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Architectural and Security Management for Grid Computing

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Abstract: *Grid computing is an environment where sharing of geographically distributed resources helps in performing the computation that cannot be achieved due to limitation like not having the proper amount of storage or the computation power required by a system to execute the job. One of the important point for grid computing devices are there low power usages and no central control point which enables users to access the small devices irrespective of their geographical position with different management policies. Security is the most important concern in Grid computing environment. In this paper an attempt has been made to understand the working of gird environment and what are the necessary points need to take by an organization in terms of security design for grid computing.*

Keywords: *Grid computing, grid components, resource management, scheduler and security.*

I. Introduction

Grid Computing enables virtual organizations to share geographically distributed resources as they pursue common goals, assuming the absence of central location, central control, omniscience, and an existing trust relationship and the transparently access resources across a distributed and heterogeneous environment. The term Grid Computing originated in the early 1990s as a metaphor for making computer power as easy to access as an electric power grid in Ian Foster 's and Carl Kesselman 's seminal work, "The Grid: Blueprint for a new computing infrastructure" (2004) [1]. The Grid infrastructure can benefit many applications, including collaborative engineering, data exploration, high-throughput computing, and distributed supercomputing. Grid computing can be term as heterogeneous environment where exchange, discovery, sharing, selection of different requiring resources like computers, PDAs, databases, access points etc can be done.

In grid computing all the nodes that are spread in large geographical areas are combined and hence the computational power is merged to reach common goals. The researchers and developers are making focus on how to make grid infrastructure well suitable for both hardware and software management. Some of the social problems related to development of grid are: [2]

- Problem for management of distributed resources though the locally managed recourses are fully retained.
- Problem for identifying the availability and solution to access the data.
- Problem to provide wide range of accessible resources in a distributed pattern for the researchers to gain knowledge from them.

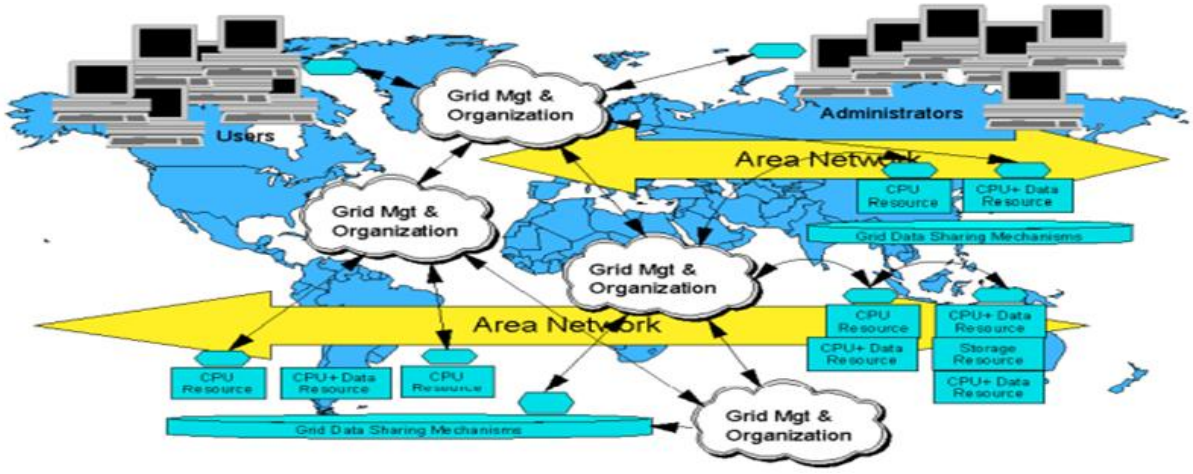

Figure 1: Conceptual diagram of grid computing.

The rest of paper is organized as: Section II provide the brief related work that has been carried out till date for grid. Gird components and its architectural view point is given in detail in Section III. Benefits for using grid and how it helps to carry out the computing are provided in Section IV. Section V presents the security measures for which the gird vendor should keep in mind while design the grid environment. Finally, Section VI concludes the paper.

II. Components Of Grid

Gird infrastructure consists of several nodes sometime refer as grid machine, resources, clients and host etc. They all work together to provide the gird platform [3]. Some of the related terms are listed below:

a) Computation: It is the processor machine where the computing is performed. The speed, architecture, software and hardware like memory and storage are the common elements of the machine which helps the processor to execute the task. The task can be divided into parts so that can be executed in parallel over the distributed grid.

b) Storage: A grid providing an integrated view of data storage is sometimes called a data grid. Storage system for grid can be of both primary (memory attached with processor) and secondary (external hard disk). Access to primary memory is fast but is unsteady in nature for which cache data are recommended. Storage capacity can be increased by using the multiple machines with a amalgamate file system.

c) Communications: Communication can be thought of an important resource of grid as the different machines have to communicate with each other so as to perform a common task. The communication can be between the gird and external to the grid. The rapid growth in communication capacity among machines today makes grid computing practical, compared to the limited bandwidth available when distributed computing was first emerging.

d) Software and License: To install software on every grid machine can be too expensive. Using a grid, the jobs requiring this software are sent to the particular machines on which this software happens to be installed. When the licensing fees are significant, this approach can save significant expenses for an organization.

e) Special equipments: Grid equipments can be different from the conventional tools in terms of architectural design, operational capacity, storage system or the computing devices.

Each of these items represents a different kind of resource that the grid can use as criteria for assigning jobs to machines. While some software may be available on several architectures, for example, PowerPC and x86, such software is often designed to run only on a particular type of hardware and operating system. Such attributes must be considered when assigning jobs to resources in the grid [4].

III. Grid Architecture

From the architectural view point grid infrastructure can be divided into four different levels [5].

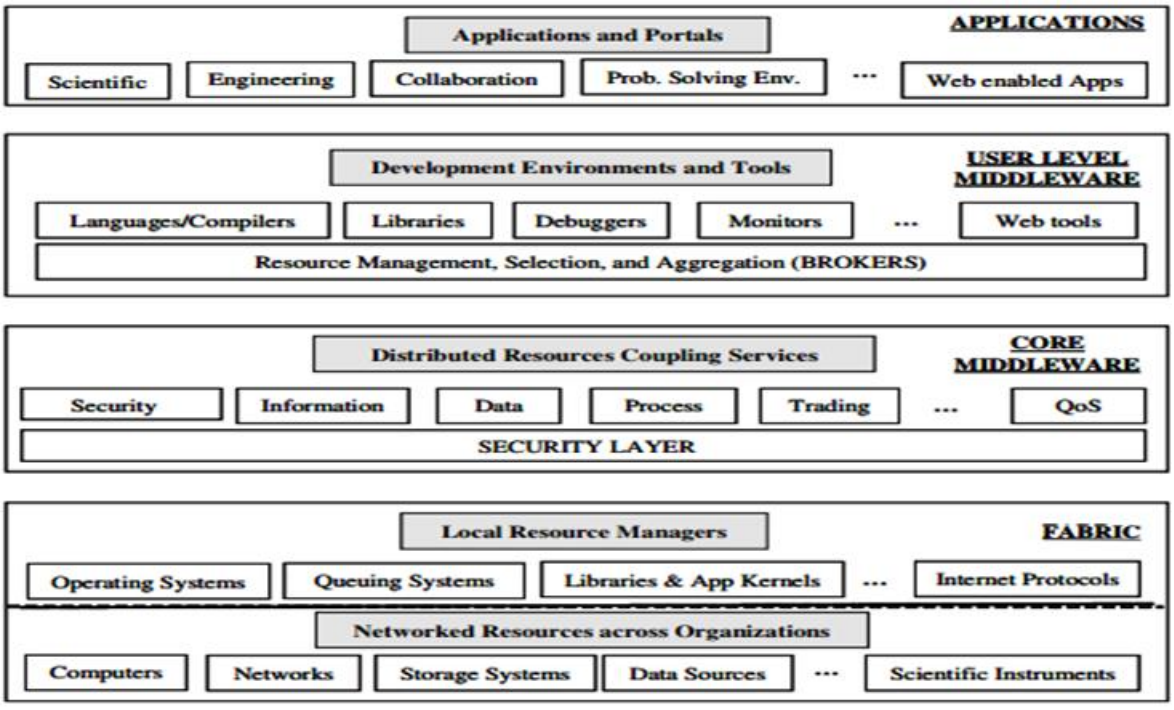

Figure 2: Architectural diagram for gird computing

Fabric Level: This is the lower most level which can be divided into two parts: Network Resources such as computers, networks, storage systems and scientific instruments like radio telescope or particular heat sensor that are used across the organizations and Local Resource Managers which are generally the operating

systems, queuing systems, libraries and Internet protocols that use the network resources to carry out the necessary computational operations.

Core Middleware Level: Security management, information and data management, remote processing are the typical type of services provided by this middleware. This layer also support for the Quality of Services (QoS)which includes trading and resource reservation.

User Level Middleware: This level relates with development environment and tools. This layer is responsible for providing the compiled and debugged data from lower level to higher level by using the specific libraries and programming tools. Resource broker manage the recourses and scheduling application tasks for execution on global resources.

Application Level: Grid application can be used for scientific, engineering or problem solving environment. HPC++ or MPI are the typical grid-enable programming languages which are used for the development of grid applications. Web enable applications are provided by the gird portals on which users can access for the results on their jobs on remote resource through web.

IV. Important Aspects Of Grid Computing

Some of the important characteristics of grid computing are given below:

Resource Balancing: In gird computing a large number of resources contributed by individual machines take places as a large single-system image. Job scheduler is use to allocate such type of heavy load process to a lower or idle grid machine to provide the computation. Depending upon the size of the job, the job scheduler can schedule different job to different gird processor. If a higher priority job comes for computing, the lower priority job may be suspended for the time being and can be executed later after finishing the computation for higher priority job. Thus, it will make the grid more fairly in distributing the works.

Reliability: High-end conventional computing systems use expensive hardware to increase reliability. This type of machines uses duplicate processors so that when they fail, one can be replaced without turning the other off. Power supplies and cooling systems are duplicated which usually leads to increase in cost. But due to the distributed nature of grid machines, the important data or work can be distributed over multiple grid machines. Thus, if there is a power or other kind of failure at one location, the other parts of the grid are not likely to be affected.

Parallel CPU capacity: CPU utilization is one of the most common features that we look for in computation. Grid infrastructure has massive CPU parallel operational ability. The work for grid can be thought as many sub-jobs. This sub-job can be executed in parallel individually in different parts of the grid. A perfectly scalable application will, for example, finish in one tenth of the time if it uses ten times the number of processors.

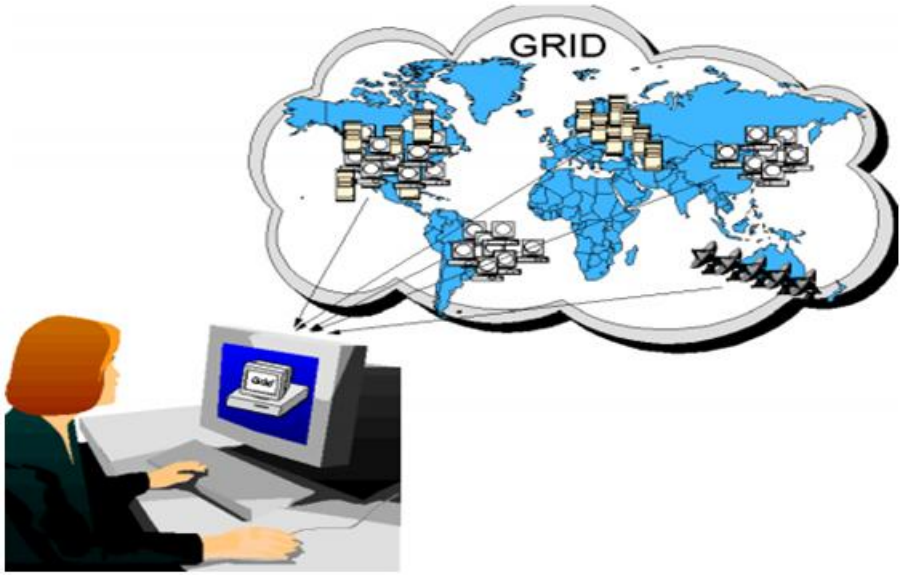

Figure 3: Grid computing management

Management: Different projects can be managed in terms of priority, policies or availability with the help of grid. The case of underutilization of particular resource while another resource find it difficult to get the computation, with the larger view a grid can offer, it becomes easier to control and manage such situations. When maintenance is required, work can be rerouted to other machines without disturbing the projects involved [3] [6].

V. Grid Security

One of the important aspects of grid computing is security as the system is working in a uniform distributed manner. Authentication, authorization, and confidentiality of communication between grid machines are the key provisions related with security for grid environment [2] [3].

An organization which is providing the grid environment is itself responsible for laying out the rules and regulation for the computation purpose. Some of the challenges related to security which the organization has to face are listed below:

Integration: The organization has to provide the security which can be integrated with the existing security system that matches with the global grid environment. The overall grid security architecture is required to be extensible to incorporate new security services as they become available.

Interoperability: The organization has to take care for the interoperability option as the grid environment consists of multiple distributed resources which need to interact with each other. Security policy like secure conversation and identifying different source from different province is needed.

Trust Relationship: The organization has to build its security policy related with other organization as the services are going to be shared among them. The security should involve the trust establishment relationship with other vendors for the common grid request. Grid environment is so dynamic that it is impracticable to establish end-to-end trust prior to execution of an application. The issue of trust establishment becomes complicated with transient Grid services.

VI. Conclusion

Grid Computing is a computing model that provides the ability to perform higher throughput computing. This paper overviews the structure, operation and key parameters of grid computing. Grid computing works in distributed manner by using the various computational resources available over the grid environment. The advantage of using grid computing and how well it manages the resources with the function of scheduler has been mentioned in the paper. In this paper, attempt has been made to show the working principle of grid computing with its architecture and security measures that should be kept in mind with design the grid environment.

References

[1] Foster, Ian, and Carl Kesselman, eds, The grid 2: blueprint for a new computing infrastructure, Elsevier, 2003.
[2] Parashar, Manish, and Craig A. Lee, Grid computing: introduction and overview, Proc. of the IEEE, special issue on grid computing 93.3, 2005, 479-484.
[3] Wu, R. X., Chien, A., Hiltunen, M. A., Schlichting, R. D., & Sen, S, A high performance configurable transport protocol for grid computing, Proc. of 5th IEEE International Symposium of Cluster Computing and the grid, Vol.2, 2005, 1117-1125.
[4] Buyya, Rajkumar, and Srikumar Venugopal, A gentle introduction to grid computing and technologies, database 2, 2005: R3.
[5] Baker, Mark, Rajkumar Buyya, and Domenico Laforenza, Grids and grid technologies for wide-area distributed computing, Software: Practice and Experience 32.15, 2002, pp. 1437-1466.
[6] Kettimuthu, R, Allcock, W, Liming, L, Navarro, J.-P, Foster, I., Gridcopy: moving data fast on the grid, IEEE International parallel and distributed processing symposium, IPDPS 2007. doi:10.1109/IPDPS.2007, 1 – 6.