Chapter 114
Grid Computing:
Enabled Resource Management Models

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ABSTRACT

To calculate the potential impact of grid on the enterprise, one just needs to look back a decade or so ago. Those who remember how LANs developed in company years before the Web was born can easily get a picture of how Grid Computing in corporations may change in the years to come. In the early days of the Internet, there was a strong opposition to linking computers together in a network. Ultimately, however, the Internet has become a ubiquitous tool, and many experts predict the same outcome for Grid Computing on the enterprise. There are still concerns to consider and obstacles to be overcome, but the momentum behind corporate Grid Computing is quickly gathering pace. The integration of Grid Computing technologies into enterprise computing systems can provide a much richer range of possibilities. This integration should provide enhanced capabilities and interoperability to meet current virtual organization demands.

INTRODUCTION

This paper explains distributed computing concepts focusing on the enterprise or virtual organization and concepts such as infrastructures, shared services, business components, client state. All these concepts play a role in today's competitive IT organization. Also in this paper is a discussion of computational economy, which is an emerging field in distributed computing. Its main goal is to drive grid technologies into the mainstream business world. This section describes exciting research conducted in the fields of resource management models, computational economy, and economy-driven grid applications on the enterprise.

As industry has become involved in distributed systems, the term *grid* has become a marketing slogan - so much so that any type of distributed file - system can be called a storage grid, or a scheduler deployed in a cluster can be called a cluster grid, or if a user connects through a file - sharing application, he could be using a digital media distribution grid. Experts suggest that a grid must be evaluated for the

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applications, business value, and scientific results that it delivers, rather than for its architecture. Carl Kesselman defined the grid as a hardware and software infrastructure that provides dependable, consistent, pervasive, and inexpensive access to high-end computational capabilities (Foster & Kesselman, 2001). This definition suggests the idea of a form of on - demand access to computing, data, and services that evolved from early ideas of computer utilities. Indeed, in the 1960s, Len Kleinrock suggested the spread of computer utilities, similar to electric and telephone utilities that will service people (Foster, 2002).

Foster and colleagues suggested addressing social and policy issues with the idea of coordinated resource sharing and problem solving in dynamic, multi - institutional virtual organizations. This implies resource - sharing arrangements between providers and consumers resulting in a common purpose (Foster & Kesselman, 2001). This sharing of computers, software, data, and other resources is highly controlled by resource providers and consumers defining clearly what is shared, who is allowed, and the conditions under which sharing occurs. A logical group of resource providers and consumers is known as a virtual organization (VO) (Foster, 2002).

Foster suggests the following checklist for characteristics of a grid - enabled application:

- **Decentralized Resource Coordination:** A grid should integrate and coordinate resources and users in different domains and address issues of security, policy, payment, and membership;
- **Standards and Open Source Protocols:** These should be used for authentication, authorization, resource discovery, and resource access;
- **Quality of Service Delivery:** Resources should be used in a coordinated fashion to deliver quality of service, response times, throughput, and availability to meet complex user demands (Foster, 2002).

Today's computing platforms are inexpensive and easy to use, and they are significantly more reliable and extensible than their predecessors. Public marketplace demands and the rapid pace of technological innovation dictate that today's management teams must embrace new mechanisms of providing their organization; with expandable tools to enhance existing tactical and strategic advantages (Silva, 2006).

The needs of enterprise computing in our world today are driven by the following:

1. The need for flexible workload management systems to enhance existing computing environments;
2. Queuing and scheduling of computational workload across complex networks to optimize hardware and software utilization and minimize job turnaround times;
3. High - performance computing workload management;
4. Applications in a broad range of computing environments, such as financial services, life sciences, visual effects, animation, meteorology and others;
5. Reduction of operational expenses, improvement of operational efficiencies, increase in timeliness and accuracy of data collection and dissemination.

Strategic factors play a role as well:

1. The ability to stay closer to your customers, vendors, prospects, and partner;
2. The ability to efficiently and effectively capture operational metrics for quick accurate, and informed strategic decision making;
3. Smooth and shortened turnaround for investment.