GRID BUSINESS AREAS

One of the most valuable aspects of all Grid Computing systems are that they attract the business they are intended to address. In an "on-demand" scenario, these Grid Computing environments are the result of autonomic provisioning of a multitude of resources and capabilities, typically demonstrating increased computing resource utilization, access to specialized computer systems, cost sharing, and improved management capabilities.

There have been a significant number of commercialization efforts, which support Grid Computing in every sector of the marketplace. In general terms, the utilization of Grid Computing in business environments provides a rich and extensible set of business benefits. These business benefits include (but are not limited to):

- Acceleration of implementation time frames in order to intersect with the anticipated business end results.
- Improved productivity and collaboration of virtual organizations and respective computing and data resources.
- Allowing widely dispersed departments and businesses to create virtual organizations to share data and resources.
- Robust and infinitely flexible and resilient operational infrastructures.
- Providing instantaneous access to massive computing and data resources.
- Leveraging existing capital expenditures investments, and operational expenditure investments, which in turn help to ensure optimal utilization and costs of computing capabilities.
- Avoiding common pitfalls of overprovisioning and incurring excess costs.

Many organizations have started identifying the major business areas for Grid Computing business applications. Some examples of major business areas include (but are not limited to):

- Life sciences, for analyzing and decoding strings of biological and chemical information

- Financial services, for running long, complex financial models and arriving at more accurate decisions
- Higher education for enabling advanced, data- and computation-intensive research
- Engineering services, including automotive and aerospace, for collaborative design and data-intensive testing
- Government, for enabling seamless collaboration and agility in both civil and military departments and other agencies
- Collaborative games for replacing the existing single-server online games with more highly parallel, massively multiplayer online games

Let us now introduce and explore the analytics of each of these industry sectors by identifying some of the high-level business-area requirements for Grid Computing systems. In doing so, we will look at the facilities necessary for grid systems in order to meet these requirements.

Life Sciences

This industry sector has noted many dramatic advances in the life sciences sector, which have in turn provided rapid changes in the way that drug treatment and drug discovery efforts are now being conducted. The analytics and system efforts' surrounding genomic, proteomics, and molecular biology efforts provides the basis for many of these Grid Computing advancements in this sector. These advances have now presented a number of technical challenges to the information technology sector, and especially the Grid Computing disciplines.

Grid Computing efforts have realized that these challenges include huge amounts of data analysis, data movement, data caching, and data mining. In addition to the complexity of processing data, there needs to be additional requirements surrounding data security, secure data access, secure storage, privacy, and highly flexible integration. Another area that requires attention is the querying of nonstandard data formats and accessing data assets across complex global networks.

The above requirements presented by life sciences require a Grid Computing infrastructure to properly manage data storage, providing access to the data, and all while performing complex analysis respective to the data. The Grid Computing systems can provide a common infrastructure for data access, and at the same time, provide secure data access mechanisms while processing the data. Today, life sciences utilizes the Grid Computing systems to execute sequence comparison algorithms and enable molecular modeling using the above-collected secured data. This now provides the Life Sciences sector the ability to afford world-class information analysis respective to this discussion, while at the same time providing faster response times and far more accurate results.

Financial Analysis and Services

This industry sector has noted many dramatic advances in the financial analysis and services industry sector. The technological and business advances are most noted in the information technology areas, the emergence of a competitive market force customer satisfaction, and reduction of risk as the most competitive areas financial communities continually strive to achieve. The requirements related to sophistication, accuracy, and faster execution are among the more salient objectives across financial communities. These objectives are now achieved by real-time access to the current and historical market data, complex financial modeling based on the respective data, and faster response times to user queries.

Grid Computing provides the financial analysis and services industry sector with advanced systems delivering all the competitive solutions in Grid Computing. These solutions exemplify the infrastructure and business agility necessary to meet and exceed the uniqueness that the financial analysis and services industry sector requires. This particular value statement is accomplished by the fact that many of these solutions in this industry are dependent upon providing increased access to massive amounts of data, real-time modeling, and faster execution by using the grid job scheduling and data access features. For this to be most successful, these financial institutions tend to form virtual organizations with participation from several different departments and other external organizations. In addition to the use of existing resources, a grid system can provide more efficiency by easily adapting to the rapidly changing algorithms pertaining to the financial analytics.

Research Collaboration

Research-oriented organizations and universities practicing in advanced research collaboration areas require the analysis of tremendous amounts of data. Some examples of such projects are subatomic particle and high energy physics experiments, remote sensing sources for earth simulation and modeling, and analysis of the human genome sequence.

These virtual organizations engaged in research collaboration activities generate petabytes[2] of data and require tremendous amounts of storage space and thousands of computing processors. Researchers in these fields must share data, computational processors, and hardware instrumentation such as telescopes and advanced testing equipment. Most of these resources are pertaining to data-intensive processing, and are widely dispersed over a large geographical area.

The Grid Computing discipline provides mechanisms for resource sharing by forming one or more virtual organizations providing specific sharing capabilities. Such virtual organizations are constituted to resolve specific research problems with a wide range of participants from different regions of the world. This formation of dynamic virtual organizations provides capabilities to dynamically add and delete virtual organization participants, manage the "on-demand" sharing of resources, plus provisioning of a common and integrated secure framework for data interchange and access.

Engineering and Design

The enormous competitive pressure in the business and industry sectors today afford most engineering and design far less turnaround time. They need mechanisms to capture data, speed up the analysis on the data, and provide faster responses to market needs. As we already know, these engineering activities and design solutions are inherently complex across several dimensions, and the processing requirements are much more intense than that of traditional solutions of the past.

These complexities fall into several areas of solutions in Grid Computing that span across industry sectors all over the world. These complexities are described (but are not limited to) the following areas:

- The analysis of real-time data to find a specific pattern within a problem
- The parametric studies to verify different aspects of the systems
- The modeling experiments to create new designs
- The simulation activities to verify the existing models for accuracy

Collaborative Games

There are collaborative types of Grid Computing disciplines that are involving emerging technologies to support online games, while utilizing on-demand provisioning of computation-intensive resources, such as computers and storage networks. These resources are selected based on the requirements, often involving aspects such as volume of traffic and number of players, rather than centralized servers and other fixed resources.

These on-demand-driven games provide a flexible approach with a reduced up-front cost on hardware and software resources. We can imagine that these games use an increasing number of computing resources with an increase in the number of concurrent players and a decrease in resource usage with a lesser number of players. Grid Computing gaming environments are capable of supporting such virtualized environments for enabling collaborative gaming.

Government

The Grid Computing environments in government focus on providing coordinated access to massive amounts of data held across various agencies in a government. This provides faster access to solve critical problems, such as emergency situations, and other normal activities. These key environments provide more efficient decision making with less turnaround time.

Grid Computing enables the creation of virtual organizations, including many participants from various governmental agencies (e.g., state and federal, local or country, etc.). This is necessary in order to provide the data needed for government functions, in a real-time manner, while performing the analysis on the data to detect the solution aspects of the specific problems being addressed. The formation of virtual organizations, and the respective elements of security, is most challenging due to the high levels of security in government and the very complex requirements.

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