Keynote Speeches

Market-Oriented Cloud Computing: Vision, Hype, and Reality of Delivering Computing as the 5th Utility

Rajkumar Buyya

The University of Melbourne and Manjrasoft, Melbourne, Australia

Abstract

Computing is being transformed to a model consisting of services that are commoditised and delivered in a manner similar to utilities such as water, electricity, gas, and telephony. In such a model, users access services based on their requirements without regard to where the services are hosted. Several computing paradigms have promised to deliver this utility computing vision and they include Grid computing, P2P computing, and more recently Cloud computing. The latter term denotes the infrastructure as a "Cloud" in which businesses and users are able to access applications from anywhere in the world on demand. Cloud computing delivers infrastructure, platform, and software (application) as services, which are made available as subscription-based services in a pay-as-you-go model to consumers. These services in industry are respectively referred to as Infrastructure as a Service (Iaas), Platform as a Service (PaaS), and Software as a Service (SaaS). To realize Cloud computing, vendors such as Amazon, HP, IBM, and Sun are starting to create and deploy Clouds in various locations around the world. In addition, companies with global operations require faster response time, and thus save time by distributing workload requests to multiple Clouds in various locations at the same time. This creates the need for establishing a computing atmosphere for dynamically interconnecting and provisioning Clouds from multiple domains within and across enterprises. There are many challenges involved in creating such Clouds and Cloud interconnections.

This keynote talk (1) presents the 21st century vision of computing and identifies various IT paradigms promising to deliver the vision of computing utilities; (2) defines the architecture for creating market-oriented Clouds and computing atmosphere by leveraging technologies such as VMs; (3) provides thoughts on market-based resource management strategies that encompass both customer-driven service management and computational risk management to sustain SLA-oriented resource allocation; (4) presents the work carried out as part of our recent initiative in Cloud Computing, called as Megha: (i) Aneka, a software system for providing PaaS within private or public Clouds and supporting market-oriented resource management, (ii) internetworking of Clouds for dynamic creation of federated computing environments for scaling of elastic applications, (iii) creation of 3rd party Cloud brokering services for content delivery network and e-Science applications and their deployment on capabilities of IaaS providers such as Amazon and Nirvanix along with Grid mashups, and (iv) CloudSim supporting modelling and simulation of Clouds for performance studies; and (5) concludes with the need for

convergence of competing IT paradigms for delivering our 21st century vision along with pathways for future research.

Dr. Rajkumar Buyya is an Associate Professor of Computer Science and Software Engineering; and Director of the Grid Computing and Distributed Systems Laboratory at the University of Melbourne, Australia. He is also serving as the founding CEO of Manjrasoft Pty Ltd., a spin-off company of the University, commercialising innovations originating from the GRIDS Lab. He has authored over 280 publications and three books. The books on emerging topics that Dr. Buyya edited include, High Performance Cluster Computing (Prentice Hall, USA, 1999), Content Delivery Networks (Springer, 2008) and Market-Oriented Grid and Utility Computing (Wiley, 2009). Dr. Buyya has contributed to the creation of high-performance computing and communication system software for Indian PARAM supercomputers. He has pioneered Economic Paradigm for Service-Oriented Distributed Computing and developed key Grid and Cloud Computing technologies such as Gridbus and Aneka that power the emerging e-Science and e-Business applications. In this area, he has published hundreds of high quality and high impact research papers that are well referenced. *The Journal of Information and Software Technology* in Jan 2007 issue, based on an analysis of ISI citations, ranked Dr. Buyya's work (published in *Software*: *Practice and Experience Journal* in 2002) as one among the "Top 20 cited Software Engineering Articles in 1986-2005". He received the Chris Wallace Award for Outstanding Research Contribution 2008 from the Computing Research and Education Association of Australasia. He is the recipient of 2009 IEEE Medal for Excellence in Scalable Computing.

Evolvement from physical grid to virtual grid

Lian Li

College of Computer and information engineering

Hefei University of Technology, China

Abstract

Grid is rapidly grown as a common computing platform within lasted twenty years, which integrals various discrete resources into a uniform system to be shared by numerical users, not only the utilizers but also developers, without perception of allochthonous and heterogeneity. Up to date, the grid is evolving from physics grid to virtual grid, i.e. from a grid programming oriented the resources to a grid programming oriented services. It results the application of grid more fields and scopes. The virtual technique has promoted greatly the emerging of many standards on grid, and catalyzes a new programming for grid application, which is called orchestration of services, The virtual grid change the fashion and concept of using computers. In this report, we discuss some theoretical points of virtual technique, the current situation of grid standards, and the problems in grid system developing.

Prof. Li Lian is faculty in school of information science and engineering, Lanzhou University, Director of Open-source software and real-time system engineering researching centre of Education Ministry (OSSRT), and computer mathematic and web computing Laboratory at Lanzhou University, China. He has authored over 60 publications. The recent researching include, virtualization technique, grid computing, pervasive computing, network algorithms, algorithms of mathematic problem, mathematical theory on computer science. Prof. Li Lian has developing an e-science system on chemistry application supported by National Natural Science Foundation of China (NNSF). He is associate director of theoretical computer science branch, China Association of Computer Science, and director of steering committee for computer curricula on science and technique, Education Ministry of China.

Virtualization Technology for Computing System

Hai Jin

School of Computer Science and Technology
Huazhong University of Science and Technology, China

Abstract

Virtualization technology (VT) being a re-emerging technology has become a hot topic in recent years. It is a decoupling technique that separates system software from hardware platform while making applications run pervasively. Many academic institutes and research labs from industries have devoted great research efforts in various aspects. In 2007, Chinese Ministry of Science and Technology initialized a basic research project (973 project) with 6 universities and 2 research institutes on virtualization technology for computing system in many topics, such as architecture design philosophy of virtualization technology, VT design for single computing system, VT design for multiple computing systems, user environment for VT, security, reliability and trust issue related to VT, and performance evaluation and benchmarks for computing system with VT. In this talk, we will give insight for this project in details, including its motivation, goal, and research issue etc. Some preliminary research results with this project will also be illustrated.

Dr. Hai Jin is a professor of computer science and engineering at the Huazhong University of Science and Technology (HUST) in China. He is now Dean of the School of Computer Science and Technology at HUST. Jin received his PhD in computer engineering from HUST in 1994. In 1996, he was awarded a German Academic Exchange Service fellowship to visit the Technical University of Chemnitz in Germany. Jin worked at The University of Hong Kong between 1998 and 2000, and as a visiting scholar at the University of Southern California between 1999 and 2000. He was awarded Excellent Youth Award from the National Science Foundation of China in 2001. Jin is the chief scientist of ChinaGrid, the largest grid computing project in China.

Jin is a senior member of the IEEE and a member of the ACM. Jin is the member of Grid Forum Steering Group (GFSG). He has co-authored 15 books and published over 400 research papers. His research interests include computer architecture, virtualization technology, cluster computing and grid computing, peer-to-peer computing, network storage, and network security.

Jin is the steering committee chair of International Conference on Grid and Pervasive Computing (GPC), Asia-Pacific Services Computing Conference (APSCC). Jin is a member of the steering committee of the IEEE/ACM International Symposium on Cluster Computing and the Grid (CCGrid), the IFIP International Conference on Network and Parallel Computing (NPC), and the International Conference on Grid and Cooperative Computing (GCC), International Conference on Autonomic and Trusted Computing (ATC), International Conference on Ubiquitous Intelligence and Computing (UIC).