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REVIEW ARTICLE

ARCHITECTURE AND STANDARDS OF GRID COMPUTING

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Architecture and Standards of Grid Computing

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INTRODUCTION

A grid computer is multiple number of same class of computers clustered together. A grid computer is connected through a super fast network and share the devices like disk drives, mass storage, printers and RAM Grid Computing is a cost efficient solution with respect to Super Computing Operating system has capability of parallelism

Grid computing combines computers from multiple administrative domains to reach a common goal, to solve a single task, and may then disappear just as quickly.

One of the main strategies of grid computing is to use middle ware to divide and apportion pieces of a program among several computers, sometimes up to many thousands. Grid computing involves computation in a distributed fashion, which may also involve the aggregation of large-scale cluster computing-based systems.

The size of a grid may vary from small—confined to a network of computer workstations within a corporation, for example—to large, public collaborations across many companies and networks. "The notion of a confined grid may also be known as an intra-nodes cooperation whilst the notion of a larger, wider grid may thus refer to an inter-nodes cooperation".

Grids are a form of distributed computing a “super virtual computer” is composed of many networked loosely coupled acting together to perform very large tasks. This technology has been applied to computationally intensive scientific, mathematical, and academic problems through volunteer computing and it is used in commercial enterprises for such diverse applications as drug discovery and back office data processing in support for e- commerce and web services.

Coordinating applications on Grids can be a complex task, especially when coordinating the flow of information across distributed computing resources. Grid workflow systems have been developed as a specialized form of a workflow management system designed specifically to compose and execute a series of computational or data manipulation steps, or a workflow, in the Grid context.

In order to aggregate distributed and heterogeneous high end machines, standards are needed. The standardization of network communication between heterogeneous systems

Led to the explosion of the Internet. Similarly the emerging standardization for sharing resources will lead to the explosion of grid computing.

ARCHITECTURE

The components that are required to form a grid can be divided into four layers based on their role in the grid system. They are:

- **Fabric**: At the lowest level this consists of resources users share and access including computers, storage systems, catalogs, networks, sensors, processors.

- **Connectivity and Resource Layers**: Contains the core communication and authentication protocols and also protocols that enable secure initiation, monitoring and control of resource-sharing operations.

- **Collective Layer**: Contains protocols, services, and APIs that implement interactions across collections of resources.

- **User Applications**: Includes user applications which call on the components in other layers to complete their tasks.

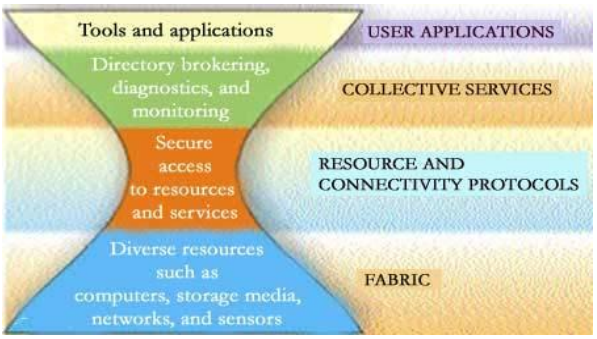

Figure : Architecture

(Source: Foster)

STANDARDS

• **Globus Toolkit**: This is an open source toolkit released by the Globus Alliance, whose members include researchers at Argonne National Laboratory, the University of Southern California's Information Sciences Institute, the University of Chicago, the University of Edinburgh, and the Swedish Center for Parallel Computers. Some of the prominent corporate sponsors of the alliance include IBM, Microsoft and Cisco. The toolkit includes software for security, information infrastructure, resource management, data management, communication, fault detection and portability.

• **Open Grid Services Architecture [OGSA]**: This is an evolving standard with significant industry support OGSA defines what grid services are, what they should be capable of, what types of technologies they should be based on, but doesn't give a technical and detailed specification for the implementation.

• **Open Grid Services Infrastructure [OGSI]:** OGSI gives a formal and technical specification of the standards defined by OGSA.

The grid services defined by OGSA and OGSI are extensions of web services4. The Globus Toolkit Version 3(GT3) is implemented based on the specification of OGSI standards and hence OGSA standards. Figure presents the interrelationship between OGSA, OGSI, Web Services and the Globus Toolkit implementation. The core services supported by the Globus Toolkit include:

¾ Grid Security Infrastructure (GSI) – Authentication and related security services.

¾ Grid FTP - Grid based file transfer protocol built on standard FTP protocol.

¾ Globus Resource Allocation Manager (GRAM) – Resource Allocation and Process Management.

¾ Meta computing Directory Service (MDS) – Provides information about the available resources within the grid and their status.

¾ Global Access to Secondary Storage(GASS) – Remote access to data via sequential and parallel interfaces

With evolving standards, IT vendors are competing with each other to provide grid services based on these standards. Appendix A contains a list of leading grid solution providers. The relative market positioning of major OEMs-Original equipment manufactures is listed in Table.

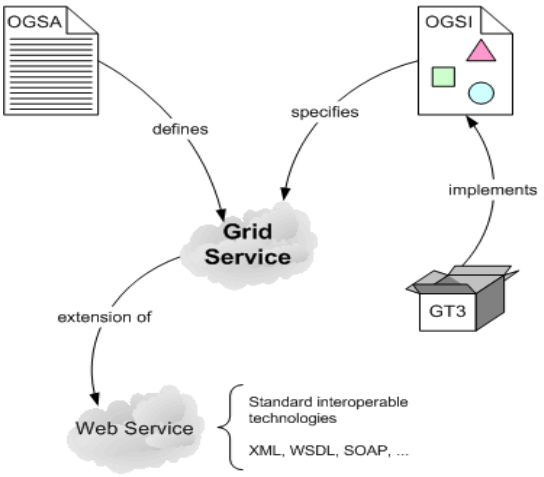

Figure: OGSA, OGSI, Web Services, Globus Toolkit

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