Utility-Oriented Grid Computing and the Gridbus Middleware

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Abstract

Grid computing, one of the latest buzzwords in the ICT industry, is emerging as a new paradigm for Internet-based parallel and distributing computing. It enables the sharing, selection, and aggregation of geographically distributed autonomous resources, such as computers (PCs, servers, clusters, supercomputers), databases, and scientific instruments, for solving large-scale problems in science, engineering, and commerce. It leverages existing IT infrastructure to optimize compute resources and manage data and computing workloads. The developers of Grids and Grid applications need to address numerous challenges: security, heterogeneity, dynamicity, scalability, reliability, service creation and pricing, resource discovery, resource management, application decomposition and service composition, and qualify of services. A number of projects around the world are developing technologies that help address one or more of these challenges. To address some of these challenges, the Gridbus Project at the University of Melbourne has developed grid middleware technologies that (1) enable the creation of Utility Grids, which provide economic incentive for Grid service providers for sharing resources; and (2) support rapid development and optimal deployment of eScience and eBusiness applications on enterprise and global Grids. The components of Gridbus middleware are: Grid application development environment for rapid creation of distributed applications, Grid service broker and application scheduler, Grid workflow management engine, SLA (service-level agreements) based Scheduler for clusters, Web-services based Grid market directory (GMD), Grid accounting services, Gridscape for creation of dynamic and interactive resource monitoring portals, Portlets for creation of Grid portals that support web-based management of Grid applications execution, and GridSim toolkit for performance evaluation. In addition, Gridbus also includes a widely used .NET-based enterprise Grid technology and Grid web services framework to support the integration of both Windows and Unix-class resources for Grid computing.

The Tutorial covers the following topics

1. Fundamental principles of grid computing and emerging technologies that help in creation of Grid infrastructure and applications.
2. A Review of major international efforts in developing Grid software systems and applications both in academic, research and commercial settings.
3. Service-Oriented Grid Architecture for realising utility computing environment that supports resource sharing in research and commercial environments. Realization of this architecture by leveraging standard computing technologies (such as Web Services) and building new services that are essential for constructing industrial-strength Grid engines.
4. Gridbus middleware and technologies for creating enterprise and global utility Grids.
5. Issues in setting up Grids that can scale from enterprise to global and deploying applications on them.
8. Sociological and industrial implications of this new Internet-based distributed computing paradigm and its impact on the marketplace.
About the Speaker

Dr. Rajkumar Buyya is an Associate Professor and Reader of Computer Science and Software Engineering; and Director of the Grid Computing and Distributed Systems (GRIDS) Laboratory at the University of Melbourne, Australia. He received B.E and M.E in Computer Science and Engineering from Mysore and Bangalore Universities in 1992 and 1995 respectively; and Doctor of Philosophy (PhD) in Computer Science and Software Engineering from Monash University, Melbourne, Australia in 2002. He was awarded Dharma Ratnakara Memorial Trust Gold Medal in 1992 for his academic excellence at the University of Mysore, India. He received Richard Merwin Award from the IEEE Computer Society (USA) for excellence in academic achievement and professional efforts in 1999. He received Leadership and Service Excellence Awards from the IEEE/ACM International Conference on High Performance Computing in 2000 and 2003. He received "Research Excellence Award" from the University of Melbourne for productive and quality research in computer science and software engineering in 2005. The CiteSeer Research Index in August 2006 ranked Dr. Buyya's research work among the top 0.73% most cited authors in Computer Science (and 0.28% in the list with article citation counts normalized by publication year) out of 790,329 authors in the database.