

# PERSONAL WIRELESS COMMUNICATIONS (PWC) 2002

## 23-25 October 2002, Grand Hyatt Singapore

### Tutorial Programme

#### Tutorial 1: Pervasive Networking: Architecture and Protocols

by Dr. Amitava Mukherjee, PricewaterhouseCoopers Ltd, India and Dr. Debashis Saha, Indian Institute of Management, India

#### Synopsis

We are moving towards a world of pervasive computing in which users can access and manipulate information from anywhere at anytime, i.e., anytime/anywhere -> any device -> any **network** -> any data. Computing devices and networks are becoming ubiquitous. In this new world, computing will no longer be tethered to desktops: users will become increasingly mobile. As users move across environments, they will desire to remain connected all along so that they can continue to access a dynamic range of applications and software services. They will want to carry with them (logically) their unfinished/scheduled tasks including computing, sensing, communicating, etc. Consequently, many research themes have appeared over the past few years advocating a computing paradigm similar in spirit to ubiquitous computing. The terms, such as pervasive, invisible, calm, anytime/anywhere, wearable, augmented reality, information appliances, may evoke a more symbiotic relationship between humans and their environment. We can view this as yet another paradigm shift in the relationship between humans and computers. Human-Centered: What can and should we expect for human interaction within a smart environment? Technology-Centered: What new requirements do smart environments place on technology infrastructure, specifically networking infrastructure? What new advances in programming or system construction must accompany this paradigm shift? In the context of human-computer interaction (HCI), a smart pervasive computing environment is one that adapts to the needs of the information consumer, in terms of input/output capabilities, as he/she moves and accesses information in a dynamically changing environment. Potential changes include the number of information consumers or information providers, or changes in location of the individual or objects in the environment. We can understand these changes as the context that defines the user's situation, whether it is in an office, home, car, airport, etc. Today's infrastructure for networking and communication does not support this model of pervasive computing very well. Now a day, if a mobile user wants to use the computing resources of a new environment, he/she has to manually figure out how to be connected. We will discuss the networking infrastructure for the smart pervasive networking environment, which covers the requirements of cellular network, mobile ad-hoc network, wireless sensor network and wired environment specifically optical wavelength division multiplexing (WDM) network. The cellular network is the single-hop wireless network where ad-hoc and wireless sensor networks are in the part of multi-hop wireless network. The WDM network plays the key role of backbone infrastructure in the pervasive networking environment. We will also discuss the different types of access protocols used for these different types of networks in the pervasive networking environment. We will discuss the networking infrastructure for the smart pervasive networking environment, which covers the requirements of cellular network, mobile ad-hoc network, wireless sensor network and wired environment specifically optical wavelength division multiplexing (WDM) network. The cellular network is the single-hop wireless network where ad-hoc and wireless sensor networks are in the part of multi-hop wireless network. The WDM network plays the key role of backbone infrastructure in the pervasive networking environment. We will also discuss the different types of access protocols used for these different types of networks in the pervasive networking environment.

#### Outline

1. Introduction to pervasive computing and networking
2. Back-bone architecture: internet and optical (WDM)
3. Wireless network architectures: single-hop and multi-hop
4. Adaptability and scalability for pervasive networking
5. Protocol interoperability for pervasive networking
6. Research issues
7. Future directions

## **Biography**

**Amitava Mukherjee** received his Ph.D. degree in Computer Science from Jadavpur University, Calcutta, India. He was in the Department of Electronics and Telecommunication Engineering at Jadavpur University, Calcutta, India from 1983 to 1995 as an Asso. Professor. Since June 1995, he is Principal Consultant in PricewaterhouseCoopers Ltd., Calcutta, India. His research interests are in the area of Mobile Computing and Communication, Pervasive Computing and M-Commerce, Optical Networks, Combinatorial Optimization and Distributed Systems. His interests also include the Mathematical Modeling and its applications in the fields of Societal Engineering and International Relations. He is the author of over 60 technical papers, one monograph and four books. He is a member of IEEE, IEEE Communication Society.

**Debashis Saha** received his B.E. degree in Electronics & Telecommunication Engg., from Jadavpur University, Calcutta, India, in 1986, and his M. Tech. and Ph. D. degrees, both in Electronics & Electrical Communication Engg., from the Indian Institute of Technology (IIT) at Kharagpur, India, in 1988 and 1996, respectively. He was a senior research scholar at IIT, Kharagpur between 1988 and 1990 while conducting research on protocol engineering. He was with Jadavpur University as a faculty member in the Computer Science & Engg Department from 1990 to 2001. Recently, he has joined Indian Institute of Management (IIM) Calcutta as an Associate Prof. In the MIS group. His research areas are: Network protocols, Topological design, WDM optical networks, Wireless/Mobile Communication & networking, and Pervasive Computing. He has published more than hundred papers in various conferences and journals and delivered several invited talks and tutorials in networking conferences/workshops. He is currently the principal investigator of two major govt. funded projects on WDM Optical Networking Research Initiatives. He has co-authored two books and a monograph. Dr. Saha is a life-member of Computer Society of India (CSI), a member of IFIP WG 6.8, a Senior Member of IEEE, and a member of IEEE Computer Society and IEEE Communication Society. He is a recipient of the prestigious Career Award for Young Teachers (1997) from the All India Council for Technical Education (AICTE), Govt. of India, and is a SERC Visiting Fellow (1999) and a BOYSCAST Fellow (2000) of Dept. of Science & Technology (DST), Govt. of India.

## **Tutorial 2: Mobile and Wireless Internet - Protocols and Satellites-based Architectures by Dr. Guy Omidyar and Dr. Yeo Boon Sain, Institute for Communications Research, Singapore**

### **Synopsis**

Satellites play an important role in providing mobility and seamless access in the Internet services. Global solutions could be reached with integration of satellites with terrestrial providers. Together, they can expand businesses in e-commerce and trading for many years to come. Integration of fixed and portable 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 demands on Mobile Internet and its military applications have grown rapidly. The deployment of broadband IP - based technologies over satellite networks and integration of IP with broadband wireless access networks are becoming increasingly important. Although considerable attention has been shown in Mobile Satellite Systems (MSS), these networks have, in general, been investigated independently of terrestrial networks. However, if MSS are to be used to major advantage, then they must be considered with a view to integrating both types of network. This talk introduces the different types of satellite systems (GEO, MEO and LEO) and discusses the different technical aspects of the systems. The role and the type of the applications of these systems, as either integral or inter-work entity of future mobile communication infrastructure, will be discussed. This tutorial will address various approaches undertaken in the design of advanced mobile satellite systems the impact of mobility, roaming, session establishment and management, location management and handoff, flow and congestion control, error control on current protocols. Mobility introduces further challenges in the area that have neither been fully understood nor resolved in the preceding network generation. Finally, current standards efforts and the direction of research activities in Wireless World Research Forum WWRF and from European Commission on next generations will be discussed.

Also included:

- Introduction to terrestrial wireless systems
- Introduction to satellite system architectures (LEO, MEO, GEO), and its roles and applications in future mobile communication infrastructure
- Approaches undertaken in the design of advanced mobile satellite systems
- Concepts, issues and problems of wireless systems and hybrid systems (Mobility issues, end-to-end QoS provisioning, location management, resource management, routing, etc)
- Problems and impact of mobility management, call admission control and signalling messages for hybrid satellite and terrestrial systems
- Requirements for extending IP and ATM protocols at wireless interfaces
- Standards efforts and direction of research projects activity are discussed

### **Potential Audience:**

Students, researchers and industry affiliations, and individuals working for government, military, science and technology institutions and would like to learn more about mobile and wireless network protocols included satellite and terrestrial and research.

### **Biography**

**Dr. Guy Omidyar** (gomidyar@icr.a-star.edu.sg) received the D.Sc. in Electrical Engineering from George Washington University. He has been an associate professorial Lecturer at George Washington University and a professor invite at University de Versailles-Saint-Quentin. He lectures extensively on theory and practice of mobile and wireless communications networks. He was a science advisor for US. Internal Revenue Service and conducted research at the Research Institute of Illinois Institute of Technology. He worked at Bell Communications Research and contributed to the standardisation and was a technology advisor at Telecom Egypt. He was a consulting engineer and worked on future NASA Telecom projects. He was chairman of IEEE communications society of communication system integration and modelling committee. He is the standing committee chair of Mobile and Wireless Communication Network (MWCN) conferences: <http://www.cin.ufpe.br/~mwcn2001/> and Co-chair of IFIP TC6 WG 6.8. He is the director of international affairs office at Institute for Communications Research, Singapore.

**Dr. Boon Sain YEO** (yeobs@icr.a-star.edu.sg) received the B.Eng (Hons) and Ph.D. in Electrical Engineering from University of Glasgow and Imperial College respectively. He was an R&D engineer in Siemens from 1996 - 1998 before pursuing his Ph.D. Since 2001, he has been working in Institute for Communications Research, Singapore, as an Associate Member of Technical Staff. His main research interests include mobile satellite systems, network management of wireless systems, internetworking of hybrid communication systems, and operation research.

## **Tutorial 3: QoS in the Next Generation of Wireless Networks** **by Dr. Pascal LORENZ, University of Haute-Alsace, France**

### **Synopsis**

Emerging Internet Quality of Service (QoS) mechanisms are expected to enable wide spread use of real time services for example, 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 to guarantee QoS services as well as high rate for the communications. The promising service level agreement to a mobile Internet user is hard to come by, since there may not be enough resources available in some parts of the IP/ATM networks as mobile terminal is moving into. The emerging QoS architectures, differentiated services and integrated services do not consider the network nodes are mobile. 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. Integration of fixed and portable 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 demands on mobile Internet have grown rapidly and predicted to generate billions of dollars in revenue. The tutorial covers an introduction to QoS in heterogeneous networks, Internet delivery over future wireless networks, the ATM, MPLS, DiffServ, IntServ protocols. It addresses characteristics of the Internet and its mobility features and how it could guarantee QoS using wireless IP services. It also presents concepts of routing, quality-of-service provisioning and security, baseline architecture of the inter-networking protocols and end to end traffic management issues.

### **Biography**

**Pascal LORENZ** received his Ph.D. degree in 1994 from the University of Nancy, France. Between 1990 and 1995 he was research engineer at WorldFIP Europe and at Alcatel-Alsthom. Since 1995 he is associate professor at the University of Haute-Alsace. 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](#) conferences and the Co-Chair of [ICATM'00](#), [ICATM'01](#) conferences. Since 2000, he is Technical Editor of IEEE Communications Society Editorial Board. He is member of many international committees programs and he has served as guest editor for a number of special issues, including Telecommunication System, IEEE Communications Magazine and LNCS. He has served as referee for several IEEE conferences, he has organized several technical sessions and has chaired many of them. He is the author of 60 international publications.

## **Tutorial 4: Mobile Ad Hoc Networking - Issues and New Challenges** **by Dr. Winston Seah, Institute for Communications Research, Singapore**

### **Synopsis**

Ad hoc networks represent a networking paradigm that is different from the traditional wireless and mobile networks that are based on the cellular concept and relied on good infrastructure support. Ad hoc networks are rapidly deployable and function without infrastructure support - the most distinguishing feature. While mobile ad hoc networks have been in use for military tactical communications for a relatively long time under the name of packet radio networks, there is a growing number of non-military applications. We first describe the key characteristics of mobile ad hoc networks and briefly discuss the research that has taken place in recent years, focusing on the routing protocols and selected link layer protocols, with reference to recent standardization efforts. We then discuss some open issues and challenges facing the design and development of mobile ad hoc networking technology, including emerging issues related to energy consumption. We conclude with a short discussion on current research efforts addressing new applications such as embedded sensor networks and undersea networks.

### **Biography**

**Winston Khoon Guan SEAH** is a Principal Member of Technical Staff, and director of the Internet Technologies programme in the Institute for Communications Research (ICR). He received the Dr. Eng. degree from Kyoto University, Kyoto, Japan, in 1997. Winston is also an associate of the Singapore Advanced Research and Education Network (SingAREN) and concurrently holds joint teaching appointments in the Department of Electrical and Computer Engineering, and Department of Computer Science in NUS where he lectures in mobile computing and computer networks courses respectively. He is actively involved in research and development in the areas of mobile ad hoc networks, mobile/wireless Internet technologies, and Internet quality of service (QoS).

Personal Wireless Communications (PWC'2002) Conference  
24 - 25 October 2002, Grand Hyatt Singapore

**Preliminary Conference Programme: Thursday, 24 October**

Time	Session
8:00 am – 8:20 am	<b>Registration (open till noon for walk-in participants)</b>
8:20 am – 8:30 am	<b>Opening Remarks</b> Professor Lye Kin Mun PWC2002 Chair Dr. Jan Slavik IFIP TC6 WG 6.8 Chair Dr. Guy Omidyar IFIP TC6 WG 6.8 Co-chair
8:30 am – 9:15 am	<b>Keynote Address: Information Services for an Automobile</b> <b>Dr. Tadao Saito, Professor Emeritus of the University of Tokyo, Japan</b> <b>Chair: Dr. Guy Omidyar, Institute for Communications Research, Singapore</b>
9:15 am – 9:45 am	<b>Session 1: Power Control/MIMO Receiver Algorithms</b> <b>Chair: Dr. Francois Chin, Institute for Communications Research, Singapore</b>  <b>Second-Order Statistics of Closed-Loop Power Controlled Signals in Multi-Path Rayleigh Fading Channels</b> Hafez Hadinejad-Madram and Xiaolong Jiang, Institute for Communications Engineering, Aachen University of Technology, Germany  <b>Performance Comparison of Multiple-Transmit Multiple-Receive V-BLAST Algorithms</b> Hufei Zhu, Zhongding Lei and Francois Chin, Institute for Communications Research, Singapore
<i>Tea Break (available from 10am – 11am)</i>	
9:45 am – 11:45 am	<b>Session 2: Ad-Hoc Networking</b> <b>Chair: Dr. Jiang Shengming, Institute for Communications Research, Singapore</b>  <b>Market-based Network Formation for an Ad Hoc, P2P Wireless Network</b> Yasunori Yamamoto, Junseok Hwang, Syracuse University, USA  <b>An Efficient Proactive Routing Method for Mobile Ad-hoc Networks using Peer-to-Peer and Cellular Communication System</b> Hiroaki Morino, Tadao Saito, Chuo University, Japan and Mitsuo Nohara, Toyota InfoTechnology Center Co., Ltd, Japan  <b>A Mobile Multicast Framework for CDMA-based Ad Hoc Networks</b> Hsu-Yang Kung and Su-Man Chen, National Pingtung University of Science and Technology, Taiwan  <b>Multipath Routing in Ad Hoc Wireless Networks with Directional Antenna</b> Somprakash Bandyopadhyay, Siuli Roy, Indian Institute of Management, India Tetsuro Ueda, Kazuo Hasuike, ATR Adaptive Communications Research Laboratories, Japan  <b>A Reactive Service Composition Architecture for Pervasive Computing Environments</b> Dipanjan Charkraborty, Filip Perich, Anupam Joshi, Timothy Finin and Yelena Yesha, University of Maryland, USA
11:45 am – 12:30 pm	<b>Panel Session: Data Applications for PWC: From Technology Driven to Demand Oriented Market Strategies</b> <b>Chair: Dr. Michael Li, Institute for Communications Research, Singapore</b> Prof. Luís Valadares Tavares, Technical Institute of Lisbon, Portugal, Prof. Manuel João Pereira, Catholic University of Lisbon, Portugal and Paulo Azevedo, SONA E, Portugal

**Preliminary Conference Programme: Thursday, 24 October**

Time	Session
12:30 pm – 1:30 pm	Lunch
1:30 pm – 2:00 pm	<b>Invited Talk: Mobility with Secured 802.11 Wireless Network</b> <b>Ng Tock Hiong, Network Consultant – Singapore, Cisco Systems (USA) Pte Ltd, Singapore</b> <b>Chair: Dr. Jan Slavik, TESTCOM, Czech Republic</b>
2:00 pm – 3:30 pm	<b>Session 3: Personal Wireless Communications</b> <b>Chair: Dr. Jackson Lam, Institute for Communications Research, Singapore</b>  <b>Bluetooth PAN and External IP Networks</b> Tore E. Jønvik, Unik-University of Oslo, Norway, Paal Engelstad and Do van Thanh, Telenor R&D, Norway  <b>DTV for Personalized Mobile Access and Unified Home Control</b> Jianlin Guo, Fernando Matsubara, Johnas Cukier and Haosong Kong, Mitsubishi Electric Research Labs, USA  <b>A Novel Internet Radio Service for Personal Communications; The Private Channel Service</b> Kensuke Arakawa, Yasushi Ichikawa and Yuko Murayama, Iwate Prefectural University, Japan  <b>Tools for On-Door Communications on WWW</b> Keishi Suzumura, Hiromi Gondo and Yuko Murayama, Iwate Prefectural University, Japan
<i>Tea Break (available from 3pm – 4pm)</i>	
3:30 pm – 4:00 pm	<b>Session 4: Buffer Control/Receiver</b> <b>Chair: Dr. Michael Chia, Institute for Communications Research, Singapore</b>  <b>Buffer Control Using Adaptive MQAM for Wireless Channels</b> Anh Tuan Hoang, and Mehul Motani, Institute for Communications Research, National University of Singapore, Singapore  <b>Low Complexity Iterative Receiver based on Successive Cancellation for MIMO</b> Holger Claussen, University of Edinburg, UK, Hamid Reza Karimi, Bells Labs Research, Lucent Technologies, USA and Bernard Mulgrew, University of Edinburg, UK
4:00 pm – 5:30 pm	<b>Session 5: Satellites/High Altitude Platforms Station</b> <b>Chair: Dr. Boon Sain Yeo, Institute for Communications Research, Singapore</b>  <b>Dedicated Bandwidth Approach for Channel Allocation in a Multi-Service Up/Down Link of a Low Earth Orbit Satellite Constellation</b> Rima Abi Fadel and Samir Tohmé, Ecole Nationale Supérieure des Télécommunications, France  <b>Softer Handover Schemes for High Altitude Platform Station (HAPS) UMTS</b> Woo Lip Lim, Yu Chiann Foo and Rahim Tafazolli, University of Surrey, UK
	<b>Session 6: Quality of Service (QoS)</b> <b>Chair: Prof. Pascal Lorenz, University of Haute-Alsace, France</b>  <b>Adaptive QoS and Handover Issues in Wireless Multimedia Networks Using a Dynamic Adaptive Architecture: DYNAA</b> Rola Naja and Samir Tohmé, Ecole Nationale Supérieure des Télécommunications, France  <b>Dynamic QoS Guarantee with Repeater in Power Controlled WCDMA Urban Environment</b> Mohammad N. Patwary, Predrag Rapajic University of New South Wales, Australia and Ian Oppermann, Southern Poro Communications, Australia

**Preliminary Conference Programme: Friday, 25 October**

Time	Session
8:30 am – 9:00 am	<b>Invited Talk: Future Terminals and Personal Area Networks</b> Prof. Do van Thanh, Telenor R&D, Norway Chair: Dr. Canchi Radhakrishna, Institute for Communications Research, Singapore
9:00 am – 10:00 am	<b>Session 7: UMTS/Wireless LANs</b> Chair: Dr. Canchi Radhakrishna, Institute for Communications Research, Singapore  <b>Very Tight Coupling of Wireless LANs and UMTS Networks: A Technical Challenge and a Great Opportunity for Mobile Operators</b> Manfred Litzemberger, Hajo Bakker, Stephen Kaminski and Klaus Keil, Alcatel Research and Innovations, Germany  <b>Dynamic UMTS Simulator for Congestion Studies and Evaluation of Resource Management Techniques</b> Sami Nousiainen, Krzysztof Kordybach, Paul Kemppe and Veli-Pekka Kröger, VTT Information Technology, Finland  <b>Capacity and Coverage Increase with Repeaters in UMTS</b> Mohammad N. Patwary, Predrag Rapajic University of New South Wales, Australia and Ian Oppermann, Southern Poro Communications, Australia
<i>Tea Break (available from 10am – 11am)</i>	
10:00 am – 12:00 noon	<b>Pre-Authenticated Fast Handoff in a Public Wireless LAN Based on IEEE 802.1x Model</b> Sangheon Park and Yangheon Choi, Seoul National University, Korea  <b>Service Integration Multiple Access (SIMA)</b> <b>A Protocol for Supporting Voice &amp; Data in Wireless LANs</b> Apichan Kanjanavapastit, Mahanakorn University of Technology, Thailand and Hassan Mehrpour, University of New South Wales, Australia  <b>Spatial Variation of Digital Television Signal in an Indoor Environment</b> Ong Jin Teong, Yan Hong and Shanmugam Ganeshkumar, Nanyang Technological University, Singapore
	<b>Session 7.1: Security</b>  <b>Development of a Strong Streaming Ciphering Technique Using Non-Linear Fuzzy Logic Selector</b> Ahmed M. Al-Naamany and Afaq Ahmad, Sultan Qaboos University, Sultanate of Oman
	<b>Session 8: Multiple Access Techniques</b> Chair: Dr. Jon W Mark, University of Waterloo, Canada  <b>Wireless MAC Scheme for Service Differentiation</b> <b>A Distributed Protocol</b> Abdulla Firag and Harsha Sirisena, University of Canterbury, New Zealand  <b>Packet Acquisition Evaluation of Slotted Spread ALOHA Data Networks</b> Waseem Jibrail and Ranjith Liyana-Pathirana, University of Western Sydney, Australia
<i>Lunch</i>	
12:00 noon – 1:00 pm	
1:30 pm – 2:00 pm	<b>Invited Talk: IDA's Technology Bets, A Methodology to Identify and Facilitate Adoption of New and Novel Technologies in Singapore</b> Dr. Tan Geok Leng, Director for Enabler and Network Technologies, Infocomm Development Authority (IDA) of Singapore, Singapore Chair: Dr. Liou Koujuch, Institute for Communications Research, Singapore

Preliminary Conference Programme: Friday, 25 October

Time	Session
2:00 pm – 4:00 pm	<p><b>Session 9: Code Division Multiple Access (CDMA)</b>  <b>Chair: Dr. Francois Chin, Institute for Communications Research, Singapore</b></p> <p><b>On Erlang Capacity of CDMA Systems</b>            Samad S. Kolahi, Unitec Institute of Technology, New Zealand</p> <p><b>Power and Spreading Gain Allocation in CDMA Data Networks for Services with a Relative Priority</b>            Kwang-Seop Jung, Sun-Mog Hong and Eun-Young Park, Kyungpook National University, Korea</p> <p><b>Adaptive Closed-Loop Power Control Using an MMSE Receiver in DS-CDMA Systems</b>            Lian Zhao and Jon W Mark, University of Waterloo, Canada</p> <p><b>CORDIC based QRD-RLS Adaptive Equalizer for CDMA Systems</b>            Tim Zhong Mingqian, AS Madhukumar and Francois Chin, Institute for Communications Research, Singapore</p> <p><b>Resource Allocation Using Dynamic Spreading Gain Control for Wideband CDMA Networks Supporting Multimedia Traffic</b>            Hailong Huang, National University of Singapore, Singapore and Francois Chin, Institute of Communications Research, Singapore</p> <hr/> <p><b>Session 9.1: Turbo Code</b></p> <p><b>On the Fixed-Point Implementation of Turbo Code in 3G system</b>            Sun Mingyong, Institute for Communications Research, Singapore and Tan Wee Tiong, STMicroelectronics Asia Pacific Pte Ltd, Singapore</p>
<i>Tea Break (available from 3pm – 4pm)</i>	
4:00 pm – 5:30 pm	<p><b>Session 10: Mobility</b>  <b>Chair: Dr. Harsha Sirisena, University of Canterbury, New Zealand</b></p> <p><b>Cellular Positioning by Database Comparison and Hidden Markov Models</b>            Trond Nypan and Oddyar Hallingstad, UniK – University Graduate Center, Norway</p> <p><b>Architectural Considerations for Personal Mobility in Wireless Internet</b>            Mazen Malek Shiaa and Finn Arve Agesen, NTNU University, Norway</p> <p><b>A Development of Flexible Access Control System for Advanced ITS Networking</b>            Mitsuo Nohara, Sheng-Wei Cai, Hitoshi Inoue, Yoshiro Okamoto and Tadao Saito, Toyota InfoTechnology Center, Co.,Ltd, Japan</p> <p><b>Ubiquitous Access to Personalised Services</b>            Tore E. Jønvik, Unik-University of Oslo, Anne Marie Hartvigsen, AgderUniversity College, Norway and Do van Thanh, Telenor R&amp;D, Norway</p> <hr/> <p><b>Session 10.1: Array via Cramer-Rao Bound</b></p> <p><b>Designing Super-Resolution Array via Cramer-Rao Bound in a Coherent Source Environment</b>            F.H.Kashani, Iran University of Science and Technology, Iran, F.Arazm, Tehran University and M.Asgari, IRIB, Iran</p>

**PWC'2002**  
**REGISTRATION FORM**  
 23-25 October 2002  
 Grand Hyatt, Singapore

**Registration**

- Website: [www.icr.a-star.edu.sg/pwc2002/registration.html](http://www.icr.a-star.edu.sg/pwc2002/registration.html)
- Fax: +65 6779 5441
- By mail: 20 Science Park Road, #02-34/37, TeleTech Park, Singapore Science Park II, Singapore 117674

**Enquiry**

- Hotline: +65 6870 9188
- Email: [pwcenquiry@icr.a-star.edu.sg](mailto:pwcenquiry@icr.a-star.edu.sg)

**Instructions: Please print all information and tick or indicate your choice accordingly. For payment via VISA or Master Card, please register online via [www.icr.a-star.edu.sg/pwc2002/registration.html](http://www.icr.a-star.edu.sg/pwc2002/registration.html)**

**1) Delegate Information**

Name \_\_\_\_\_  
 (please capitalise surname)

Designation \_\_\_\_\_ Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State/Province \_\_\_\_\_ Postal Code \_\_\_\_\_ Country \_\_\_\_\_

Phone \_\_\_\_\_ Fax \_\_\_\_\_ Email \_\_\_\_\_

Contact Person \_\_\_\_\_ Designation \_\_\_\_\_ Email \_\_\_\_\_  
 (if different from above)

Special dietary requirement: Vegetarian  Company Sponsored: Yes  No

**2) Registration**

Registration Fees (US\$)		
	On or by 25 Sep	After 25 Sep
<b>Full Registration</b> , 2 days conference & 2 tutorials, 23-25 Oct (inclusive of lunch, refreshments, banquet on 24Oct and a copy of conference proceedings for conference and tutorial notes for tutorials)	US\$595 <input type="checkbox"/>	US\$650 <input type="checkbox"/>
<b>Conference Registration</b> , conference only, 24-25 Oct (inclusive of lunch, refreshments, banquet on 24Oct and a copy of conference proceedings for conference)	US\$475 <input type="checkbox"/>	US\$525 <input type="checkbox"/>
<b>Tutorials Registration</b> , tutorials only, 23 Oct (inclusive of lunch, refreshments and a copy of tutorial notes for relevant tutorials)		
• <b>2 Tutorials</b> (Tutorial 1 or 2 in the AM <b>and</b> Tutorial 3 or 4 in the PM)	US\$170 <input type="checkbox"/>	US\$180 <input type="checkbox"/>
• <b>1 Tutorial</b> (either Tutorial 1 or 2 in the AM <b>or</b> Tutorial 3 or 4 in the PM)	US\$120 <input type="checkbox"/>	US\$125 <input type="checkbox"/>
<b>Please tick the tutorial(s) you plan to attend.</b> <b>AM Session</b> Tutorial 1: Pervasive Networking: Architecture and Protocols <input type="checkbox"/> Tutorial 2: Mobile and Wireless Internet - Protocols and Satellites-based Architectures <input type="checkbox"/> <b>PM Session</b> Tutorial 3: QoS in the Next Generation of Wireless Networks <input type="checkbox"/> Tutorial 4: Mobile Ad Hoc Networking - Issues and New Challenges <input type="checkbox"/>		

Additional Options (US\$)			
	Qty	Unit Price (US\$)	Total Price (US\$)
Welcome Reception		Complimentary	
Additional banquet ticket on 24 Oct		US\$55	
Additional copy of conference proceedings		US\$95	
Additional copy of tutorial notes		US\$10	

### 3) Payment Method

Bank Draft/Cheque: Payments should be made in **United States dollars only** and prior to date of tutorials & conference.

All cheques should be made payable to **Institute for Communications Research**, and sent to:

**PWC'2002 Conference Secretariat**

**Institute for Communications Research**

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TeleTech Park, Singapore Science Park II

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**Note: Please note that all bank charges are to be borne by the participant. Payment is to be made prior to the conference and tutorials. Admittance will only be permitted upon receipt of full payment.**

### 4) Venue

Grand Hyatt Singapore

Level 1, Sir Stamford II & III

10 – 12 Scotts Road, Singapore 228211

### 5) Time

8.30 am – 5:30 pm. Registration begins at 8:00 am.

### 6) Cancellation & Substitution

PWC'2002 organiser reserves the right to cancel the tutorials due to unforeseen circumstances. Should you be unable to attend, a substitute participant is welcome at no extra charge. For cancellations by 31 August 2002, a full refund will be made. For cancellations between 1 September 2002 to 14 September 2002, a partial refund of 50% will be made. No refund will be made for cancellations after 14 September 2002.

Signature of Participant

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