Grid Portals: Building easy and Secure Grid Interfaces for Non-experts

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BEST SYSTEMS

gridwise technologies

About this presentation

- This presentation is a result of cooperation between Gridwise Technologies and BestSystems
- This project is a work-in-progress. Please download the most recent version of the presentation from:

http://gridwisetech.com/resources

Purpose of the Project

Evaluation of tools for building user interfaces to the Grid:

- Quickly and efficiently
- Easy-to-use yet secure
- Enabling access to Grid services from anywhere

Purpose of the Project

GUI
(e.g. Web browser)

Credentials

Globus
GRAM

PBS
job manager

Non-technical user wants to access Grid resources in a graphical, easy, secure way

Possible solutions

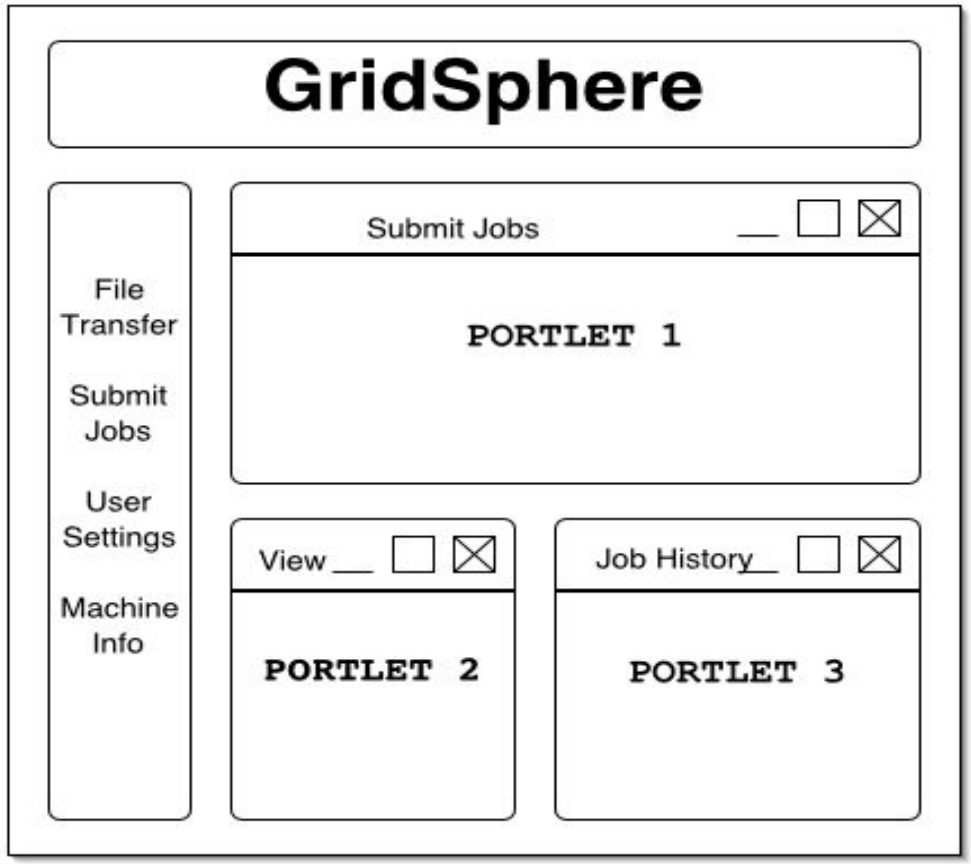
- Grid Portal
- Shell
- Typical GUI written in Java/C++

Why Grid Portal?

- Browser based user interface for accessing Grid services
- Accessible from anywhere and everywhere
- Support for user configuration and customization
- Provides ease of development and integration

Grid Portal Page

Most of Grid Portal pages are composed of portlets



Source: Novotny, Russel, Wehrens – Future Grid Portal Development

What is a Portlet

- "Application" window within portal page
- Portlet API: an API for building atomic, adaptable user interface to service providers and Web content
- JSR 168 - Specs from JCP
- Portlets have well defined packaging and deployment model --> ease of code sharing and porting

Some Grid Portals

- Grid-Port (from SDSC)
- Astrophysics Simulation Collaboratory – ASC (from NSCA)
- Open Grid Computing Environments Collaboratory – OGCE
- GridSphere

Some Portlet-Based Portals

- Jakarta Jetspeed
- IBM WebSphere
- Oracle i9AS Portal
- GridSphere

Secure integration of GridSphere and Globus Toolkit 4

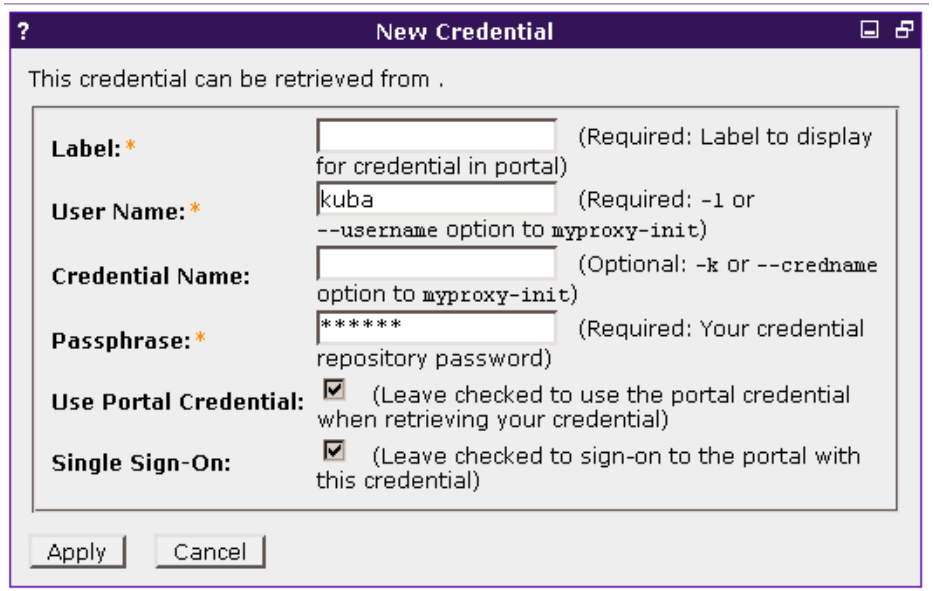
1. About GridSphere
2. Security issues
3. Integration

Why GridSphere 2.0?

- Part of GridLab project, funded by European Commission
- 100% compliant with JSR 168 Portlet API (passed Sun TCK)
- Portlet API implementation nearly fully compatible with IBM's WebSphere 4.2

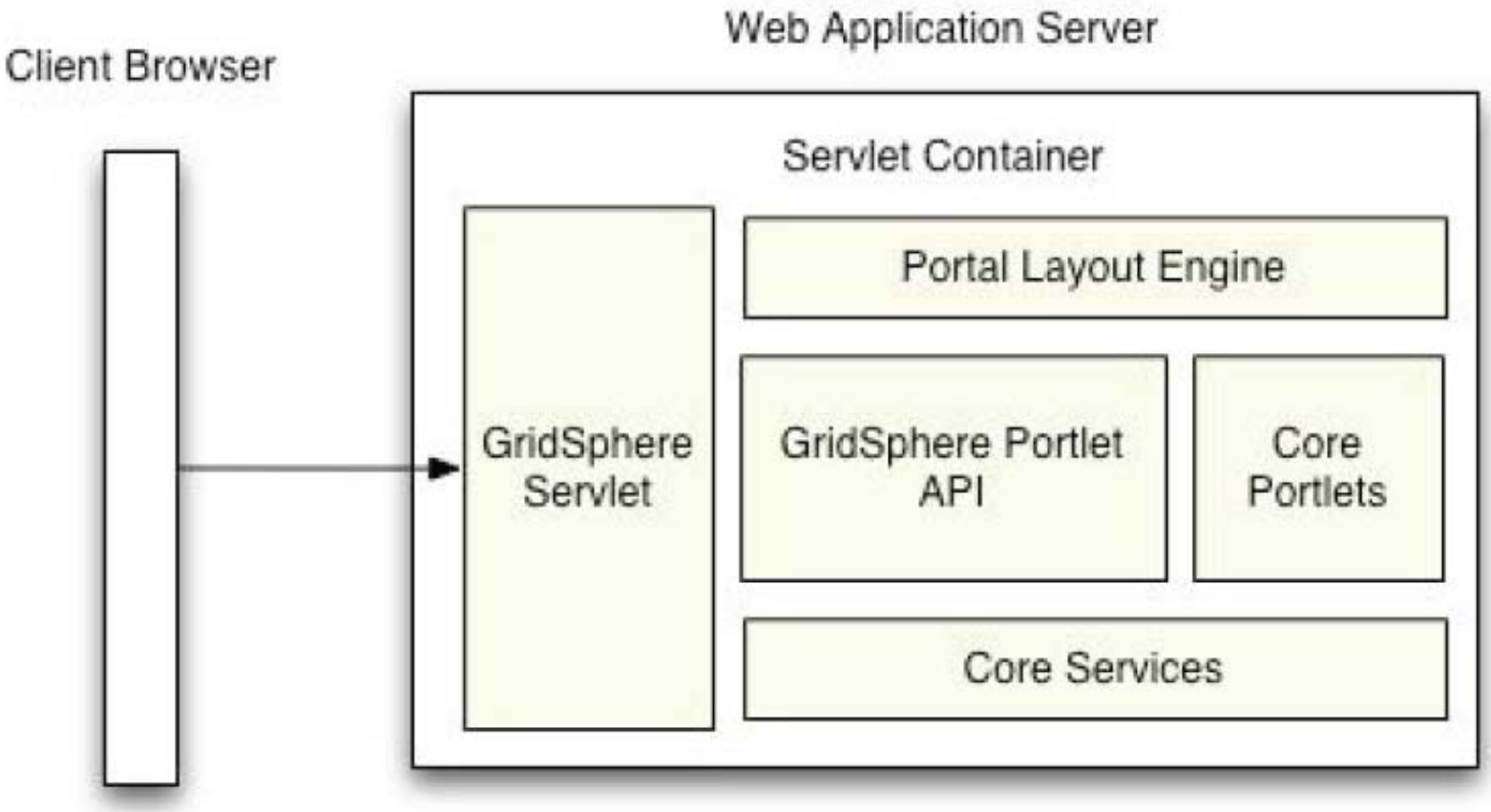
Why GridSphere 2.0?

- Provides visual beans and JSP tag libraries
- Built-in support for Role Based Access Control
- Comes with a set of Grid portlets
- Decent integration with JUnit/Cactus
- Open source



An example GridSphere portlet

GridSphere 2.0 Architecture



Source: Novotny, Russel, Wehrens: GridSphere: A Portal Framework

Secure integration of GridSphere and Globus Toolkit 4

Security issues

Security Requirements

- Mapping user identities to credentials
- Secure channel between user, portal and remote resources
- Single sign-on
- Protection of credentials
- Uniform credentials/certification infrastructure

Primitives: Authentication

GUI
(e.g. Web browser)

Credentials

Globus
GRAM

PBS
job manager

Mutual authentication of Grid portal and GRAM server

Mutual authentication of user and Grid portal

Mapping between user "portal ID" and "Grid ID" (certificate subject)

Grid portal: Use scenarios

- Data transfer
  - Transfer of data between user, Grid portal and other resources
  - Direct transfer of data between user and Grid resources
- Job execution
- Information enquiries

Secure integration of GridSphere and Globus Toolkit 4

Integration

Our solution

Based on:

- GridSphere Core Portlets
  - LoginPortlet
- GridSphere Grid Portlets
  - Credential Retrieval Service
  - Job Submission Service
- MyProxy 1.16

Running a job: Pre-WS GRAM

GUI
(GridSphere in
a Web browser)

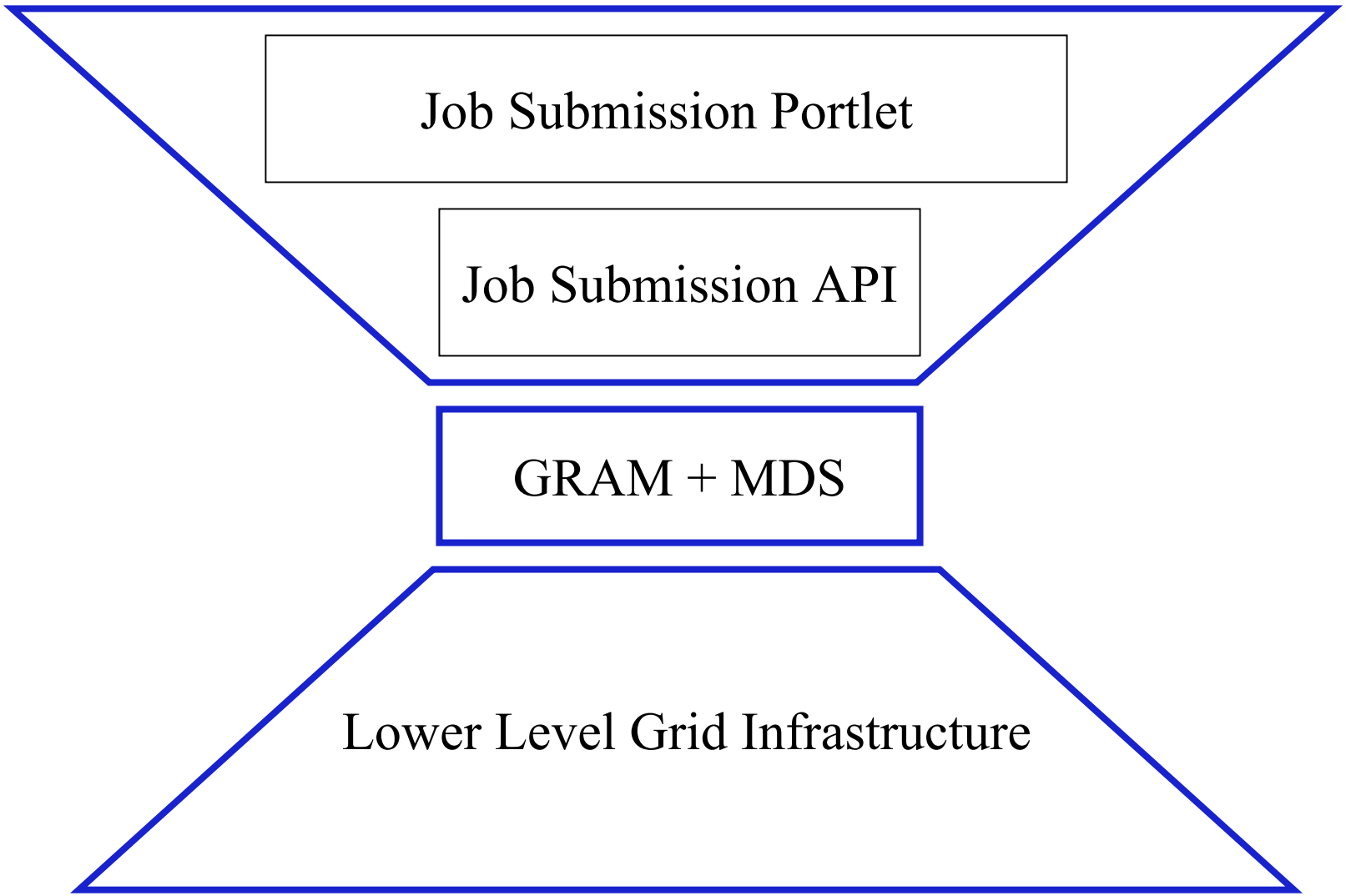
MyProxy

Credentials

Globus
Pre-WS GRAM
gatekeeper

PBS
job manager

GridSphere: Job submission



Our Gridsphere-based security solution

- SSL communication
- Access control based on roles (guest, user, admin, super)
- Certificate retrieval from MyProxy

Summary

Developed solution proved to be:

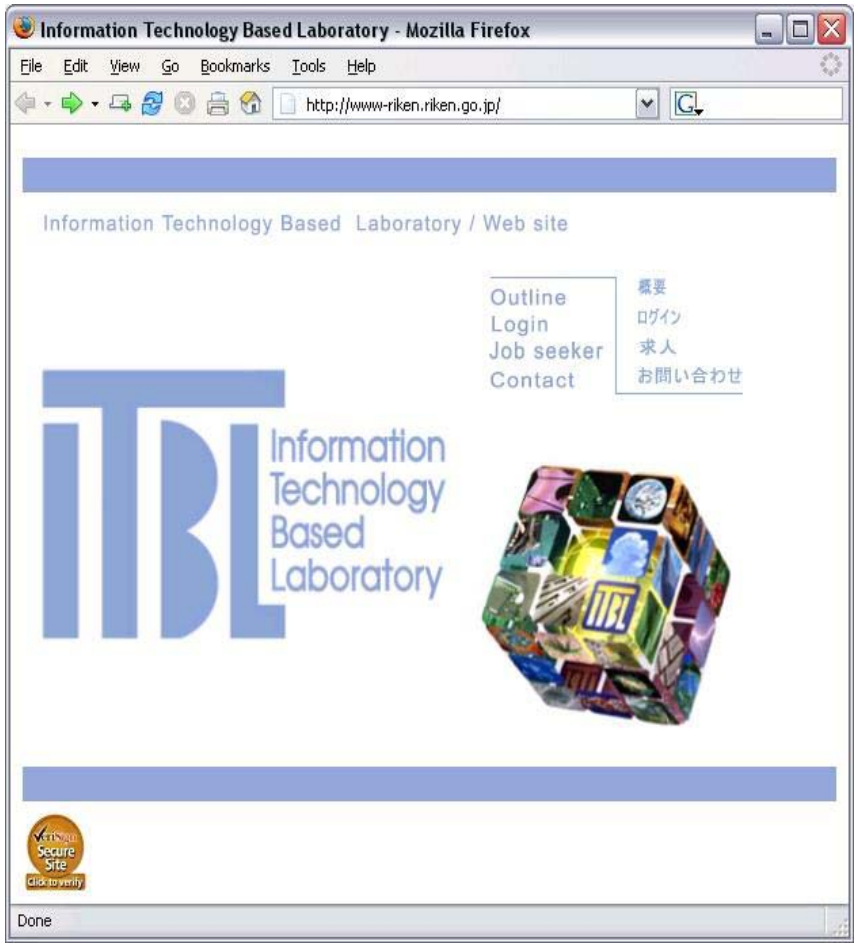
- Fully functional
- Easy to use and maintain
- And secure

Information Technology Based Laboratory (ITBL) portal

Portal framework integrating Globus, HotPage and GridPort

Information Technology Based Laboratory (ITBL)

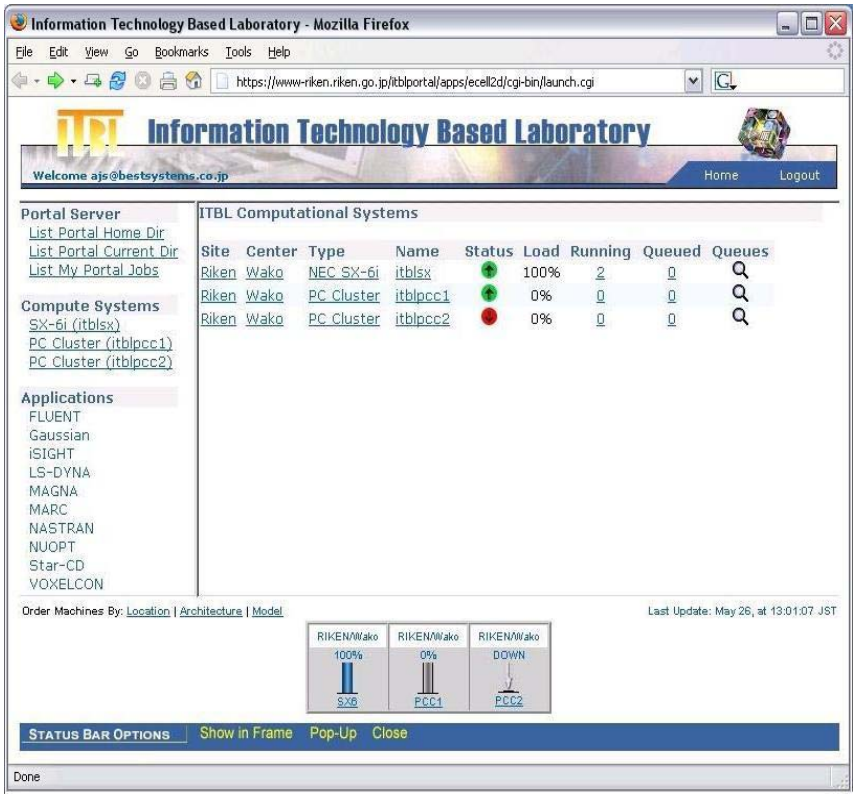
- Portal Web site for RIKEN (Institute of Physical and Chemical Research), Japan
- Implements a virtual joint research environment for IT
- Information Database
- Job Portal



Information Technology Based Laboratory (ITBL)

- The ITBL Project required a simple job portal to help remove obstacles for performing computer simulations, such as installing or accessing applications and HW resources
- An application showroom was created to provide HPC resources, accessed through a web-based framework built on Globus, HotPage and GridPort
- GridPort dictates that user certificates are stored on the Web Server, so security is minimal but hands-on experience can be achieved quickly

ITBL Job Portal



- Grid-based Job Portal
- Monitor status of ITBL compute machines
- Submit jobs
- Uses Globus
- Based on HotPage and GridPort

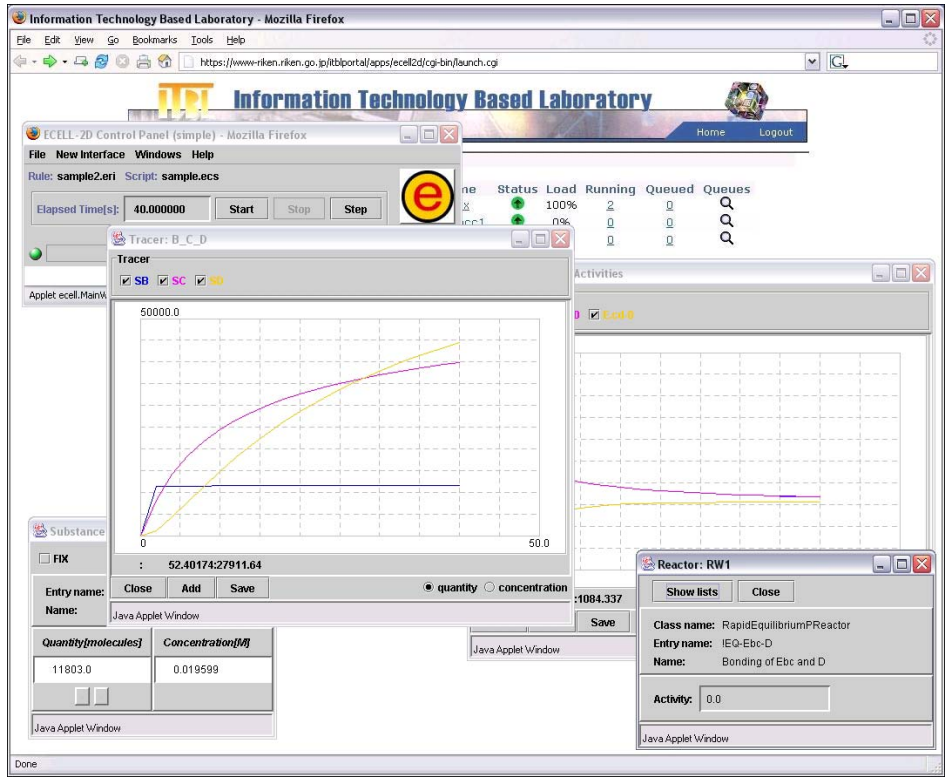
Application Showroom

- Provides a selection of applications already integrated with the ITBL portal
- Applications use the HPC resources of ITBL seamlessly
- Researchers can experiment with applications without performing the installation themselves, or having to obtain licenses for the applications
- All applications are available to researchers after initial sign-on

Following is an example of one application,E-CELL2D

E-CELL2D

- A whole-cell simulator based on E-CELL2 by Prof. Tomita's group at Keio University
- E-CELL2D is a distributed (client-server) version of E-CELL2
- Simulation engine runs on a Linux server
- Client Java applet provides the GUI

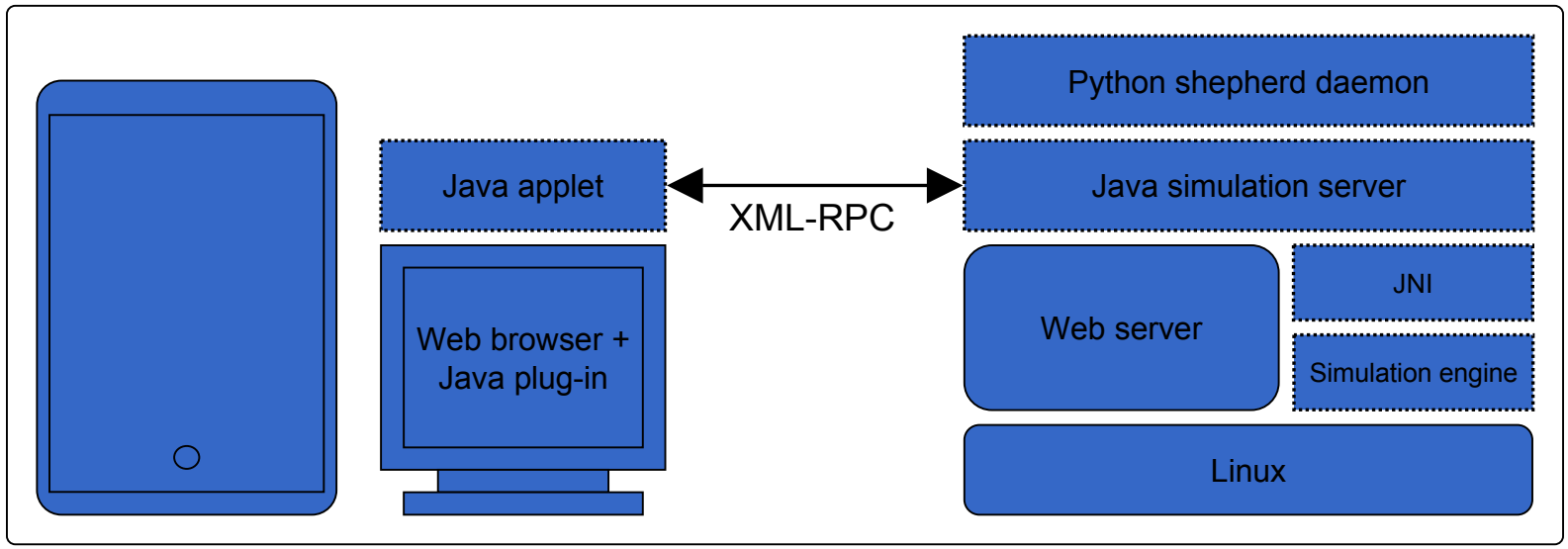


Distributed E-CELL2

- E-CELL2 required a user to install the application on either a Windows or Linux PC, together with a JRE, Perl interpreter and Borland C++ compiler (for creating E-CELL Reactors)
- E-CELL2D separates the simulation engine from the GUI so the engine calculations can be performed on a remote resource
- Implemented by RIKEN and BestSystems, Inc.

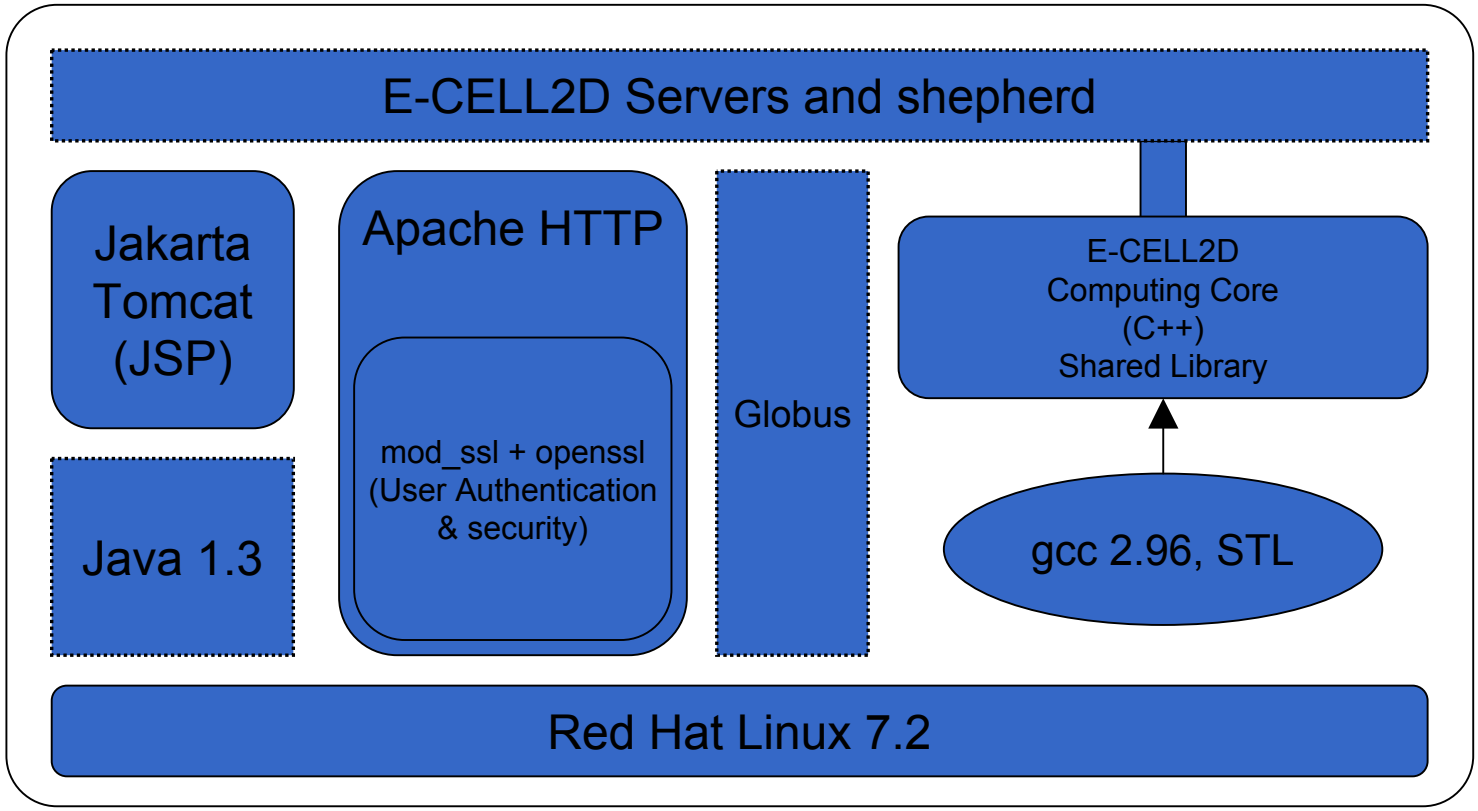
E-CELL2D Architecture

- Simulation engine written in C++ uses JNI to communicate with a front-end Java simulation server
- Server communicates with the client Java applet using XML-RPC
- Web Server checks authentication and authorization using Globus and initiates a server using a Python shepherd



E-CELL2D Server

- Currently, simulation engine is executed on same machine as Web Server



Future E-CELL2D Plans

- Move simulation engine off Web Server onto HPC back-end resource
- Communicate with back-end resource using Ninf-G or move simulation server together with engine
- Load-balance back-end simulation engines with number of users and HPC resources

Achievements of Globus portal

- HotPage/GridPort framework provides a very simple interface to the Globus commands
- Job portal was quickly implemented
- Job portal uses Globus to provide single sign-on. Once a user is signed on then applications integrated with the portal can easily be used

Summary

- Gridwise Technologies and BestSystems evaluated a number of Grid portal frameworks
- GridSphere and HotPage/GridPort were chosen for two target implementations
- BestSystems (Japan) and Gridwise (US & Europe) will work together to fulfill any customer requirements for world domination! ;)
  - More: http://gridwisetech.com/resources and pawel@gridwisetech.com