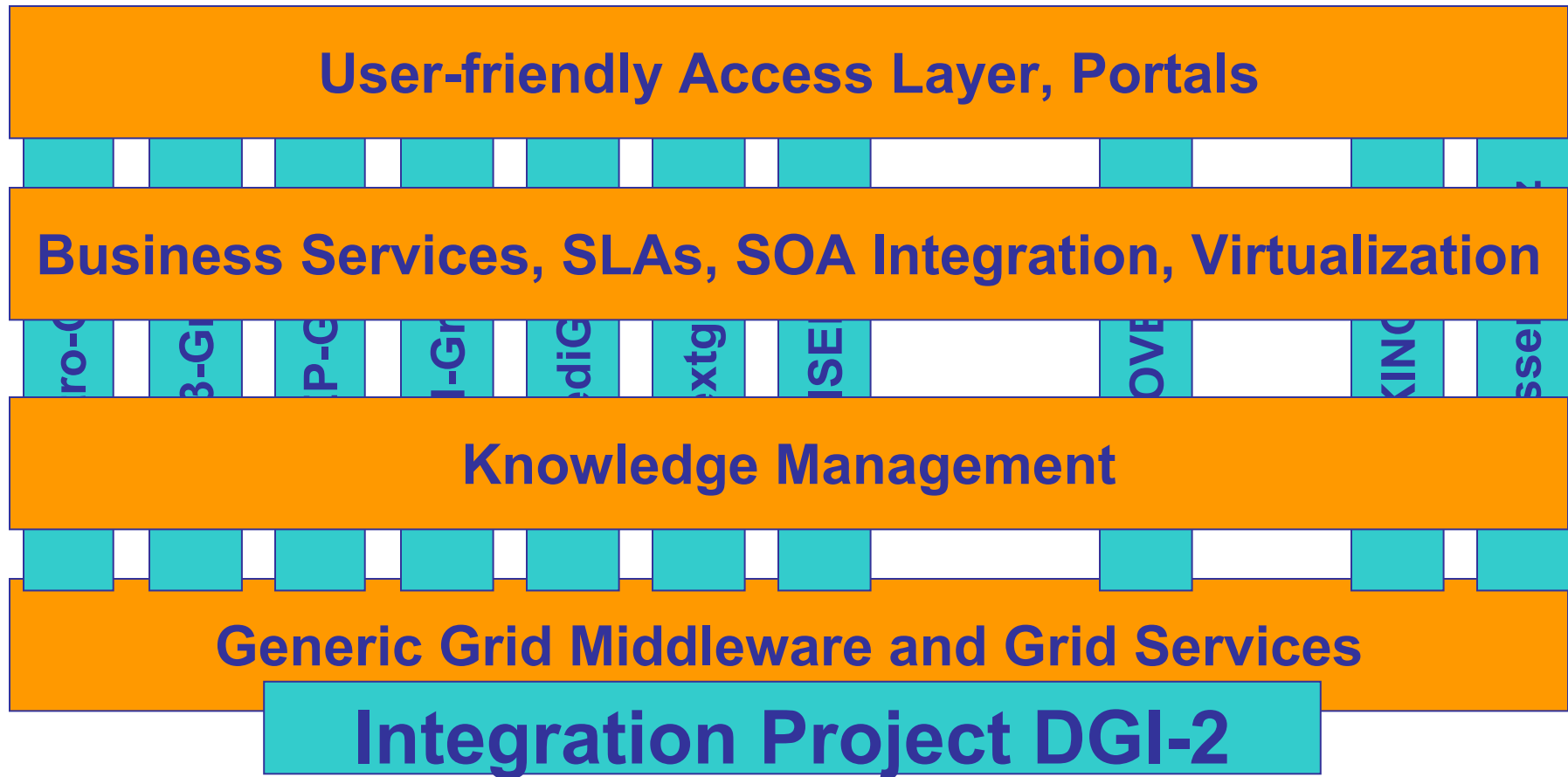
➤ Important:

- Sustainable production grid infrastructure after the end of the funding
- Integration of new communities
- Evaluating business models (operational models) for grid services

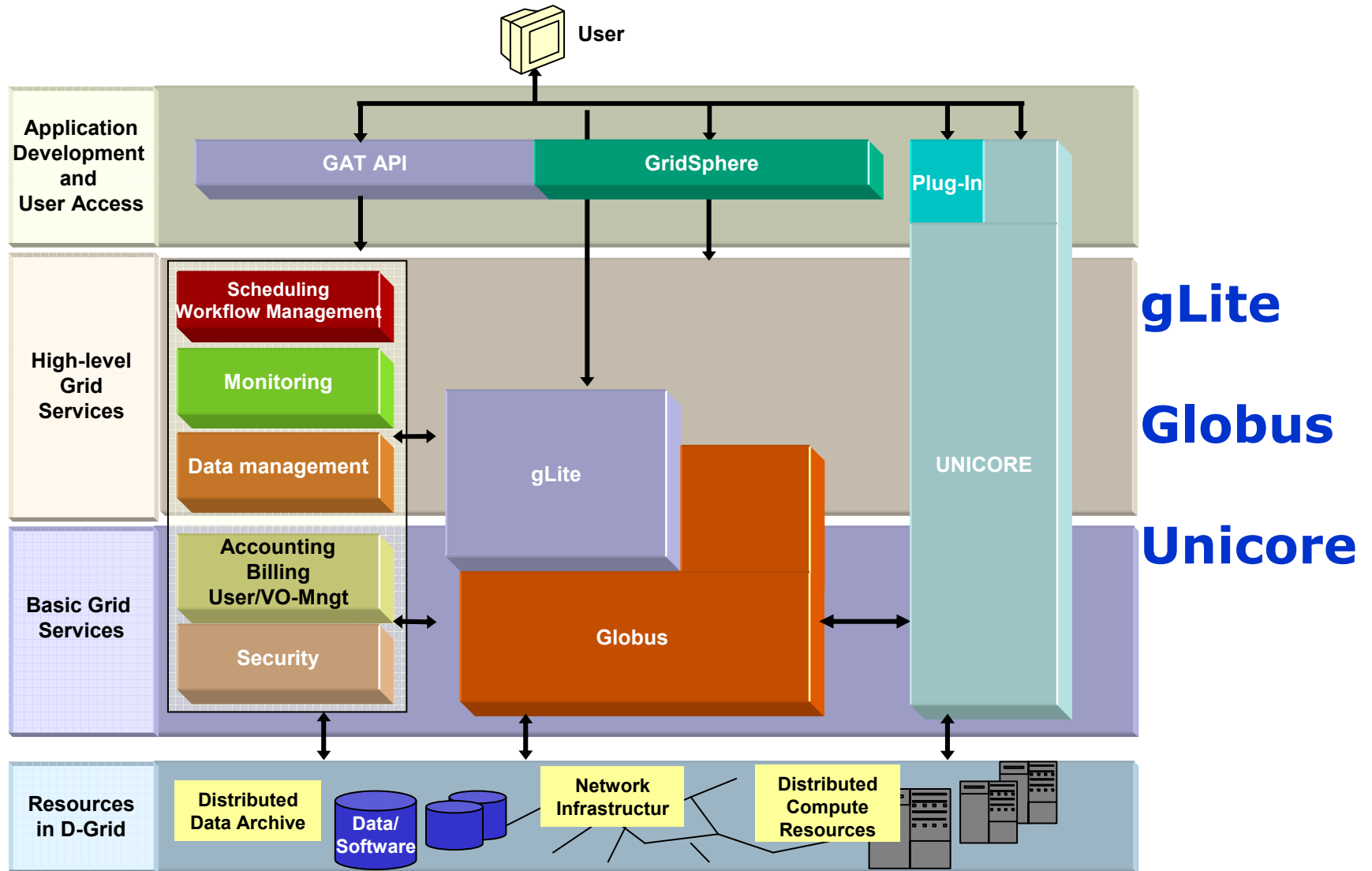
*) funded by the German Federal Ministry for Science and Education



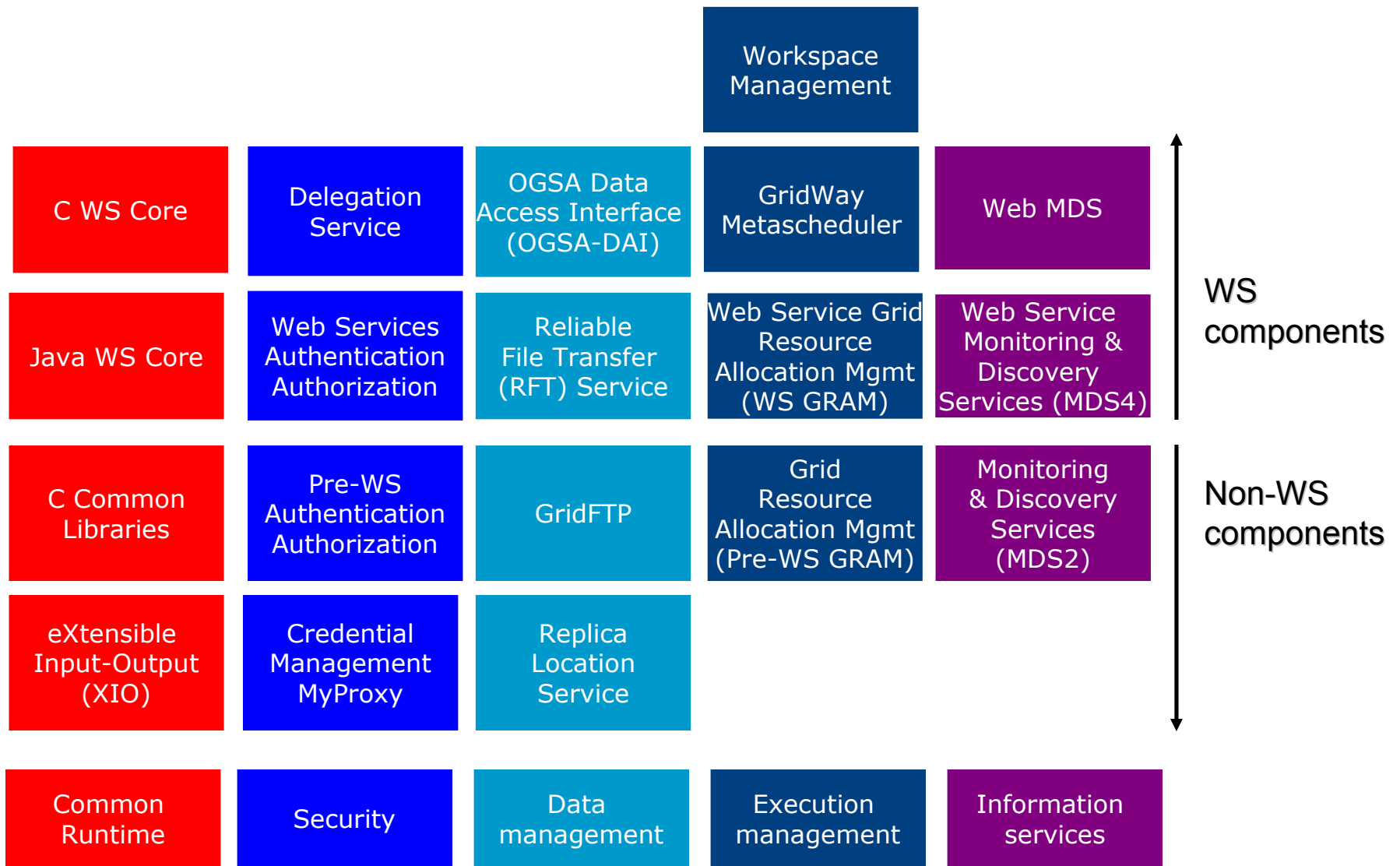
D-Grid -1, -2, -3 2005 - 2011



D-Grid: 3 Grid Middlewares !



Globus Toolkit Architecture

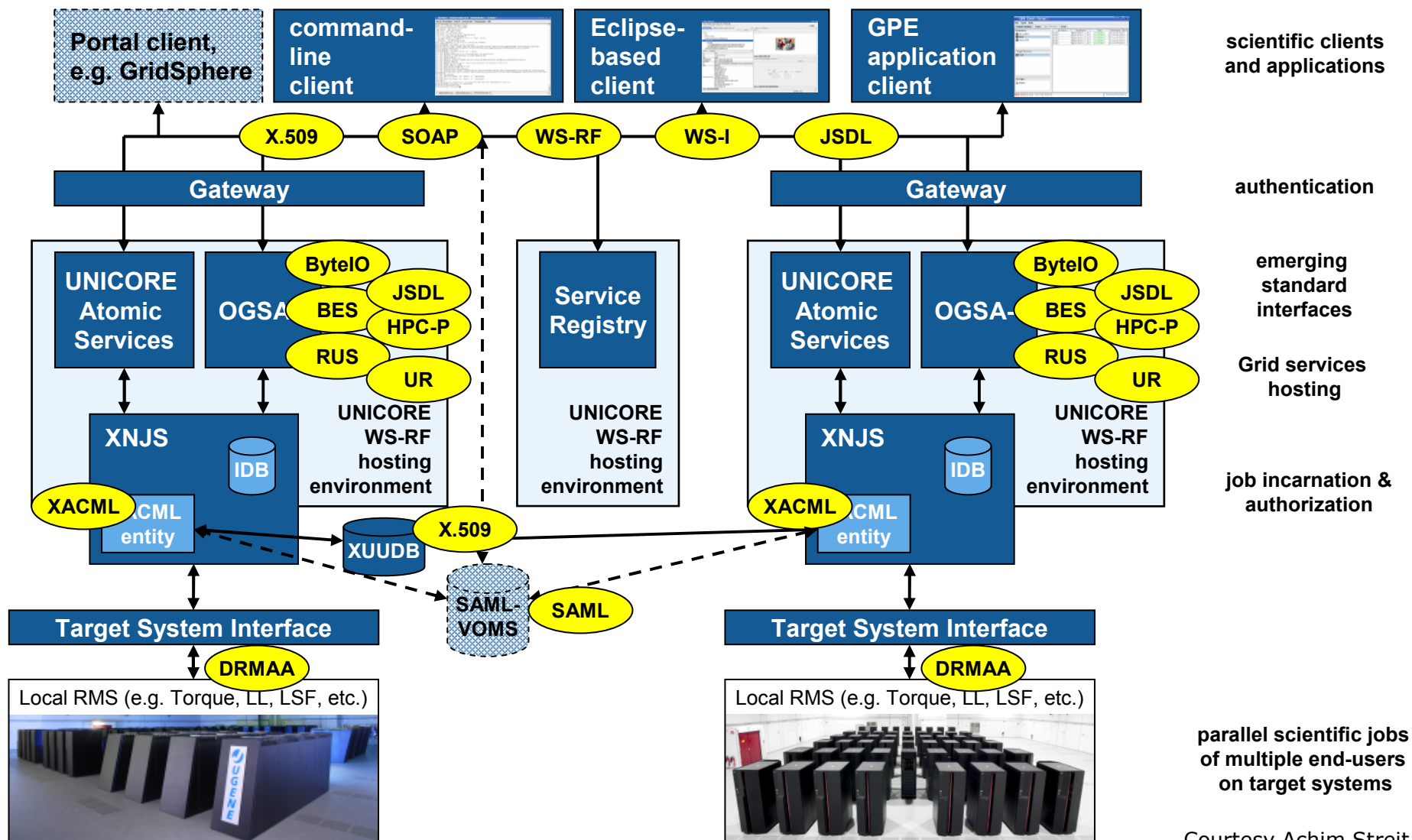


Courtesy Gabriel Mateşcu

Standards in Globus

- **Security and client-service communication**
 - X.509, XML, WSDL, SOAP, SSL/TLS, HTTP
 - WS-RF, WS-Addressing, WS-Notification, WS-Security
 - Under adoption: SAML
- **Information System, Monitoring & Accounting**
 - XML, XML-schema, GLUE Schema
- **Job Management**
 - DRMAA; under adoption: BES, JSDL
- **Data Management**
 - GridFTP, DAIS

UNICORE 6 Architecture

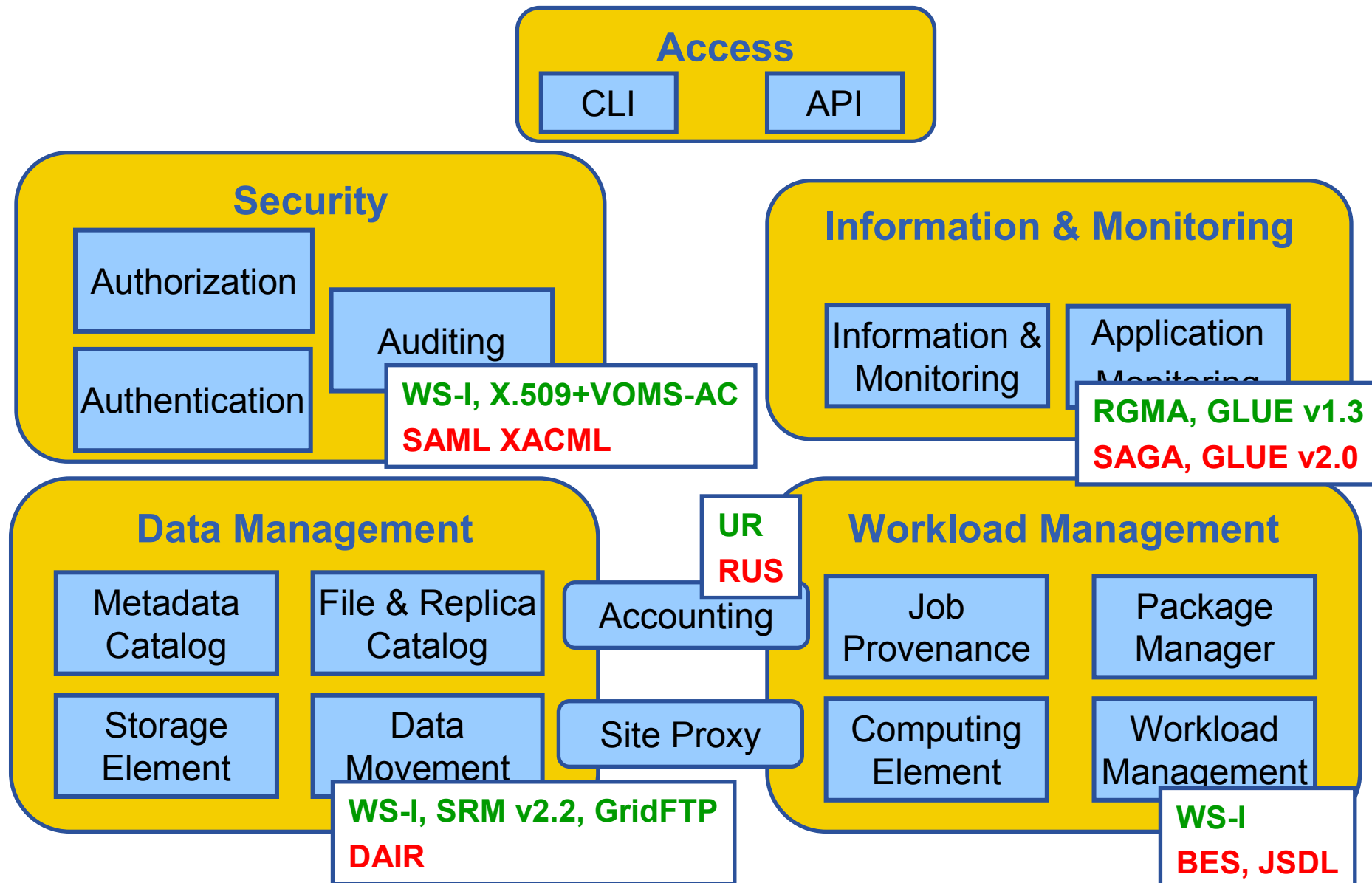


Courtesy Achim Streit



- ▶ Security
 - ▶ Full **X.509** certificates as base line, **XACML** based access control
 - ▶ Support for **SAML**-based VOMS & **X.509** proxies in development
- ▶ Information system, monitoring, accounting
 - ▶ **GLUE 2.0** information service in development (strong interaction with the GLUE WG)
 - ▶ **OGSA-RUS** for accounting in development (incl. **UR** for storing)
- ▶ Job management
 - ▶ **OGSA-BES**, **HPC-P**: creation, monitoring and control of jobs
 - ▶ job definition compliant with **JSDL** (+ JSDL HPC ext.)
 - ▶ **DRMAA** communication to local resource manager for job scheduling
- ▶ Data management
 - ▶ Fully **OGSA-Bytelo** compliant for site-to-site transfers
- ▶ Web-Services (**WS-RF 1.2**, **SOAP**, **WS-I**) stack !

Courtesy Achim Streit



- **Security**
 - Use X.509 certificates and VOMS Attribute Certificates
 - In future SAML and XACML for attribute and policy management
- **Information system, monitoring and accounting**
 - GLUE schema (1.3 now, 2.0 in future) accessed through LDAP
 - In future use a SAGA compliant interface for access
 - UR for description of accounting usage records
 - In future will adopt the RUS interface
- **Job Management**
 - Adopt BES interface in CREAM (in OMII-Europe)
 - but currently not descriptive enough
 - JSDL (with extensions) used to describe jobs
- **Data Management**
 - SRM 2.2 interface for data access and GridFTP for file transfers
- **Use a Web Service Interface wherever possible**
 - When performance allows it

Standards Summary **gLite** **Globus** **Unicore**

Security	X.509	X.509	X.509
	VOMS	VOMS	VOMS
	SAML	SAML	SAML
	XACML	XACML	XACML
<hr/>			
Information Syst, Monitoring & Acctg Accounting	GLUE	GLUE	GLUE
	XML	XML	XML
	UR		RUS/UR
<hr/>			
Job Management	BES	BES	BES
	JSDL	JSDL	JSDL
	DRMAA	DRMAA	DRMAA
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Information Syst, Monitoring & Acctg Accounting	GLUE	GLUE	GLUE
	XML	XML	XML
	UR		RUS/UR

Job Management	BES	BES	BES
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		DRMAA	DRMAA

Data Management	GridFTP	GridFTP	
	SRM2.2	DAIS	ByteIO

=> Standards-based Interoperability in OMII-Europe

Our Goal: Sustainability of e-Infrastructures

e-IRG Workshop in April '07:

- **Theme 1:** Towards a European Grid Infrastructure.
Lessons, recommendations: EGI, OMII-UK, HET, CEC, DEISA, Tony Hey
- **Theme 2:** Sustainability for e-Infrastructures.
Sharing policies, resource provisioning, Grid economy, business models, national Grid services, e-social science, large-scale research infrastructures
- **Theme 3:** Bridging the gap between academia and industry.
Innovation, industry involvement, EGEE and CoreGRID experience with industry, strategy for collaboration

e-IRG Workshop EML Heidelberg, April 19 – 20, 2007

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Standards are the key towards achieving these goals !

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Last but not least: Standards are a prerequisite for an International Grid Community



Courtesy Dieter Kranzmueller



Last but not least: Standards enable D-Grid to become part of the International Grid Community



European Grid Initiative

Courtesy Dieter Kranzmueller





21th Century



Knowledge Engine

20th Century



Combustion Engine

19th Century



Steam Engine

Thank You !

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