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Next Generation Computing on the Internet (GRID)

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Abstract- Grid computing is increasingly being viewed as the next phase of distributed computing. Built on pervasive Internet standards, grid computing enables organizations to share computing and information resources across department and organizational boundaries in a secure, highly efficient manner. The next generation Grid will virtualize the notion of distribution in computation, storage and communication over unlimited resources.

The NGG vision, which has emerged as the vision for Grid Technologies, consists of three complementary perspectives the end-user perspective which implies the simplicity of access to and use of Grid technologies. the architectural perspective where the Grid is seen as a large evolutionary system made of billions of interconnected nodes of any type and the software perspective of a programmable and customizable Grid.

Index Terms- Grid Computing, Deployment, Next Generation Grid (**NGG**). Service Oriented Knowledge Utility (**SOKU**).

I. Introduction

Today we are in the Internet world and everyone prefers to enjoy fast access to the Internet. But due to multiple downloading, there is a chance that the system hangs up or slows down the performance that leads to the restarting of the entire process from the beginning. This is one of the serious problems that need the attention of the researchers. So we have taken this problem for our research and in this paper we are providing a layout for implementing our proposed Grid Model that can access the Internet very fast. By using our Grid we can easily download any number of files very fast depending on the number of systems employed in the Grid. When practically implemented, our Grid provides the user to experience the streak of lightening over the Internet while downloading multiple files.

Emerging pervasive wide area Grid computing environments are enabling a new generation of applications that are based on seamless aggregation and integration of resources, services and information. The Grid computing helps in exploiting under utilized resources, achieving parallel CPU capacity, provide virtual resources for collaboration and reliability.

Grid computing is based on the idea of joining individual computers and clusters of computers and organizing them into a single logical entity with a common interface. This interface will act as a meta-computer offering, for example, uniform access control and resource locator services to the user applications. By using these services, applications can be developed and tested on local machines and subsequently submitted to the meta-computer without modifications when a significant increase in computer resources are needed for the project. Grid-based systems fall into two basic categories, depending on the requirements of the applications. Those that exploit the availability of large quantities of computing power distributed over a network are usually denoted Computational Grids, while those that focus on accessing and displaying large quantities of information, typically to a scientific or business community, are denoted Access Grids. These two types of Grid systems complement one another in giving their users access to globally available information. Both types of Grids will be covered by the proposed center.

A Grid provides an abstraction for resource sharing and collaboration across multiple administrative domains. The term resource covers a wide range of concepts including physical resources (computation, communication, and storage), informational resources (databases, archives, and instruments), individuals (people and the expertise they represent), capabilities (software packages, brokering and scheduling services) and frameworks for access and control of these resources (OGSA – Open Grid Services Architecture, The Semantic Web). At present multiple different.

Grid technologies co-exist, which stimulates creativity in the research community. Ultimately, however, we envision one Grid based on agreed interfaces and protocols just like the Web. Within that environment virtual organizations can co-exist, evolve and interact with each other in a secure way. This should avoid a proliferation of non-interoperable Grids, which would hamper the wide acceptance of Grid technology.

The SOKU Concept

Service Oriented Knowledge Utility paradigm and Next Generation Grids is a computing approach to our future IT architecture. It encompasses several important domains including foundations of service-oriented computing, service-oriented architecture, grid and utility computing, business process management, business integration.

The Service Oriented Knowledge Utility concept:

Service Oriented – the architecture comprises services which may be instantiated and assembled dynamically, hence the structure, behavior and location of software is changing at run-time.

Knowledge – SOKU services are knowledge-assisted (‘semantic’) to facilitate automation and advanced functionality, the knowledge aspect reinforced by the emphasis on delivering high level services to the user.

Utility – A utility is a directly and immediately useable service with established functionality, performance and dependability, illustrating the emphasis on user needs and issues such as trust.

II. REASONS FOR USING GRID COMPUTING

When you deploy a grid, it will be to meet a set of customer requirements. To better match grid computing capabilities to those requirements, it is useful to keep in mind the reasons for using grid computing. 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. There are at least two prerequisites for this scenario. First, the application must be executable remotely and without undue overhead. Second, the remote machine must meet any special hardware, software, or resource requirements imposed by the application.

III. THE GRID VISION

Grid is a socially shared, integrated system consisting of resources shared by multiple administrative/virtual organizations that gives transparent access to affordable and unaffordable resources under commonly agreed set of rules.

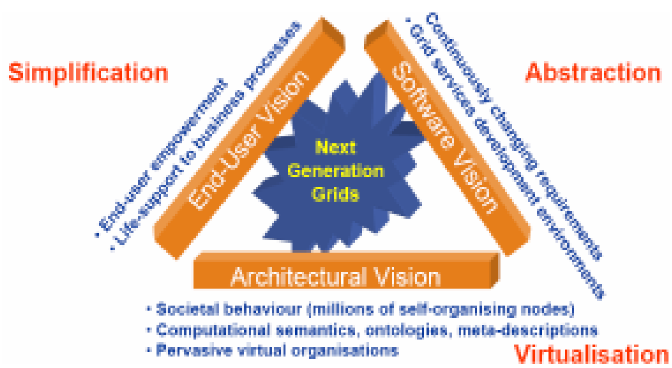

Fig 1 Grid Vision

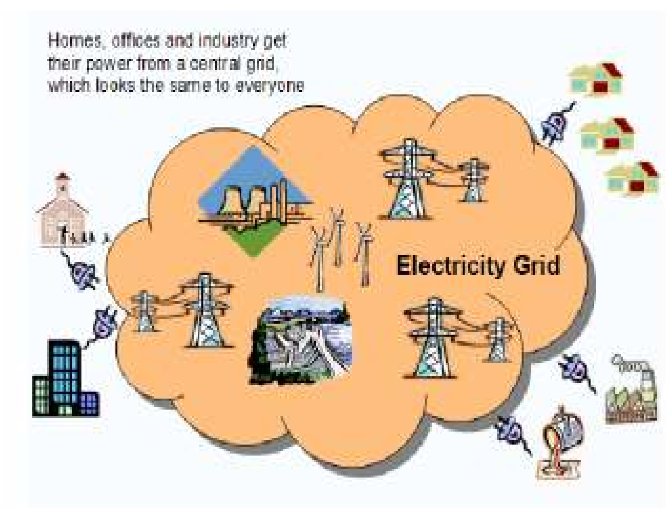

Fig 2 GRID ARCHITECTURE

The three primary types of grids and are summarized below:

Computational Grid
A computational grid is focused on setting aside resources specifically for computing power. In this type of grid, most of the machines are high-performance servers.

Scavenging grid
A scavenging grid is most commonly used with large numbers of desktop machines. Machines are scavenged for available CPU cycles and other resources. Owners of the desktop machines are usually given control over when their resources are available to participate in the grid.

Data Grid
A data grid is responsible for housing and providing access to data across multiple organizations. Users are not concerned with where this data is located as long as they have access to the data.

IV. PROPERTIES OF GRIDS

A. The main issues that characterize computational grids are-

i. **Heterogeneity**
A Grid involves a multiplicity of resources that are heterogeneous in nature and might span numerous administrative domains across wide geographical distances.

ii. **Scalability**
A Grid might grow from few resources to millions. This raises the problem of potential performance degradation as a Grids size increases. Consequently, applications that require a large number of geographically located resources must be designed to be extremely latency tolerant.

iii. **Dynamicity or Adaptability**
In a Grid, a resource failure is the rule, not the exception. In fact, with so many resources in a Grid, the probability of some resource failing is naturally high. The resource managers or applications must tailor their behavior dynamically so as to extract the maximum performance from the available resources and services.

iv. **Transparency**
The complexity of the Grid architecture is hidden to the final user. The user must be able to use a Grid as it was a unique virtual super computer. Resources must be accessible setting their location apart.

v. **Openness**
Each sub component of the Grid is accessible independently to the other components.

vi. **Fault Tolerance**
Grids must be able to work even if a component fails or a system crashes.

vii. **Concurrency**
Different processes on different nodes must be able to work at the same time.

B. Grid has the following characteristics

i. Grid Computing is called High Throughput .
ii. Its a mix of open source, proprietary software /applications/databases
iii. No Single System Image (SSI), all the connected resources are autonomous
iv. virtualization of resources
v. Decentralized scheduling, administering and job management
vi. Highly volatile, resources join and leave the Grid at their own will and wish.
vii. unlimited number of nodes/resources
viii. All the resources are highly heterogeneous in nature (from silicon to applications to application services called web service)
ix. Internet is used as Information Highway. Grid is built on top of Internet and is used as Computing/Sharing Highway

C. Grid security

i. **Authentication**
Verifying the validity of a claimed individual and identifying who he or she.
ii. **Access Control** Assurance that each user.
iii. **Data Confidentiality**
Assurance that sensitive information must not be revealed to parties that it. Assurance that sensitive information must not be revealed to parties that it was not meant for.
iv. **Data Integrity**
Assurance that the data is not altered or destroyed in an unauthorized manner.
v. **Key Management**
The secure generation, distribution, authentication and storage of keys used in cryptography.

V. ACCESSING THE INTRANET GRID

When any user wants to access our proposed Intranet Grid in order to download multiple files over the Internet, then he should follow certain procedures that we consider necessary for the security of our Grid. The main Requirements for Processing in Grid Environment are:

i. Security Single sign-on, authentication, authorization, and secure data transfer.
ii. Resource Management Remote job Submission and Management.
iii. Data Management.
Secure and robust data movement.
iv. Information Services.
Directory services of available resources and their status.

VI. SERVER VIRTUALIZATION

Virtualization is a method of running multiple independent virtual operating systems on a single physical computer. Virtualization, in computing, is the creation of a virtual (rather than actual) version of something, such as a hardware platform, operating system, a storage device or network resources.

A virtual organization is a collection of people and resources that work in a coordinated way to achieve a common goal. To use grid facilities, any user must subscribe to a virtual organization as a member. Each people or resource can be a member of more virtual organizations at the same time and each virtual organization can contain people or resources belonging to different administration domains.

Server virtualization is the masking of server resources, including the number and identity of individual physical servers, processors, and operating systems, from server users. The server administrator uses a software application to divide one physical server into multiple isolated virtual environments. The virtual environments are sometimes called virtual private server.

Virtual machines are based on the host/guest paradigm. Each guest runs on a virtual imitation of the hardware layer. This approach allows the guest operating system to run without modifications. It also allows the administrator to create guests that use different operating systems.

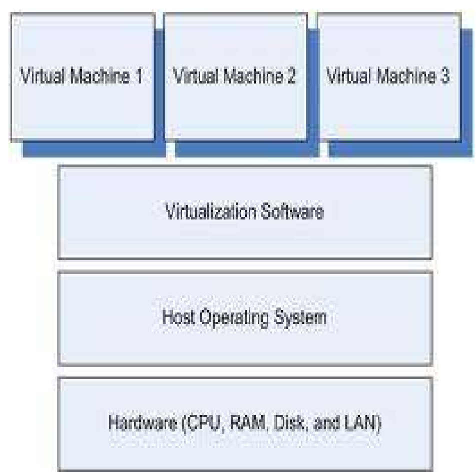

Fig 3 Server Virtualization

VII. CLOUD COMPUTING

Cloud computing is basically an Internet-based network made up of large numbers of servers - mostly based on open standards, modular and inexpensive. Clouds contain vast amounts of information and provide a variety of services to large numbers of people. The benefits of cloud computing are Reduced Data Leakage.

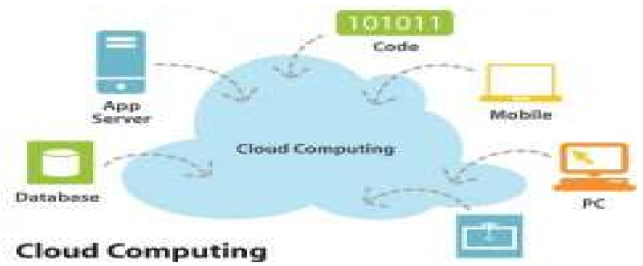

Fig 4 Cloud Computing

A. These services are broadly divided into three categories

- Infrastructure-as-a-Service (IAAS)
- Platform-as-a-Service (PAAS)
- Software-as-a-Service (SAAS).

➢ **Infrastructure-as-a-Service (IAAS)**

Infrastructure-as-a-Service (IAAS) like Amazon Web Services provides virtual servers with unique IP addresses and blocks of storage on demand. Customers benefit from an API from which they can control their servers. Because customers can pay for exactly the amount of service they use, like for electricity or water, this service is also called utility computing.

➢ **Platform-as-a-Service (PAAS)**

Platform-as-a-Service (PAAS) is a set of software and development tools hosted on the provider's servers. Developers can create applications using the provider's APIs. Google Apps is one of the most famous Platform-as-a-Service providers.

➢ **Software-as-a-Service (SAAS)**

Software-as-a-Service (SAAS) is the broadest market. In this case the provider allows the customer only to use its applications. The software interacts with the user through a user interface. .

VIII. CONCLUSION

Traditional computing environments don't provide flexibility for sharing resources to form virtual organizations. Grid Computing provides promising and efficient way of using computing and storage resources. It serves as a "computing on demand" model similar to the way electrical power is used. Ideal for collaborative environments because it provides dynamic resource sharing among different geographic locations and also it hides the complexity from the user who will see the Grid as a huge computing and storage device.

Grid technology has proven that it is the best technology to work over the internet on commerce, businesses, educations, science, researches, and many other projects by eliminating the geographical and economical limitations of the resources. By using this technology now, we can finish our projects in short time and without depending on one main server or super computers.

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