# The Porting of a Grid Software for Virtual Eye Surgery from Globus 4 to gLite

Abstract

"Grid-Enabled SEE++" is a software system that deals with the support of diagnosis and treatment of strabismus. Its goal is to adapt and to extend the original SEE++ in several steps and to develop an efficient grid-based tool for "Evidence Based Medicine", which supports the surgeons to choose the optimal surgery techniques in case of the treatments of certain eye motility disorders. Originally, we have designed and developed a grid-enabled version of the SEE++ based on Globus Toolkit 4. Since we met with some limitations of Globus 4, we also designed a version of "Grid-Enabled SEE++" compatible with gLite.

Terminology

- **Strabismus** is the common name given to usually persistent or regularly occurring misalignment of the eyes where eyes point in different directions such that a person may see double images.

- SEE++ is able to simulate a typical medical examination called **Hess-Lancaster test**, from which the reason for the pathological situation of the patient can be estimated.

- The outcome of the Hess-Lancaster test consists of two **Gaze Patterns** of blue points and of red points respectively (see the diagram in the middle of the GUI of SEE++ on Figure 1) . The blue points represent the image seen by one eye and the red points the image seen by the simulated other eye; in a pathological situation there is a deviation between the blue and the red points.

- **Pathology Fitting:** It is possible to give the measured gaze pattern of a patient as input. In this case, SEE++ takes some default or estimated eye data and modifies a subset of them until the calculated gaze pattern of the simulated eye (red points) matches the measured gaze pattern (green points).
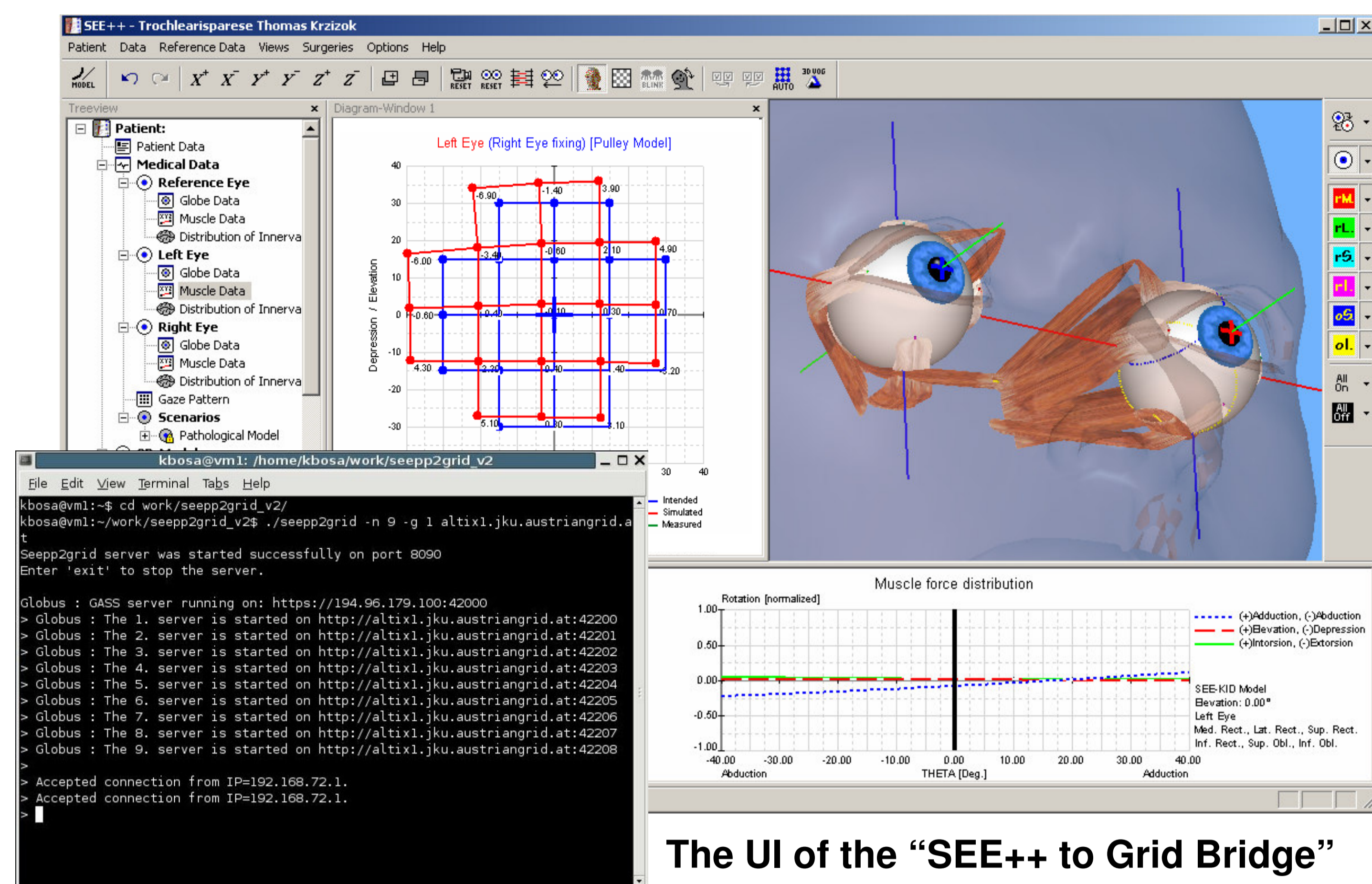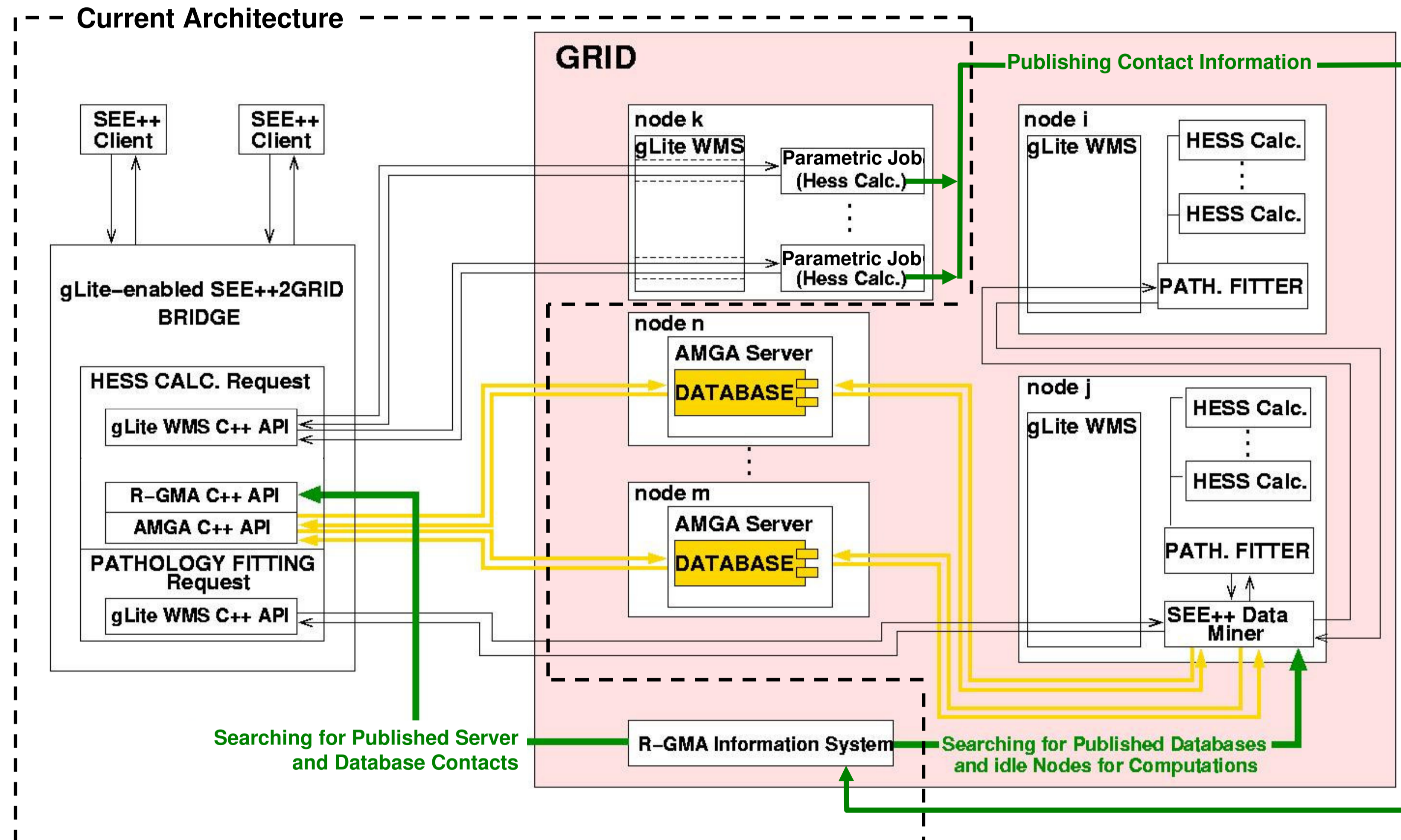

The UI of the "SEE++ to Grid Bridge" (in front) and the GUI of the SEE++

Globus Design
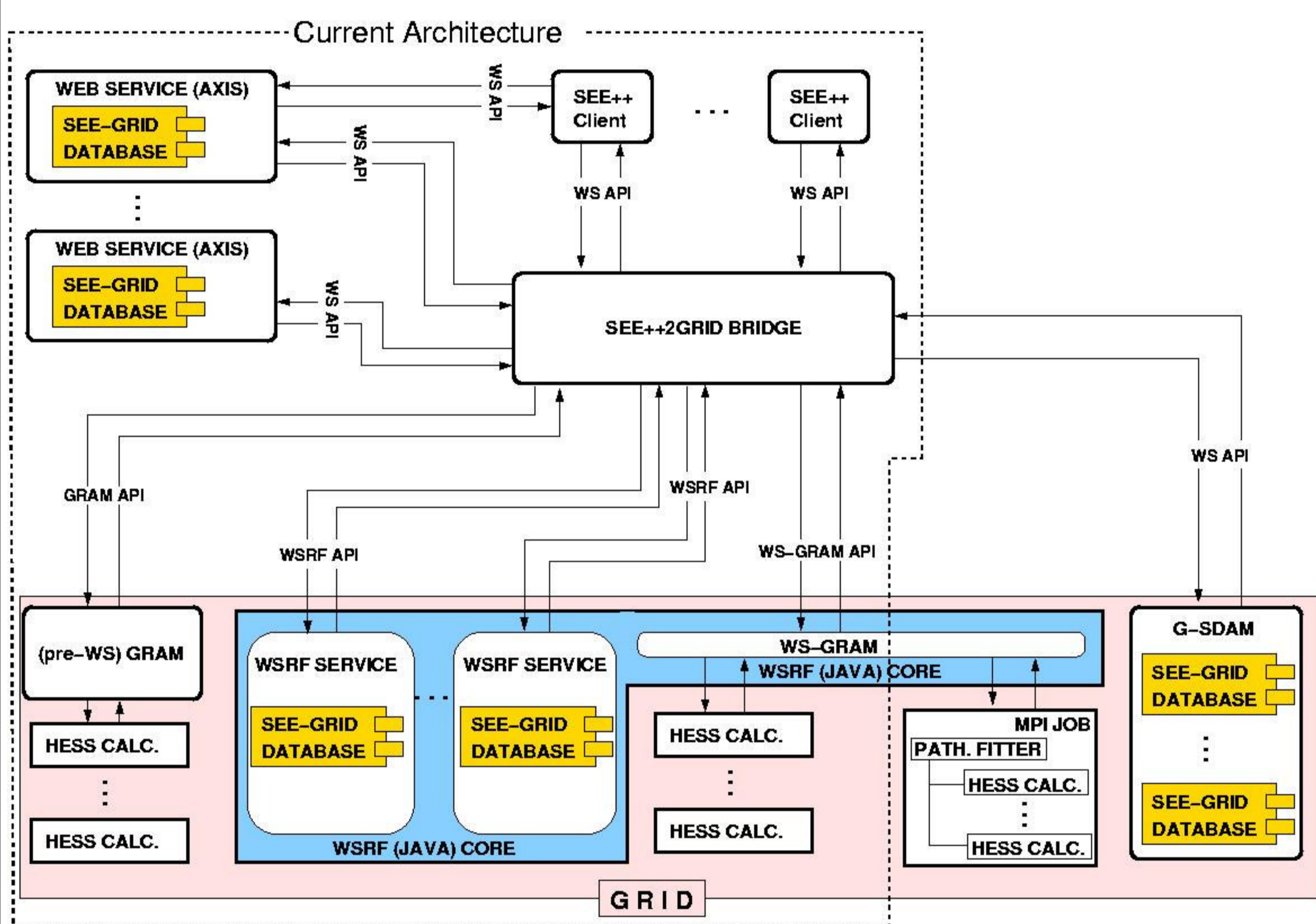
gLite Design

Advantages of the gLite Version

- **Automatic Resource Discovery**

- **Published Server Contact Information via R-GMA** (more than one SEE++ bridge is able to use the SEE++ servers – No Hack as in the Globus version)

- **Ability of Real Time Monitoring** (Published Server Workload via R-GMA)

- **Staging Files** (executables and input files (approx. 2Mb) do not need to be preinstalled on the WNs).

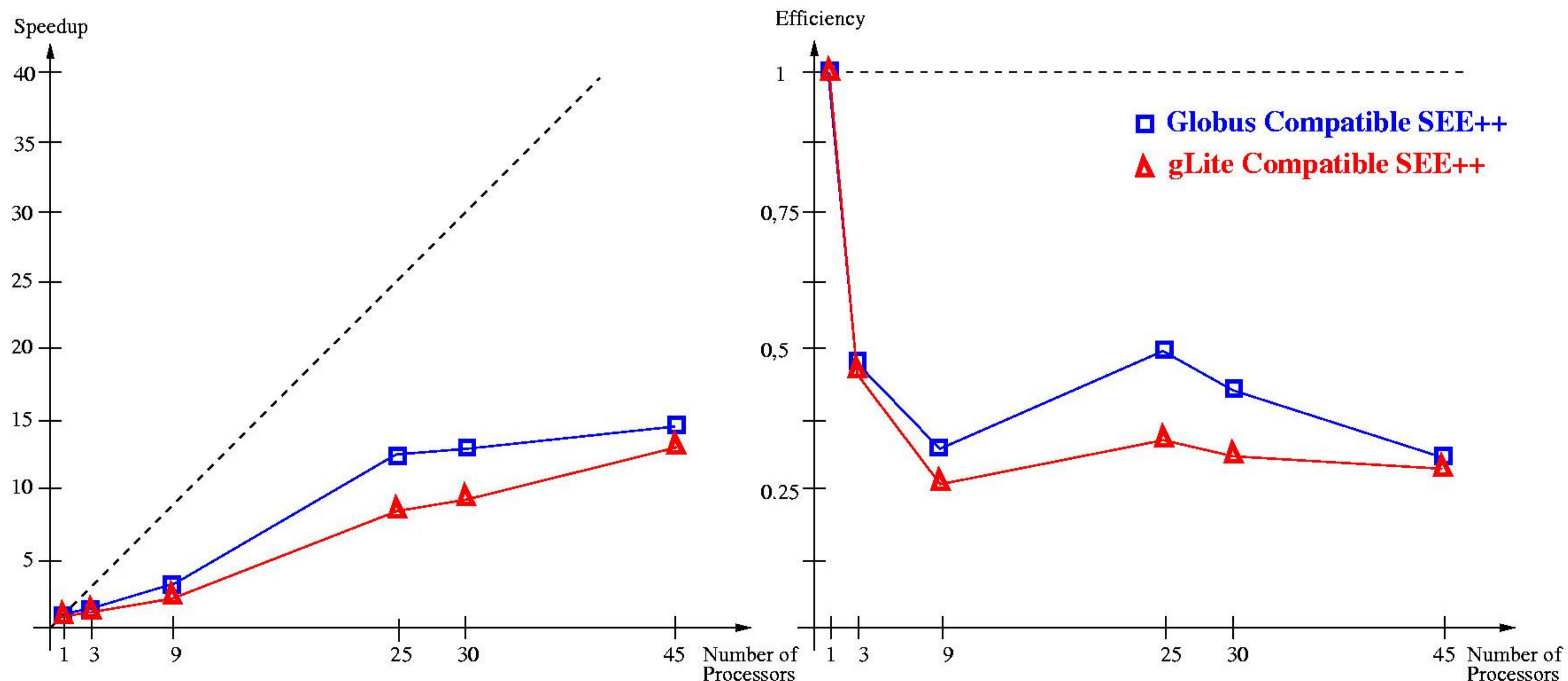- **SEE++ Servers Are Submitted as *Parametric* Jobs via WMProxy**

Comparative Benchmarks

Number of Submitted grid-Enabled SEE++ Servers	1	3	9	25	30	45
Submission via Globus pre-WS GRAM to one Cluster	0,85s	0,92s	0,98s	1,06s	1,09s	1,15s
Submission via Globus WS-GRAM to one Cluster	9,5s	10s	11s	15s	16s	20s
Submission with Resource Discovery (+staging 2Mb to the WNs) via gLite WMProxy and Publishing the Contact Information into R-GMA	38s	46s	1 min 31s	2 min 22s	2 min 36s	3 min 44 s

Startup Times in Globus and in gLite Versions (Average Values of 5 executions)

Number of Jobs/Servers	1	3	9	25	30	45
Hess Test with Globus Compatible SEE++	27.18s	18.81s	9.11s	2.17s	2.10s	1.89s
Hess Test with gLite Compatible SEE++	39.48s	28.05s	16.87s	4.63s	4,21s	3.03s

Hess-Lancaster Test with 45 Points in Globus and gLite (Average Values of 5 executions)

□ Globus Compatible SEE++
▲ gLite Compatible SEE++

Speedup and Efficiency Diagrams of Hess-Lancaster Test in Globus and gLite