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The Grid Computing:-An Emerging Technology

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Abstract
Grid Computing helps computer resources from various domains to reach a common goal. The grid can be thought of as a distributed system with non-interactive workloads that involve a large number of files. With the emergence of Grid and application technologies, scientists and engineers are building more and more complex applications to manage and process large data sets, and execute scientific experiments on distributed resources. This method of pooling resources for solving large-scale problems is called as Grid Computing. This Paper consist of the basic concept of Grid Computing and comparison with cloud computing.

Keywords: Grid computing, Features, comparison with Cloud Computing.

Introduction
Grid is a type of parallel and distributed system that enables the sharing, selection, and aggregation of geographically distributed "autonomous" resources dynamically at runtime depending on their availability, capability, performance, cost, and users' quality-of-service requirements. In grid computing individual users obtain computing resources like storage, applications, data, processors etc. on demand with limited knowledge of where the resources are located. Grid computing captures the basics of distributed computing that involves coordinating as well as sharing computing, data, application and storage or network resources across dynamic and geographically dispersed organization. The management features of grid software enables the linking of computer resources together in a way that lets an individual use a single machine to leverage as well as access the collected power of all the machines within the grid computing system. The purpose of grid computing was to allow access to computer based resources like from CPU cycles to data servers in the same manner as real world utilities. Grid computing is a form of distributed computing whereby resources of many computers in a network are used at the same time, to solve a single problem. Grid systems are designed for collaborative sharing of resources. It can also be thought of as distributed and large-scale cluster computing.

Fig.: Grid Computing

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Grid Characteristics

Grid computing is applying the resources of many computers in a network to a single problem at the same time - usually to solve a scientific as well as technical problem that requires a great number of computer processing cycles. The essential characteristics of grid can be elaborated as follows:

1. Resource sharing
2. Geographical distribution
3. Heterogeneity
4. Large scale
5. Multiple administrations
6. Resource coordination
7. Transparent access
8. Dependable access
9. Consistent access
10. Decentralization (Loosely coupled)
11. Dynamism
12. Distributed Job Management & scheduling

Grid Architecture

Computational grids have to be designed so as to serve different communities with varying characteristics and requirements. Because of this reason we cannot have a uniform single architecture. But in general we can identify basic services that almost all the grids will provide although different grids will use different approaches for the realization of these services.

This description of grid architecture does not provide a complete enumeration of all the required protocols and services but it identifies the requirements for general class of components. This architecture organizes the components into layers as shown in Figure
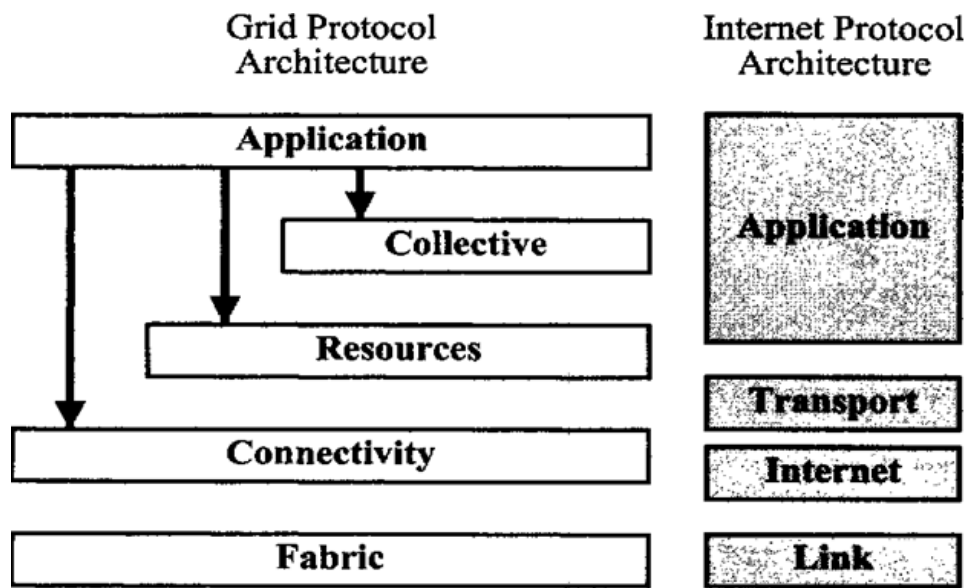

Fig.: Grid Architecture

The Layers of the grid are as follows

- **Fabric Layer**

  This layer provides the resources, which could comprise computers (PCs running Windows NT or UNIX), storage devices and databases. The resource could also be a logical entity such as a distributed file system or computer pool. Excellent fabric functionality could mean that sophisticated sharing operations can be accomplished. For this, it should support enquiry mechanisms to discover their state, structure and capabilities. It should also have resource management mechanisms that provide some control of delivered quality of service.

- **Connectivity Layer**

  This layer consists of the core communication and authentication protocols required for transactions. Communication protocols enable the exchange of data between fabric layer resources. Authentication protocols provide secure cryptographic mechanisms for identifications of users and resources. For communication transport, naming and routing are required. These protocols can be drawn from TCP/IP protocol stack.

- **Resource Layer**

  This layer builds on the Connectivity layer communication and authentication protocols to define Application Program Interfaces (API) and Software Development Kit (SDK) for secure negotiation, initiation, monitoring, control, accounting and payment of sharing operations. The protocols, which the resource layers implement to achieve the above functionality are implemented with the help of functions provided by the Fabric layer. Resource layer protocols can be distinguished primarily into two classes, which are Information Protocols and Management Protocols.

1. **Information Protocol**

   This protocol is used to obtain the necessary information about the structure and the state of the resource.

2. **Management Protocol**

   In order to negotiate the access to the shared resources this protocol is used.

- **Collective Layer**

  This layer is different from the resource layer in the sense, while resource layer concentrates on interactions with single resource; this layer helps in coordinating

multiple resources. Its tasks can be varied like Directory Services, Co-allocation and scheduling, monitoring, diagnostic services, and software discovery services.
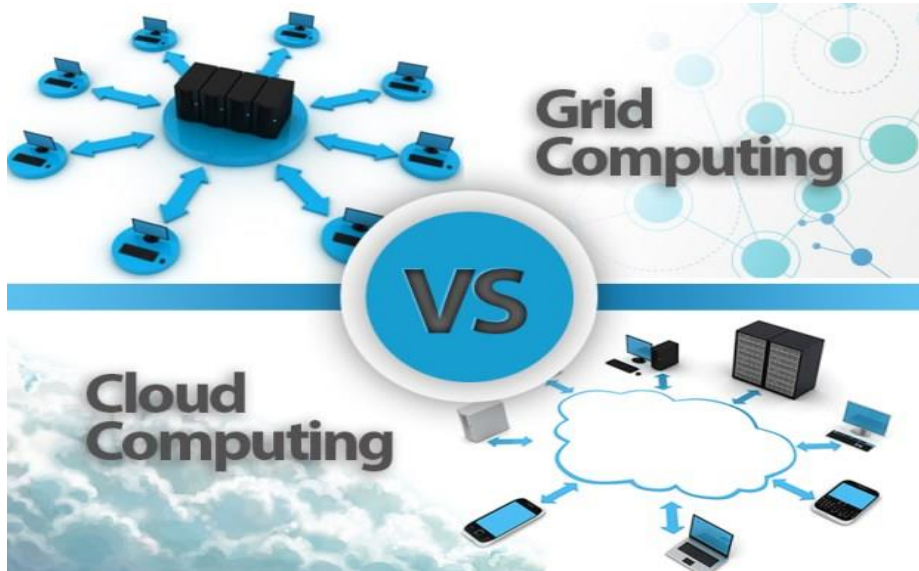
- **Application Layer**
  This layer consists of the user applications and programs and which call upon another layer.

Grid Applications
Distributed supercomputing
High-throughput computing
On-demand computing
Data-intensive computing
Collaborative computing

Comparison between Grid Computing and Cloud Computing

Grid Computing	Cloud Computing
Resources are pre-reserved	Resources are on-demand
Distributed computing architecture	Client-server architecture
Used for specific purposes	Used for business and public needs
Grids evolve slower than cloud	Clouds evolve faster than grid
It is the base concept of cloud computing	Cloud offers more services than grid computing
Grids tends to be more loosely coupled, heterogeneous, and geographically dispersed compared to conventional cluster computing systems	In fact almost all the services on the Internet can be obtained from cloud, e.g. web hosting, multiple OS, DB support and much more.
Grid computing federates resources located within different organizations	Cloud computing is typically provided within a single organization (Amazon), that simplifies many aspects, particularly security, availability and heterogeneity

Benefits of Grid Computing
1. Enables applications to be easily scaled.
2. Better utilization of underused resources.
3. Enables the linking of cheaper computers together, instead of spending a lot of money on one machine.
4. Technologies being used are open source, trust and transparency is encouraged
5. Increased reliability of computing.
6. Allows the sharing of computer resources across networks.
7. Parallelization of processing.
8. Resource balancing.

Advantages and Disadvantages of Grid Computing
Advantages
- Resource Balancing
- Virtualized resources across an enterprise. (Like Data Grids, Compute Grids.)
- Enable collaboration for virtual organizations
- Flexible, Secure, Coordinated resource sharing.
- Give worldwide access to a network of distributed resources.

Disadvantages

- Need for interoperability when different groups want to share resources. –Diverse components, policies, mechanisms –E.g., standard notions of identity, means of communication, resource descriptions.
- Need for shared infrastructure services to avoid repeated development, installation. –E.g., one port/service/protocol for remote access to computing, not one per tool/application.

Conclusion
- Grid Computing is becoming the platform for next generation e-science experiments.
- By Intranet Grid it is very easy to download multiple files.
- Grid is a type of parallel and distributed system that enables the sharing, selection, and aggregation of geographically distributed "autonomous" resources.
- Resource sharing and resource use in dynamic, scalable virtual organizations. We have also presented both requirements and a framework for Grid architecture.
- Grids tend to be more loosely coupled, heterogeneous, and geographically dispersed compared to conventional cluster computing systems.

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