ADCOM 2009 Tutorial (Half Day):
Cloud Computing – The Next Revolution in Information Technology

Prof. Dr. Rajkumar Buyya, and Dr. Srikumar Venugopal

Overview and Scope: 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 tutorial (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 new Cloud Computing initiative, called Cloudbus: (i) Manjrasoft's 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.

About the Speakers:

Dr. Rajkumar Buyya is Director of the Cloud Computing and Distributed Systems (CLOUDS) 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 its innovations in Grid and Cloud Computing. 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 wellreferenced. 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. He has recently received promotion to full Professorship at the University of Melbourne. visit his Cyberhome: http://www.buyya.com

Dr. Srikumar Venugopal is a Lecturer at the School of Computer Science and Engineering, University of New South Wales in Sydney, Australia. He received a Ph.D. degree from the University of Melbourne in 2006 on the topic of scheduling distributed data-intensive applications on grid resources. He has published 40 papers including in journals such as ACM Computing Surveys, Journal of Parallel and Distributed Computing, and Proceedings of IEEE. His research interests include resource anagement for grid and cloud infrastructures, and distributed data-intensive applications.