Chapter 7
Hierarchical Load Balancing Model by Optimal Resource Utilization

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ABSTRACT

Powerful computational capabilities and resource availability at a low cost is the utmost demand for high performance computing. The resources for computing can viewed as the edges of an interconnected grid. It can attain the capabilities of grid computing by balancing the load at various levels. Since the nature of resources are heterogeneous and distributed geographically, the grid computing paradigm in its original form cannot be used to meet the requirements, so it can use the capabilities of the cloud and other technologies to achieve the goal. Resource heterogeneity makes grid computing more dynamic and challenging. Therefore, in this article the problem of scalability, heterogeneity and adaptability of grid computing is discussed with a perspective of providing high computing, load balancing and availability of resources.

1. INTRODUCTION

Grid computing is web and internet-based technology where large number of computers or nodes are connected to each other with an interconnection network known by local area network and wide area network (Khan, 2017). Grid technology enables us to exploit large scale sharing of resources within distributed and (often) loosely coordinated groups called virtual organizations (which may either be several such organizations, or parts of large organizations, or simply virtual groups). Grids provide scalable, secure, and reliable technique to find the resource and optimally use of that resource remotely. To achieve the higher processing speed and storage we need an infrastructure that can handle the number of resources and use their processing speed and storage to solve the complex problem is known by grid computing environment; enables entirely new applications, which may be highly computing intensive or data intensive (both CPU-bound and data-bound applications).

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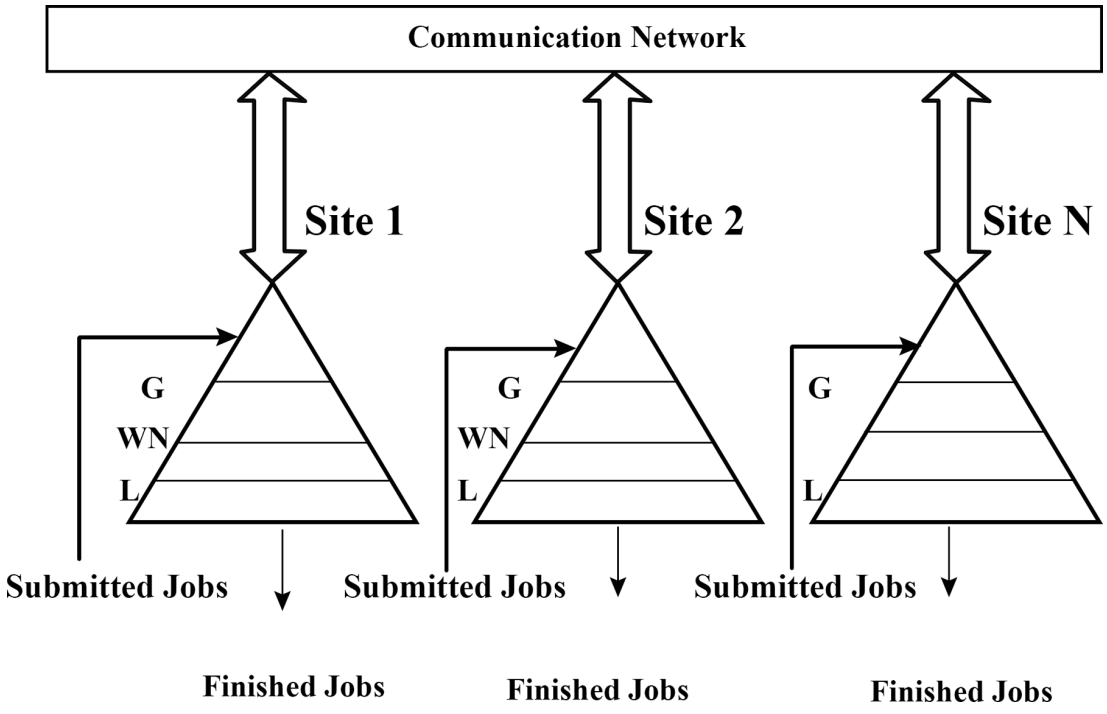
Grid computing enables to sharing of resources (Touzene, 2011) and coordinating between the nodes without any geographical limitations to solve any large problem in heterogeneous and multi administrative environment (Ian, 2001). By Grid computing method we can collect the resources and processors in a network from other nodes (computers) to solve the any specific problem that requires a huge amount of resources and processing speed. In grid computing we can effectively use the ideal systems by connecting them in a Grid Architecture so that we can maximize the utilization of resources and use the Grid structure to solve the large problems. Grid Computing is the method where we can dynamically share the resources and processor to other nodes without any geographical limitations, systems can be anywhere in the globe. Systems are having heterogeneous in nature (System may have different architectures and different scheduling policies, etc.); some are autonomous.

The main idea by grid computing comes into picture because of sharing of computing power. The same thing is not possible to have on our personnel computer even the personnel computer having much speed and much storage. A huge number of applications like scientific applications, biomedical application, etc. need much amount of power that cannot be possible by personnel computer.

The two solutions for such problems are either use the high configuration computer that is very costly or use of many computers in a grid fashion to solve the large problem.

A grid computing environment defined by a collection of locations L connected by a communicating network shown in Figure 1. Set *L* contains *n* different locations, by $l_1, \ldots, l_n$. Grid system is layered and having four different levels from root to leaves. The root denotes the Grid level, then Group, location and finally at leaves working nodes. Each level element having its own processing capabilities; that is managed by the grid application software.

Figure 1. Communicating network



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