



# GRID ENABLED VARSITY EXAMINATION RESULT SYSTEM (**GREVERS**)

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## ABSTRACT

Grid computing started as a project to link geographically dispersed supercomputers, but now it has grown far beyond its original intent. The Grid infrastructure can benefit many applications, including collaborative engineering, data exploration, high-throughput computing, and distributed supercomputing. Computing Grids are basically networks that pool resources -- CPU cycles, storage or data from many different machines and apply them to one complex application.

This work explores different features of a grid technology. With focus on data and application sharing on grid, a real time, University Result application that is windows-based and user-friendly was developed using VB.net deployed on an already existing test bed (the AccessGrid) and the observations in terms of Connectivity, Accessibility, Security, Flexibility, and Memory Robustness were recorded. This will enable online real time access to academic records for the purpose of assessing a candidate's suitability for admission for higher degrees or a transfer to any other institutions in the world among other applications. It is envisaged that this work will lead to the development of a worldwide Data Grid, enabling universities result (transcripts) sharing thus alleviating the difficulties encountered by inability to verify applicants' results for academic and other purposes.

**Keywords:** *Accessgrid, Grid Computing, University Examinations Results, VB.Net.*

## 1. INTRODUCTION

GRID technology is an internet-based discovery traced to mid 90's that focuses on group-to-group communication using an ensemble of resources including multimedia large-format displays, it also provides an access point for individual desktop users (node), permitting one-to-many or one-to-one communication.

This work becomes imperative as there is the need to have only one standard of computing undergraduates' results (GPA) in the academic world without having to buy and or install the result-computing application software on the computer of the personnel that needs the cumulative result (CGPA) of the individual grades of a student's performance in an examination once the user is licensed and connected to the grid platform running the software.

## 2. REVIEW OF GRID COMPUTING

The term Grid is chosen as an analogy to the electric power Grid that provides consistent, pervasive, dependable and transparent access to electricity, irrespective of its source or location. [2, 10].

Grid computing provides a flexible infrastructure to share Internet-connected resources, including computers, data storages, software, sensors, instruments, and wireless equipment[7]. It implements the model of on-demand resource sharing across administrative domains[7]. Grid Computing provides scalable, secure, high-performance mechanisms for discovering and negotiating access to remote resources, the Grid promises to make it possible for scientific collaborations to share resources on an unprecedented scale, and for geographically distributed groups to work together in ways that were previously impossible. [9]



### A. Capabilities of Grid computing (Source: [17])

The primary purpose of deploying a grid is to meet a set of customer requirements. In order to better match grid computing capabilities to those requirements, it is expedient to keep in mind the reasons for using grid computing. This section therefore describes the most important capabilities of grid computing.

1) *Exploiting underutilized resources.* The easiest use of grid computing is to run an existing application on a different machine. The machine on which the application is normally run might be unusually busy due to an unusual peak in activity. The job in question could be run on an idle machine elsewhere on the grid. Two prerequisites are however, important for this scenario. First, the application must be executable remotely and without undue overhead. Secondly, the remote machine must meet any special hardware, software, or resource requirements imposed by the application.

2) *Parallel CPU capacity.* The potential for massive parallel CPU capacity is one of the most attractive features of a grid. In addition to pure scientific needs, such computing power is driving a new evolution in industries such as the biomedical field, financial modeling, oil exploration, motion picture animation, and many others. The common attribute among such uses is that the applications have been written to use algorithms that can be partitioned into independently running parts.

3) *Applications.* There are many factors to consider in grid-enabling an application. One must understand that not all applications can be transformed to run in parallel on a grid and achieve scalability. Furthermore, there are no practical tools for transforming arbitrary applications to exploit the parallel capabilities of a grid. Nevertheless, new computation intensive applications written today are being designed for parallel execution and these will be easily grid enabled, if they do not already follow emerging grid protocols and standards.

4) *Virtual resources and virtual organizations for collaboration.* Another important grid computing contribution is to enable and simplify collaboration among a wider audience. In the past, distributed computing promised this collaboration and achieved it to some extent. Grid computing takes these capabilities to an even wider audience, while offering important standards that enable very heterogeneous systems to work together to form the image of a large virtual computing

system offering a variety of virtual resources. The users of the grid can be organized dynamically into a number of virtual organizations, each with different policy requirements. These virtual organizations can share their resources collectively as a larger grid. Sharing starts with data in the form of files or databases. Data can also be duplicated throughout the grid to serve as a backup and can be hosted on or near the machines most likely to need the data, in conjunction with advanced scheduling techniques. Sharing is not limited to files, but also includes many other resources, such as equipment, software, services, licenses, and others.

5) *Access to additional resources.* In addition to CPU and storage resources, a grid can provide access to increased quantities of other resources and to special equipment, software, licenses, and other services. The additional resources can be provided in additional numbers and/or capacity.

6) *Resource balancing.* A grid federates a large number of resources contributed by individual machines into a greater total virtual resource. For applications that are grid enabled, the grid can offer a resource balancing effect by scheduling grid jobs on machines with low utilization. This feature can prove invaluable for handling occasional peak loads of activity in parts of a larger organization. This can happen in two ways:

- An unexpected peak can be routed to relatively idle machines in the grid.
- If the grid is already fully utilized, the lowest priority work being performed on the grid can be temporarily suspended or even cancelled and performed again later to make room for the higher priority work.

Without a grid infrastructure, such balancing decisions are difficult to prioritize and execute.

7) *Reliability.* High-end conventional computing systems use expensive hardware to increase reliability. They are built using chips with redundant circuits that vote on results, and contain much logic to achieve graceful recovery from an assortment of hardware failures. The machines also use duplicate processors with hot pluggability so that when they fail, one can be replaced without turning the other off. Power supplies and cooling systems are duplicated. The systems are operated on special power sources that can start generators if utility power is interrupted. All of this builds a reliable system,



but at a great cost, due to the duplication of high-reliability components.

8) *Management*. The goal to virtualize the resources on the grid and more uniformly handle heterogeneous systems will create new opportunities to better manage a larger, more disperse Information Technology (IT) infrastructure. It will be easier to visualize capacity and utilization, making it easier for IT departments to control expenditures for computing resources over a larger organization.

Grid offers management of priorities among different projects. In the past, each project may have been responsible for its own IT resource hardware and the expenses associated with it. Often this hardware might be underutilized while another project finds itself in trouble, needing more resources due to unexpected events. With the larger view a grid can offer, it becomes easier to control and manage such situations.

### 3. RATIONALE FOR THE RESEARCH

The following reasons among others have motivated this research work:

- To study how grid and its features work.
- To develop a real time online, University Result application that is accessible on a Grid.
- To incorporate the examination result application into an already existing testbed.
- To explore the potentials of grid technology in its effective sharing and usage capabilities from different international remote locations.

### 4. METHODOLOGY

The execution of the project is divided into phases and goals are achieved through each phase. These include:

- i) An extensive state-of-the-art survey of existing models for grid resource sharing and data exploration with a view to applying the knowledge to our immediate environment. This is carried out through the following consultation:
- ii) Development of University Examination Result system to implement (i) above, using Object Oriented Programming approach.
- iii) Deployment and testing of the software using an existing test bed (AccessGrid)

### 5. RESULTS

In connecting to the grid platform, that is, to house the developed application with its database; the under listed were observed:

- Accessibility
- Security
- Flexibility
- Memory Robustness

**Connectivity:** Failure in connection on a grid is an occurrence in which the Venue client could not communicate with the grid server.

**Accessibility:** Access to your data and any other data made available on the grid is relatively easy and fast but the *middleware* poses a problem in which there is a queue of people waiting to use the application almost at the same time you want to access it, this increases the access time though the *middleware* is doing everything possible to reduce the queue by managing the optimal allocation of resources but the more the queue, the more the access time.

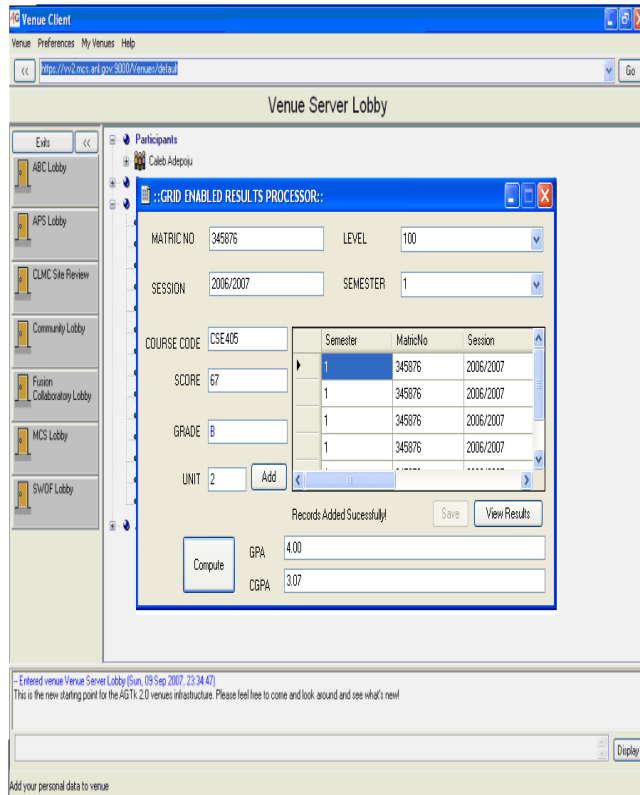
**Security:** There is an in-built authentication mechanism for establishing the identity of a user or resource; the grid proxy certificate earlier mentioned is duly used on this grid testbed. Also, the default testbed provides an option for allowing or denying access to your grid resources.

**Flexibility:** All data, most especially, the executable files are flexible and can run at the node user's end without any previous installation or platform incompatibility.

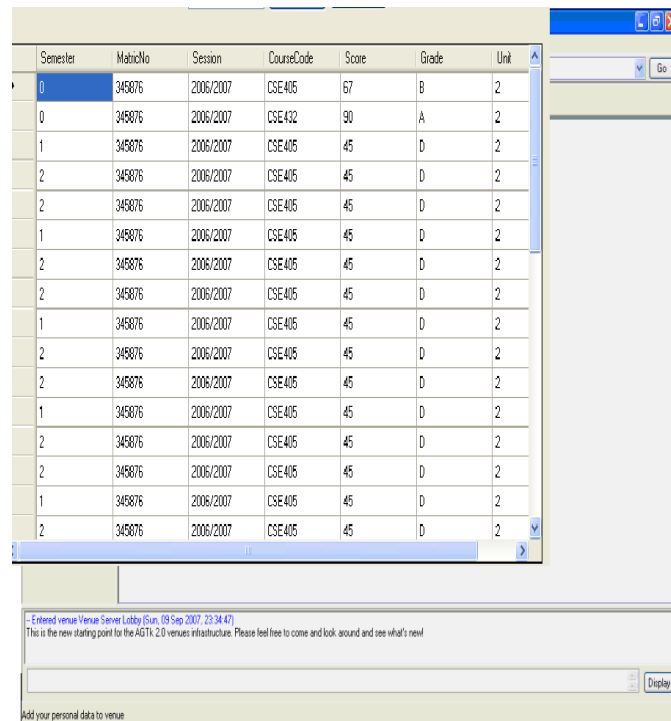
**Memory Robustness:** Computing resources brought together on grid are geographically distributed and heterogeneous without physical proximity with the storage capacities of individual systems on grid forming a single system image, granting users and applications seamless access to vast resources. Each testbed does not restrict the size of data a node user could put on the grid.

Below are a few screen shots taken from the running of the application on the grid testbed. Figure 1 shows the user interface of the application while figure 2 shows a query of the result database on the Grid.

- Connectivity



**Figure 1: The Result Processor running on the Grid node.**



Semester	MatricNo	Session	CourseCode	Score	Grade	Unit
0	345876	2006/2007	CSE405	67	B	2
0	345876	2006/2007	CSE432	90	A	2
1	345876	2006/2007	CSE405	45	D	2
2	345876	2006/2007	CSE405	45	D	2
2	345876	2006/2007	CSE405	45	D	2
1	345876	2006/2007	CSE405	45	D	2
2	345876	2006/2007	CSE405	45	D	2
2	345876	2006/2007	CSE405	45	D	2
1	345876	2006/2007	CSE405	45	D	2
2	345876	2006/2007	CSE405	45	D	2
2	345876	2006/2007	CSE405	45	D	2
1	345876	2006/2007	CSE405	45	D	2
2	345876	2006/2007	CSE405	45	D	2
2	345876	2006/2007	CSE405	45	D	2
1	345876	2006/2007	CSE405	45	D	2
2	345876	2006/2007	CSE405	45	D	2

**Figure 2: The Result Processor Database running on the Grid.**

## 6. CONCLUSION

The result processing application was deployed on a grid testbed (the Accessgrid) and various features of a grid environment were explored. With the deployment of a system such as this, results of graduates from an institution can be made available real time online for academic record verification purposes and similar uses.

Though, the work and the data grid implementation is fascinating but it is unfortunate that a reliable internet service is a major backbone to any grid creation and implementation. It can be frustrating hosting data on the grid for sharing purpose on the Accessgrid environment for bandwidth limitation in our environment. This challenge would however be addressed through the next stage of this research which aims at developing a locally hosted grid infrastructure for the purpose of sharing academic record online real time. Confidentiality and security among other issues would also be relevant issue to consider as this research takes further directions.

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