

## Tutorials for AICCSA 2006

<b>Friday March 10, 2006</b>				
<b>Time/Room</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
8:00 am – 9:30 am	<p style="text-align: center;"><b>Tutorial-1</b></p> <p>Pascal Lorenz</p> <p>IP-Oriented QoS in the Next Generation Networks: Application to Wireless Networks</p>	<p style="text-align: center;"><b>Tutorial-3</b></p> <p>Aris M. Ouksel</p> <p>Sensor Networks: Applications, Architectures, and Communication Protocols</p>	<p style="text-align: center;"><b>Tutorial-5</b></p> <p>Sajal Das</p> <p>Smart Environments – Technology, Protocols and Applications</p>	<p style="text-align: center;"><b>Tutorial-7</b></p> <p>Mohamed E. Fayad</p> <p>Architectures on Demand for Any Domain Using Stable Software Patterns</p>
9:30 am – 10:00 am	<b>Coffee Break</b>			
10:00 am – 11:30 am	<b>Tutorial-1 (Cont.)</b>	<b>Tutorial-3 (Cont.)</b>	<b>Tutorial-5 (Cont.)</b>	<b>Tutorial-7 (Cont.)</b>
<b>11:30 pm – 1:30 pm</b>	<b>Lunch</b>			
1:30 pm – 3:00 pm	<p style="text-align: center;"><b>Tutorial-2</b></p> <p>Mohamed Eltoweissy</p> <p>Sensor and Actor Networks: Perspectives, Challenges and Research Directions</p>	<p style="text-align: center;"><b>Tutorial-4</b></p> <p>Rainer Leupers</p> <p>Design of Application Specific Processor Architectures</p>	<p style="text-align: center;"><b>Tutorial-6</b></p> <p>Hassan Gomaa</p> <p>Designing Software Product Lines with UML 2.0: From Use Cases to Pattern-Based Software Architectures</p>	<p style="text-align: center;"><b>Tutorial-7 (Cont.)</b></p> <p>Mohamed E. Fayad</p> <p>Architectures on Demand for Any Domain Using Stable Software Patterns</p>
3:00 pm – 3:30 pm	<b>Coffee Break</b>			
3:30 pm – 5:00 pm	<b>Tutorial-2 (Cont.)</b>	<b>Tutorial-4 (Cont.)</b>	<b>Tutorial-6 (Cont.)</b>	<b>Tutorial-7 (Cont.)</b>

## **T1: IP-Oriented QoS in the Next Generation Networks: Application to Wireless Networks**

**Instructor:** Pascal Lorenz, University of Haute Alsace, France.

### **Abstract**

Emerging Internet Quality of Service (QoS) mechanisms are expected to enable wide spread use of real time services such as VoIP and videoconferencing. The "best effort" Internet delivery cannot be used for the new multimedia applications. New technologies and new standards are necessary to offer Quality of Service (QoS) for these multimedia applications. Therefore new communication architectures integrate mechanisms allowing guaranteed QoS services as well as high rate communications. The service level agreement with a mobile Internet user is hard to satisfy, since there may not be enough resources available in some parts of the network the mobile user is moving into. The emerging Internet QoS architectures, differentiated services and integrated services, do not consider user mobility. QoS mechanisms enforce a differentiated sharing of bandwidth among services and users. Thus, there must be mechanisms available to identify traffic flows with different QoS parameters, and to make it possible to charge the users based on requested quality. The integration of fixed and mobile wireless access into IP networks presents a cost effective and efficient way to provide seamless end-to-end connectivity and ubiquitous access in a market where the demand for mobile Internet services has grown rapidly and predicted to generate billions of dollars in revenue. This tutorial covers to the issues of QoS provisioning in heterogeneous networks and Internet access over future wireless networks as well as ATM, MPLS, DiffServ, IntServ frameworks. It discusses the characteristics of the Internet, mobility and QoS provisioning in wireless and mobile IP networks. This tutorial also covers routing, security, baseline architecture of the inter-networking protocols and end to end traffic management issues.

### **Biography**

**Pascal Lorenz** (lorenz@ieee.org) received a PhD degree from the University of Nancy, France. Between 1990 and 1995 he was a research engineer at WorldFIP Europe and at Alcatel-Alsthom. He is a professor at the University of Haute-Alsace and responsible of the Network and Telecommunication Research Group. His research interests include QoS, wireless networks and high-speed networks. He was the Program and Organizing Chair of the IEEE [ICATM'98](#), [ICATM'99](#), [ECUMN'00](#), [ICN'01](#), [ECUMN'02](#) and [ICT'03](#), [ICN'04](#) conferences and co-program chair of [ICC'04](#). Since 2000, he is a Technical Editor of the IEEE Communications Magazine Editorial Board. He is the secretary of the IEEE ComSoc Communications Systems Integration and Modelling Technical Committee. He is senior member of the IEEE, member of many international program committees and he has served as a guest editor for a number of journals including Telecommunications Systems, IEEE Communications Magazine and LNCS. He has organized and chaired several technical sessions and gave tutorials at major international conferences. He is the author of 3 books and 135 international publications in journals and conferences.

## **T2: Sensor and Actor Networks: Perspectives, Challenges and Research Directions**

**Instructor:** Mohamed Eltoweissy, Virginia Tech, USA

### **Abstract**

Sensor and Actor NETWORKS (SANETs) are emerging as a vital technology for a wide variety of next generation pervasive applications ranging from healthcare to homeland security and emergency response. SANETs are heterogeneous networks having widely differing sensor and actor node characteristics; while sensor nodes are small, inexpensive devices with limited computation, communication and energy resources, actor nodes are resource-rich. Also, the number of sensor nodes deployed may be in the order of hundreds or thousands. In contrast, actor nodes are smaller in number due to the different coverage requirements and physical interaction methods of actuation. Typically, a deployed SANET is expected to operate autonomously in unattended environments. Operational requirements of SANETs may vary according to a network's mission defined over a multi-dimensional context, such as field of deployment (e.g., hostile versus friendly), type of application (e.g., monitoring, tracking, intrusion detection and mitigation), mode of operation (e.g., normal, exception, post-event recovery), and time. In SANETs, depending on the application, there may be a need to rapidly respond to sensor input. Moreover, so as to provide right actions, sensor data must still be valid at the time of acting. The objective of this tutorial is to provide an understanding of SANETs and to identify and motivate key research areas. Also to be discussed are some fundamental research contributions that may enable SANETs to realize their potential. The tutorial will be divided into three modules: (1) background (including applications) of SANETs; (2) challenges and research map; and (3) open discussion. Also, an extensive list of recommended readings will be provided.

### **Biography**

**Mohamed Eltoweissy** is an associate professor in The Bradley Department of Electrical and Computer Engineering at Virginia Tech. He also holds a courtesy appointment in the Department of Computer Science. Eltoweissy is founder and director of the Center for Cyber Assurance and Trust (CyCare). Eltoweissy has over 85 publications in archival journals and respected books and conference proceedings. Among Eltoweissy's research contributions are novel combinatorial-based survivable key management schemes for sensor and ad hoc networks, service-oriented architecture for sensor networks, and stochastic models for the optimization of security protocols. Eltoweissy is the guest editor of the Special Issue of Elsevier's Journal of Computer Communications on Sensor-Actuator Networks (SANETs). He also is active in serving on program committees and NSF panels, in journal editorials and organization of professional meetings. Eltoweissy is a senior member of IEEE, and a member of ACM, ACM SIGBED, and ACM SIGSAC. In 2003, Eltoweissy was nominated for the Virginia SCHEV outstanding faculty awards; the highest honor for faculty in Virginia.

### **T3: Sensor Networks: Applications, Architectures, and Communication Protocols**

**Instructor:** Aris M. Ouksel, The University of Illinois-Chicago, USA

#### **Abstract**

This half-day tutorial is intended for researchers, students and engineers to gain an overall understanding of the current challenging issues in wireless sensor networks. The miniaturization of computing devices and advances in wireless communication and sensor technology have been pushing computing from the stationary desktop to the mobile outdoor. It is now possible to build radios and exceptionally small devices that can be deployed in a network of nodes to sense fields and forces in the physical world providing dense monitoring of physical phenomena, processing and communicating collected information, and coordinating with other nodes. Combining these capabilities with the Internet will advance many sophisticated scientific and technological pursuits while supporting improvements in various areas of application, such as manufacturing, agriculture, construction, and transportation, and organizational workflows in general.

#### **Biography**

Aris M. Ouksel is currently a professor at the University of Illinois at Chicago. He holds positions at both the Information and Decision Sciences Department and the Computer Science Department. He obtained his PhD and MS degrees from Northwestern University. His current research interests are in Mobile Ad-hoc and Sensor Networks, Emergent Semantics in Heterogeneous Information Systems, Self-Organizing Data Structures in Peer-to-Peer Architectures, and Information Economics. He has received grants from the National Science Foundation, various state and city agencies, as well as several major corporations. He is currently of following journals: International Journal of E-Business Research, Idea Group (2003---), Journal of Parallel and Distributed Syst., Kluwer Inc. (2000----). He was editor of the Journal of Knowledge and Info. Syst., Springer-Verlag. (1998-2003).

### **T4: Design of Application Specific Processor Architectures**

**Instructor:** Rainer Leupers, RWTH Aachen University, Germany.

#### **Abstract**

Application-specific instruction set processors (ASIPs) are a key implementation technology in today's embedded SoC designs. By means of a dedicated architecture and instruction set, optimized for a given application domain, they offer the necessary compromise between energy-efficiency and flexibility. Further benefits of ASIPs include better product differentiation, reduced royalty fees, and support for IP reuse in platform-based system-on-chip (SoC) designs. Consequently, ASIPs have already become an industrial reality in many important areas like DSP, multimedia, and networking. In

telecommunications, network processors (NPUs) have become a new architecture paradigm, since e.g. encryption as in IPv6/IPsec has very specific processing requirements. In high data rate wireless communication applications, like for instance 3G cell phones, specific parts of the digital signal processing cannot be implemented energy-efficiently on a standard processor. On the other hand, hardwired solutions (ASICs) are not flexible enough. Here, ASIPs are the optimal solution. So far, the large amount of man-power required for ASIP architecture and software tool design as well as SoC integration has been a major obstacle. However, recent developments in EDA technology now permit a highly automated ASIP design methodology, which enables efficient ASIP-based design with limited manpower and overcomes traditional HW/SW integration bottlenecks. Simultaneously, new generations of configurable processors, employing a user-extensible base architecture, are continuously appearing on the IP market. The purpose of this tutorial is to provide the audience with an introduction to this important area and to outline the state of the art in ASIP architectures, design methodology, and tools.

### **Biography**

**Rainer Leupers** received the Diploma and Ph.D. degrees in Computer Science with honors from the University of Dortmund, Germany, in 1992 and 1997. From 1997-2001 he was the chief engineer at the Embedded Systems group at the University of Dortmund. During 1999-2001 he was also a project manager at ICD, where he headed industrial compiler and processor simulator tool projects. In 2002, Dr. Leupers joined RWTH Aachen University as a professor for Software for Systems on Silicon. His research and teaching activities revolve around software development tools, processor architectures, and electronic design automation for embedded systems, with emphasis on compilers for application specific processors. He authored several books and more than 100 technical papers on design tools for embedded processors, and he served in the program committees of leading EDA and compiler conferences, including DAC, DATE, and ICCAD. Dr. Leupers received several scientific awards, including Best Paper Awards at DATE 2000 and DAC 2002. He has been a co-founder of LISATek, an EDA tool provider for embedded processor design (acquired by CoWare Inc. in 2003).

## **T5: Smart Environments – Technology, Protocols and Applications**

**Instructor:** Sajal Das, The University of Texas-Arlington, USA.

### **Abstract**

This tutorial is about smart environments. Smart environments link computers to everyday settings and commonplace tasks. The desire to create smart environments has existed for decades, and recent advances in such areas as mobile and pervasive computing, wireless and sensor networks, machine learning, middleware and agent based technologies now allow this dream to become reality. A definition of “smart” or “intelligent” is “the ability to acquire and apply knowledge”, while “environment” refers to our surroundings. We therefore define a smart environment as *one that is able to*

*acquire and apply knowledge about an environment and its inhabitants in order to improve their experience in that environment.* The type of experience that individuals wish from their environment varies with the individual and the type of environment. They may wish the environment to ensure the safety of its inhabitants, they may want to reduce the cost or overhead of maintaining the environment, or they may want to automate tasks that are typically performed in the environment. The expectations of such environments have evolved with the history of the field. The objective of this interdisciplinary tutorial is to provide a practical foundation for designing smart environments, introduce the necessary technologies and supporting algorithms and protocols to build smart environments, as well as describe successful smart environment projects realized in a variety of settings.

### **Biography**

**Sajal K. Das** received B.S. degree in 1983 from Calcutta University, M.S. degree in 1984 from Indian Institute of Science at Bangalore, and Ph.D. degree in 1988 from the University of Central Florida at Orlando, all in Computer Science. He is a Professor of Computer Science and Engineering and also the Founding Director of the Center for Research in Wireless Mobility and Networking (CRWMaN) at the University of Texas at Arlington (UTA). Prior to 1999, he was a professor of Computer Science at the University of North Texas (UNT), Denton where he founded the Center for Research in Wireless Computing (CRW) in 1997, and also served as the Director of the Center for Research in Parallel and Distributed Computing (CRPDC) during 1995-97. Dr. Das is a recipient of the UNT Student Association's Honor Professor Award in 1991 and 1997 for best teaching and scholarly research; UNT's Developing Scholars Award in 1996 for outstanding research; UTA's Outstanding Faculty Research Award in Computer Science in 2001 and 2003; UTA's College of Engineering Research Excellence Award in 2003; and the University Award for Distinguished Record of Research in 2005. Dr. Das has visited numerous universities, government and industry research labs worldwide for collaborative research and invited seminar talks. He is also frequently invited as a keynote speaker at international conferences and symposia. He is the coauthor of the book *Smart Environments: Technology, Protocols and Applications*, published by John Wiley in 2005. Dr. Das' current research interests include design and development of smart environments, resource and mobility management in wireless networks, mobile and pervasive computing, wireless multimedia, ad hoc and sensor networks, mobile internet architectures and protocols, distributed and grid computing, performance modeling and simulation. He has published over 350 research papers in these areas in international journals and conferences, directed numerous industry and government funded research projects, and holds five US patents in wireless mobile networks. He received Best Paper Awards in the 5th Annual ACM International Conference on Mobile Computing and Networking (MobiCom'99), 16th International Conference on Information Networking (ICOIN'01), 3rd ACM International Workshop on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM'00), and 11th ACM/IEEE International Workshop on Parallel and Distributed Simulation (PADS'97). Dr. Das serves as the Editor in Chief of the *Pervasive and Mobile Computing* (PMC) journal and also as an Associate Editor of *IEEE Transactions on Mobile Computing*, *IEEE Transactions on Parallel and Distributed Systems*, *ACM/Springer Wireless Networks*, *Parallel Processing*

*Letters*, and *Journal of Parallel, Distributed and Emerging Systems*. He served as General Chair of IEEE WoWMoM'05, IEEE PerCom'04, IWDC'04, IEEE MASCOTS'02, ACM WoWMoM'00-02; General Vice Chair of IEEE PerCom'03, ACM MobiCom'00, IEEE HiPC'00-01; Program Chair of IWDC'02, WoWMoM'98-99; TPC Vice Chair of ICPADS'02; and as TPC member of numerous IEEE and ACM conferences. He is the Vice Chair of the IEEE Computer Society's TCPP and TCCC Executive Committees and on the Advisory Boards of several cutting-edge companies.

## **T6:** Designing Software Product Lines with UML 2.0: From Use Cases to Pattern-Based Software Architectures

**Instructor:** Hassan Gomaa, George Mason University, USA.

### **Abstract**

This half-day tutorial addresses how to develop object-oriented requirements, analysis, and design models of software product lines using the Unified Modeling Language (UML) 2.0 notation. During requirements modeling, the tutorial covers how to develop kernel, optional, and alternative use cases for defining the software functional requirements of the system. The tutorial also describes the feature model for capturing product line requirements and how it relates to the use case model. During analysis, the tutorial covers how to develop static models for defining kernel, optional, and variant classes and their relationships. It goes on to describe how to create dynamic models in which statecharts define the state dependent aspects of the product line and interaction models describe the dynamic interaction between the objects that participate in each kernel, optional, and alternative use case. The tutorial then covers how to develop the OO software architecture for the product line, in which the system is structured into component-based subsystems. The tutorial gives an overview of the structural architecture patterns and communication patterns that can be used in designing component based distributed product lines. The tutorial is illustrated by means of several examples. The tutorial is based on a book by the author, "Designing Software Product Lines with UML: From Use Cases to Pattern-Based Software Architectures", Addison Wesley Object-Oriented Technology Series, 2005.

### **Biography**

**Hassan Gomaa** is Chair and Full Professor in the Department of Information and Software Engineering at George Mason University, Fairfax, Virginia. He received a B.Sc.(Eng.) in Electrical Engineering from University College, London University, and the DIC and Ph.D. in Computer Science from Imperial College of Science and Technology, London University. He has worked in both industry and academia, and has published over 130 technical papers and three textbooks. His book, "Software Design Methods for Concurrent and Real-Time Systems", was published by Addison Wesley in 1993 and was translated into Chinese in 2003. His second book, entitled "Designing Concurrent, Distributed, and Real-Time Applications with UML", was published by Addison Wesley in 2000 and was translated into Chinese in 2004. His latest textbook

entitled “Designing Software Product Lines with UML” was published by Addison Wesley in July 2004. He has considerable experience in teaching courses and tutorials on software design. He has made conference and tutorial presentations at many international software engineering conferences. He was a keynote speaker at the Asia-Pacific Software Engineering Conference in December 2004. He has taught several in-depth industrial courses on software design in North America, Europe, Japan, and Korea. He also consults in both the technical and management aspects of software engineering. His current research interests include object-oriented analysis and design for concurrent, real-time, and distributed systems, software product lines, component-based software architecture, software reuse, software performance engineering, intelligent software agents, software engineering environments, and software process models. His research has been funded by several organizations including the National Science Foundation, NASA and DARPA.

## **T7: Architectures on Demand for Any Domain Using Stable Software Patterns**

**Instructor:** Mohamed E. Fayad, San José State University, USA.

### **Abstract**

The rapid growth of technology coupled with the tightened development time and production cost constraints have imposed a tremendous pressure and desire for software enterprises to create new and innovative designs to respond to a rapidly changing business environment. Enterprises must invest in building stable architectures that can be ready to be adapted in many different ways to meet the new challenges. These kinds of architectures are called *architectures on demand* as they can be adapted accordingly to meet the future requirements and changes in the system. The primary focus of this tutorial is to show how software stability concepts with UML are used to develop on-demand architectures. The tutorial focuses on three key aspects: (1) Enduring Business Themes (EBTs) or business goals and transformations which we call stable analysis patterns, (2) Business Objects (BOs) or business process design which we call stable design patterns, and (3) Industrial Objects (IOs) or application objects. Both EBTs and BOs form a stable core, and hence, provide architectures on demand for any domain. We call these architectures, stable architectural patterns.

### **Biography**

**Mohamed Fayad** is a Full Professor of Computer Engineering at San Jose State University from 2002 to present. He was a J.D. Edwards Professor, Computer Science & Engineering, at the University of Nebraska, Lincoln, from 1999 to 2002, and an associate professor at the computer science and computer engineering faculty at the University of Nevada, from 1995 - 1999. He has 15+ years of industrial experience. Dr. Fayad is a Senior Member of the *IEEE*, a Senior Member of the *IEEE Computer Society*, a Member of the *ACM*, an *IEEE Distinguished Speaker*, an Associate Editor, Editorial Advisor, and

a Columnist for *The Communications of the ACM* and his column is *Thinking Objectively*, and a columnist for *Al-Ahram Egyptians Newspaper* (2 million subscribers), an Editor-In-Chief for *IEEE Computer Society Press - Computer Science and Engineering Practice Press (1995-1997)*, IASTED Technical Committee member on Software Engineering (2001-2004), a general chair of IEEE/Arab Computer Society International Conference on Computer Systems and Applications (AICCSA 2001), Beirut, Lebanon, June 26-29, 2001, and he is the president of *Arab Computer Society (ACS)* from April 04 to present. Dr. Fayad was a guest editor on nine theme issues: *CACM's OO Experiences*, Oct. 1995, *IEEE Computer's Managing OO Software Development Projects*, Sept. 1996, *CACM's Software Patterns*, Oct. 1996, *CACM's OO Application Frameworks*, Oct. 1997, *ACM Computing Surveys – OO Application Frameworks*, March 2000, *IEEE Software - Software Engineering in-the-small*, Sept./Oct. 2000, and *International Journal on Software Practice and Experiences*, July 2001, *IEEE Transaction on Robotics and Automation -- Object-Oriented Methods for Distributed Control Architecture*, October 2002, and *Annals of Software Engineering Journal – OO Web-Based Software Engineering*, October 2002. He has published articles in many journals and magazines, such as *IEEE Software*, *IEEE Computer*, *JOOP*, *ACM Computing Surveys* and *CACM* on OO software engineering methods, experiences, aspect-oriented programming, internet & web applications, enterprise and application frameworks, design patterns, and management. He has given tutorials and seminars on OO Technologies and Experiences at many conferences and he has presented various seminars in USA and several countries, such as Hong Kong (April 96), Canada (10 times), Bahrain, Saudi Arabia, Egypt (15 times), Portugal (Oct. 96, July 99), Finland (July 99), Mexico (Oct. 98), Argentina (3 times), Chile (00), Peru (02), and Spain (02), Brazil (04), UK (05). Dr. Fayad received an MS and a Ph.D. in computer science, from the University of Minnesota at Minneapolis. His research topic was *OO Software Engineering: Problems & Perspectives*. He is the lead author of several Wiley books: *Transition to OO Software Development*, August 1998, *Building Application Frameworks*, Sept., 1999, *Implementing Application Frameworks*, Sept., 1999, *Domain-Specific Application Frameworks*, Oct., 1999, and 3 new books in Progress: *Stable Analysis Patterns*, *Stable Design Patterns*, *Stable Patterns in Action*.