GENERAL CHAIRMAN'S GREETING

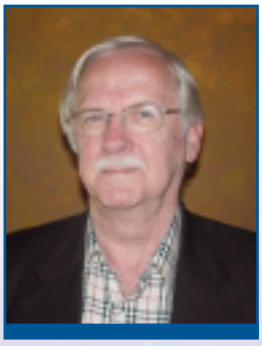
On behalf of the IEEE GLOBECOM/EXPO 2006 Executive Committee, I am pleased to invite you to the 49th annual IEEE GLOBECOM international conference which will be held in San Francisco, California during 27 November to 1 December 2006.

At this IEEE GLOBECOM 2006 conference we will conduct the "first ever" IEEE Communications EXPO which includes industry exhibits, focusing on components, subsystems, systems and an extensive EXPO technical program that is geared for the communication industries "designers and developers". Additionally the EXPO will feature an ACCESS '06 Business Forum by executives and experts from industry and government.

The IEEE GLOBECOM technical program will feature 13 symposia focusing on recent communications research and development, given by the world's top scientists, professors and engineers in our field.

The conference will be held at three of San Francisco's finest hotels: The Fairmont, The Intercontinental Mark Hopkins, and The Stanford Court, located on San Francisco's beautiful Nob Hill and intersected by the city's famous cable car system.

We encourage you to make plans early to enjoy one of the most beautiful cities in the world, and also to visit nearby Silicon Valley and Napa Valley. We look forward to seeing you at IEEE GLOBECOM /EXPO 2006.



Terrence Kero
President, Myaani Inc.
General Chair
IEEE GLOBECOM/
EXPO 2006

REMARKS FROM TECHNICAL PROGRAM CHAIRS

On behalf of the technical program committee, we would like to welcome you to the 49th annual IEEE Global Telecommunications Conference, held in San Francisco - the fabulous gateway city to America's high-tech industry. IEEE GLOBECOM 2006 will showcase a technical program consisting of 13 Symposia and the General Conference, covering many exciting aspects of telecommunications and new emerging technologies. We received a record number of submissions this year with 2548 manuscripts, out of which 1024 have been accepted. The program is the result of a rigorous review process, with each paper received at least three reviews from the respective research community. The papers for the technical symposia are divided into 149 oral presentation sessions and 10 poster presentation sessions. All accepted papers, both for oral and poster presentation, will be published in the conference proceedings.

We would like to offer special thanks to all our symposia chairs and vice-chairs, their technical committees, and the external reviewers. The selection of papers and the success of the technical symposia were made possible by their diligence and hard work. We also thank the authors of the submitted papers for their support of IEEE GLOBECOM 2006. We hope to see you all in San Francisco in November!

Zhi Ding
Professor
University of California, Davis

Chen-Nee Chuah
Associate Professor
University of California, Davis

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IEEE GLOBECOM 2006 PATRONS as of August, 2006

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IEEE COMMUNICATIONS EXPO EXHIBITING COMPANIES as of August, 2006

- **Intel**
- **SAMSUNG**
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- **Wiley**

For further details on how to Exhibit at IEEE Communications Expo,
please contact Connie Shaw at J. Spargo & Associates at 703-631-6200 ext. 3905

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Bill Smith

Tuesday 28 November

Speaker:
Bill Smith, CTO, BellSouth

Bill Smith is Chief Technology Officer for BellSouth Corporation. In this role, he is responsible for setting the technology direction of BellSouth's core infrastructure. His department includes, network and operations technology, Internet protocol (IP) applications, next generation strategy as well as BellSouth Entertainment, LLC.

A native of Asheville, North Carolina, he attended North Carolina State University at Raleigh, where he graduated with honors in 1979.

Bill began his career with BellSouth in 1979 and moved through a variety of job responsibilities over the next several years. He has been involved in BellSouth's advanced technology efforts since returning from an assignment at Bell Communications Research in New Jersey in 1987. He has held a number of assignments dealing with a variety of issues including technology, operations, marketing, and public policy. Bill was also an active participant in national and international telecommunications standards. Most recently Bill was responsible for BellSouth's DSL, Internet and wholesale business units.

Bill serves as Chairman of the Board of the Alliance for Telecommunications Industry Solutions (ATIS), a Washington, D.C. based technical planning and standards organization serving the telecommunications industry. He serves on the Board of Directors of eAccess, Ltd., a communications firm based in Tokyo, Japan. He is also involved in a number of organizations within the Atlanta community, including serving on the Executive Board of the Atlanta Area Council of the Boy Scouts of America, and as Chairman of the Board of the Make-A-Wish Foundation of Georgia and Alabama. Bill is also on the Board of Advisors for the Graduate School at North Carolina State University.

Ki Tae Lee

Wednesday 29 November

Speaker:
Ki Tae Lee, President, Samsung Telecommunications Network Business

Mr. Ki Tae Lee heads Samsung Electronics' Telecommunication Network Business. He became the Company's President in January 2001, following years of distinguished service.

Joining Samsung in 1973, Mr. Lee has held a number of positions during his career. From 2000 to 2001, he served as Executive Vice President of Information and Communications Business. In February 1999, he was named Executive Vice President and General Manager of Wireless Terminal Division. Previously, he also managed Fax Business, Video Business and Sound Facilities.

Among his many accomplishments are the launch of Samsung's very first mobile phone and commercialization of the first CDMA handset. His strong and consistent drive for technology innovation and market leadership has helped Samsung become the third largest handset provider in the world in only ten years.

Today, Mr. Lee's accomplishments are legendary, both at Samsung and in the telecommunications industry. He was listed as one of "The Stars of Asia" by Business Week in July 2002. He also received many outstanding awards and industry recognition, including IMI Grand Prize for Best Management from the Federation of Korean Industries (FKI) in December 2005 and IEEE Distinguished Industry Leader Award in May 2005. In April 2003, he also received Information and Communications Grand Prize at the 48 th Annual Information and Communications Ceremony. In November 1998, he was awarded Order of Industrial Service Merit in recognition of his contribution to the industry's quality management.

Mr. Lee is Honorary Chairman of the Korean Society of Quality Management (KSQM). He has served as Chair of the Korea Association of Information and Telecommunication (KAIT), and of the Korea Association of Photonics Industry Development (KAPID). He is a member of the National Academy of Engineering of Korea (NAEK).

Mr. Lee received a bachelor's degree in Electrical Engineering from InHa University in 1972.

Chris Rice

Wednesday 29 November

Speaker:
Christopher Rice, Executive Vice President, Network Planning and Engineering, AT&T Services

As Executive Vice President, Chris Rice oversees the Network Planning and Engineering Group for the new AT&T Inc. His responsibilities also include overseeing the development and deployment of advanced access, switching, and routing technologies for the company. Prior to being appointed to his current position in March 2004, he was responsible for SBC Communications' enterprise-wide technology direction, new technology introduction, platform development and network regulatory.

Previously, Mr. Rice served as Vice President-Network Engineering, where he was responsible for all current planning and engineering for SBC Southwest and SBC SNET. Prior to that, he was Vice President-Network Planning and engineering for SBC Internet Services, where he was responsible for all network planning, engineering, systems and operations. Since joining the company he has also held a variety of other management positions in network operations, network engineering, network planning, project management and outside plant operations.

Mr. Rice began his career in 1980 with Southwestern Bell Telephone in toll switching systems network operations. In 1986 he joined Bell Communications Research ("Bellcore"), where he had responsibility for the support and systems analysis of operational support systems. In 1994 he held the position of Vice President-Network Planning and Engineering for Southwestern Bell Messaging Inc., where he was responsible for network operations, network planning and engineering, and information systems. In 1989 he received the Texas Synergy Award for the Interdepartmental Showcase. In 1990 he received the Texas Synergy Award for Addison 1 AESS to DMS-100 Conversion. Mr. Rice received a B.S. in Engineering Technology in 1980 from Texas A&M University in College Station, Texas.

Thursday 30 November

Speaker:
Prof. Jean Walrand, University of California Berkeley

Jean Walrand received the Ph.D. degree from the Department of Electrical Engineering and Computer Sciences of the University of California at Berkeley where he is now Professor. His research interests include decision theory, stochastic processes, and communication networks. He is the author of An Introduction to Queueing Networks (Prentice Hall, 1988) and of Communication Networks: A First Course (2nd ed. McGraw-Hill,1998) and co-author of High-Performance Communication Networks (2nd ed, Morgan Kaufman, 2000).Prof. Walrand is a Fellow of the Belgian American Education Foundation and of the IEEE and a recipient of the Lanchester Prize and of the Stephen O. Rice Prize.

IEEE GLOBECOM 2006 will feature 13 Technical Symposia and the General Conference, featuring 153 oral presentation sessions (915 papers) and 10 poster sessions (109 papers). (P) designates the poster session.

GENERAL CONFERENCE:

5 oral sessions, 1 poster session

Co-Chairs:

Chen-Nee Chuah, University of California, Davis
Stefano Galli, Telcordia Technologies, Inc.

Lutz Lampe, University of British Columbia
Haniph Latchman, University of Florida

Vice Chairs:

Erozan Kurtas, Seagate Corp.
Nedeljko Varnica, Marvell

- Power Line Communications
- Resource Management in Wired & Wireless Networks
- Theoretical Framework for Communication Networks
- Information Theory and Coding for Data Storage
- Signal Processing for Data Storage
- (P)General Topics

ADVANCED TECHNOLOGIES & PROTOCOLS FOR OPTICAL NETWORKS (ATPON)

9 oral sessions, 1 poster session

Co-Chairs:

Maurice Gagnaire, ENST Paris

Nasir Ghani, Tennessee Technological University

Vice-Chair:

Suresh Subramaniam, George Washington University

- Access Networks
- Core Networks Design
- Metro/Long-Haul Networks
- Multi-domain/Multi-layer Networks
- Optical Burst Switching
- Optical Packet Switching
- Survivability
- Test Bed & System Design
- Traffic Engineering & Protocols
- (P)Topics in Optical Networks

COMMUNICATION THEORY :

17 oral sessions, 1 poster session

Co-Chairs:

Hamid Jafarkhani, University of California, Irvine

Erchin Serpedin, Texas A&M University

- Cooperative Networks-I
- Cooperative Networks-II
- Cooperative Networks-III
- Detection and Coded Modulation-I
- Detection and Coded Modulation-II
- Diversity Techniques
- Error Control Coding
- Fading Channel
- Information Theoretic Aspects of Source-Channel Coding
- LDPC and Convolutional Codes
- MIMO Systems-I
- MIMO Systems-II
- MIMO Systems-III
- Multicarrier Signaling Schemes
- Multiple Access Schemes
- OFDM Systems
- Space-Time Codes
- (P)Topics in Communication Theory

CONTROL AND MANAGEMENT OF HIGH PERFORMANCE NETWORKS (CMHPN):

5 oral sessions, 1 poster session (joint with ISET, NGN, WCS)

Co-Chairs:

Daniel Awduche, Verizon Business

Piet Demeester, Ghent University

Ibrahim Habib, The City University of New York

- Admission and Congestion Control
- Dynamic Provisioning and Control
- Dynamic Routing
- Protection and Restoration Techniques
- Transport Control Protocols
- (P)Topics in Networking and Services

INTERNET SERVICES AND ENABLING TECHNOLOGIES (ISET):

3 oral sessions, 1 poster session (joint with CMHPN, NGN, WCS)

Co-Chairs:

Volker Hilt, Bell Laboratories/Lucent Technologies

Anees Shaikh, IBM TJ Watson Research Center

- Network Service Design and Deployment
- Peer-to-Peer Services and Technologies
- Service-Enabling Protocols and Extensions
- (P)Topics in Networking and Services

MULTIMEDIA COMMUNICATIONS:

5 oral sessions

Co-Chairs:

Gary Chan, The Hong Kong University of Science and Technology

Pascal Frossard, Swiss Federal Institute of Technology

- Multimedia Content Distribution Networks
- Multimedia Processing
- Multimedia Streaming
- Peer-to-Peer Overlay Networks
- Wireless Multimedia

NETWORK AND INFORMATION SECURITY SYSTEMS (NISS):

8 oral sessions, 1 poster session

Co-Chairs:

Hsiao-Hwa Chen, National Sun Yat-Sen University
Mohsen Guizani, Western Michigan University

Stamatios Kartalopoulos, University of Oklahoma
Koduvayur Subbalakshmi, Stevens Institute of Technology

- Ad-Hoc & Sensor Networks-I
- Ad-Hoc & Sensor Networks-II
- Biometrics & Optical Networks
- DoS & Intrustion/Anomaly Detection
- Encryption, Authentication & Key Management-I
- Encryption, Authentication & Key Management-II
- Information & Application Security
- Worms & Other Issues
- (P)Other Security Topics

NEXT GENERATION NETWORKS:

7 oral sessions, 1 poster session (joint with, NGN, CMHPN, ISET, WCS)

Co-Chairs:

Nirwan Ansari, New Jersey Institute of Technology

Mohammad Atiquzzaman, University of Oklahoma

- Broadband Access
- Network and Transport Layer Protocols
- Next Generation Mobile Systems
- QoS and Network Security
- Switching and Routing-I
- Switching and Routing-II
- Switching and Routing-III
- (P)Topics in Next Generation Networks

QUALITY, RELIABILITY AND PERFORMANCE MODELING FOR EMERGING NETWORK SERVICES (QRPM):

8 oral sessions, 1 poster session

Co-Chairs:

Michael Devetsikiotis, North Carolina State University
Algirdas Pakstas, London Metropolitan University - North Campus

Hiromi Ueda, Tokyo University of Technology

- Control of Network Services
- Network Design
- Peer-to-Peer Networking and Traffic Engineering
- Traffic Control for Network Services-I
- Traffic Control for Network Services-II
- Traffic Engineering
- Traffic Modeling and Scheduling
- Voice and Video Quality Control
- (P)Topics in Quality, Reliability, and Performance Modeling

SATELLITE AND SPACE COMMUNICATIONS:

5 oral sessions

Co-Chairs:

Michael Hadjitheodosiou, University of Maryland
Abbas Jamalipour, University of Sydney

Mario Marchese, CNIT - University of Genoa

- Performance Evaluation of Satellite Communication Systems
- Physical Layer Solutions for Satellite Communications
- Resource Optimization in Satellite Systems
- Routing and Mobile Networking in Satellite Networks
- Solutions for Next Generation Satellite Networks

SIGNAL PROCESSING FOR COMMUNICATIONS AND ELECTRONICS (SPCOMM):

12 oral sessions, 1 poster session

Co-Chairs:

Hung Nguyen, The Aerospace Corporation
Bin Qiu, Monash University

Mohammad Saquib, University of Texas, Dallas

- Channel Estimation
- Channel Estimation and Equalization
- Coding and Wireless Systems
- Communications Signal Processing
- Equalization
- MIMO Systems-I
- MIMO Systems-II
- OFDM Systems-I
- OFDM Systems-II
- Signal Processing Algorithms
- Signal Processing for CDMA
- Wireless Systems
- (P)Topics in Signal Processing for Communications

WIRELESS AD HOC AND SENSOR NETWORKS - TOWARDS ANYTIME ANYWHERE INTERNETWORKING (WASNET):

19 oral sessions, 1 poster session

Co-Chairs:

Raouf Boutaba, University of Waterloo
Hossam Hassanein, Queens University
Hussein Mouftah, University of Ottawa
Guoliang Xue, Arizona State University

- Aggregation
- Coverage
- Cross-Layer Design
- Energy Efficiency
- Localization
- MAC-I
- MAC-II
- MAC-III
- Mobility
- Performance Evaluation
- Power Control
- QoS-I
- QoS-II
- Resource Allocation
- Resource Management
- Routing
- Security
- Survivability
- Topology Control
- (P)Topics in Wireless Ad Hoc and Sensor Networks

WIRELESS COMMUNICATIONS AND NETWORKING:

47 oral sessions, 2 poster sessions

Co-Chairs:

Sastri Kota, Harris Corporation
Yi Qian, University of Puerto Rico at Mayaguz
Shahrokh Valaee, University of Toronto
Boon Sain Yeo, Wavex Technologies

- 3G and Beyond Systems
- Ad Hoc and Sensor Networks
- Allocation, Control, and Power Adaptation
- Antenna
- CDMA-I
- CDMA-II
- CDMA-III
- Cellular Systems
- Channel and Frequency Estimation for OFDM
- Channel and Frequency Estimation for UWB
- Coding and Modulation
- Cognitive Radio
- Cooperative Networks
- Cross Layer Design
- Handoff in Wireless Networks
- MIMO-I
- MIMO-II
- MIMO-III
- MIMO-IV
- MIMO-V
- MIMO-OFDM
- Multi-Hop Networks
- Network and Resource Management
- OFDM System Design Issues
- OFDM Systems
- Performance Analysis
- Quality of Service
- Resource Allocation for OFDM Systems
- Resource Allocation with Fairness and QoS Constraints
- Space-Time Coding-I
- Space-Time Coding-II
- TCP
- UWB System Performance-I
- UWB System Performance-II
- WiMax-I
- WiMax-II
- Wireless Channel-I
- Wireless Channel-II
- Wireless Channel-III
- Wireless Mesh Networks
- Wireless Network Design
- Wireless Network Protocols
- Wireless Sensor Networks
- WLAN Networks-I
- WLAN Networks-II
- WLAN Networks-III
- WLAN Networks-IV
- (P)Topics in Wireless Communications and Networks-I
- (P)Topics in Wireless Communications and Networks-II

WORLD CLASS SOLUTIONS - NETWORKING THE GLOBE (WCS):

3 oral sessions, 1 poster session (joint with CMHPN, ISET, NGN)

Chair:

Charalabos Skianis, National Centre for Scientific Research 'Demokritos'

Vice-Chairs:

Pascal Lorenz, University of Haute Alsace
Spilios Makris, Telcordia Technologies
Jose-Marcos Nogueira, Federal University of Minas Gerais

- Information Highways and Infrastructures
- Pricing and Cost
- Services in the Global Era
- (P)Topics in Networking & Services

ACCESS '06 BUSINESS FORUM

TUESDAY 28 NOVEMBER, 2006

8:00am	**Keynote Session** **Chair: Dr. Adam Drobot**, President Advanced Technology Solutions & CTO, Telcordia Technologies **Speaker: Bill Smith**, CTO, BellSouth			
9:15am	COFFEE BREAK			
9:45am	**Fiber Access Systems** Chair: **Thomas Pfeiffer**, Alcatel SEL AG	**Broadband Operations** Chair: **Douglas Zuckerman**, Doug Zuckerman Associates	**3G Planning and Operations** Chair: **C. Skianis**, NCSR "Demokritos", and **Jie Zhang**, University of Luton	**Consumer Electronics in Access Networks** Chair: **Robert Fish**, Panasonic Research Labs
12:30pm	Awards Luncheon			
2:00pm	**Optical Access Networks** Chair: **Tetsuya Yokotani**, Mitsubishi Electric	**Community Networks** Chair: **Richard Wolff**, Guihausen Chair, Montana State University	**Wireless Options for the Last Mile** Chair: **Norman Thiel**, Thiel Consulting	**The Business of Broadband** Chair: **Bart Stuck**, Signal Lake Venture Fund

WEDNESDAY 29 NOVEMBER, 2006

8:00am	**Keynote Session** **Chair: Dr. Adam Drobot**, President Advanced Technology Solutions & CTO, Telcordia Technologies **Speakers: Ki Tae Lee**, President, Samsung Telecommunications Network Business **Christopher Rice**, Executive Vice President , Network Planning and Engineering, AT&T Services			
9:15am	COFFEE BREAK in the Expo Hall			
9:45am	**Supporting Triple Play Services** Chair: **Oren Marmur**, CTO FlexLight Networks	**Global Broadband Deployments** Chair: **Bruno Orth**, Deutsche Telekom	**Broadband over Power Line** Chair: **Stefano Galli**, Telcordia Technologies	**What's Next in DSL Technology?** Chair: **John Cioffi**, Stanford University
12:15pm	**ACCESS '06 Executive Panel**			
2:00pm	**Technology & Business Lessons from around the Globe** Chair: **Niel Ransom**, Teknovis and former CTO of Alcatel	**Metropolitan Wireless Access Networks** Chair: **William J. Kaminsky**, TechSolve	**Last Mile Wireless Technologies and the World Wide Research Forum (WWRF)** Chair: **Pieter van Rooyen**, Vice-Chairmen Americas of the WWRF and Chief Architect of Broadcom's Mobile and Wireless	**Business Unit Broadcom Ensuring QoS and Securing Converged Services** Chair: **Scott Porestsky**, Reef Point Systems

THURSDAY 30 NOVEMBER, 2006

8:00am	**Keynote Session** **Speakers: Prof. Jean Walrand**, University of California Berkeley **Chris Vein**, CIO, City and County of San Francisco **Graham Richard**, Mayor, Fort Wayne, Indiana			
9:15am	COFFEE BREAK in the Expo Hall			
9:45am	**Fiber to the Home – The New Empowerment** Chair: **Paul Green**	**WiMax Technology and Standards** Chair: **TBA**	**Universal Wireless System** Chair: **Chris Vein**, CIO City and County of San Francisco	

TUESDAY 28 NOVEMBER, 2006

Morning Session: 9:45am - 12:15pm **Afternoon Session:** 2:00pm - 6:00pm

9:45am-6:00pm	**D8: Emerging Wireless Communication Standards and Technologies** **Topic: Networks** Chair: **Dr. Dilip Krishnaswamy** (Intel)	
	D14: Netflow, IPFIX, and Beyond: Integrated Routing, Traffic Analysis, and Modeling for highly Accurate Network Engineering **Topic: Control and Management of High Performance Networks** Chair: **Dr. Cengiz Alaettinoglu** (Packet Design Inc.)	**D6: Seamless Mobility** **Topic: Networks** Chair: **Rana P. Sircar** (Wipro Technologies)
9:45am-6:00pm	**D10: Modeling and Simulation Tools for Network Designers and Developers** **Topic: Simulation Systems** Chairs: **Jack L. Burbank** (JHU/APL)**, William Kasch** (Johns Hopkins University/APL)**,** and **Jon Ward** (JHU/APL)	
9:45am-6:00pm	**D1: IPTV Iteroperability, from Buzzword to Reality** **Topic: IPTV** Chair: **Richard Brand** (Nortel)	

WEDNESDAY 29 NOVEMBER, 2006

Morning Session: 9:45am - 12:15pm **Afternoon Session:** 2:00pm - 6:00pm

	D4: Challenges and Opportunities in Software Outsourcing to China **Topic: Outsourcing** Chairs: **Dr. Stanley Chum** (Bitek Communications Inc.) and **Dr. Jason Cheng** (Beijing ZGC Software Association)	**D11: BT Case Study – BT's 21st Century Next Generation Networks and Systems** **Topic: Next Generation Networks and Systems** Chair: **John P. Wittgreffe** (BT Group PLC)
	D7: Emerging Communications/Networking Technologies and Services in India **Topic: Networks** Chair: **Dr. Dilip Krishnaswamy** (Intel)	**D9: NSF and Industry Support for Convergence Curriculum Development** **Topic: Affordable Technical Education Programs** Chairs: **Tim Ryan** (City College of San Francisco), **Pierre Thiry** (City College of San Francisco), **and James Jones** (Photisis Consulting)
	D2: Beyond the Hype: the Theory, Practice, and Real World Application of Quantum Cryptography **Topic: Quantum Cryptography** Chairs: **Dr. Audrius Berzanskis** (MagiQ Technologies) and **Andrew Hammond** (MagiQ Technologies)	**D13: Nanotechnology in Communications** **Topic: Nanotechnology** Chair: **Dr. Amr S. Helmy** (University of Toronto)
9:45am-6:00pm	**D5: Photonic Design Automation of Optical Communication Systems** **Topic: Design Techniques** Chair: **Dr. Andre Richter** (VPIsystems) and **Dr. James D. Farina** (VPIsystems)	

THURSDAY 30 NOVEMBER, 2006

9:45am-6:00pm	**D3: Emerging Wireless/Networking/Communication Technologies in China** **Topic: Networks** Chair: **Kai Miao** (Intel Corp)
9:45am-6:00pm	**D12: Ubiquitous Human to Human Telecommunication Systems Design, Development and Standardization** **Topic: Networks** Chair: **Dr. Ryoichi Komiya** (National Institute of Information and Communications Technology, Japan)
9:45am-6:00pm	**D15: Session Initiation Protocol (SIP): A technology for enabling next generation networks and services** **Topic: Next Generation Networks and Systems** Chair: **Dr. Arup Acharya** (IBM TJ Watson Research Center), **Dr. Archan Misra** (IBM T J Watson Research Center), and **Avshalom Houri** (IBM Software Group)

TUTORIALS

IEEE GLOBECOM 2006 is pleased to offer 23 tutorials. These in-depth sessions presented by experts have been specifically selected to compliment the IEEE GLOBECOM 2006 technical program.

Monday 27 November, 9:00am – 12:00pm

T2: Mutiple Antenna Systems-From Optimum Combining to MIMO: an approach based on random matrix theory

Topic: Wireless Communications

Instructors: Dr. Marco Chiani, Univ. of Bologna
Dr. Moe Win, LIDS MIT

This tutorial provides the basic principles and applications of multiple antenna systems, including MIMO and distributed MIMO, and their analysis based on random matrix theory. We discuss recent results on the effect of space and time correlation on the capacity of MIMO systems. Then we present practical solutions for MIMO systems, and their performance analysis. Finally, we illustrate some applications of multiple antenna systems and MIMO in cellular systems, wireless LAN, and cooperative diversity for energy constrained wireless sensor networks.

Monday 27 November, 9:00am – 5:00pm

T3: MPLS - the Importance of Offering the Right Solution at the Right Moment. Timeliness, Benefits, and Deployment from the Origins, to ATM, to Optical Networks

Topic: MPLS

Instructor: Dr. Mario Baldi, Politecnico di Torino

This tutorial provides an overview of MPLS from its inspiring principles to its various fields of application. By retracing the evolution of MPLS, the tutorial discusses how it became the next technology promising to satisfy present and future networking needs.
After a presenting the basic mechanisms and operating principles of MPLS, the tutorial discusses the two feature of MPLS that make it a particularly important technology today. The first one, which the tutorial gives particular emphasis to, is related to enabling traffic engineering. First, the limitations of IP with respect to the realization and operation of large backbones are analyzed. Then, traffic engineering features that enable MPLS to overcome such limitations are illustrated together with their underlying mechanisms and protocols.
The second important feature is related to the control plane of MPLS that, on the one hand, is well integrated with the control plane of IP, on the other hand is suitable for deployment on connection oriented networks. For this reason the control plane of MPLS has become a unifying solution for various network technologies. The tutorial first explains the relation between MPLS and different infrastructure technologies, such as Ethernet, PPP, ATM and FR, DWDM, and circuit switching. Then the control plane of MPLS is described discussing how MPLS signaling protocols are used for set-up and restoration of MPLS Label Switched Paths (LSPs), possibly generalized in terms of circuits, optical channels, and sub-lambda channels.
The participants are expected to have basic knowledge on packet switching and the Internet Protocol Suite.

Monday 27 November, 2:00pm – 5:00pm

T16: MIMO Detection: Theory and Practice

Topic: Communication Theory

Instructor: Dr. John R. Barry, Georgia Tech

This tutorial presents the basic principles of MIMO detection. We describe the fundamental problem, and present an overview of MIMO techniques that are used in practice. These include linear detection techniques, such as the zero-forcing and mibomnimum-MSE detectors. We will provide several views of the decision-feedback detector, including the nulling-and-cancelling view, the matrix view, the Gram-Schmidt view, the whitened-matched filter view, and the linear-prediction view. We will compare the ZF and MMSE versions of these detectors. We will also describe multistage detectors and tree-based detectors like the sphere detector and its variations, as well as lattice-aided detectors. The impact of ordering on performance and complexity will be described.
This tutorial will provide an overview of MIMO detection as currently practiced, and it will identify emerging trends and current research in this area.

Monday 27 November, 9:00am – 12:00pm

T4: WiMAX: An Advanced Broadband Wireless System

Topic: Wireless Communications

Instructor: Dr. Doru Calin, Bell Labs, Lucent Technologies

The tutorial is primarily addressing the emerging broadband wireless solutions as specified by the IEEE 802.16 standards, often referred to as WiMAX (Worldwide Interoperability for Microwave Access) technology. WiMAX is an Orthogonal Frequency Division Multiplexing (OFDM) based system which offers promising high spectral efficiency, scalable carrier bandwidth options (e.g. from 1.25MHz to 20MHz), flexible spectrum options (e.g. 2-6GHz), multiple duplexing options (Time Division Duplexing & Frequency Division Duplexing), various subchannelization options and users mobility thanks to its 802,16e variant. Technologies such as Hybrid Automatic Repeat Request (H-ARQ), Space Time Coding (STC), Advanced Antenna Systems (AAS), Multiple Input Multiple Output (MIMO) and Space Division Multiple Access (SDMA) have been enhanced to support mobile environments and to improve the broadband access speed.

Monday 27 November, 2:00pm – 5:00pm

T6: Unraveling QoS in 802.16 Wireless Broadband Access Networks: The Role of MAC, Cross-Layer Design, and Scheduling

Topic: Wireless Communications

Instructors: Dr. Vishal Sharma, Metanoia, Inc./IIT Bombay
Dr. Abhay Karandikar, IIT Bombay

The main theme of this workshop/tutorial will be to elucidate medium access control (MAC) layer operation and cross-layer design techniques for providing quality-of-service (QoS) in wireless broadband networks. We will use the recently approved IEEE 802.16 standard as an example, for two important reasons:
The rich feature-set it presents, and the flexibility it provides the system/network designer in choosing various schemes for scheduling traffic, while accounting for interactions between an advanced PHY (physical layer) and the corresponding MAC (data link).
Growing interest from operators worldwide in this emerging technology, due to the prospects of using it in a variety of applications, such as wireless data backhaul or in regions of the world where there is little or no wired infrastructure.
The IEEE 802.16 standard for fixed and mobile wireless broadband access systems is a complex standard with many features to enable data services over BWA links. These include, for instance, longer range (of 10s of miles), advanced coding and modulation schemes (OFDM, OFDMA) and power control at the physical layer, and the definition of traffic classes and advanced automatic-repeat request (ARQ) schemes at the MAC layer, to name a few.
From a traffic scheduling perspective, one must understand the key features of the standard that relate to QoS at the MAC layer, and develop a range of alternative QoS architectures that can provide the required performance. It also requires developing insights into the role/functions of the principal components of these architectures. For example, base-station (BS) or subscriber-station (SS) schedulers, traffic request classifiers, contention estimators, and so on.

Monday 27 November, 2:00pm – 5:00pm

T19: Sensor Networks - Protocols, Technologies and Applications

Topic: Networking the Globe

Instructor: Dr. Anura P. Jayasumana, Colorado State University

This tutorial will provide a review of sensor networks, and look at the fundamental issues in designing and analyzing sensor networks. Emerging and potential applications will be considered together with the associated sensors. Localization and tracking will be used as examples to expose the scalability constraints in these sensor networks. Network architectures, protocols, and standards will be covered, including sensor hardware, net-

working, OS support, algorithms, and scalability. Also covered will be querying, routing, and network self-organization.

Monday 27 November, 9:00am – 12:00pm

T1: Broadband Fiber Access

Topic: Advanced Technologies & Protocols for Optical Networks

Instructor: Dr. Leonid G. Kazovsky, Stanford University

This tutorial will include results of some six years of research conducted by my group, Photonics and Networking Research Laboratory at Stanford University. The research was conducted with a generous support of various industrial companies (including both service providers and equipment manufacturers) and government agencies (such as NSF).

Monday 27 November, 9:00am – 12:00pm

T7: Traffic Analysis for Network Security

Topic: Computer & Network Security Systems

Instructor: Dr. Thomas Chen, Southern Methodist University

This half-day tutorial will give an overview of how traffic data is collected and analyzed for security applications. The tutorial is organized into four major parts. The first part presents an introduction to various network-based security threats including scans, viruses, worms, spyware, and denial of service attacks. This part is essential background to understanding how these attacks typically generate specific patterns of traffic that is different and distinguishable from legitimate traffic. The success of traffic analysis depends on the observation that malicious traffic behaves in a uniquely identifiable way.

The second part of the tutorial describes how traffic data is monitored and collected from various points in the network, such as sniffers, routers, firewalls, intrusion detection systems, and honeypots. Descriptions will include illustrations with examples of open-source and proprietary software tools.

The third part of the tutorial shows methods to analyze traffic data at the packet, flow, and session levels. The processing of protocol header information in packets at the IP, TCP, and other protocol layers is described. The necessity of parsing and filtering the (usually voluminous) raw traffic data is motivated, with examples of relevant software tools.

The last part of the tutorial describes interpretation of traffic data to detect intrusions based on known signatures or behavior anomalies. Examples of manifestations of scans, backdoors, viruses, worms, and other types of attacks are shown. Finally, the tutorial will be concluded with a summary of current difficulties and limitations of traffic analysis for security.

Monday 27 November, 2:00pm – 5:00pm

T10: Service Delivery Platforms - Driving Enablers for NGN Service Revenue

Topic: Next Generation Networks

Instructors: Dr. Anett Schuelke, NEC Network Laboratories
Dr. Daniele Abbadessa, NEC Network Laboratories

This tutorial starts with an identification of the challenges for creating, provisioning and enabling services in NGN. The need to create a large service portfolio and introduce it quickly to market requires operators to move away from the traditional silo-approach for service developments, as already recognized by fixed and mobile operators. They are starting to invest in IP-based networks and new service platforms. SIP Application Servers IMS and Service Delivery Platforms (SDP) are the services areas that will attract most of the investments. Operators will adopt different strategies for the introduction of SIP Application Server, IMS and SDP, however, markets trends shows that the initial IMS and SDP deployments will speed-up in the next 12 to 24 months, whilst full deployment are expected to follow at later dates.

When it comes to SDP, it is important to stress the fact that there is no comprehensive definition for it, because SDP functionalities do not reside on a single platform, but rather comprise of an integrated set of software modules. These modules collectively enable carriers to launch and manage potentially thousands of services to their customers. We will attempt to introduce and explain the current standardization activities and their technical enablers together with their achievements discussed in alignment with the current market trends. We will provide an extensive overview of the Service Oriented Architecture (SOA) approach evolving from the IT world and provide the connection o the Telecom's service oriented architecture approach. This is followed by an in-depth overview of Telecom Standardizations, their SDP evaluation and the roadmaps of next-generation service creation and provisioning solutions. The tutorial concludes with a discussion of the issues and challenges to deploy NGN service platforms and building user-centric services.

Monday 27 November, 9:00am - 5:00pm

T11: Mobile DTV

Topic: Multimedia Communications

Instructor: Dr. Ernest Tsui, Intel

The purpose of this tutorial is to provide mobile platform OEMs, DTV card vendors, DTV component manufacturers, and broadcast TV infrastructure providers guidance in the design and development of systems that would provide satisfactory DTV broadcast reception to notebook computers and handheld devices under the constraints of reasonable size, complexity, and power. The areas covered will be client and infrastructure architectures, required performance with emphasis on mobile environments, thermals, power dissipation, and co-existence with other wireless transmitters on the notebook. We concentrate on the PHY layer and network and transport layers that are associated with the PHY layer in regards to SNR and interference. Other aspects such as transport, digital rights management, conditional access, etc. are not within the scope of this tutorial.
The tutorial is intended for the following audiences and purposes:
• Development of detailed DTV product specifications and DTV infrastructure requirements
• Architects and designers of DTV clients on notebook computers

Monday 27 November, 2:00pm – 5:00pm

T9: IPTV Technologies and Deployment Challenges

Topic: Multimedia Communications

Instructors: Anurag Srivastava, Bell Laboratories
Dr. Swarup Acharya, Bell Labs, Lucent Technologies

In this tutorial, we will provide an overview of the network architectures and technologies that comprise an end-to-end IPTV system. As appropriate, we will highlight the various tradeoffs (e.g., channel change latency vis-à-vis compression technology) and compare it with the CATV approach. We will focus on hardware and software technologies from the service provider core to the home --- multicast transport, DSL technologies, MPEG standards and home-networking requirements such as the IPTV set-top box. We will also review the regulatory issues faced by Telcos relating to unbundling of their access infrastructure and statewide franchisee agreements. Since IPTV may not only be limited to Fiber/DSL, we briefly highlight competitive threats from emerging technologies such as Broadband over Power Lines. Finally, we describe the various lifestyle services such as "CallerId-on-TV" and converged voice-video applications that provides IPTV its cutting-edge differentiation.

Monday 27 November, 9:00am – 5:00pm

T14: IEEE802.11n: Throughput, Robustness, and Reliability Enhancements to WLANs

Topic: Wireless Communications

Instructors: Dr. Eldad Perahia, Intel Corporation
Robert Stacey, Intel Corporation

This tutorial provides a comprehensive overview of the technology in the p802.11n draft standard.
We begin with an overview of the applications, environments, channel models, use cases, and usage models developed by the study group and task group which provided the framework for proposal development. We continue with a history of the various coalitions that ultimately led to the final joint proposal adopted as the draft standard.
The technical description of the draft standard starts with a detailed dis-

cussion of the key throughput enhancing features: multiple-input, multiple-output (MIMO) / space division multiplexing (SDM) in the PHY and packet aggregation in the MAC. Further throughput enhancements in the PHY include 40 MHz channelization, reduced guard interval, tone filling, high rate coding, and efficient (greenfield) preambles. In the MAC this includes enhancements to the block acknowledgement (BA) protocol, such as a compressed BA frame format, implicit BA request, partial state operation, and no ACK delayed BA protocol. The reverse direction data protocol, which provides throughput enhancements for certain types of traffic patterns, is also discussed.
Additional topics include PHY interoperability techniques and MAC techniques and reduced inter-frame space (RIFS) operation, 20/40MHz phase coexistence operation, and channel width management.

Monday 27 November, 9:00am – 5:00pm

T21: Almost Sixty Years of Error-Correction Coding: How we Reached the Shannon Limit

Topic: Communication Theory

Instructor: Dr. Bernard Sklar, Communications Engineering Services

Block codes, convolutional codes, and trellis-coded modulation represent the core techniques for obtaining coding gain. We review these fundamentals by addressing: how to generate codes, how to decode them, the advantage of non-binary codes (such as Reed-Solomon) in bursty noise, the benefits of soft-decisions, and how they are implemented with Viterbi decoding of convolutional codes. Owing to recent developments, soft-decision decoding has now become very important for block codes - which leads us to the main thrust of this tutorial - examining the remarkable coding strides accomplished in this decade. These advances, which are bringing digital system performance extremely close to the theoretical limitation of what is possible, entail the use of iterative decoding techniques which we examine by using turbo-code and low-density parity-check (LDPC) code examples. We focus on the astounding performance of LDPC, and demonstrate the workings of the message-passing algorithm used with such iterative decoding methods.

Monday 27 November, 2:00pm – 5:00pm

T23: Concluding the Packet-TDM Controversy

Topic: Packet and Circuit Switching

Instructor: Tom Minnis, Strategic Advisory Group

The purpose of this tutorial is to provide a balanced knowledge of both packet switching and circuit switch technologies - two basic switching methodologies for building networks. The tutorials will provide the design concepts and principles underlying circuit-switching and packet-switching systems. These tutorials will help bridge the conceptual and language barriers that exists between the packet and circuit camps. Becoming fluent in both packet and circuit switching technologies will enable engineers to design systems that take advantage of both technologies, while not stumbling over the limitations of either.

Friday 1 December, 9:00am – 12:00pm

T18: Fixed Mobile Convergence: Architectures, Solutions, Services

Topic: Wireless Communications

Instructor: Joseph Ghetie, Telcordia Technologies Consultant

The wireless networking coverage includes fixed Wireless Local Area Networks (WLAN), Wireless Access (WiMAX), Wireless PAN (WPAN) and GSM/CDMA mobile cellular radio networks. Current and emerging networking solutions are evaluated for their approach, functionality and management abilities. 802.11a/b/g WLANs, 802.16 WiMAX, GSM/GPRS cellular radio, and the standardization effort in IEEE, Wi-Fi Alliance, 3GGP Release 6, Unlicensed Mobile Access (UMA), IP Multimedia Subsystem (IMS), and IETF Session Initiation Protocol (SIP) are analyzed. The tutorial also evaluates the Quality of Services of various solutions targeting the use of a common handsets and unique telephone numbers across wireless networks.

Friday 1 December, 2:00pm – 5:00pm

T8: Technologies for All-IP Wireless Networks from 3G to 4G

Topic: Next Generation Networks

Instructors: Dr. Prathima Agrawal, Auburn University
Dr. Jyh-Cheng Chen, National Tsing Hua University

This tutorial is intended to address state-of-the art technologies necessary for building a practical all-IP wireless network. The tutorial will focus on IP layer and upwards. Evolution of technologies from 2G, 2.5G, 3G to 4G will be discussed. Challenges in realizing applications like mobile IP telephony and streaming multimedia over wireless IP networks will be elaborated. The tutorial will also cover various mature and on-going IETF protocols including signaling, registration, configuration, dynamic address-binding, location management, AAA, quality of service, broadcasting streaming content, and integration with legacy cellular systems for both IPv4 and IPv6 based networks. Practical experience of the presenters in building a prototyping indoor-outdoor testbed emulating mobile wireless Internet in conformance with 3GPP and 3GPP2 architecture will be shared.

Friday 1 December, 9:00am – 5:00pm

T12: Wireless Mesh Networking

Topic: Wireless Communications

Instructors: Dr. Prasant Mohapatra, University of California
Dr. Samir Das, SUNY at Stony Brook
Steven Conner, Intel Corporation

Wireless mesh networks are multihop networks of wireless router platforms. A mesh network can provide multihop communication paths between wireless clients – serving as a community network or as a broadband access network for the Internet. Wireless mesh networks are considered cost-effective alternatives to wireless LANs, as there is no necessity to deploy any wired infrastructure to support a mesh network. There are several technical challenges that must be addressed for mesh networking to be as effective as any other form of broadband networking. Much of these challenges relate to multihop wireless communication and limited capacity. This tutorial is designed to introduce essential mesh networking concepts, lay down the technological challenges and describe how the research community is addressing them. We will explore the issues associated to each layer of the protocol stack as well as various cross-layer approaches. We will also discuss the experiences and lessons learnt from various experimental testbeds - academic and industrial. Techniques to build simple mesh network platforms will be explained. We will also discuss about the ongoing standardization efforts (IEEE 802.11s) and commercial advances in the area.

Friday 1 December, 9:00am – 12:00pm

T20: Adaptive MIMO Techniques and Performance

Topic: Wireless Communications

Instructors: Dr. Iain B. Collings, CSIRO
Dr. Robert W. Heath Jr, University of Texas at Austin
Matthew R. McKay, University of Sydney
Antonio Forenza, University of Texas at Austin

This tutorial will present an introduction to general MIMO systems, with a particular focus on practical correlated transmission environments. We will discuss a number of low complexity transmission architectures suitable for practical coded MIMO implementations, including the IEEE802.11n and IEEE802.16 standards. The focus of the tutorial will be on examining the potential advantages that can be gained by adapting and switching between different coded MIMO transmission schemes, depending on the quality and correlation in the MIMO channel. A summary of the main analysis techniques will be presented, as well as simulation studies which examine the various system design tradeoffs.

Friday 1 December, 2:00pm – 5:00pm

T13: Reconfigurable Technology for MIMO-OFDM Systems with a focus on 802.16/802.16e

Topic: Wireless Communications

Instructors: Dr. Raghu M. Rao, Xilinx Inc.
Dr. Chris H. Dick, Xilinx Inc

In this tutorial we will start off by discussing the wireless propagation environment and study the characteristics of the wireless environment in the presence of scattering and mobility. We will introduce the audience to the key concepts of OFDM and MIMO-OFDM systems, relating aspects of information theory that led to the development of MIMO-OFDM systems. We will then consider the practical issues related to OFDM system and receiver algorithms, including the impact of RF and analog impairments on OFDM and MIMO-OFDM systems. The 802.16/802.16e physical layer will be discussed and will be used to exemplify the various aspects of OFDM and MIMO-OFDM technology.
In addition we will discuss some architectural aspects of FPGAs that make them a popular choice for developing wireless communication systems at the basestation, given their configurability and time to market advantages. Newer generation FPGAs also have dedicated fabric for efficient implementation of DSP and communication systems. Newer, higher level design methodologies, further improve this time to market advantage of FPGAs. We will briefly discuss these methodologies and also introduce some of the DSP and communication centric features of popular FPGAs.

Friday 1 December, 9:00am – 5:00pm

T15: System-level MIMO: Theory and Applications

Topic: Wireless Communications

Instructors: Dr. Howard C. Huang, Bell Labs, Lucent Technologies
Dr. Constantinos B. Papadias, Athens Information Technology

The purpose of this tutorial is to explore the performance tradeoffs of MIMO in wireless systems consisting of multiple simultaneous MIMO links found in emerging next-generation wireless networks. The tutorial would be based on our most up-to-date understanding of the theoretical system-level traits of MIMO systems as applied to different types of wireless networks. Beyond providing a system-level perspective of MIMO, this tutorial also addresses system simulation methodologies for MIMO networks and shows how the discussed principles are already penetrating the design and analysis of next-generation wireless standards.

Friday 1 December, 9:00am – 5:00pm

T17: Generalized MultiProtocol Label Switched (GMPLS) Networks

Topic: Advanced Technologies & Protocols for Optical Networks

Instructor: Dr. Malathi Veeraraghavan, University of Virginia

This tutorial will first describe the GMPLS architecture and protocols. This includes a quick review of data-plane technologies, such as SONET, WDM and Ethernet 802.1q VLANs, followed by a more-detailed treatment of the three GMPLS control-plane protocols, RSVP-TE, OSPF-TE and LMP. We will then describe different applications of GMPLS networks, including both commercial, such as fast restoration and rapid provisioning for OPEX savings, as well as research/educational, such as Grid computing, support of eScience projects, etc. Recently, several GMPLS testbeds such as CHEETAH, Dragon, HOPI, UltraScience Net, Ultralight, OMNInet, CA*net4, UKlight, SURFnet, etc. have been created to support science applications. We will describe the goals and accomplishments of these testbed projects. Finally, we will cover some advanced topics such as multi-region networks in which different types of GMPLS networks are interconnected. Security and billing are important issues in today's Internet. We will describe proposed solutions for control-plane security and billing in GMPLS networks.

Friday 1 December, 9:00am – 12:00pm

T22: Roadmap to Cross-Layer and Cross-System Optimization for B3G

Topic: Wireless Communications

Instructors: Dr. C. SKIANIS, NCSR 'Demokritos'
Dr. George Kormentzas, University of Aegean

The key objectives of this tutorial are in part motivated by the importance of cross-layer interactions, in order to efficiently use the radio resource space in wireless networks, and in part by the vision of the integration of heterogeneous wireless technologies providing new wideband services running over flexible QoS-enabled IP based access and core networks. This tutorial brings into the foreground a broad range of research results on cross-system and cross-layer optimization algorithms taking into account issues related to usage behavior, mobility patterns, traffic profiling, QoS issues, security, network selection and relevant horizontal/vertical handovers. Specifically, the tutorial will firstly address the importance of cross-layer interactions, in order to efficiently use the radio resources in wireless networks. Afterwards, heterogeneous platform management algorithms will be presented and advanced resource management policies, including the potential for load balancing across different systems/networks, will be discussed. Subsequently, studies concerning both cross-layer and cross-system optimization in B3G environment will be presented. Finally, specific solutions/cases deployed in the context of various EU-funded projects will be analyzed in accordance with current efforts of various forums such as 3GPP, IEEE, IETF, ETSI and WWRF.

Friday 1 December, 2:00pm – 5:00pm

T5: Advancements in Converged WDM Network Architectures: Extending from the Multi-service Metro to an IP-over-WDM Core

Topic: Advanced Technologies & Protocols for Optical Networks

Instructor: Dr. Loukas Paraschis, Cisco Systems

This tutorial reviews the evolution and the advancements of converged WDM architectures, initially in the multi-service metro networks, and currently into an IP-over-WDM core. We analyze the functionality, characteristics, and challenges of these networks. We also discuss the key applications that motivated these networks to scale levering WDM transport. The tutorial then focus on the emerging intelligent WDM converged transport layer which improves significantly the network capital and operational cost. We evaluate the interplay among the network architectures, and the enabling technologies, most notably including OADM and switching, optical amplification and dispersion compensation, electronic processing (FEC, EDC) etc. Unlike traditional WDM transport where the main design objective has been to maximize the capacity and reach of networks with typically well-defined (often simple point-to-point) topologies, converged WDM networks call for cost-sensitive, “open” architectures that allow for service flexibility. We discuss in detail the innovation in WDM system design, and the most important performance characteristics of the current and emerging optical technologies that enable high performance metro-optimized fiber transmission digital systems, that cost-effectively scale to multiple 10 Gb/s wavelengths and more than 1000 km, meeting the diverse needs of current and future enterprise and residential applications. We further review the future evolution in metro networks, along with the important related research topics. We then review the currently emerging converged IP-over-WDM core network architectures, and identify the related promise in CapEx and OpEx efficiencies. For these core networks, flexibility remains the primary motivation but scalable 40 Gb/s WDM transport for thousands of km becomes also important. We review the future evolution in these networks, along with the important related research topics.

For complete tutorial descriptions and the biography of each instructor see:
www.ieee-globecom.org/2006/tutworkshops.html

WORKSHOPS

All workshops will have notes. The notes are included with the workshop registration fee. Copies can be purchased with conference registration advance or on-site.

Monday 27 November, 9:00am – 12:00pm

W1: The Seventh International Workshop on Optical Networking Technologies: Examining the Case for Optical Burst Switching

Chair: Dr. Tarek El-Bawab, Jackson State University

Optical Burst Switching (OBS) introduces a new method of switching at the granularity of optical data bursts. This is a granularity between optical circuits, which are whole-sale large-bandwidth lightpaths, and optical packets, which are small data units that are difficult to buffer, process, and route using today's optical technologies. As such, OBS has the potential to enhance bandwidth efficiency and cost effectiveness in transport networks, and can circumvent some technological barriers facing optical packet switching. OBS has attracted a lot of interest among several research groups and become a popular topic of study worldwide. Several equipment vendors have also looked at OBS thoroughly. Many in the optical networking community consider this technology enthusiastically, and have adopted the case for OBS.

A lot of OBS research efforts however are confined to network simulations, and assume green-field or hypothetical scenarios. In practice, several architectural, technological, and economic issues are involved in the OBS proposal. OBS requires dynamic capability to rapidly allocate optical wavelengths to data bursts, and to rapidly release them after burst transmission. It requires advanced burst assembly strategies, scheduling algorithms, signaling, and control schemes. Progress in some optical component technologies is desirable, and may be required. Many professionals see difficulties in designing high-performance OBS networks that can satisfy all these requirements while achieving robustness, reliability, simplicity, and economics. Some are concerned about how a new OBS-based transport layer would fit into existing network architectures, and how it would work with IP/TCP, SONET/SDH, and other existing layers.

Monday 27 November, 9:00am - 5:00pm

W2: 1st International Workshop on Bandwidth on Demand

Chairs: Dr. Takeo Hamada, Fujitsu Laboratories of America
Dr. Burkhard Stiller, University of Zürich and ETH Zürich
Dr. Richard Rabbat, Fujitsu Laboratories of America
Dr. David Hausheer, University of Zurich

Electronic marketplaces for trading bandwidth have emerged since the late 1990's, but were seriously hit by the economic downturn in 2001. The promise of instant bandwidth availability had led to the development of market mechanisms that companies used to trade bandwidth just as other commodities. However, those trading markets all but disappeared with the bursting of the telecom bubble. Driven by the recent technical advances in telecommunications and the new potentials of emerging peer-to-peer (P2P) and next generation networks (NGN), the goal of this workshop is to take a fresh and innovative look at the concept of bandwidth on demand (BOD).

Recent advances in the Internet-based communications domain, in which the support of Quality-of-Service and diverse application services become possible, require in many cases short-termed bandwidth assignments for, e.g., large sporting events or cultural open air activities. In addition, the support of bandwidth trading in a fully decentralized and secured manner, e.g., based on P2P schemes, shows further advantages in terms of reliability and scalability for large-scale systems.

The area of bandwidth trading is receiving new interest with the changing nature of competition in the telecom industry. Competition is not along the traditional lines of providing phone service to the same customer and tagging along some data offerings, but is a cutthroat competition for the ownership of the customer's experience with phone, video, Internet and wireless service. These competing firms need to provision their network very efficiently and cost-effectively, and are adopting technologies such as an automated control plane and data-friendly transport technologies to enable a reduction in their operational expense. It is the aim of the workshop to understand how these aspects are going to change the telecom industry, what new services will be enabled and how ultimately the customer experience will change. With respect to the disappearance of centralized structures due to scalability concerns, the use of decentralized and trusted technology approaches in a fully distributed system, such as with P2P approaches, gains momentum. Avoiding single point of failures and providing secure solutions for fully distributed bandwidth trading infrastructures will result in feasible and open bandwidth on demand solutions.

Friday 1 December, 9:00am - 5:00pm

W3: MobiArch 2006 -- First IEEE/ACM Workshop on Mobility in the Evolving Internet Architecture

Chairs: Dr. Xiaoming Fu, University of Goettingen
Dr. Katherine Guo, Bell Labs
Dr. Jon Crowcroft, University of Cambridge

With the development of wireless access technologies and mobile devices, mobility has become an indispensable component of today's Internet vision. Yet, issues like efficient mobility management, locator-identifier split, multi-homing, security and operational concerns are still in their early stages of development. Moreover, the Internet architecture, its end-to-end principles and business models will require rethinking due to the massive penetration of mobility into the Internet.

Invited Presenters:
Mobile Networking and the IETF: **Charles Perkins**, Nokia
EU B3G Cluster Activities: **Ivano Guardini**, Telecom Italia Lab
Panel Session: **Hannes Tschofenig**, Siemens
TBD: **Taieb Znati**, Uuniversity. Pittsburg/NSF

Friday 1 December, 9:00am - 5:00pm

W4-Workshop on Automotive Networking and Applications

Chairs: Wai Chen, Telcordia Technologies
Onur Altintas, Toyota Info Technology Center, Japan

This workshop intends to bring together researchers, professionals, and practitioners to address recent developments and challenges in deploying vehicle-to-vehicle and vehicle-with-infrastructure networking technologies, and their applications including safety-assistance and driver-convenience. Sensors, radars, cameras, navigation systems, and microprocessors are technologies already in-use in vehicles to support applications such as parking-assistance, lane-keeping, and adaptive cruise-control. These technologies have greatly improved the levels of safety and comfort to drivers. Recently significant efforts have been made to enhance and integrate the latest wireless communications technologies into the vehicle and transportation systems to enable safety and information applications. For example, significant industrial and governmental efforts are underway to push from "passive-safety" to "active-safety" by employing advanced networking functions in vehicles and highway infrastructure.

When such communications and networking capabilities are installed, the vehicle itself can interact intelligently with other vehicles and the highway system, achieving a much higher degree of vehicular safety. Such capabilities can also support many exciting new applications, such as traffic management, vehicle diagnostics and mobile commerce. The increasing importance of vehicle and infrastructure communications is recognized by governments, highway authorities, automobile manufacturers and the academic community.

Submission Instructions

Authors are invited to submit full papers of up to 20 double-spaced pages, including references, figures and tables. All submissions should be submitted electronically in Postscript or Adobe PDF format to both of the workshop co-chairs at:
http://autonet2006.research.telcordia.com/myreview/

SOCIAL EVENTS

IEEE Communications Society Awards Luncheon - Tuesday 28 November 2006, 12:30pm
Celebrate with your colleagues at this biannual event honoring the achievements of the IEEE and IEEE Communications Society members. This event is included with the full conference registration. Tickets can be purchased for $60.00 per person.

IEEE GLOBCOM 2006 Welcome Reception - Tuesday, 28 November 2006, 6:30pm
The entire IEEE GLOBECOM 2006 Executive Committee welcomes you to San Francisco! Join us as we kick off the IEEE GLOBECOM 2006 Expo. This event is included with the conference registration fee. Accompany guests are welcome to attend.

Conference Dinner Show- Wednesday 29 November 2006 • Thursday 30 November 2006, 7:00pm
This year you will have the option to choose either to attend the Conference Banquet on either Wednesday 29 or Thursday 30 November. The banquet will feature live entertainment and promises to be a fun filled and exciting event. Please select your option dates when registering. This event is included with full conference registration. Tickets can be purchased for $125.00 for other conference registration categories and accompanying guests.

TOURS Guest Tours in and around San Francisco

The deadline for the tours is Friday, 3 November. Tours will be cancelled by 3 November if the minimum number of participants is not met.

San Francisco Highlights
(Approximately 4 hours)
Monday, 27 November, 2006, 1:00-5:00pm, $40
The forty nine square miles of San Francisco are a colorful tapestry of steep hills, picturesque houses, clanging cable cars, fishing boats, summer fog, Chinese pagodas, cosmopolitan cafés and breathtaking views. Five continents and three centuries blend together on forty-three hills, waiting to be discovered. Today you will see some of the legendary landmarks of “Everybody’s Favorite City.”

Magical Marin: Majestic Muir Woods & Sparkling Sausalito
Tuesday, 28 November, 2006, 9:00-1:00pm, $45

One of the first parks ever set aside for the coastal redwoods, this national park was named for the renowned conservationist, John Muir. The redwoods located here have a biological ancestry dating back well over a million years. Fossils of virtually identical trees appear in the record from some 160 to 170 million years ago, preceding the Jurassic Age of dinosaurs. These fossils are found across the Northern Hemisphere, in Manchuria, France, Alaska, Greenland and even on Arctic islands. Redwoods have no aging mechanisms, are extremely resistant to disease, and have few natural enemies. Thus individual redwoods can live to be thousands of years old. Your guests will have time to wander among these ancient trees. They will come away with a sense of the immense grandeur and spans of time encompassed by this noble forest.

Next your guests will visit sparkling Sausalito, a Riviera like bayside village with its winding wooded streets, eclectic houseboats, unique boutiques and art galleries. There will be ample time to explore the shops and galleries, or simply stroll along the waterfront and view the San Francisco skyline and Bay.

Emphasis on Art
Wednesday, 29 November, 9:30-1:30pm, $72

Guest will visit The California Palace of the Legion of Honor and San Francisco’s newest museum, the de Young, was founded in Golden Gate Park during the California Midwinter International Exposition of 1894.

Chinatown Discovery - A Walking Excursion
(Approximately 3 hours)
Wednesday, 29 November, 2:00 - 5:00pm, $50

Discover exotic Chinatown on foot! In downtown San Francisco, the present has been built over the remnants of the past. This is especially true of Chinatown. From the towering steel and concrete of San Francisco’s Financial District, you will pass the historic Lion Gates and be transported into the "city-within-the-City", which recalls the days of early Chinese immigration. The first Chinese settled these streets during the Gold Rush and were swiftly followed by thousands of others. Today, San Francisco's Chinese population is one of the largest outside of Asia.

The Best of the California Wine Country
(Approximately 8 hours)
Thursday, 30 November, 9:00 - 5:00pm, $115
Guests will explore the finest wine-producing region in the nation: California’s Napa and Sonoma Valleys.

SIGN UP FOR THESE TOURS EARLY SPACE IS LIMITED AND WE DON’T WANT YOU TO MISS OUT!

ABOUT SAN FRANCISCO

San Francisco is a world-class destination and continues to be "Everybody's Favorite City." From grand, sweeping views to neighborhood color and character, from glimpses of history to world-class dining and shopping - San Francisco is home to a little bit of everything.

For further information please visit: http://www.onlyinsanfrancisco.com

San Francisco is served by two international airports: The San Francisco International Airport (SFO) http://www.flysfo.com and the Oakland International Airport http http://www.oaklandairport.com/index2.cfm. The conference hotels are located approximately 30 minutes from SFO and 45 minutes from the Oakland Airport.

Ground transportation is available from both airports via Taxis, Door-to-Door Vans, Pre Arranged Vans, or Public Transit. The cost of a taxi from SFO to the conference hotels is between $37.00-$45.00

Airport Express San Francisco
http://www.airportexpresssf.com

Bay Shuttle Service
http://www.bayshuttle.com

Lorrrie's Airport Shuttle
http://www.lorries-shuttles.com/sfovancart.htm

BART/Public Transportation
http://www.bart.gov

HOTEL INFORMATION

The conference hotels for IEEE GLOBECOM 2006 are the Fairmont Hotel, *Mark Hopkins and *Stanford Court Hotels.
To make a reservation please visit the respective websites. Reservations must be received by **3 November, 2006**.

Fairmont Hotel San Francisco (Headquarters Hotel)
Single/Double Main Building $199.00 + sales tax

950 Mason Street
San Francisco, California, USA
Tel: +1-415-772-5000
For online reservations
http://www.fairmont.com/sanfrancisco/
On-Line Pass Code:GRIEE1

Mark Hopkins InterContinental San Francisco
Single/Double $199.00 + sales tax

Number One Nob Hill
999 California Street
San Francisco, California 94108 USA
Tel: +1 415 392 3434, Fax: +1 415 421 3302
For online reservations
http://www.ichotelsgroup.com/h/d/ic/1/en/cwshome/DPRD-6RFTWF/SFOHA

The Stanford Court, A Renaissance Hotel
Single/Double $199.00 + sales tax

905 California Street
San Francisco, CA 94108 USA
Tel: 1-415-989-3500

For Superior Rooms @ $199
http://marriott.com/property/propertypage/sfosc?groupCode=ice-icea&app=resvlink

For Deluxe Rooms @ $219
http://marriott.com/property/propertypage/sfosc?groupCode=ice-icec&app=resvlink

*The Mark Hopkins and Stanford Court Hotels are directly across the street from the Fairmont Hotel.

IMPORTANT NOTICE:
The IEEE Communications Society has a contractual obligation to fill a guaranteed block of rooms the Fairmont, Mark Hopkins and Stanford Court. Significant financial penalties will be assessed if the Society should IEEE GLOBECOM 2006 fall short if the expected number of guest rooms committee. By staying at the conference hotel, you will enjoy the convenience of residing at the conference venue and to a far greater extent provide valued assistance in support of IEEE ComSoc's financial obligations.

1

Please Print or Type

Name: _____
Prof./Dr./Mr./Ms./Mrs. Last Name First Name

Preferred Name on Badge/Nickname: _____

Company/Organization: _____

Title/Position: _____ Email: _____
(required for confirmation)

Mailing Address: _____
Street/PO Box

_____
City Province/State Country Postal/Zip

Telephone: ( ) _____ Fax: ( ) _____

Accompanying Guest : _____
Last Name First Name Badge/Nickname
(for name badge only)

Members of IEEE and the following ComSoc Sister Societies may register at the MEMBER rate:
Please enter your membership number in the space provided. If you are a member of an IEEE sister society, please check off below.
❒AEIT ❒CCIS ❒CIC ❒CIE ❒CIEE ❒EZS ❒HTE ❒IEICE ❒IETE ❒KICS ❒LITKA ❒POPOV ❒REV ❒SEE ❒SBrT ❒SR ❒VDE
Membership Number _____
I am registering as (check all that apply): ❒ A Technical Paper Presenter ❒ A Technical Paper Author ❒ A Workshop Paper Author/Presenter ❒ A Technical Session Chair ❒ A Design & Developers/ Speaker/Organizer ❒ IEEE GLOBECOM EXPO Only ❒ A Tutorial Presenter
❒ ACCESS '06 Executive Business Forum participant

- My primary interest is (check one) ❒ IEEE Globecom 2006 ❒ Design & Developers Forum ❒ ACCESS '06 Executive Business Forum ❒ EXPO Only
- How did you hear about IEEE GLOBECOM 2006? (check one) ❒ Advance Program ❒ Web Site ❒ Colleague ❒ E-Mail ❒ Other _____
- I have special needs (please check & attach description): ❒ access ❒ audio ❒ visual ❒ vegetarian ❒ Other _____
- Organizational Status: ❒ Industry ❒ Academia ❒ R&D ❒ Government ❒ Other _____

Full registration (RG-01, RG-02, RG-05, RG-06, RG-09, RG-10, RG-17, RG-18) includes:
Welcome Reception, Plenary, Technical Sessions, Access'06 Executive Business Forum, D & D Forum, entrance to exhibits, Awards Luncheon, Conference Banquet and CD-ROM Record

Limited Registration RG-03, RG-04, RG-07, RG-08, RG-11, RG-12, RG-19, RG-20 includes:
Welcome Reception, Plenary, Technical Sessions, Access'06 Executive Business Forum, D&D Forum, entrance to exhibits and CD-Rom Record

Accompanying Guest Includes:
Welcome Reception, Guest Hospitality Suite and ability to purchase Tour and Social Event Tickets

Tutorial/Workshop Only Includes:
Welcome Reception, entrance to the Tutorial/Workshop(s) registered for and the notes or proceedings for those sessions

All Other Registration Includes:
Welcome Reception, Plenary, Technical Sessions, Access'06 Executive Business Forum, D & D Business Forum, Telecom Business Forum, Access to Expo floor and CD-ROM.

2 **REGISTRATION FEES - All attendees must be registered.** Select one of RG01-RG023.

TECHNICAL PAPER PRESENTER REGISTRATION (On/By Wednesday 30 August, 2006)
IEEE/ComSoc Policy: All IEEE GLOBECOM 2006 technical paper presenters must register at the FULL or LIMITED rate. For authors presenting multiple papers, one FULL or LIMITED registration is valid for up to three papers.
EDAS number _____

	On/By 30 October	
RG-01 – PRESENTER – Full ComSoc Member	$775	$_____
RG-02 – PRESENTER – Full IEEE Member (includes complimentary Full year IEEE ComSoc membership)		
❒ Check here if you do not wish a complimentary IEEE ComSoc Membership	$815	$_____
RG-03 – PRESENTER – Limited IEEE ComSoc Member	$580	$_____
RG-04 – PRESENTER – Limited IEEE Member (includes complimentary Full year IEEE ComSoc membership)		
❒ Check here if you do not wish a complimentary IEEE ComSoc Membership	$620	$_____
RG-05 – PRESENTER – Full Non Member	$1025	$_____
RG-06 – PRESENTER – Full Non Member (includes 2007 IEEE ComSoc Affiliate Membership)*	$1125	$_____
RG-07 – PRESENTER – Limited Non-Member	$830	$_____
RG-08 – PRESENTER – Limited Non Member (includes 2007 IEEE ComSoc Affiliate Membership)*	$930	$_____

(see next page)

Required info:
Name: _____ E-mail address: _____

ATTENDEE MEMBER REGISTRATIONS

	On/By 30 October	After 30 October	
RG-09 - FULL IEEE ComSoc MEMBER	$775	$885	$_____
RG-10 – FULL IEEE MEMBER (includes complimentary Full year IEEE ComSoc membership) Check here if you do not wish a complimentary IEEE ComSoc Membership	$815	$925	$_____
RG-11 - LIMITED IEEE ComSoc MEMBER	$580	$690	$_____
RG-12 – LIMITED IEEE MEMBER (includes complimentary Full year IEEE ComSoc membership) Check here if you do not wish a complimentary IEEE ComSoc Membership	$620	$730	$_____
RG-13 - 1 DAY IEEE COMSOC MEMBER (TUE WED THU CIRCLE DAY)	$360	$445	$_____
RG-14 - 1 DAY IEEE MEMBER (TUE WED THU CIRCLE DAY)	$400	$485	$_____
RG-15 - LIFE MEMBER	$50	$50	$_____
RG-16 - STUDENT MEMBER	$250	$300	$_____

ATTENDEE NON-MEMBER REGISTRATIONS

RG-17 FULL NON-MEMBER	$1025	$1190	$_____
RG-18 FULL NON-MEMBER (includes 2007 IEEE ComSoc Affiliate Membership)*	$1125	$1290	$_____
RG-19 LIMITED NON-MEMBER	$830	$995	$_____
RG-20 LIMITED NON-MEMBER (includes 2007 IEEE ComSoc Affiliate Membership)*	$930	$1095	$_____
RG-21 1-DAY NON-MEMBER (TUE WED THU CIRCLE DAY)	$585	$700	$_____
RG-22 1-DAY NON-MEMBER (TUE WED THU CIRCLE DAY) (includes 2007 IEEE ComSoc Affiliate Membership)*	$685	$800	$_____
RG-23 Tutorials/Workshop Only	NA	NA	$ NA

*IEEE ComSoc Affilitate Membership = membership to only IEEE Communications Society

TOTAL REGISTRATION: $_____

3 TUTORIALS & WORKSHOPS

Tutorials and Workshops will be held if there is a sufficient number of registered participants. If a Tutorial or Workshop is cancelled, liability of IEEE GLOBECOM 2006 is limited to the registration fee itself. Liability due to the cancellation of a Tutorial or Workshop is limited to the Tutorial or Workshop registration fee. Please select all Tutorials & Workshops that you plan to attend. Select only one for each time slot

TUTORIALS

MONDAY - FULL DAY TUTORIAL
- ❒ T3: MPLS - The Importance of Offering the Right Solution at the Right Moment: Timeliness, Benefits, and Deployment from the Origins, to ATM, to Optical Networks
- ❒ T14 IEEE802.11n: Throughput, Robustness, and Reliability Enhancements to WLANs
- ❒ T21 Almost Sixty Years of Error-Correction Coding: How we Reached the Shannon Limit

MONDAY – MORNING HALF DAY TUTORIALS
- ❒ T2: Multiple Antenna Systems-From Optimum Combining to MIMO: An Approach Based on Random Matrix Theory
- ❒ T4: WiMAX: An Advanced Broadband Wireless System
- ❒ T1: Broadband Fiber Access
- ❒ T7: Traffic Analysis for Network Security
- ❒ T11: Mobile DTV

MONDAY – AFTERNOON HALF DAY TUTORIALS
- ❒ T16: MIMO Detection: Theory and Practice
- ❒ T6: Unraveling QoS in 802.16 Wireless Broadband Access Networks: The Role of MAC, Cross-Layer Design, and Scheduling
- ❒ T19: Sensor Networks - Protocols, Technologies and Applications
- ❒ T10: Service Delivery Platforms – Driving Enablers for NGN Service Revenue
- ❒ T9: IPTV Technologies and Deployment Challenges
- ❒ T23: Concluding the Packet-TDM Controversy

FRIDAY – FULL DAY TUTORIALS
- ❒ T12: Wireless Mesh Networking
- ❒ T15: System-level MIMO: Theory and Applications
- ❒ T17: Generalized MultiProtocol Label Switched (GMPLS) Networks

FRIDAY – MORNING HALF DAY TUTORIALS
- ❒ T18: Fixed Mobile Convergence: Architectures, Solutions, Services
- ❒ T20: Adaptive MIMO Techniques and Performance
- ❒ T22: Roadmap to Cross-Layer and Cross-System Optimization for B3G

FRIDAY – AFTERNOON HALF DAY TUTORIALS
- ❒ T8: Technologies for All-IP Wireless Networks from 3G to 4G
- ❒ T13: Reconfigurable Technology for MIMO-OFDM Systems with a Focus on 802.16/802.16e
- ❒ T5: Advancements in Converged WDM Network Architectures: Extending from the Multi-service Metro to an IP-over-WDM Core

WORKSHOP REGISTRATION (includes notes)

MONDAY – MORNING WORKSHOP
- ❒ W1: The Seventh International Workshop on Optical Networking Technologies: Examining the Case for Optical Burst Switching

MONDAY – FULL DAY WORKSHOP
- ❒ W2: 1st International Workshop on Bandwidth on Demand

FRIDAY – FULL DAY WORKSHOPPS
- ❒ W3: MobiArch 2006 -- First IEEE/ACM Workshop on Mobility in the Evolving Internet Architecture Workshop
- ❒ W4: Automotive Networking and Applications Workshop

(see next page)

Required info:
Name: _____ E-mail address: _____

TUTORIAL REGISTRATION (includes Notes)		On/By 30 October	After 30 October		
TU-FD	FULL DAY	$350	$400	_____	$_____
TU-HD	HALF DAY	$250	$300	_____	$_____
WORKSHOP REGISTRATION (includes Proceedings)		**On/By 30 October**	**After 30 October**		
WK-FD	FULL DAY	$350	$400	_____	$_____
WK-HD	HALF DAY	$250	$300	_____	$_____

TOTAL TUTORIALS & WORKSHOPS: $_____

4 EXTRA ITEMS

		Per Person	QTY	
EX-01	Awards Luncheon	$60	_____	$_____
EX-02	*Conference Dinner Show (❒ Wednesday ❒ Thursday)	$125	_____	$_____
	*Conference Dinner Show will be offered on both nights. Please indicate preferred night.			
EX-03	Additional Conference Record – CD-ROM	$50	_____	$_____
EX-04	Overlength Page Charge (if you paper is 6 pages you need to submit payment)	$100		$_____

TOTAL EXTRA ITEMS: $_____

5 OPTIONAL TOURS

		Per Person	QTY	
OT-01	San Francisco Highlights (Monday 27 November)	$40	_____	$_____
OT-02	Magical Marin: Muir Woods & Sausalito (Tuesday 28 November)	$45	_____	$_____
OT-03	Emphasis on Art [2 museums] (Wednesday 29 November)	$72	_____	$_____
OT-04	Chinatown Discovery [walking tour] (Wednesday 29 November)	$50	_____	$_____
OT-05	Best of the California Wine Country (Thursday 30 November)	$115	_____	$_____

TOTAL OPTIONAL TOURS: $_____

PAYMENT (in U.S.Dollars)

2 Registration Fees $_____ 3 Tutorials & Workshops $_____ 4 Extra Items $_____ 5 Optional Tours $_____

(Wire Transfer Info: Please E-mail globecom2006@ieee.org for wire transfer information.)

TOTAL REMITTANCE: $_____

PAYMENT METHOD Please Check One ❒ Visa ❒ Mastercard ❒ American Express ❒ Discover ❒ Check, Bank Draft or Money Order (make payable to IEEE Globecom 2006)

Card Number _____ Expiration Date _____

Name of Cardholder _____ Signature _____

I authorize IEEE/GLOBECOM 2006 to charge my credit card for the full amount in total remittance in U.S. Dollars, converted to my country's currency

QUESTIONS: IEEE GLOBECOM 2006 Conference Management Services - 445 Hoes Lane, Piscataway, NJ 08854, Fax: +1 (732) 465-6447, E-mail: Globecom06reg@ieee.org, Phone: +1 (800) 810-4333 (in the US or Canada only) or +1 (732) 981-3414 (outside US or Canada) Registrations will not be taken by phone.

IMPORTANT: Cancellations on or prior to 30 October, 2006 will incur a $100.00 administrative fee. Please submit cancellation requests in writing to IEEE GLOBECOM 2006 to the address below. No refund will be issued after 30 October, 2006.

IEEE
445 Hoes Lane, PO Box 459
Piscataway, NJ 08855-0459 USA

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www.ieee-globecom.org/2006

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PLUS
- 23 Tutorials
- 4 Workshops
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IEEE GLOBECOM 2006 EXPO

27 November – 1 December 2006
San Francisco, California, USA

Advance Program