

The background of the title slide is a light blue grid with a perspective effect, receding into the distance. Scattered across the grid are small, semi-transparent purple rectangular markers. On the left side, there is a stylized sunburst logo similar to the one in the top left corner.

# MediGRID

## Medical Image Processing in MediGRID





# Medical image Processing

Image Processing is of high importance for medical research, diagnosis and therapy

- High storage capacity
  - Volume data, high resolution images, screening
- High computing power
  - large datasets, increase of accuracy
- High variety of applications
  - specialized processing steps
- Complex workflows
  - Image processing chains





# Medical Grids

Medical Grids demand special requirements with respect to mere computing Grids

High security and safety

- Patient data, traceability of processing steps

User friendliness

- User accustomed used to graphical user interfaces

Virtualization of grid resources

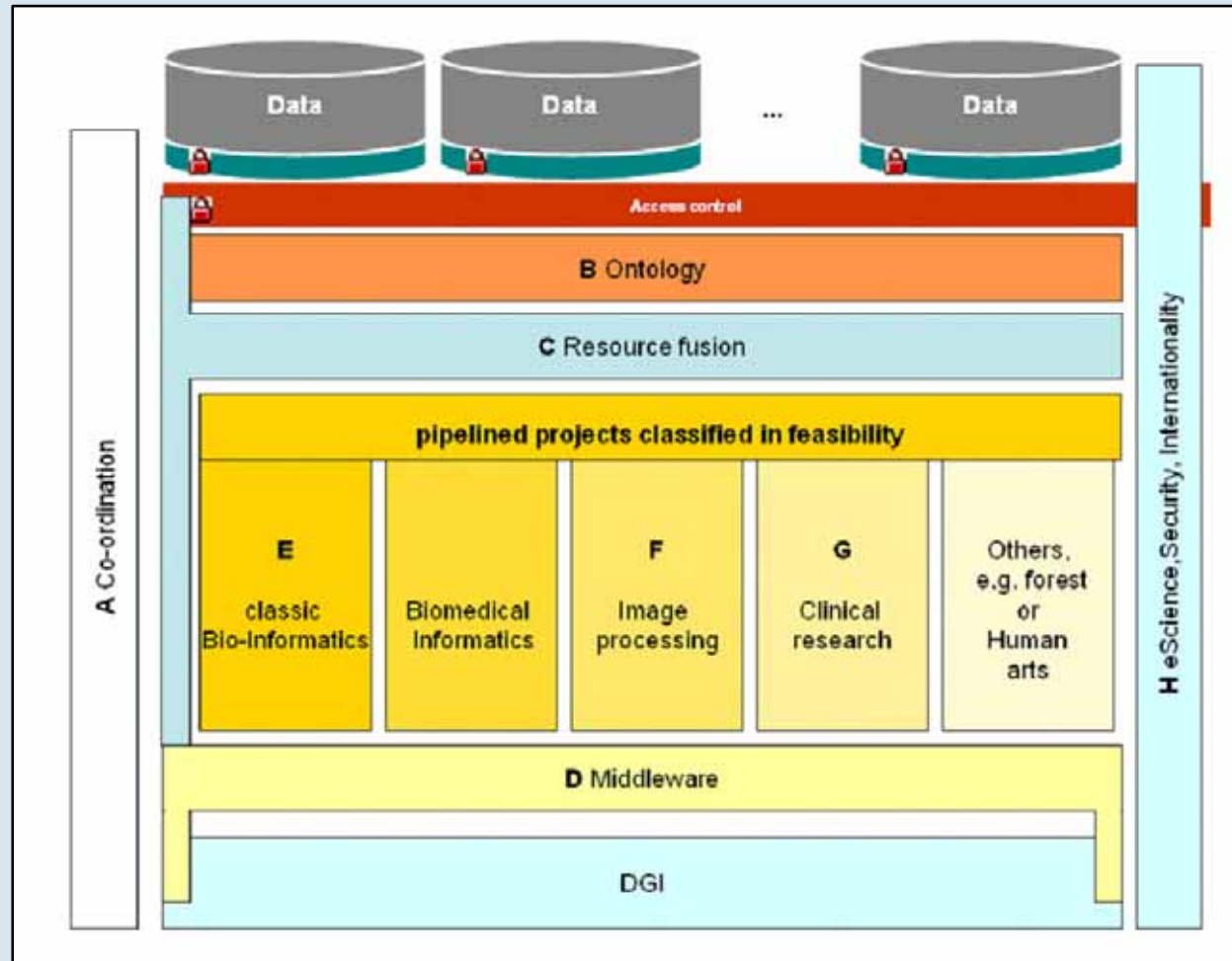
- Heterogeneous data and applications

Current research on modern Grids is working to overcome these barriers



# MediGrid

MediGrid builds an infrastructure for medicine and life sciences





# Image Processing Module

The image processing module implements representative application scenarios in the MediGrid

Current research projects

- High benefit from grid, anonymized data

Main image processing components

- Preprocessing, registration, segmentation, classification, numerical simulations

Main tools and programming languages used in research

- Matlab, itk/vtk, c++, java, ...

Main standards and integration of external resources

- DICOM, PACS, Image Retrieval



# Functional MRI Analysis

Functional MRI allows for localization of activated brain regions.

Statistical analysis over many repetitions of activation experiments

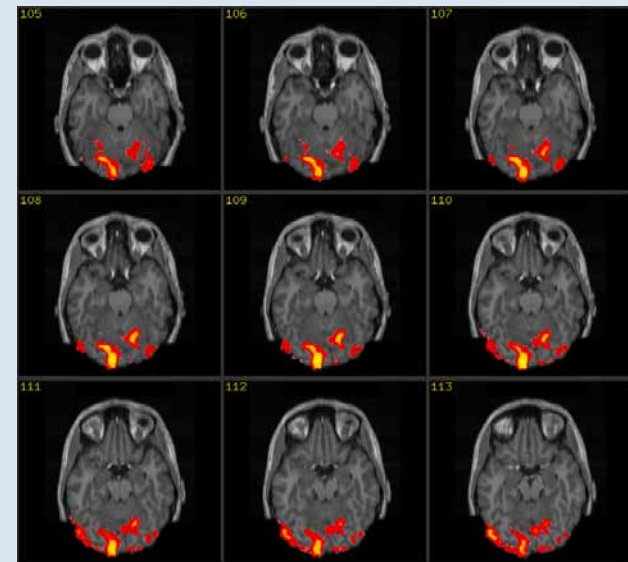
- high data volume and transfer

Preprocessing on single or few image level

- Smoothing of data
- Volume reconstruction
- Atlas-based registration

Standardsoftware SPM,

- based on Matlab





# Virtual Vascular Surgery

Hemodynamic simulations based on a patient's vascular geometry allows for virtual surgery of cardiovascular diseases

Segmentation of vascular geometry from CT images

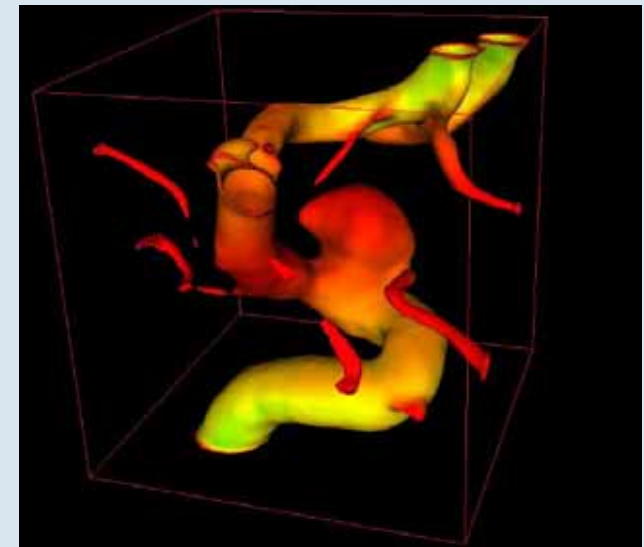
- interactive segmentation and virtual surgery

Numerical simulation of blood flow

- time consuming processing step
- initial parameters/geometry

Visualization of results

- Blood flow, pressure field





# Computer Aided Prostate Cancer Diagnosis

Location of tissue probes within the prostate volume supports prostate cancer diagnosis and therapy planning

Location of biopsy needles in TRUS images

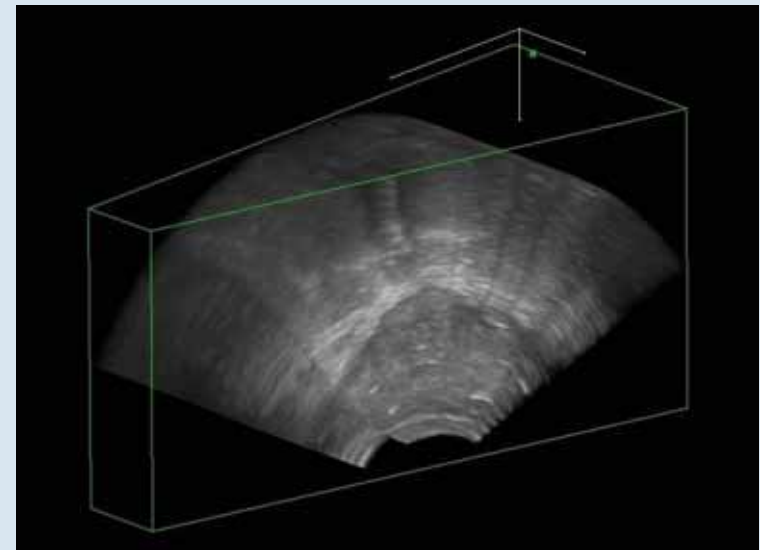
- Segmentation on 2D sequences

Location of 2D images within the prostate volume

- 2D-3D registration
- time - accuracy

Complex workflow

- further processing steps
- image retrieval
- documentation database





# Middleware Solutions

Existing middleware is adapted and – where necessary – modified or extended. New components are developed.

Basic middleware: Globus TK 4

- Mature security concept
- service oriented architecture

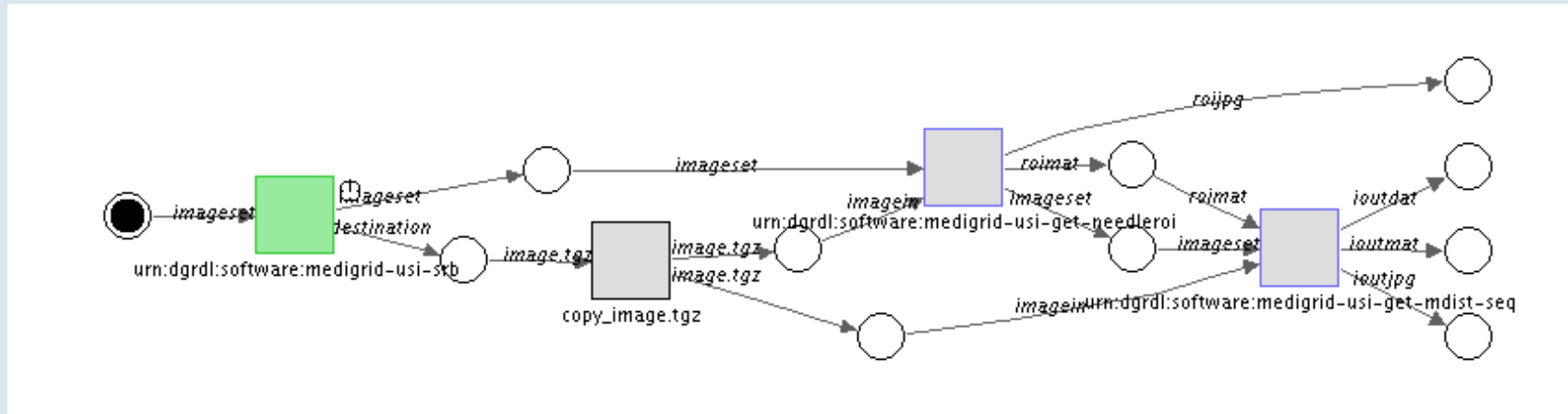
Data management

- Images: grid-Dicom
- Diverse data: SRB
- Metadata: OGSA – DAI

# Middleware Solutions

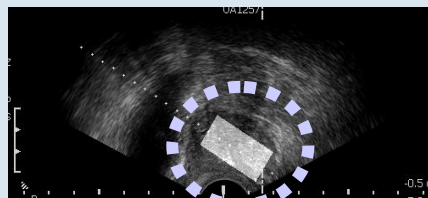
## Workflow management GWES

- D-Grid resource description language (DGRDL)

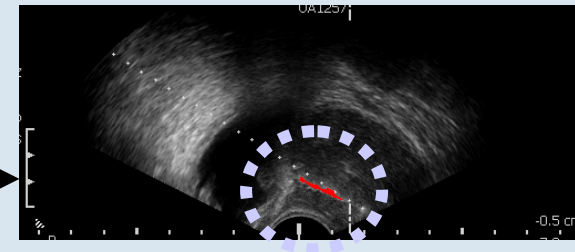


## Region of Interest

### TRUS - Bildsequenz

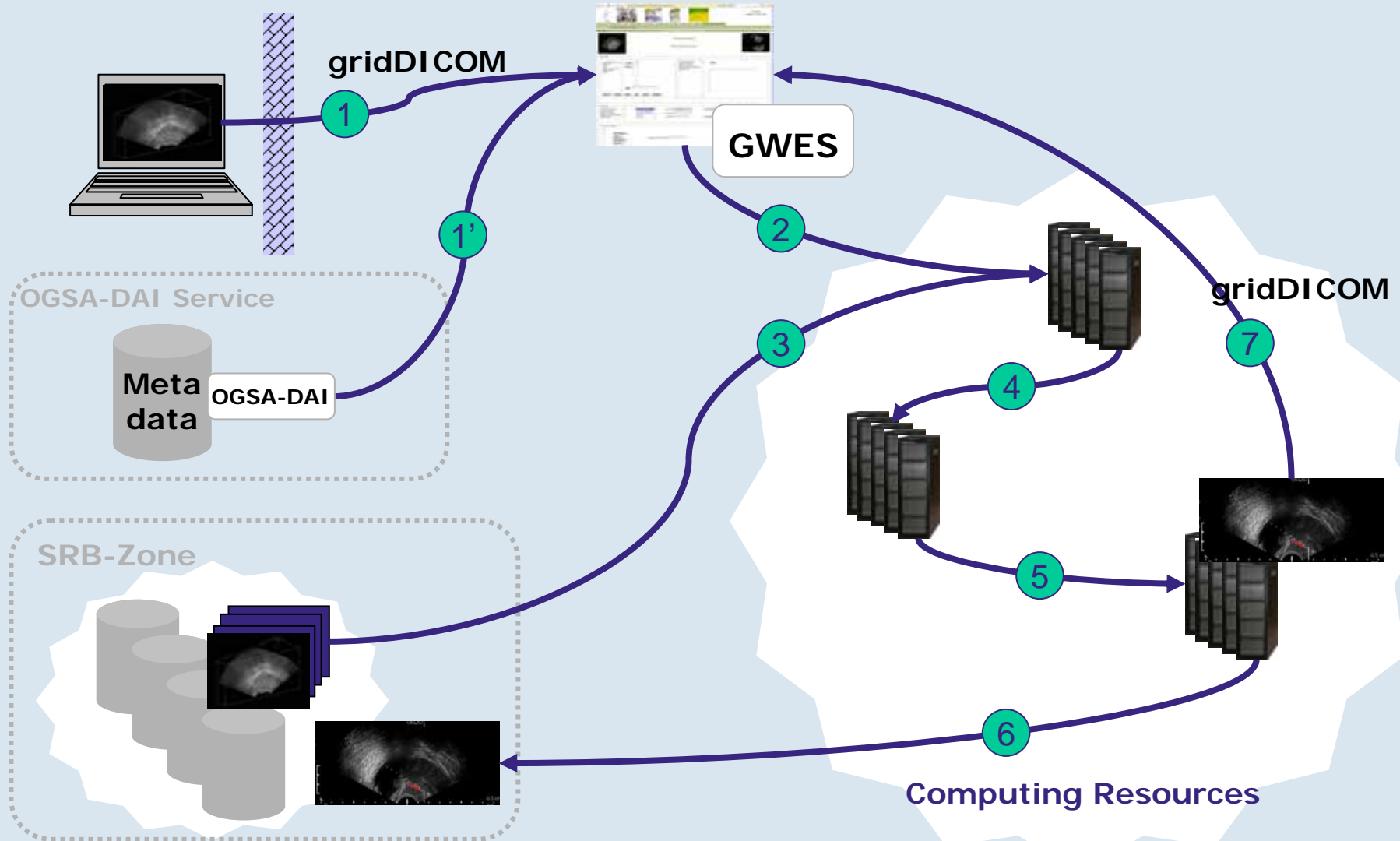


### Detektierte Nadel

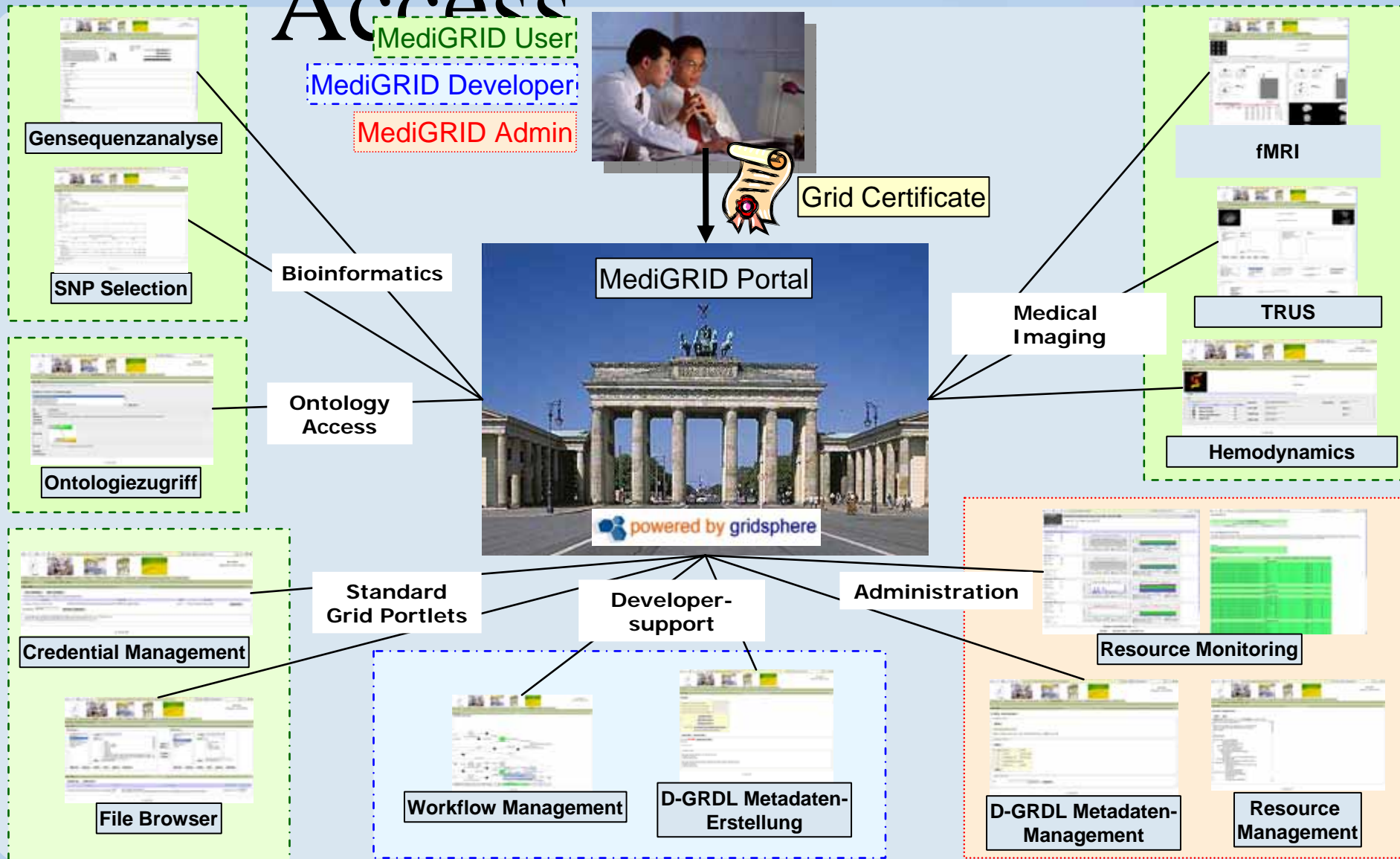




# Middleware Solutions



# Web based Access





# Results and Discussion

The scenarios could be implemented successfully in the testbed

All time consuming steps are implemented

- coarse-grained parallelization

Workflow management

- load dependend scheduling

Userfriendly access via application specific portlets

- Guidance through processing steps

Limitations and further challenges

- Interactive image processing
- Enhanced Security



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***Further informationen:***

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