GRID COMPUTING ROAD MAP AND AUTONOMIC COMPUTING

The Grid Computing Road Map

In previous chapters, we explored some of the major projects and organizational initiatives that contributed to the first generation and second generation of Grid Computing. The first two phases were concentrating on large-scale resource discovery, utilization, and sharing within the virtual organizational boundaries. The major drawback in these two phases was the lack of transparency among the middleware, which contributed to monolithic and non interoperable solutions for each grid environment.

This difference in the first two stages results in a vertical tower of solutions and applications for resource sharing among organizations. Today, we are in the third generation of Grid Computing where the applications and solutions are focusing on open technology-based, service-oriented, and horizontally-oriented solutions that are aligned with the other global industry efforts. The grid infrastructures are clearly transitioning from information aware to that of knowledge-centric frameworks.

In this chapter we begin to explore a detailed discussion on the third generation of technologies, and the respective grid architectures and the road map that is guiding the next generation of grid technology initiatives.

The next generations of Grid Computing technologies that are channeling this third generation of grid initiatives are noted as:

- Autonomic computing
- Business On Demand and infrastructure virtualization
- Service-oriented architecture and grid
- Semantic grids

2.2 Autonomic Computing

Autonomic Computing

The term "autonomic" comes from an analogy to the autonomic central nervous system in the human body, which adjusts to many situations automatically without any external help. With

the increasing complexity in dealing with distributed systems, solutions, and shared resources in grid environments, we require a significant amount of autonomic functions to manage the grid. Basic autonomic computing systems must follow the four basic principles:

- Self-configuring (able to adapt to the changes in the system)
- Self-optimizing (able to improve performance)
- Self-healing (able to recover from mistakes)
- Self-protecting (able to anticipate and cure intrusions)

Figure 2.2 automatic computing vision.

- Orchestrating complex connected problems on heterogeneous distributed systems is a complex job and requires a number of autonomic features for the infrastructure and resource management. Thus, it is important that our systems be as self-healing and self-configuring as possible in order to meet the requirements of resource sharing and to handle failure conditions. These autonomic enhancements to the existing grid framework at the application and middleware framework level provide a scalable and dependable grid infrastructure.

IBM, the pioneer in worldwide autonomic computing initiatives, has already implemented a number of projects around the world in this general concept, while keeping in mind the synergies to create global grid solutions. These global grid solutions are continuously being enhanced to include autonomic computing capabilities. Grid Computing and autonomic computing disciplines will continue to work closely together to develop highly reliable, efficient, self-managing grids. It is these two computing disciplines that alone serve as the basis for the IBM Corporation's global strategies underpinning Business On Demand.[2]

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