Development of Adaptive Service-based Software

Stephen S. Yau
Professor of Computer Science and Engineering
Director, Information Assurance Center
Arizona State University

Abstract

Adopting service-oriented architecture in large-scale distributed applications, such as e-business, healthcare, transportation, scientific computing, and homeland security, requires adaptive service-based software (ASBS), which has the capability of monitoring the changing system status, analyzing and controlling tradeoffs among multiple QoS features, and adapting its service configuration to satisfy multiple QoS requirements simultaneously. Development of ASBS with multiple QoS monitoring and adaptation capabilities in dynamic environments expeditiously and cost-effectively requires major improvements on software technology.

We will first discuss the challenges for the development of ASBS with satisfactory QoS in dynamic environments and related ongoing research, such as autonomic computing and situation awareness. Then, an overview of our research on the development of ASBS will be presented. Major research issues and possible approaches to dealing with them, such as declarative specification of situation awareness and security requirements, automated agent synthesis for situation-aware workflows, and establishing performance models for ASBS to support the development of QoS monitoring and adaptation capabilities, will be discussed.

About the Speaker

Stephen S. Yau is currently a professor of computer science and engineering and the director of Information Assurance Center at Arizona State University (ASU), Tempe. He served as the chair of the Department of Computer Science and Engineering at ASU in 1994-2001. Previously, he was on the faculties of Northwestern University, Evanston, Illinois, and University of Florida, Gainesville.

He served as the president of the Computer Society of the Institute of Electrical and Electronics Engineers (IEEE) and on the IEEE Board of Directors and the Board of Directors of Computing Research Association. He also served as the editor-in-chief of IEEE COMPUTER magazine, and organized many national and international major conferences, including the World Computer Congress sponsored by International Federation for Information Processing (IFIP) in 1989. He founded and organized the Annual International Computer Software and Applications Conference (COMPSAC) sponsored by the IEEE Computer Society, in 1977.
Panel Theme

This panel addresses bringing the power of Service-Oriented Architecture (SOA) and Cloud Computing together to deliver business and practical value to emerging software applications, hardware, and business process provisioning services over the Internet. The leading companies in the industry are moving applications and data to the Internet. Typically, there are three types of resources that can be provisioned and consumed over the Internet and shared among users, thereby leveraging economies of scale:

- Computing resource, including computing power, storage, and machine provisioning
- Software applications, delivered as software as a service and mashups of value-added applications
- Business processes that support outsourcing, composition, and provisioning

There are opportunities to explore a converging software and services architecture for enterprise users and consumer users. There are also challenges in developing a unified application development environment for Cloud Computing as well as creating a scalable, reusable, and configurable provisioning platform for Cloud Computing.

The key focus of this panel is to discuss and debate

- What is Cloud Computing, and can we leverage Grid Computing to enable it?
- How do we leverage SOA to build scalable Cloud Computing infrastructures?
- Which applications are best delivered in a Cloud Computing environment?
- How do we merge the power of SOA and Cloud Computing together
- What are appropriate strategies and execution practices to create a Services Computing Curriculum to get more skilled people ready for Business Cloud?

About the Speaker

Moderator

Liang-Jie Zhang (LJ) is a Research Staff Member and Program Manager of Application Architectures and Realization at IBM T.J. Watson Research Center. Dr. Zhang is the founding chair of IBM Research's Services Computing Professional Interest Community and has been leading an IBM Service-Oriented Architecture (SOA) tooling and architecture research projects since 2001. He has been co-leading IBM's SOA Solution Stack (aka SOA Reference Architecture: Solution View) project since 2004. His new book Services Computing has been published by Springer. He has received 2 IBM Outstanding Technical Achievement Awards, 9 IBM Creative Contribution Awards, an Outstanding Achievement Award by the World Academy of Sciences, and an Innovation Leadership Award from Chinese Institute of Electronics. Dr. Zhang has 36 granted patents and 20 pending patent applications. As the lead inventor, he holds federated Web services discovery and dynamic services composition patents. He is the chair of IEEE Computer Society Technical Committee on Services Computing. He has been appointed as the founding Editor-in-Chief of IEEE Transactions on Services Computing.
Panelists

Carl K. Chang was 2004 IEEE Computer Society President. Upon completing his presidency for the Computer Society, he was appointed to be the 2005 Chair of the IEEE Meetings and Services Committee reporting to the IEEE Board of Directors. Previously he served as the Editor-in-Chief for IEEE Software (1991-94). Chang is Professor and Chair of the Department of Computer Science at Iowa State University. He received a PhD in computer science from Northwestern University. Currently, he is the Editor-in-Chief of IEEE Computer (2007-2010).

Ephraim Feig is a Senior Director at Motorola. Prior to his joining Motorola, he was Chief Technology Officer and Chief Marketing Officer of Kintera, Inc. from 2000 until 2006 and a researcher and R&D manager at IBM from 1980 until 2000. He was elected IEEE Fellow for contributions to signal processing, holds 27 US patents, and has published more than 100 technical articles. Dr. Feig has served as an adjunct professor at several universities, including Columbia University, The City College of New York and New York Polytechnic Institute. He is a founding member of the IEEE Computer Society Technical Committee on Services Computing and this year's Program Chair of IEEE SCC. He serves on advisory boards at CUNY, UCSD and USD, and is on the board of directors of the San Diego Symphony Orchestra.

Robert Grossman is the Director of the Laboratory for Advanced Computing and the National Center for Data Mining at the University of Illinois at Chicago, where he has been a faculty member since 1988. He is also the Managing Partner of Open Data Group, which provides consulting and outsourced services focused on data. He has published over 140 papers in refereed journals and proceedings on data mining, distributed computing, high performance computing, high performance networking, business intelligence, and related areas, and lectured extensively at conferences and workshops. He is the Chair of the Open Cloud Computing Consortium. He is also the Chair of the Data Mining Group (DMG), an industry consortium responsible for the Predictive Model Markup Language (PMML), an XML language for data mining and predictive modeling.
Abstract

Cloud computing is viewed as a game-changing paradigm for enterprise and internet environments and has created palatable excitement among industry and academic leaders. It offers great opportunities for innovative web-delivered services beyond the traditional computing and internet models and is at the intersection of major new trends such as large scale mega datacenters, new programming models, social and collaborative networking, and innovative IT service delivery paradigms. In this talk, we will describe key cloud computing trends and innovation opportunities that it promises to create in traditional IT environments and the potential it offers to fuel the explosive growth in social networking, mobile internet, and open collaboration platforms.

About the Speaker

Mahmoud Naghshineh is director of services delivery research at IBM Thomas J Watson Research Center with worldwide responsibility for technologies, processes and tools for next generation IT systems service automation, deployment and management.

From 2004 to 2005, Mahmoud was a partner at IBM Business Consulting Services, responsible for managing the federal industry alliances account. Prior to that, he was the director of emerging markets at IBM Systems and Technology Group's CTO office. From 1990 to 2002, he worked at IBM Research in areas of software and services related to Web-based infrastructure, mobile and wireless Internet, embedded software, secure computing platforms, telecommunications services, and quality-of-service provisioning. He joined IBM Systems Group in 1988. He has made several major contributions to IBM products and services in areas of systems, middleware and infrastructure services.

In 2002, Mahmoud was elected as a Fellow of the IEEE and has been active in creating new industry standards in both IETF and IEEE. He has served as the editor-in-chief of IEEE Wireless Communications Magazine, program co-chair of MobiCom 2001, and chairperson for many IEEE/ACM, NSF and government research conferences and workshops. He was an adjunct professor at the department of electrical engineering, Columbia University from 1997 to 2001. He has published over 100 technical papers and holds a number of IBM outstanding recognition awards and patents. He received his doctoral degree form Columbia University, New York.