Chapter XXIX

Grid Computing Initiatives in India

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ABSTRACT

Efforts in Grid Computing, both in academia and industry, continue to grow rapidly worldwide for research, scientific and commercial purposes. Building a commanding position in grid computing is crucial for India. The major Indian National Grid Computing initiative is GARUDA. Other major efforts include the BIOGRID and VISHWA. Several Indian IT companies too are investing a lot into the research and development of grid computing technology. Though grid computing is presently at a fairly nascent stage, it is seen as a cutting edge technology. This paper presents the state-of-the-art of grid computing technology and the India’s efforts in developing this emerging technology.

INTRODUCTION

The term ‘Grid’ brings to mind an interconnected system of an electricity distribution network of power stations and high tension cables. The grid computing paradigm is similar to the electrical power grid because of similar properties like transparency, availability, pervasiveness and utility. Grid computing aims to extend this analogy by transparently integrating distributed computing resources, which may belong to different organizations, hiding their specificities and presenting a homogeneous interface to the users. Just as one may plug in a cell-phone charger into the wall socket and have no idea from where the electricity comes from, one may submit a job to a ‘computational grid’ without having any idea from where the computing power and resources are coming from. Grid computing is an approach to distributed computing that spans not only locations but also organizations, machine architectures and software boundaries to provide unlimited
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power, collaboration and information access to everyone connected to a grid (Foster, 2003). Just as an Internet user views a unified instance of content via the Web, a grid user essentially sees a single, large virtual computer (IBM, n.d.).

Though grid computing is presently at a fairly nascent stage, it is seen as a cutting edge technology. This paper aims to present the state-of-the-art of grid computing and attempts to survey India’s efforts in developing this emerging technology. The major initiatives of Brazil, Russia and China are also included in order to provide a report on the grid computing efforts of the BRIC countries.

BACKGROUND

The term ‘Grid Computing’ is relatively new and means a lot of different things to a lot of different people (Jennifer, 2003). The grid concepts and technologies were first expressed by Foster and Kesselman in 1998. Built on the pervasive Internet standards, grid computing enables research-oriented organizations to solve problems that were infeasible to solve due to computing and data-integration constraints. Grids also reduce costs through automation and improved IT resource utilization. Grids help optimize the infrastructure to balance workloads and provide extra capacity for high-demand applications (Chawla, 2007).

Grid computing can increase an organization’s agility, enabling more efficient business processes and greater responsiveness to changing business and market demands.

Grid computing uses the resources of several computers connected by a network (usually the internet) to solve large-scale computation problems. These computers need not be the powerful supercomputers or mainframes. They could be the personal computers, running different operating systems on many hardware platforms. A study showed that more than 90% of the computer power remained free most of the time in case of normal desktops (Chopra, 2007). This idle time on several thousands of computers throughout the world is used through the scheme of CPU scavenging to handle applications that would otherwise require the power of expensive supercomputers. In the SETI@home project and others like it, volunteers around the world allow their computers to be used for scientific research which shows that some people are willing to share for no direct benefit to themselves (Anderson, 2002; SETI@Home, n.d.). People on the internet can be motivated to contribute their idle resources (Abramson, 2000). The wide variety of resources distributed geographically, are used as a single unified resource which is known as the ‘computational grid’ (Baker, 2000).

Efforts in Grid Computing, both in academia and industry, continue to grow rapidly worldwide. Various grid projects are being developed for research, scientific and commercial purposes. These include large scale science and engineering projects such as Grid Physics Network (GridPhyn), NASA Information Power Grid (NASA IPG), CERN Data Grid, EU Data Grid, TeraGrid and the Earth System Grid, to name a few. India too has climbed the bandwagon. Leading researchers in the field of Grid Computing have identified the various grid projects worldwide, particularly those of India (Buyya, 2005).

MAIN FOCUS

Building a commanding position in Grid computing is crucial for India. By allowing anyone, anywhere, anytime to easily access supercomputer level processing power and knowledge resources, grids will underpin progress in Indian science, engineering and business. The challenge facing India today is to turn technologies developed for researchers into industrial strength business tools. The major Indian National Grid Computing initiative is Garuda. Other efforts include the BIOGRID and VISHWA.
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