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Karlsruhe Institute of Technology

Ultrasound Computer Tomography (USCT) on the grid

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www.interactive-grid.eu

USCT application
- New method for early breast cancer detection
- Targeted at hospitals for cancer screening
- Main advantage: **3D imaging** in a **reproducible** setup
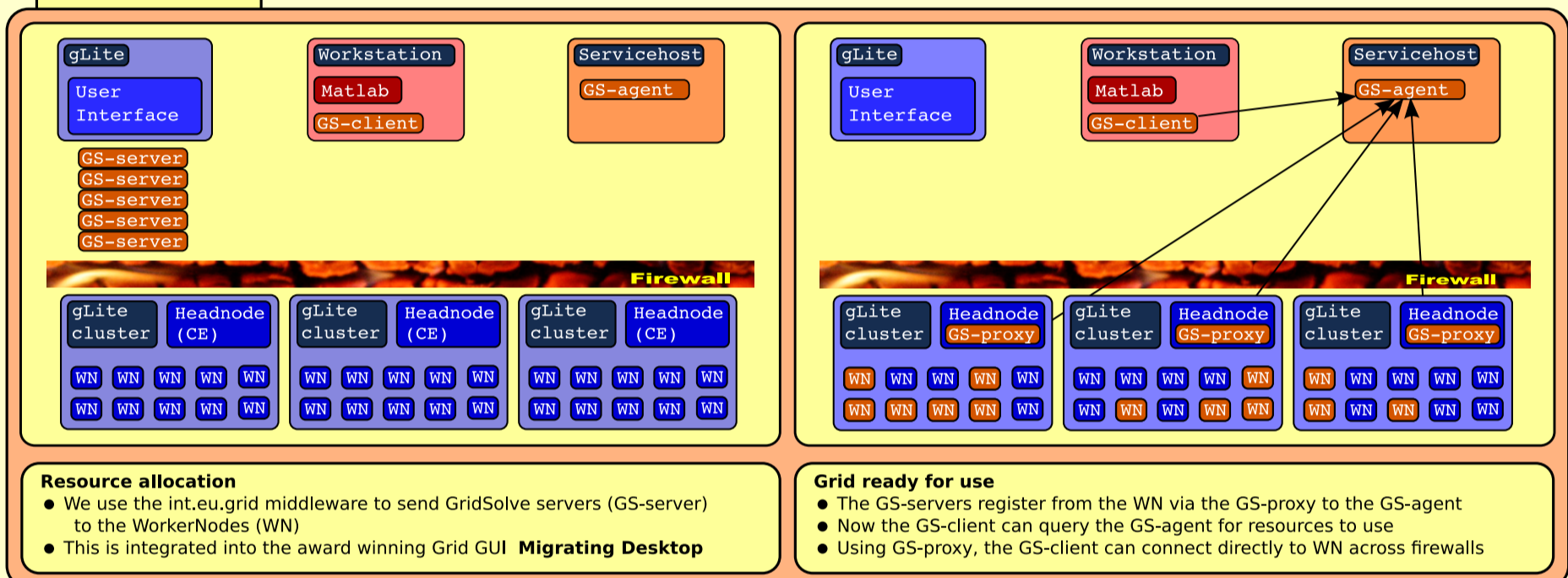
Application requirements
- One measurement 20 GB (12MB in demo)
- Reconstruction to 3D volume 100 Slices x 1 MPix[1] => 10days (1 Slice x 0,01 MPix => 20min)
- Developed in Matlab and Assembler

[1] 1 MPix = 1 Million Pixel
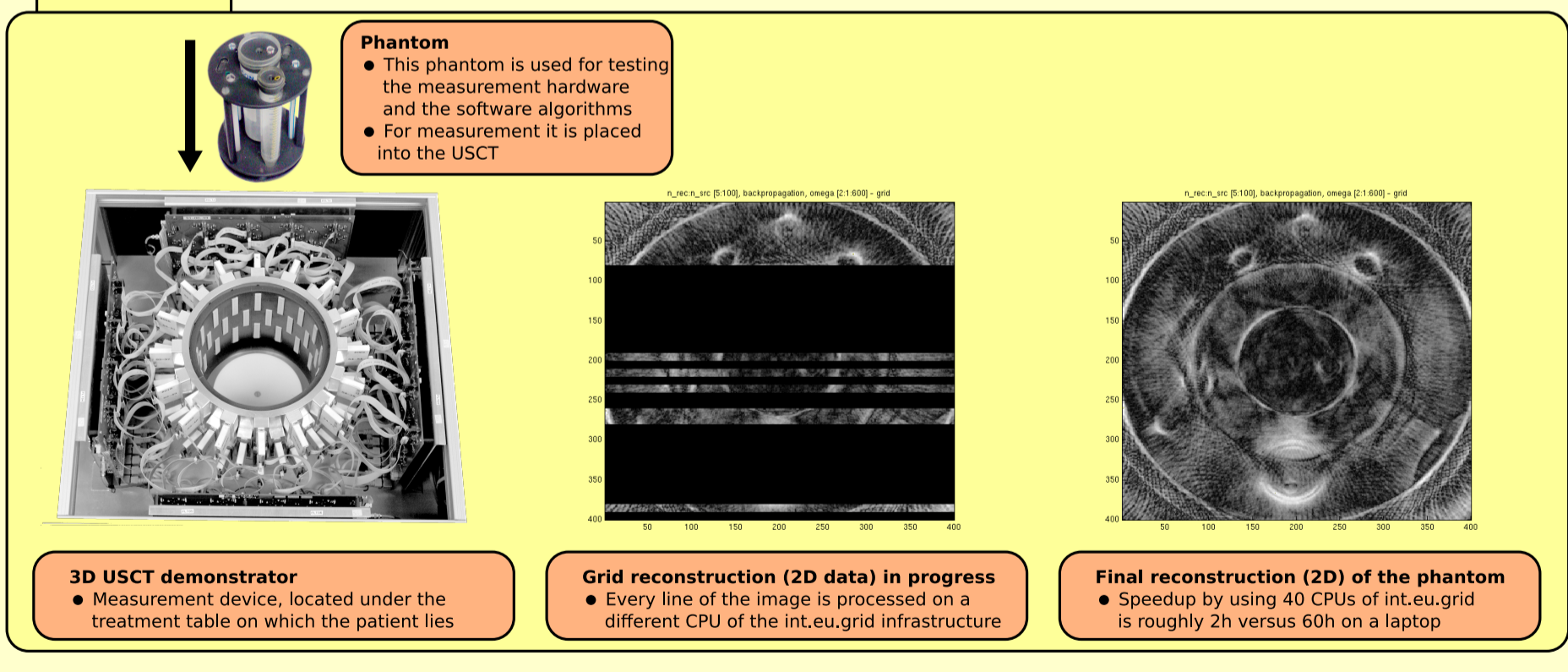
User requirements
1. Development
   - High computational power
   - In Matlab environment
   - For speedup in development
2. Production
   - 10 days of reconstruction is too long
   - Goal: ~30 Minutes

Architecture

gLite — User Interface
GS-server
GS-server
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Workstation — Matlab — GS-client

Servicehost — GS-agent

Firewall

gLite cluster — Headnode (CE) — WN WN WN WN WN / WN WN WN WN WN
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Resource allocation
- We use the int.eu.grid middleware to send GridSolve servers (GS-server) to the WorkerNodes (WN)
- This is integrated into the award winning Grid GUI **Migrating Desktop**

Grid ready for use
- The GS-servers register from the WN via the GS-proxy to the GS-agent
- Now the GS-client can query the GS-agent for resources to use
- Using GS-proxy, the GS-client can connect directly to WN across firewalls

Operation

Phantom
- This phantom is used for testing the measurement hardware and the software algorithms
- For measurement it is placed into the USCT

n_rec n_src [5:100], backpropagation, omega [2:1:600] - grid

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3D USCT demonstrator
- Measurement device, located under the treatment table on which the patient lies

Grid reconstruction (2D data) in progress
- Every line of the image is processed on a different CPU of the int.eu.grid infrastructure

Final reconstruction (2D) of the phantom
- Speedup by using 40 CPUs of int.eu.grid is roughly 2h versus 60h on a laptop

int.eu.grid

Interactive European Grid

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