

A Design and Construction of Web-based Grid Portal for Accounting Information Service

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Abstract: Computational grids are emerging as a new infrastructure for internet-based parallel and distributed computing. Grid systems enable the sharing, exchanging, discovery and aggregation of resources which distributed multiple administrative domains, organizations and enterprises. Accounting information service is one of the main obstacles to widespread adoption of the grid. But, most of grid portals do not support accounting information service. In this paper, we design an accounting information service and build a web-based grid portal including account management service and accounting information service.

Keywords: Grid, Portal, Globus, Accounting, GPDK

1. INTRODUCTION

Computational Grids are emerging as a new infrastructure for internet-based parallel and distributed computing. Grid systems enable the sharing, exchanging, discovery and aggregation of resources which distributed multiple administrative domains, organizations and enterprises. To accomplish this, grids need infrastructure that supports various services: security, uniform access, resource management, scheduling, application composition, computational economy, and accounting [1][2].

Grid portal provides single point of access to distributed information and services, and utilizes grid services on behalf of the user. Especially, web-based grid portal has several advantages. Web browsers, which are ubiquitous and are well understood and provides a common platform, are used as a client interface. Also, web-based grid portal has well defined protocols [3][4][5]. Accounting information service is one of the main obstacles to widespread adoption of the grid. But, most of grid portals are missing or lack of accounting information service.

In this paper, we design and build a web-based grid portal for accounting information service. It uses GPDK (Grid Portal Development Kit) [3] to build a web-based grid portal. For accounting information portal service, it requires account management service and accounting information database service. Account management service includes access right acquisition and release. Accounting information database service is implemented as a service based on OGSA [1][2][6]. To handle these services, we design this portal service to be modularized.

2. RELATED WORK

2.1 GPDK

GPDK [3] includes the library of core service beans, a central servlet and a collection of demo template web pages. The service beans are implemented in the J2EE technology and use the Java Commodity Grid (CoG) toolkit [7], which provides a pure Java API to Globus services. The template web pages include HTML and JSP and may be customized for the needs of a particular installation. The GPDK provides security, job submission, file transfer and information services.

2.2 GridPort

HotPage [4], Grid Computing Portal, is being written by the National Partnership for Advanced Computational Infrastructure (NPACI), has been online for a few years now. Originally designed by the SDSC, it is an implementation of the GridPort infrastructure. GridPort [5] comes as a collection of Perl modules that provide back-end grid functionality to web portals. Installation of the toolkit allows for building a portal on top of it. The grid access environment created this way enables file transfer, command execution and job submission.

3. DESIGN OF GRID ACCOUNTING PORTAL

3.1 GPDK and Grid Accounting Information Service

GPDK facilitates the development of Grid portals and provides several key reusable components for accessing various Grid services. GPDK includes the library of core service beans and has layered architecture (Figure 1).

We choose GPKD as a portal development tool, because it is more efficient than GridPort. It uses globus java classes, but GridPort uses system calls to globus executables. It uses java servlet environment, but GridPort uses Perl/CGI technology.

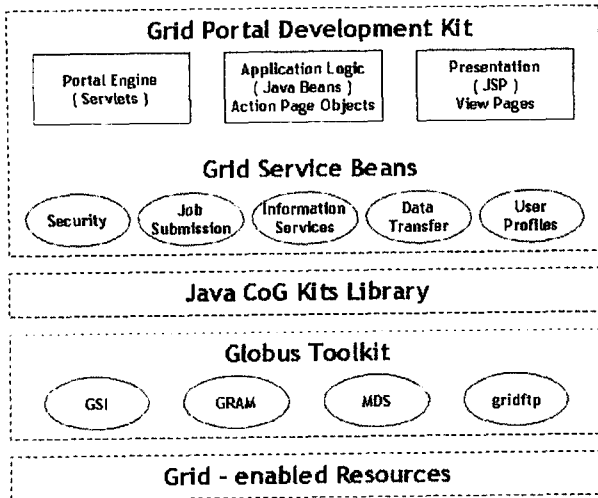


Fig. 1 Architecture of GPKD

In this paper, we developed grid accounting information service based on GPKD. This service includes account management service, accounting information retrieval, and statistical analysis of accounting information. This service utilizes security, job submission, data transfer, information service, and user profiles of GPKD.

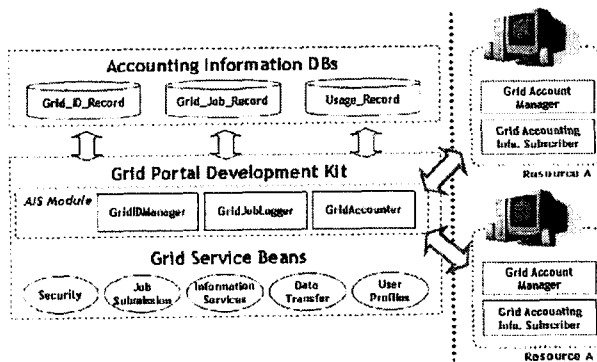


Fig. 2 Accounting Information Service based on GPKD

3.2. Accounting Information Service Module

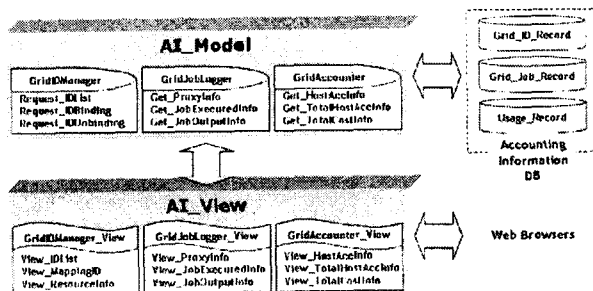


Fig. 3 MVC design of Accounting Information Service

Accounting Information Service Module comprises of two modules: AI_Model (Accounting Information Model) and AI_View (Accounting Information View) following Model-View-Controller(MVC) design pattern [10]. Each module is connected to Accounting Information DB.

3.2.1 GridIDManager

This module tries to get available username list, with user's personal information and job specification, from each local resource and tries to request for access. The result of this operation will be transferred to Accounting Information DB. The schema to be transferred to DB is shown in table 1.

Table 1 Schema: Grid_ID_Record

Attribute	Description
BindedID	Binded local username
ExecMachine	Execution machine (resource)
DN	Distinguished Name
ActivatedDate	Date that activate this binding
DeactivatedDate	Date that deactivate this binding
Email	E-mail address of user

3.2.2 GridJobLogger

GridJobLogger retrieves the information of job submission in the user's view. The schema to be transferred to is shown in table 2.

Table 2 Grid_Job_Record

Attribute	Description
DN	Distinguished Name
JobID	Identity that distinguish each job
ExecMachine	Execution machine (resource)
BeginDate	Date that job is started
Output	Standard output of job

3.2.3 GridAccounter

GridAccounter gets the accounting information, which is requested by user. Table 3 shows fields of total usage that user consumed.

Table 3 Fields of Total Usage

Field	Description
DN	Distinguished Name
TotalCPUTime	Total CPU Time that user consumed
TotalWallTime	Total Wall Time that user consumed
TotalMem	Total Memory that user consumed
TotalDisk	Total Disk that user consumed

3.2.4 Flow of Accounting Information

Figure 4 shows steps for accounting information acquisition. To submit jobs via this grid portal, user must log in the portal and request for access. If a user submits his job via this grid portal, his job log information

and accounting information are stored Accounting Information DB, a standalone information service based on DB. Accounting information is served at any time if the user request. Each model (GridIDManager, GridJobLogger, and GridAccounter) interacts with Accounting Information DB. And each view (GridIDManager_View, GridJobLogger_View, and GridAccounter_View) displays information, obtained from interaction with their model, to the user.

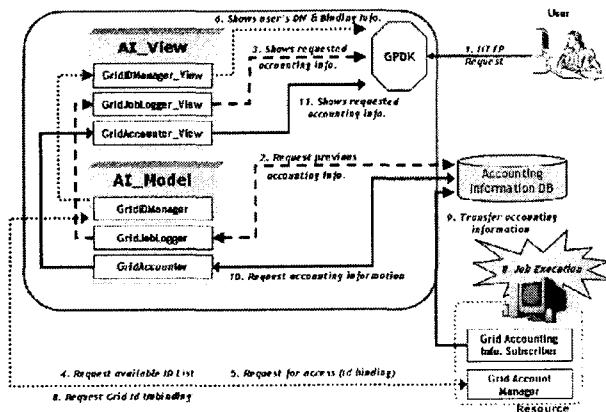


Fig. 4 Steps for Accounting Information Acquisition

4. IMPLEMENTATION AND RESULTS

4.1 Implementation

Grid portal, designed and built in this paper, comprises of Web Server with GPK, GIIS Server, Accounting Information Server, and MyProxy [12] Server. Figure 5 shows this architecture.

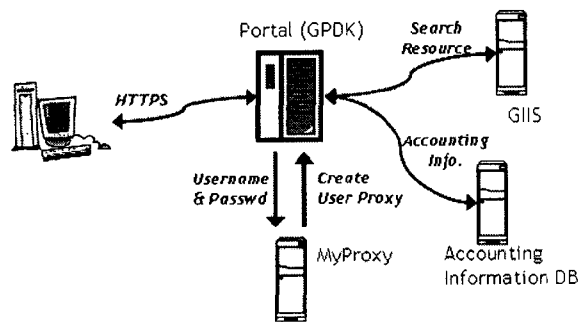


Fig. 5 The Architecture for Grid Portal Service

MyProxy is a credential repository for the grid. Storing user's grid credentials in a MyProxy repository allows users to retrieve a proxy credential whenever and wherever user need one, without worrying about managing private key and certificate files.

To build this portal service, we use Java language for main programming language, MySQL for DBMS, Globus Toolkit for grid middleware, and CoG for Java interface to Globus SDK.

4.2 Results

Designed Module comprises of GridIDManager, GridJobLogger, and GridAccounter. Each module is

independent from each other.

4.2.1 GridIDManager

Information in Figure 6 is obtained from MDS. We use Java CoG kit, which provides access to grid services through the Java framework, to obtain this information.

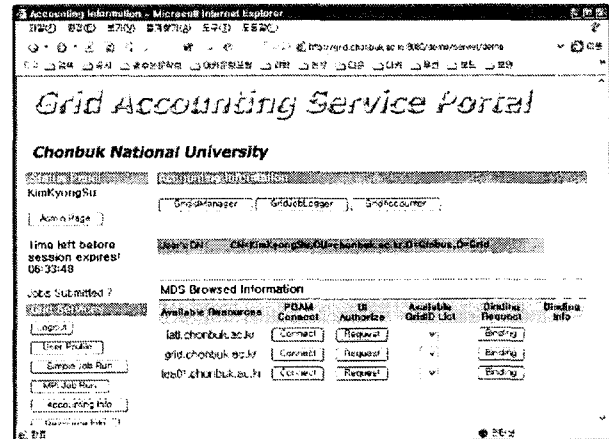


Fig. 6 First shot of GridIDManager

User requests for access by selecting one GridID among available GridID List. An example of message, used to request for access, is shown in Figure 8.

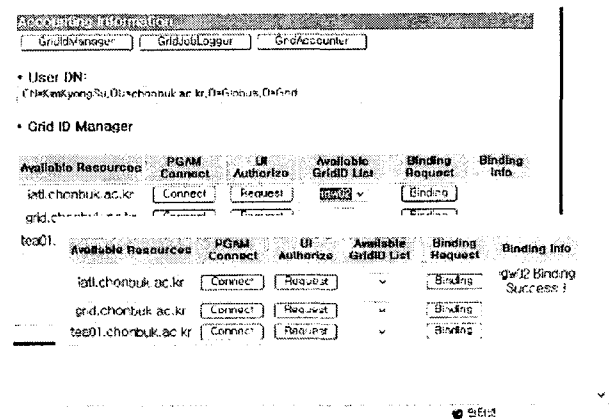


Fig. 7 Request for Access

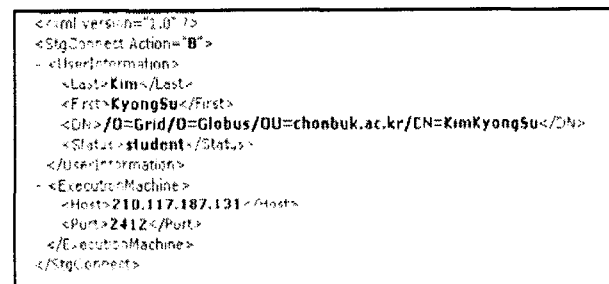


Fig. 8 An example of message to request for access

If the resource authorize user's request for access, the user will have rights of local username. He can submit his job with his rights via this grid portal.

4.2.2 GridJobLogger

Users, who submit their job via our portal service, can view information of job submission and results of job execution with GridJobLogger. Figure 9 shows a user's DN and his history about job submission and results.

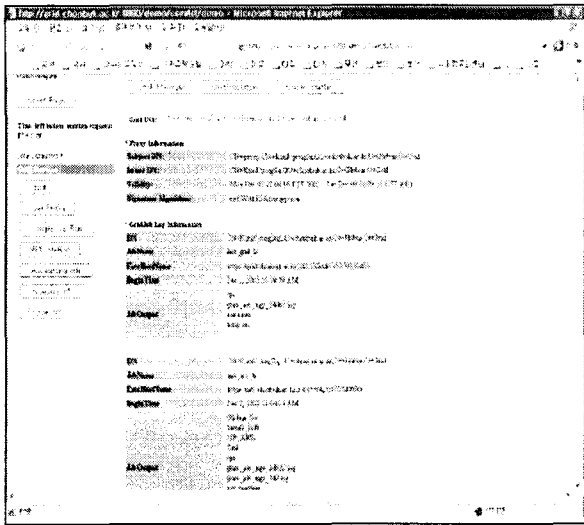


Fig. 9 Records about job submission and results

4.2.3 GridAccounter

Figure 10 shows accounting information obtained by GridAccounter. Accounting information during given interval, set by user, includes job name, start date, end date, used CPU time used wall time, count of used processors.

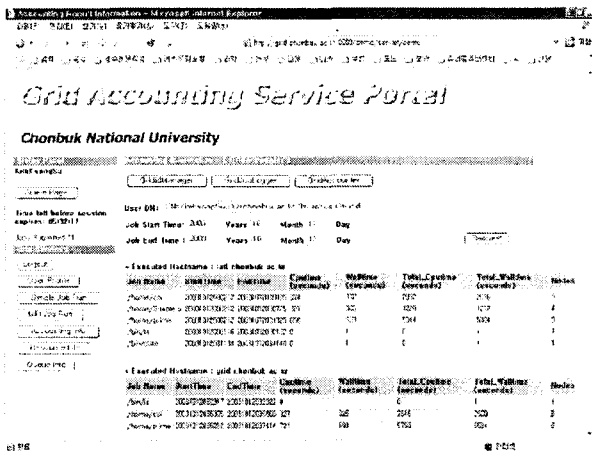


Fig. 10 Accounting Information

5. CONCLUSION

In this paper, we design and implement a web-based grid accounting information service portal. The access right acquisition service and accounting information view service is included in this portal. All the activity of a user is traced and saved into database. Information in database can be used to analysis resource's usage.

We plan to develop billing service for grid portal service. Billing service in the grid environment is very different from that in the usual internet environment. So, more sophisticated model design is needed.

References

- [1] <http://www.gridforum.org>
- [2] <http://www.globus.org>
- [3] J. Novotny, "The Grid Portal Development Kit", Concurrency: Pract. Exper. Vol. 00, pp.1-7, 2000
- [4] NPACI HotPage : <http://hotpage.npaci.edu>
- [5] GridPort : <https://gridport.npaci.edu/gridport2/>
- [6] S. Tuecke et al, "Open Grid Services Infrastructure (OGSI)" (draft), GGF, 2003
- [7] Gregor von Laszewski, "A Java Commodity grid kit", Concurrency: Pract. Exper. Vol. 13, pp.645-6622001
- [8] Thomas J. Haker, Brian D. Athey, "Account Allocations on the Grid", Center for Parallel Computing University of Michigan. 2000
- [9] S. Mullen et al, "Grid Authentication, Authorization and Accounting Requirements Research Document", (draft), GGF8. 2003
- [10] MVC Design Pattern
<http://builder.com.com/5100-6386-1049862.html>
- [11] GIIS,
http://www-unix.globus.org/api/c/globus_mds_back_giis/html
- [12] J. Novotny, S. Tuecke, V. Welch. "An Online Credential Repository for the Grid: MyProxy" Proceedings of the Tenth International Symposium on High Performance Distributed Computing (HPDC-10), IEEE Press, August 2001.
- [13] LaunchPad,
<http://www.ipg.nasa.gov/launchpad/servlet/launchpad>
- [14] KISTI Grid Testbed, <http://gridtest.hpcnet.ne.kr/>