



Interoperability in Grid Computing


Anette Weisbecker, Fraunhofer IAO, Stuttgart

18th April 2007
Special Interest Session III



Interoperability in Grid Computing

Fraunhofer IAO
Institut
Arbeitswirtschaft und
Organisation

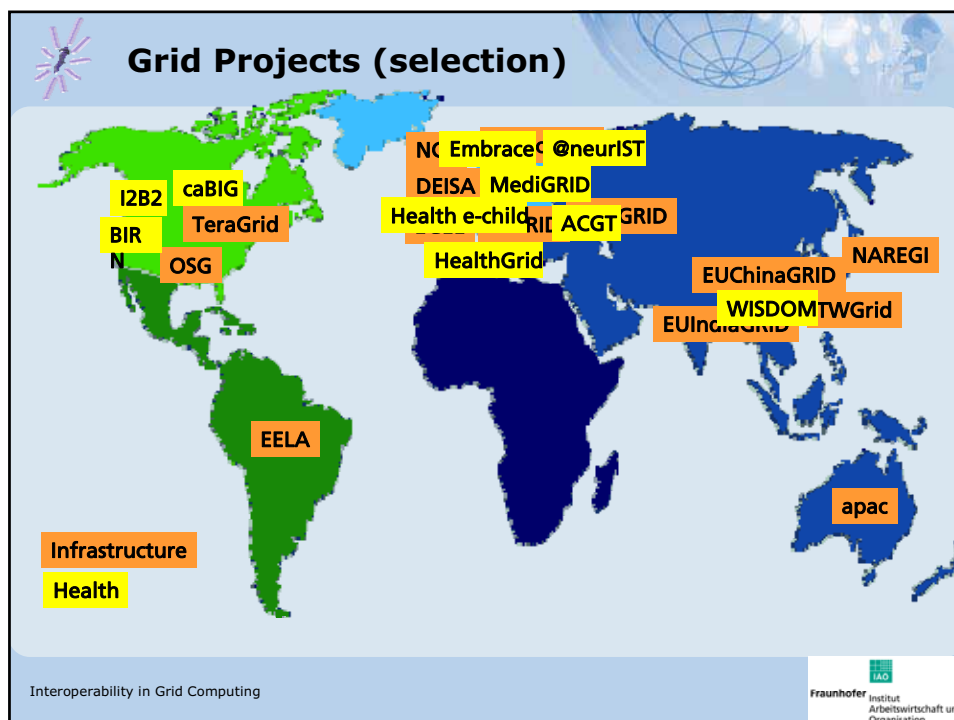
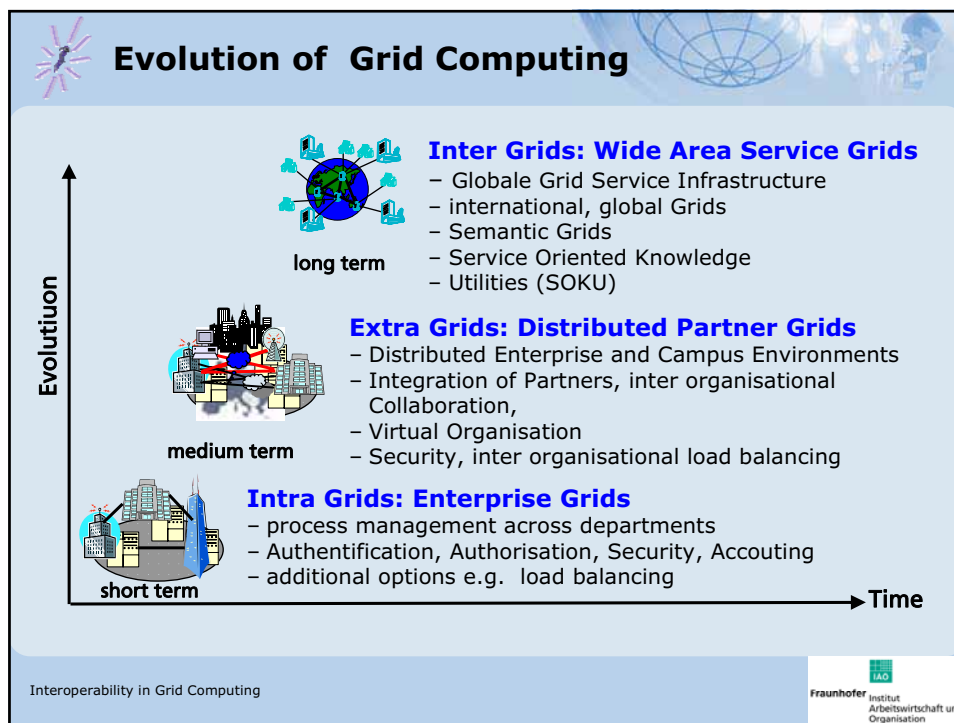


Outline: Interoperability in Grid Computing

- Grid Computing for Medicine and Life Science
- Interoperability
- Architecture and Middleware
- Data Access
- Portal
- Application Classes and Applications
- Service oriented Grids

Interoperability in Grid Computing

Fraunhofer IAO
Institut
Arbeitswirtschaft und
Organisation



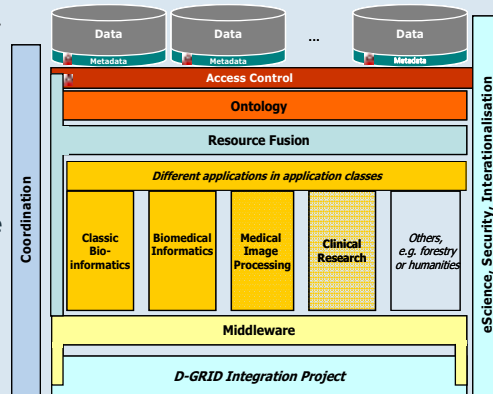


MediGRID - Grid Computing for Medicine and Life Sciences

Enhance interdisciplinary and widely location-independent collaboration within medical and biomedical research by use of GRID technologies

GRID-services in a controlled e-Science platform which is continually available, economically calculable and secured by policies as well as their implementation offer a promising opportunity for the support of future collaborative research with efficient, modern IT tools.

Transparent access to distributed resources through **virtualisation** enabled by a GRID.



Interoperability in Grid Computing

Fraunhofer
IAD
Institut
Arbeitswirtschaft und
Organisation



Specific Requirements in MedGRID

- Highest requirements on data protection and privacy (patient data, data from biosamples, genome data)
- The data basis is relatively inhomogenous as the standardization of data formats (e.g. in medical imaging or clinical studies) is so far not very advanced.
- Lack of semantic interoperability.
- Heterogeneous User Community.
MediGRID users and their main tasks:
 - Doctor (looking for data, providing data, processing data)
 - Assistant Medical Technician (providing data)
 - Researcher doing bioinformatics (processing data)
 - Researcher doing clinical studies (processing data)
 - Radiologist (providing and processing data – e.g. mammograms -> medical image processing)
 - etc.



Interoperability in Grid Computing

Fraunhofer
IAD
Institut
Arbeitswirtschaft und
Organisation



Interoperability

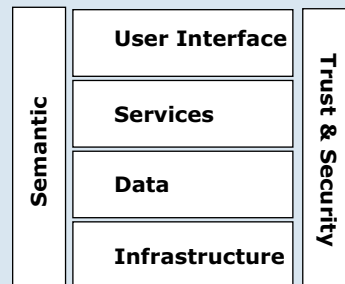
Interoperability is the collaboration of different systems, techniques and organisations.

IEEE Definition:

Interoperability is the ability of two or more systems or components to exchange information and to use the information that has been exchanged.

Necessary Requirements:

- Standards
- Semantical interoperability: speaking the same »language«



Source: Institute of Electrical and Electronics Engineers. IEEE Standard Computer Dictionary: A Compilation of IEEE Standard Computer Glossaries. New York, NY: 1990.

Interoperability in Grid Computing

Fraunhofer
IAO
Institut
Arbeitswirtschaft und
Organisation



Grid Technologies Overview

Open Source Products:

- Globus Toolkit
- Unicore
- gLite
- Condor
- Phast Grid
- GRIA
- BOINC
- Storage Resource Broker (SRB)
- OGSA-DAI (Data Access and Integration)
- XEN
- VMWare
- eXeGrid



Commercial Products:

- Univa: Globus Toolkit
- Sun N1 Grid Engine
- Nirvana SRB
- Oracle 10g Suite
- Data Synapse GridServer
- United Devices GX Synergy
- Grid Systems Nitya Extended Suite
- Platform Computing
 - Platform Globus Toolkit
 - Enterprise Grid Orchestrator
 - LSF
- Sybase: AVAKI Enterprise Information Integration (EII)



Interoperability in Grid Computing

Fraunhofer
IAO
Institut
Arbeitswirtschaft und
Organisation



Standardisation Organisations (selection)

Internet Engineering Task Force (IETF)

- Internet Protocol (Version 1: RFC 791, Version 6: RFC 2460)
- Transmission Control Protocol (RFC 793)



W3C – World Wide Web Consortium

- HTML, XML, XSLT, etc.



Organization for the Advancement of Structured Information Standards (OASIS)

- Web Services Resource Framework (WSRF) / WSRF.net, SAML, XACML,...



Open Grid Forum (OGF)

- Open Grid Services Architecture (OGSA)
- »GIN - Grid-Interoperability-Now« group within the Open Grid Forum works on interoperability between e-Infrastructures in order to provide services to global user communities

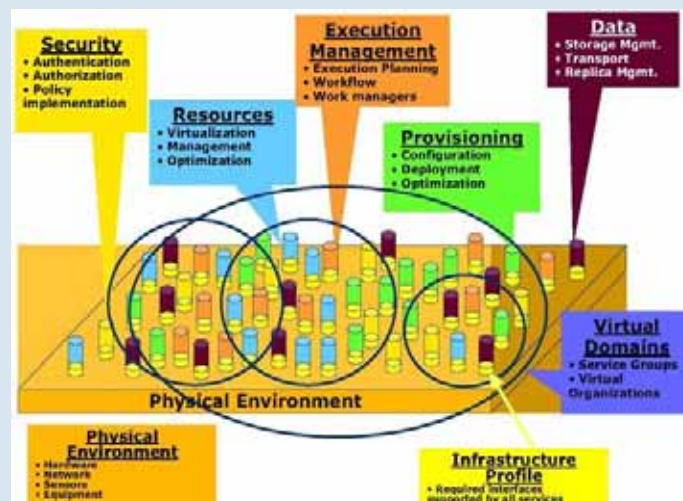


Interoperability in Grid Computing

Fraunhofer
IAD
Institut
Arbeitswirtschaft und
Organisation



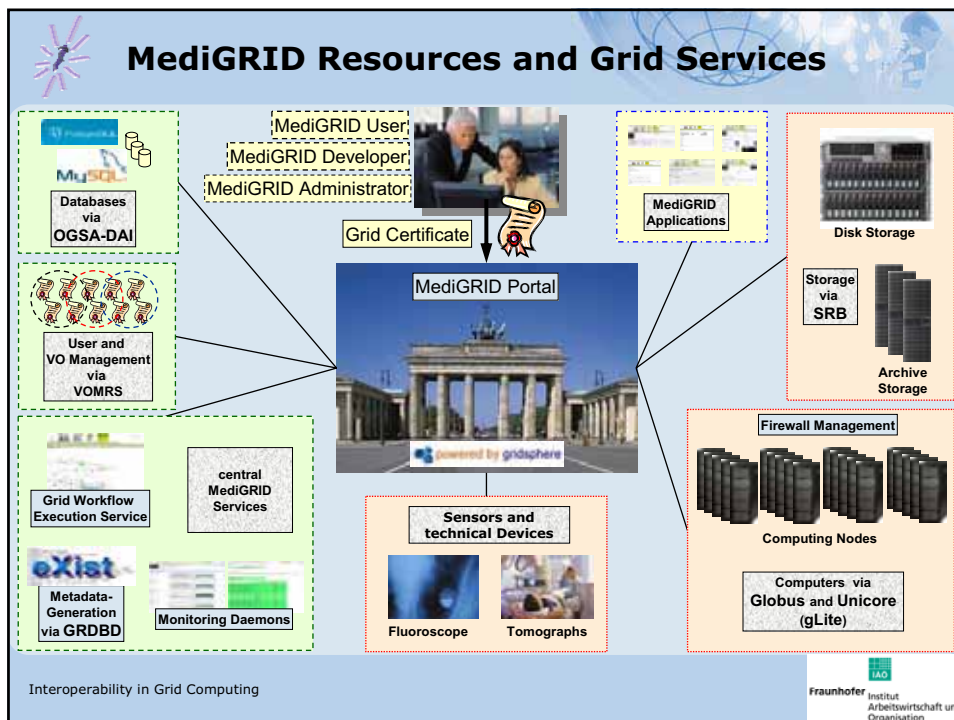
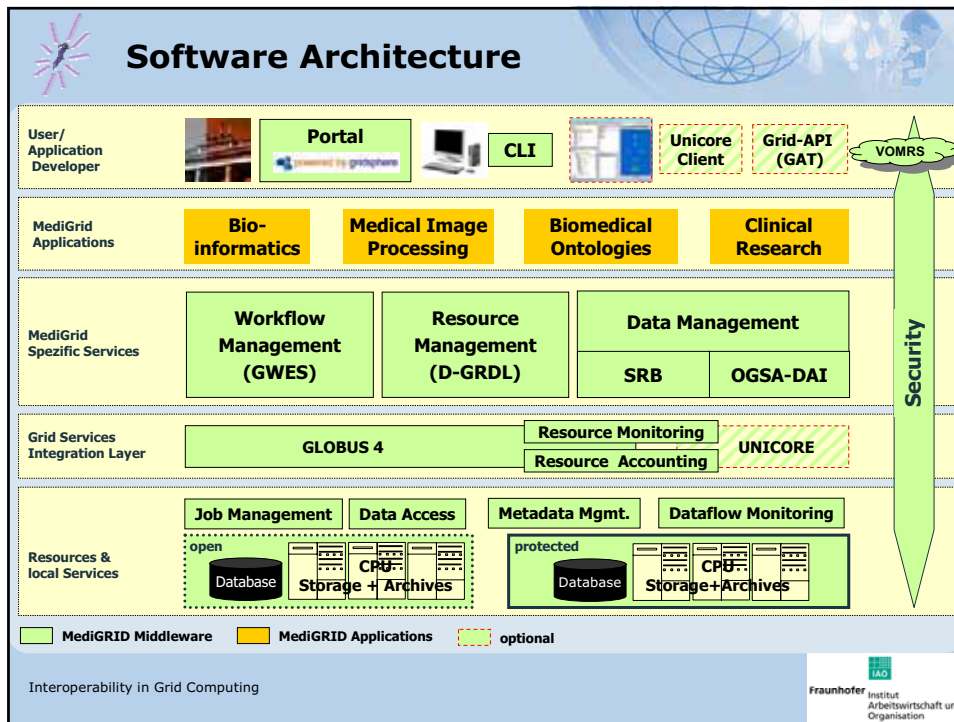
Open Grid Services Architecture Framework 1.5

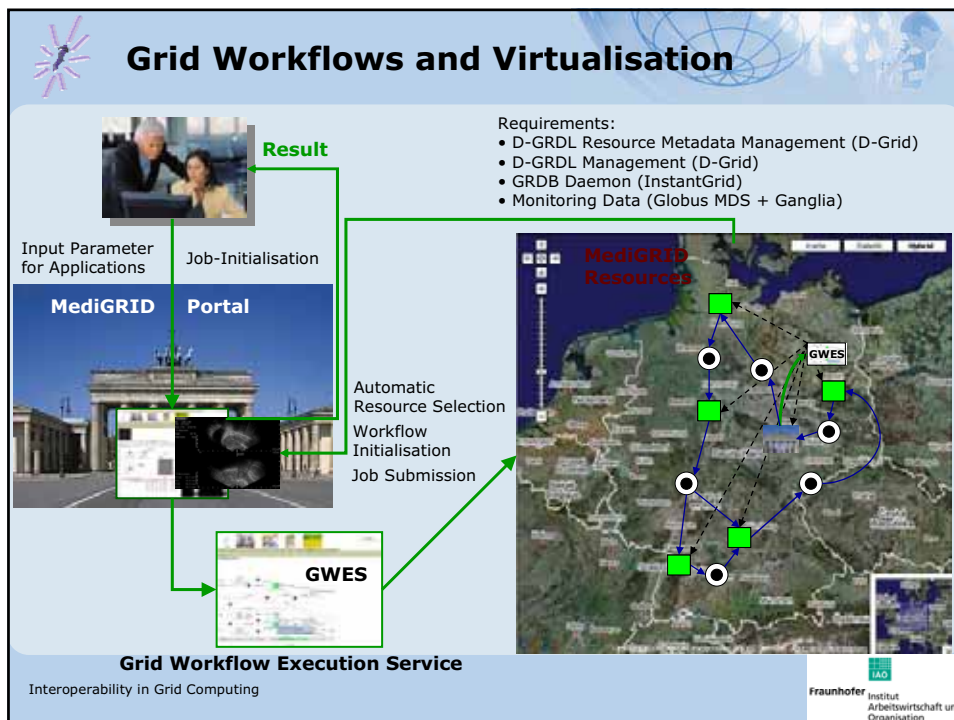
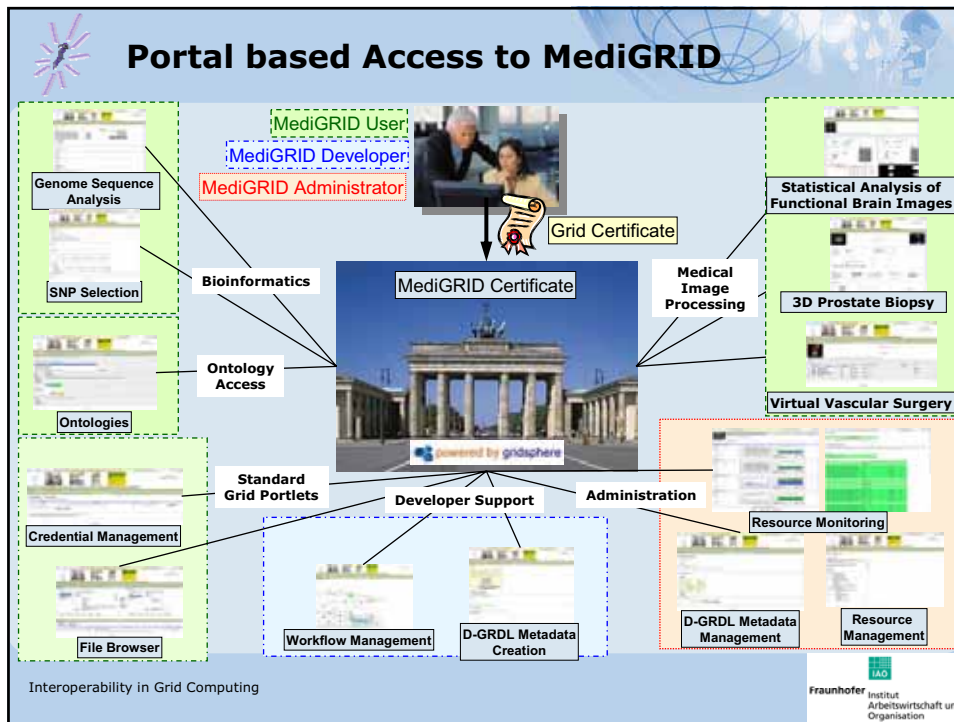


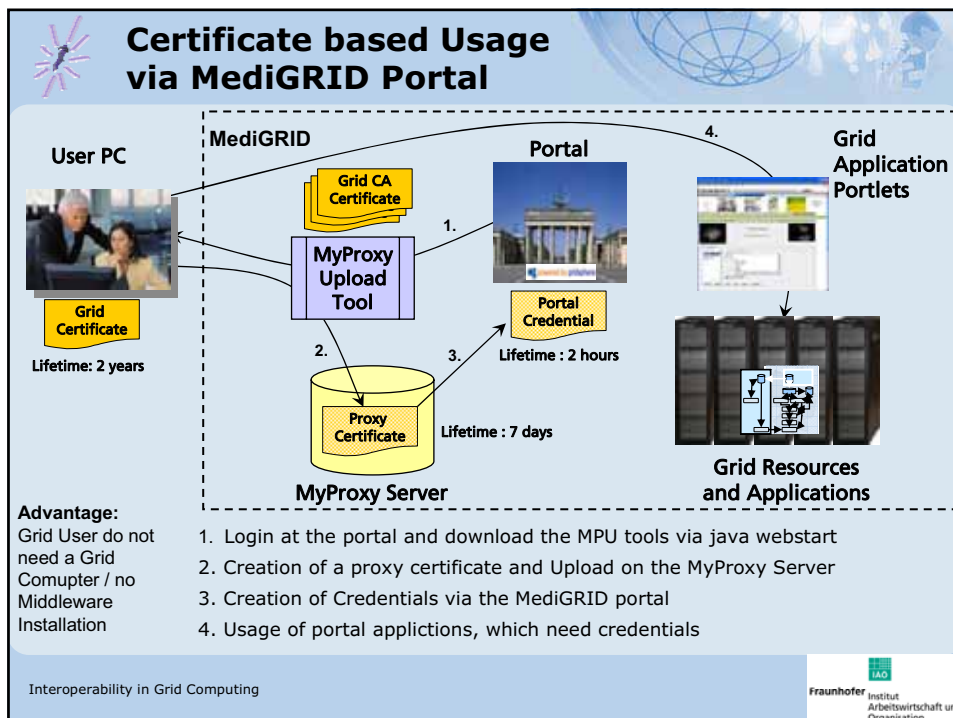
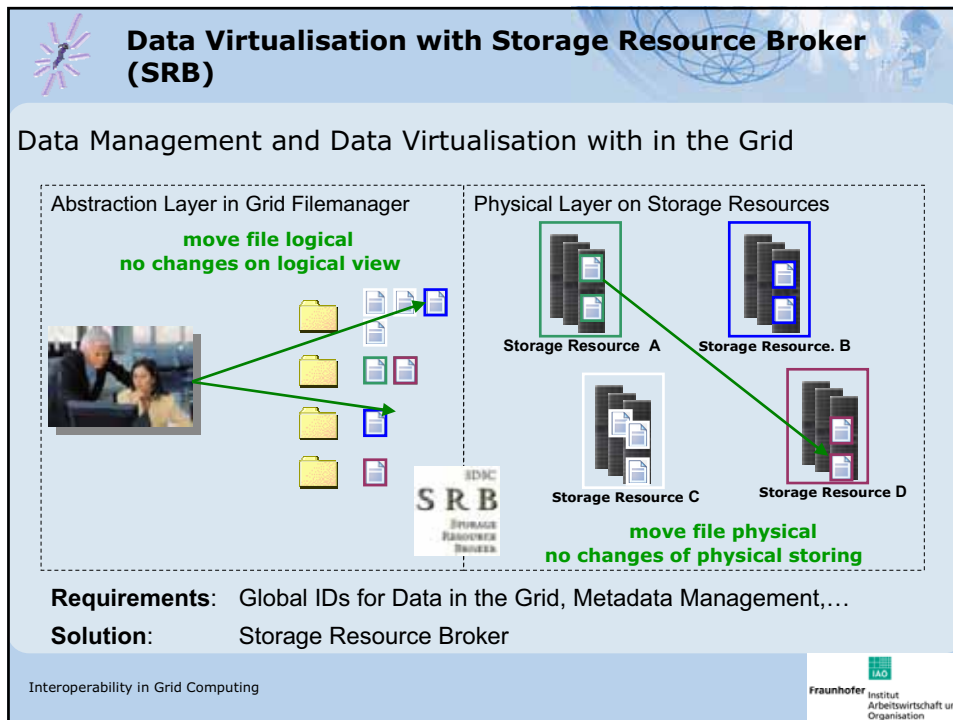
Quelle: The Open Grid Services Architecture, Version 1.5,
https://forge.gridforum.org/sf/docman/do/downloadDocument/projects.ogsa-wg/docman.root.published_documents.ogsa_1_5/doc13553

Interoperability in Grid Computing

Fraunhofer
IAD
Institut
Arbeitswirtschaft und
Organisation









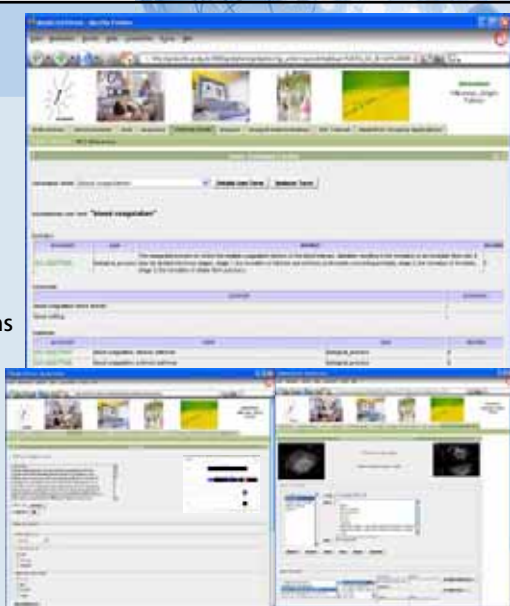
MediGRID Portal

MediGRID Portal is the central, easy to use, **world wide** access to the applications for the user

- GridSphere
- GridPortlets
- Certificates for secure access

Integration of medical applications

- Applications are callable as web services (Wrapper)
- Global identifier for transparent data access
- OGSA-DAI for connection of distributed databases
- Petri net based workflows for application processes



Interoperability in Grid Computing

Fraunhofer
IAD
Institut
Arbeitswirtschaft und
Organisation



MediGRID Application Classes with their Applications

Bioinformatics

- **Genome Sequence Analysis**
- **SNPSelection: Single nucleotide polymorphisms selection**
- RNAi: ribonucleic acid interference screening
- Sequorr: Sequence correlation

Medical Image Processing

- **3D Prostate Biopsy**
- **Statistical Analysis of Functional Brain Images**
- **Virtual Vascular Surgery**

Clinical Research

- Analysis of clinical studies in neurology

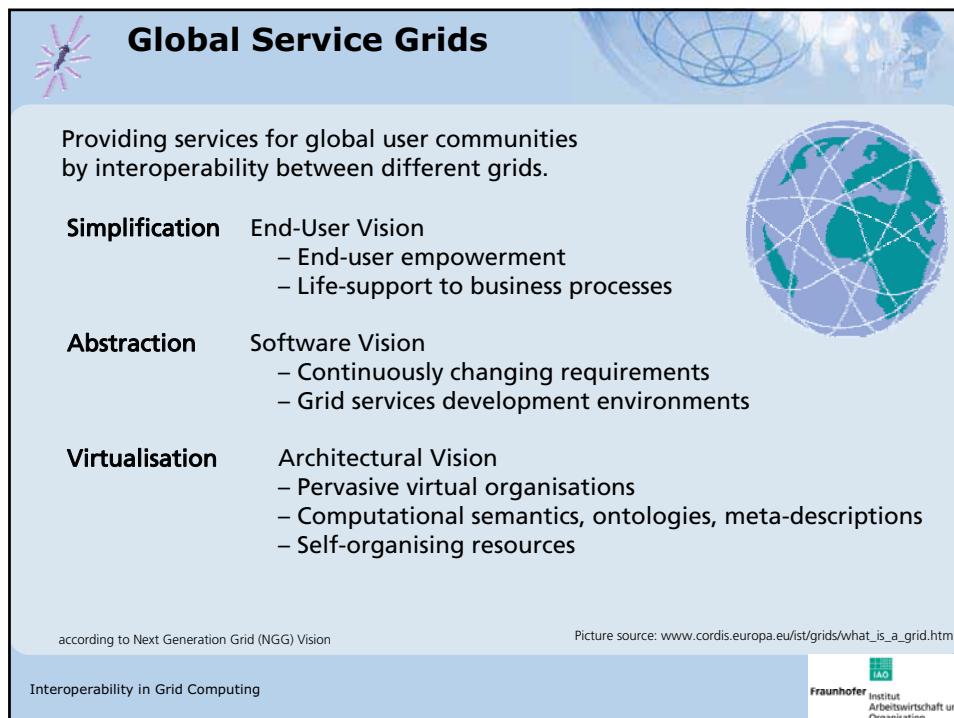
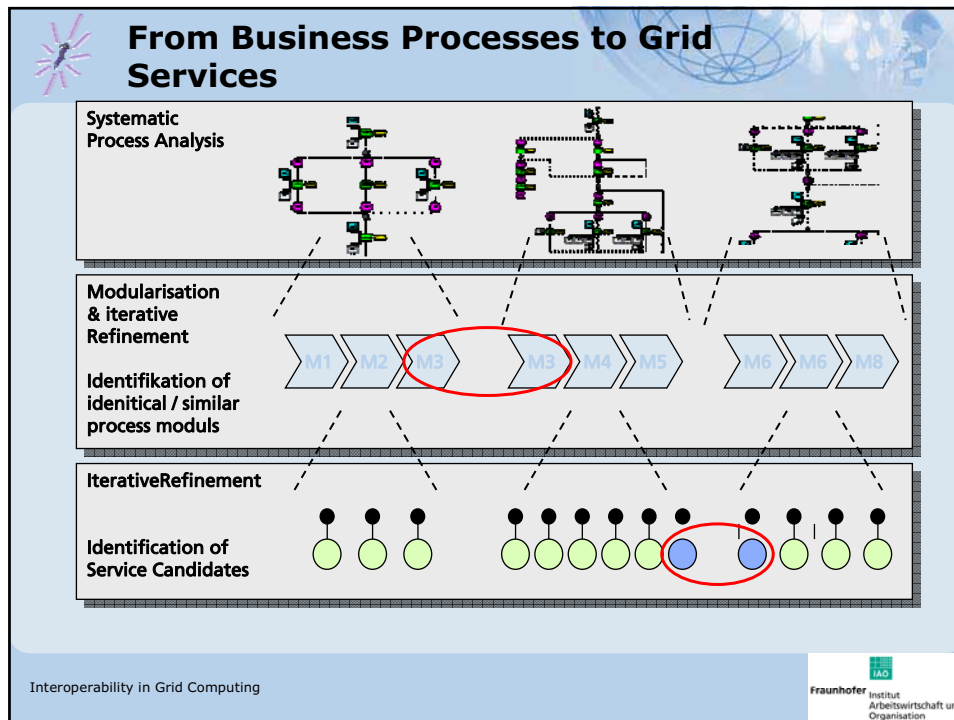
Ontologies

- Integration of different ontologies with heterogeneous formats



Interoperability in Grid Computing

Fraunhofer
IAD
Institut
Arbeitswirtschaft und
Organisation





Contact

Thank you for
your attention !

Questions ?



www.medigrid.de

Priv.-Doz. Dr.-Ing. habil. Anette Weisbecker
Fraunhofer Institute for Industrial Engineering
Nobelstraße 12
70569 Stuttgart, Germany
<http://www.iao.fraunhofer.de>
Phone: +497119702400
E-Mail: Anette.Weisbecker@iao.fraunhofer.de
<http://www.sw-management.iao.fraunhofer.de>
<http://www.enterprisegrids.fraunhofer.de>

Interoperability in Grid Computing


Fraunhofer
Institut
Arbeitswirtschaft und
Organisation