Medical Informatics
University Medicine Goettingen
Germany

MediGRID workshop

HealthGrid Conference
June 2, 2008

Applications to Public Health and Medicine

[24] MediGRID
Grid-Computing for Life Sciences

Chicago, IL
June 2, 2008
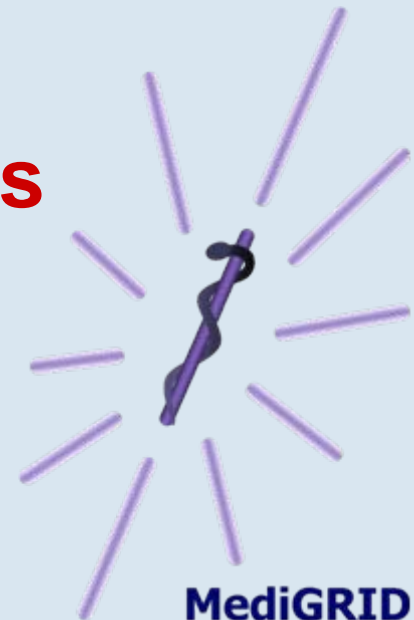
From the bench to the bedside gridwise: MediGRID

(1) **Goals and structure of the German grid initiative (D-Grid)**

(2) **Overall goals of MediGRID**

(3) **Achieved pilot scenarios**

(4) **Strategies on how to overcome the roadblocks in further dissemination of medical grid computing**

(5) **Outlook on the further development concerning industry involvement, business plans and sustainability**

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Speakers

Ulrich Sax, PhD, MediGRID

Vice Head of MediGRID, Assistant Professor in Medical Informatics, University Medicine Goettingen, Germany

Tobias Knoch, PhD, MediGRID

Assistant Professor in Biophysical Genomics, Dept. Cell Biology & Genetics, Erasmus Medical Center, Rotterdam, The Netherlands.

Biophysical Genomics, Kirchhoff Institute of Physics, Ruperto-Carola University Heidelberg, Germany

Frank Dickmann, Services@MediGRIDGrid

Coordinator and Researcher within Services@MediGRID, Business Informatics and Medical Informatics Background, University Medicine Goettingen, Germany

Karl A. Stroetmann, PhD, MediGRID

Empirica Communication and Technology Research, Bonn, Germany

Sebastian C. Semler, MediGRID

Scientific Manager of the Telematics Platform Medical Research Networks (TMF), Berlin, Germany

Agenda

Sax U: [24.1]

From the bench to the bedside gridwise: MediGRID

Knoch TA: [24.2]

Resource Sharing on the Teraflop Scale for the BioMedical research and care sector - The Erasmus Computing Grid

Dickmann F: [24.3]

Services@MediGRID: Business cases for research and healthcare industry

Stroetmann K: [24.4]

Business models and sustainability of HealthGrid solutions

Semler SC: [24.5]

Community Building and Dissemination for HealthGrids

D i s c u s s i o n

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D-Grid Initiative

Phase 1 started in September 2005

Five Community projects and the D-Grid Integration project (DGI):

- AstroGrid-D in astronomy
- C3-Grid for climate research
- HEP-Grid for high energy physics
- InGrid for engineering research
- MediGrid for medical research

Aims to build a Grid infrastructure in Germany, which will help to establish methods of e-science in the German scientific community.

www.d-grid.de

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D-Grid now

Objective

➜ To establish a sustainable Grid infrastructure in Germany that provides access to high level IT services for industry and academia

Projects

➜ 22 projects so far with 117 partners from academia, research institutions and industry

Project Funding

➜ 95 Mio € provided by the Federal Ministry of Education and Research

Project Duration

➜ 2005 – 2011 (planned)

➜ Individual projects may run up to 3 years

Contact

➜ Uwe Schwiegelshohn, D-Grid Corporation uwe.schwiegelshohn@udo.edu

➜ www.d-grid.de (also in english)

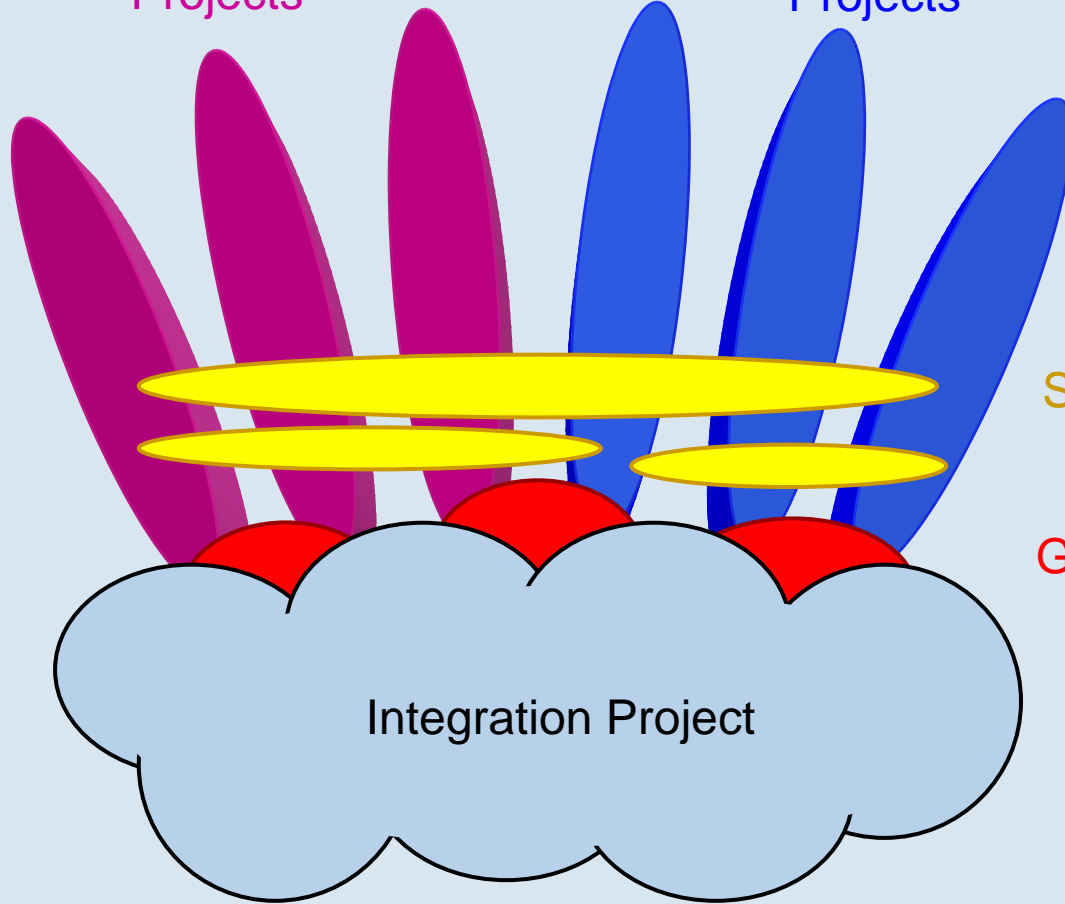Bundesministerium
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Technical Structure of D-Grid

MediGRID

Academic Community Projects

Commercial Community Projects

Service Layer Projects

Gap - Projects

Integration Project

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MediGRID

Support
➜ Globus 4.x, LCG/gLite, UNICORE, SAGA/GAT
➜ Helpdesk
➜ Reference installation

Operation of D-Grid: Guidelines and Central Parts
➜ Operation of VO services and user services
➜ Operation of resources

Security
➜ AAI/VO
➜ Firewalls

Data and Information Management
➜ dCache, OGSA-DAI, IRODS
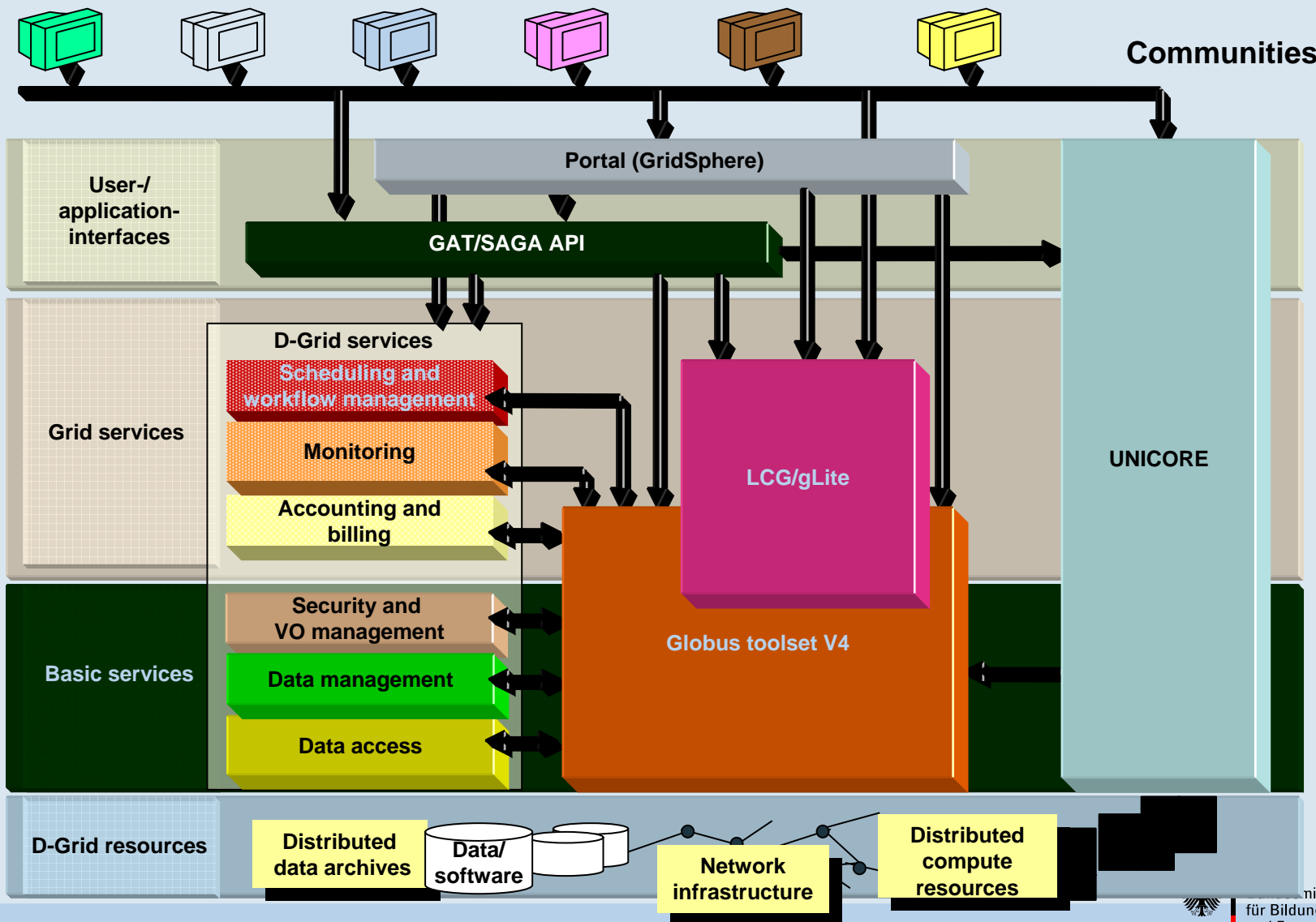➜ Meta data

Development of Basic Components
➜ Portal (GridSphere), Accounting, CRM, Monitoring

Sustainability

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D-Grid Infrastructure

From the bench to the bedside gridwise: MediGRID

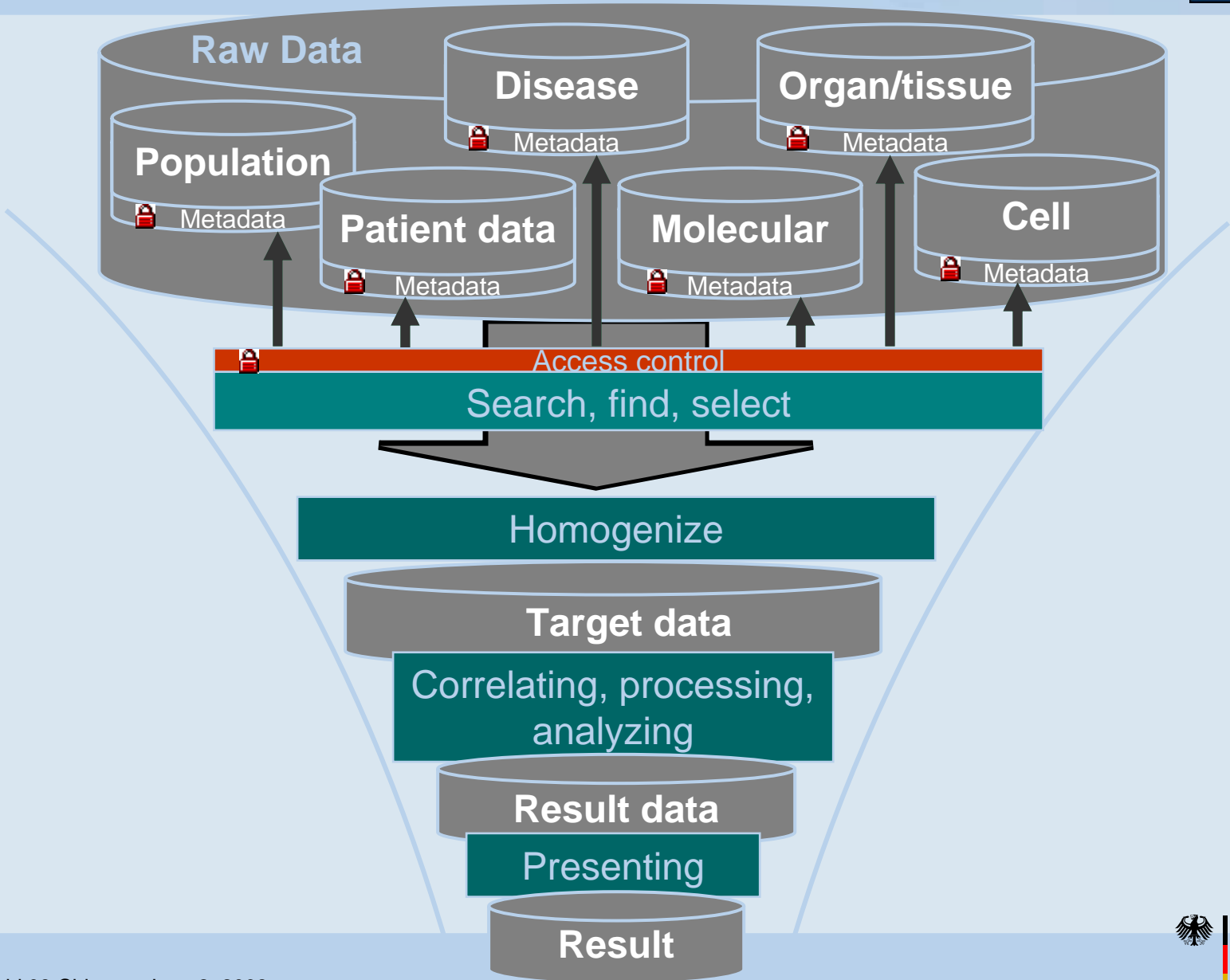**(1) Goals and structure of the German grid initiative (D-Grid)**

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MediGRID - Data flow in Life Science Grids

Raw Data

Population — Metadata
Disease — Metadata
Organ/tissue — Metadata
Patient data — Metadata
Molecular — Metadata
Cell — Metadata

Access control
Search, find, select

Homogenize

Target data

Correlating, processing, analyzing

Result data

Presenting

Result

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Mapping with entropy selected markers

Normal   Morbus Crohn

nature
genetics

We performed a genome-wide association study of 19,779 nonsynonymous SNPs in 735 individuals with Crohn disease and 368 controls.

A genome-wide association scan of nonsynonymous SNPs identifies a susceptibility variant for Crohn disease in *ATG16L1*

Jochen Hampe[1,2,10], Andre Franke[1,10], Philip Rosenstiel[1,9], Andreas Till[1], Markus Teuber[1], Klaus Huse[3], Mario Albrecht[4], Gabriele Mayr[4], Francisco M De La Vega[5], Jason Briggs[5], Simone Günther[5], Natalie J Prescott[6], Clive M Onnie[6], Robert Häsler[1], Bence Sipos[7], Ulrich R Fölsch[2], Thomas Lengauer[4], Matthias Platzer[3], Christopher G Mathew[6], Michael Krawczak[8] & Stefan Schreiber[1,2]

Gallstone gene found

MediGRID

DDP / Medizinhistorisches Museum Charite Berlin

**Kleiner Keim, großer Klumpen:
Gallensteine im medizin-historischen Museum
der Berliner Charité**

Aus Spiegel Online 16.07.2007:
http://www.spiegel.de/wissenschaft/mensch/0,1518,494630,00.html
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A genome-wide association scan identifies
the hepatic cholesterol transporter ABCG8 as
a susceptibility factor for human gallstone
disease

S Buch, C Schafmayer, H Völzke, C Becker, A Franke, H v Eller-
Eberstein, C Kluck, I Bässmann, M Brosch, F Lammert, J F Miquel, F
Nervi, M Wittig, D Rosskopf, B Timm, C Höll, M Seeger, A ElSharawy, T
Lu, J Egberts, F Fändrich, U R Fölsch, M Krawczak, S Schreiber, P
Nürnberg, J Tepel & J Hampe

*... **We performed an association scan of > 500,000
SNPs in 280 individuals with gallstones and 360
controls** ...*

Für ihre Studie verglichen Hampe und seine Kollegen zunächst die
Erbanlagen von 280 deutschen Gallenstein-Patienten mit denen von 360
gesunden Kontrollpersonen. Dabei ergaben sich an 235 Stellen des
Erbgutes besonders deutliche Unterschiede zwischen diesen beiden
Gruppen, schreiben die Wissenschaftler. Diese Positionen analysierten
die Forscher im zweiten Schritt im Erbgut von insgesamt 1105 Patienten
und 873 Kontrollpersonen genauer. Ein Variante des Gens ABCG8 kam
dabei als Risikofaktor zum Vorschein.
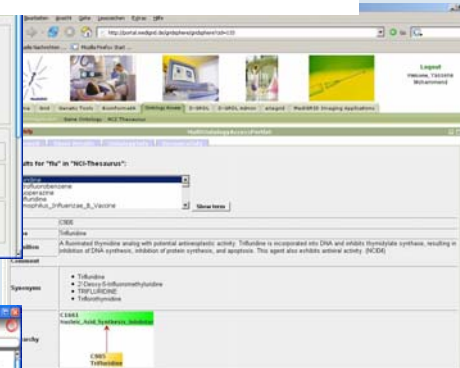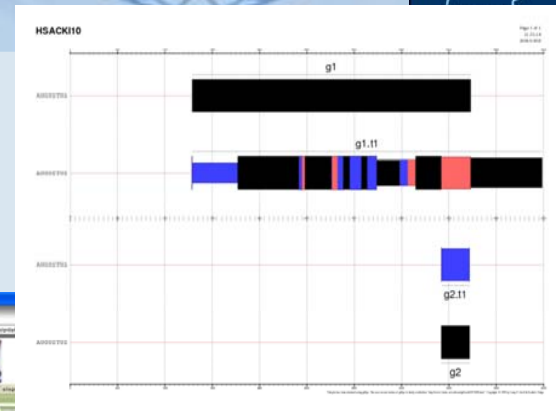
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Integrated in the MediGRID Portal:
AUGUSTUS:
Genome sequence analysis

Ontology-Access:
with OGSA-DAI-Service

Medical Imaging
➜ 3D US Prostate biopsy
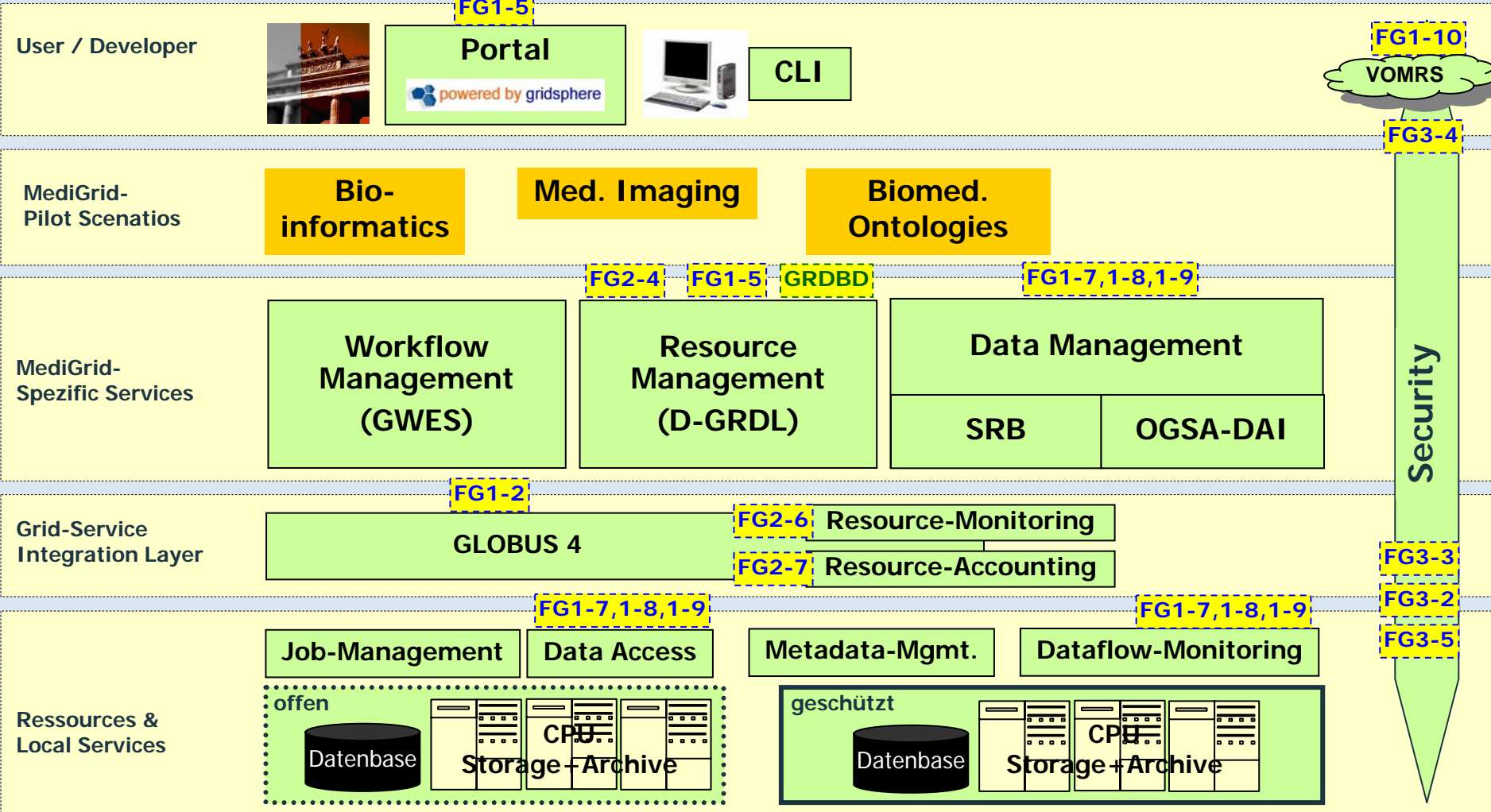➜ Virtual vascular surgery

In the pipeline:
Clinical studies Neurology

Software Architecture

MediGRID

User / Developer	FG1-5 — **Portal** powered by gridsphere — **CLI**	FG1-10 — VOMRS / FG3-4
MediGrid-Pilot Scenatios	**Bio-informatics** **Med. Imaging** **Biomed. Ontologies**	
MediGrid-Spezific Services	FG2-4 · FG1-5 · GRDBD · FG1-7,1-8,1-9 · **Workflow Management (GWES)** · **Resource Management (D-GRDL)** · **Data Management** · **SRB** · **OGSA-DAI**	Security
Grid-Service Integration Layer	FG1-2 · **GLOBUS 4** · FG2-6 **Resource-Monitoring** · FG2-7 **Resource-Accounting**	FG3-3 · FG3-2
Ressources & Local Services	FG1-7,1-8,1-9 · **Job-Management** · **Data Access** · **Metadata-Mgmt.** · **Dataflow-Monitoring** · FG1-7,1-8,1-9 · offen (Datenbase, CPU, Storage+Archive) · geschützt (Datenbase, CPU, Storage+Archive)	FG3-5

■ **MediGRID Middleware**   ■ **MediGRID Applications**

Interface to DGI project

Interface to Instant Grid

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MediGRID Portal

MediGRID Nutzer
MediGRID Entwickler
MediGRID Admin

Grid Zertifikat

MediGRID Portal

powered by gridsphere

Gensequenzanalyse

SNP Selection

Bioinformatik

Ontologiezugriff

Ontologie-zugriff

Analyse funktioneller Hirnbilddaten

3D-Prostatabiopsie

Medizinische Bildverarbeitung

Virtuelle Gefäßchirurgie

Credential Management

File Browser

Standard Grid Portlets

Entwickler-unterstützung

Workflow Management

D-GRDL Metadaten-Erstellung

Administration

Ressourcen-Monitoring

D-GRDL Metadaten-Management

Resource Management

für Bildung und Forschung

Where are we now?

MediGRID successfully set up four pilot scenarios on the GRID

Interdisciplinary work with Astronomy, HEP etc. very came out very fruitful!

Security is still an issue
- ➜ Policies
- ➜ Legal regulations (EU, countries)
- ➜ Technology
- ➜ Acceptance

Usability might be a road block
- ➜ Streamline grid specific working procedures (certificates
- ➜ Tackle stability!

MediGRID US-Workshop 11-15. November 2006

v.l.n.r. Yannick Legré (HealthGrid EU, Port-au-Chevau), Otto Rienhoff (MediGRID, Univ. Göttingen), Peter Covitz (caBIG, NCICB, Washington), Berit Hamer (Univ. Göttingen), Dagmar Krefting (MediGRID, Charité Berlin), Howard Bilofsky (US HealthGrid, Univ. of Pennsylvania, Philadelphia), Parvati Dev (US HealthGrid, University School of Medicine, Stanford), Michael Hartung (MediGRID, Univ. Leipzig), Anette Weisbecker (MediGRID, Fraunhofer IAO, Stuttgart), Jochen Hampe (MediGRID, UKSH Kiel), Sebastian Claudius Semler (MediGRID, TMF, Berlin), Thomas Steinke (MediGRID, Zuse Institute Berlin).

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Sustainability
➜ Required by grant authorities
➜ Core Elements: business cases, technology
➜ Core Elements: education and dissemination
➜ → new applications and new communities!

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Strategies on how to overcome the roadblocks in further dissemination of medical grid computing

•Community Building (Dissemination, „pre sales")

•Grid Coaching (Teaching, ressource sharing, HR for grid pros)

•Grid Software Lifecycle Management (stability, releases)

•Semantic and Technical Interoperability

•Long Term Archiving in the Grid / with the Grid

•Business Models for Research Oriented Grid Projects