

# PROGRAM



## **21st IEEE INTERNATIONAL PERFORMANCE, COMPUTING, AND COMMUNICATIONS CONFERENCE**

**EMBASSY SUITES PHOENIX NORTH  
PHOENIX, ARIZONA, U.S.A.  
APRIL 3-5, 2002**



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**IPCCC 2002  
GENERAL CHAIRS' MESSAGE**

Welcome to the 2002 International Performance, Computing and Communications Conference (IPCCC). IPCCC is now into its third decade of providing a forum for academia and industry to share ideas in the areas of performance and research progress in computers and communications. We are very pleased to be able to continue the IPCCC tradition of excellence through a very difficult time of tragedies and international issues. IPCCC is especially grateful in these times for the continued sponsorship of the IEEE Computer Society and the IEEE Communications Society. Our keynote talk continues our tradition of being at the technical leading edge with a discussion of power and performance issues in 10-20Ghz microprocessor systems of the future.

This year's program contains a set of rigorously refereed papers presented in 16 sessions. It includes a group of workshop papers that we hope will provide a stimulating interactive environment for the discussion of new ideas in this critical subject area. In addition, there are two panel sessions, one discussing Pervasive Computing and another discussing the Performance Requirements for Embedded Systems, which we think you will find thought provoking.

Again this year we have a day of tutorial sessions which are aimed at providing the latest information on topics of keen interest taught by experts from both academia and industry. Topics include ad hoc networking, distribution protocols for video-on-demand, quality of service in next generation wireless networks, and pervasive and mobile commerce applications.

Of course, the conference wouldn't exist without the countless hours of volunteer work by the program and executive committees. Our heartfelt thanks go to all of the committee members and the paper referees whose diligent and quality work make this conference a success. It is truly a privilege to work with such a marvelous group of dedicated professionals.

In addition to the tutorials and the technical conference program, we urge you to enjoy the beautiful Phoenix climate and scenery. Please try to make one of the tours to Grand Canyon, Sedona or Tombstone that we have arranged for your convenience. Welcome to IPCCC2002, welcome to Phoenix, and thank you for your support of IPCCC.

MATT DIETHELM AND SUMI HELAL  
GENERAL CHAIRS, IPCCC 2002

**IPCCC 2002 KEYNOTE SPEAKER**

**BOB CARROLL**  
VICE PRESIDENT OF ENGINEERING, PRIMARION CORPORATION

**"CHALLENGES FOR 10 GHZ PROCESSORS"**

THURSDAY, APRIL 5, SUITE C, 8:00 A.M. - 9:00 A.M.

At last year's ISSCC, Intel Vice President and Chief Technology Officer Pat Gelsinger stated that, "If current (processor) trends continue... you'd also have a heat generator with the intensity of a nuclear reactor." Based on this premise, we propose a system approach to solving this and other potentially catastrophic bottlenecks to the inevitable 10Ghz processor. We believe that what's required to get the most out of future processors is a balanced system in the "active processor area" between processors, power and I/O.

What must future power systems deliver? They must be able to stop droops in a fraction of a nanosecond. The approach required is an intelligent power supply delivering information-quality power to the processor, stopping droops, and further, anticipating them ahead of the processor.

What must future I/O deliver? Either 10x the pins, which is highly impractical, or 10x the speed per pin. The only way to do the latter is to deliver optical links. Optical enables the separation of devices and delivers the speed that future computing and communications applications demand.

This presentation will challenge the engineering community to join Primarion in solving the impending issue of balanced bandwidth in the interdependent processor environment and, ultimately, avoiding the next Big Bang that will inevitably occur if high-performance processors everywhere "hit the wall". We pose the key industry challenges ahead as well as some

Mr. Carroll joined Primarion from the MITRE Corporation. At MITRE, Mr. Carroll was Director of Communications and Networking, and prior, Director of Microelectronics. Before MITRE, Mr. Carroll managed Hughes Aircraft Company's Advanced Circuit Development, where he led the design of high-performance mixed signal products.

**GROUP TOURS FOR IPCCC BY SOUTHWEST CUSTOM TOURS**

Tours will be conducted by Southwest Custom Tours on Saturday, April 6. The first is a Grand Canyon excursion which costs \$84.00 per person. The second is a Sedona Tour at \$47.00. The third is a Tombstone tour for \$69.00. To sign up for a tour, contact Southwest Tours at (800)513-1381 or go to: [www.southwest-tours.com](http://www.southwest-tours.com). When registering for a tour, mention IPCCC to ensure the correct discounted price. For more information, check with IPCCC 2002 registration desk.

IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT SOUTHWEST CUSTOM TOURS.  
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TECHNICAL PROGRAM SCHEDULE  
THURSDAY, APRIL 4, 2002

KEYNOTE SPEAKER: 8:30 A.M. - 9:30 A.M. (SUITE C) BOB CARROLL, "CHALLENGES FOR 10 GHz PROCESSORS"  
BREAK: 9:30 A.M. - 9:45 A.M.

TRACK 1 (SUITE A)

SESSION 1: 9:45 A.M. - 11:00 A.M.

TRACK 2 (SUITE B)

SESSION 1.1: SOFTWARE ARCHITECTURE

SESSION CHAIR: LY SAUER

- 1.1.1 PERFORMANCE STUDIES OF REMOTE METHOD INVOCATION IN JAVA  
GEORGE KOUTSOGIANNAKIS AND MARIOS SAVVA, ILLINOIS INSTITUTE OF TECHNOLOGY; AND J. MORRIS CHANG, IOWA STATE UNIVERSITY
- 1.1.2 JAVA VIRTUAL MACHINE PERFORMANCE ANALYSIS WITH JAVA INSTRUCTION LEVEL PARALLELISM AND FOLDING SCHEME  
AUSTIN KIM AND MORRIS CHANG, ILLINOIS INSTITUTE OF TECHNOLOGY
- 1.1.3 PARALLEL COMPACT WY QR FACTORIZATION FOR ASYNCHRONOUS MESSAGE PASSING  
IAN N. DUNN, MERCURY COMPUTER SYSTEMS; AND GERARD G. L. MEYER, JOHNS HOPKINS UNIVERSITY

SESSION 1.2: ROUTING PROTOCOLS

SESSION CHAIR: TBD

- 1.2.1 AN EFFICIENT DISTRIBUTED QoS-BASED MULTICAST ROUTING ALGORITHM  
HASAN URAL AND KEQIN ZHU, UNIVERSITY OF OTTAWA
- 1.2.2 BANDWIDTH TREE - A DATA STRUCTURE FOR ROUTING IN NETWORKS WITH ADVANCED RESERVATIONS  
TAO WANG AND JIANER CHEN, TEXAS A&M UNIVERSITY
- 1.2.3 USING SIGNATURES TO IMPROVE URL ROUTING  
ZORNITZA GENOVA AND KENNETH J. CHRISTENSEN, UNIVERSITY OF SOUTH FLORIDA

BREAK: 11:00 A.M. - 11:15 A.M.

SESSION 2: 11:15 A.M. - 12:30 P.M.

SESSION 2.1: MODELING METHODOLOGY

SESSION CHAIR: SCOTT BRANDT

- 2.1.1 PERFORMANCE MODELING FOR ADAPTIVE PARALLEL EMBEDDED SYSTEMS  
SAMEH ASAAD, IBM T.J.WATSON RESEARCH CENTER; TED BAPTY AND SANDEEP NEEMA, VANDERBILT UNIVERSITY
- 2.1.2 A HIDDEN SEMI-MARKOV MODEL FOR WEB WORKLOAD SELF-SIMILARITY  
SHUN-ZHENG YU, ZHEN LIU, MARK S SQUILLANTE, CATHY XIA, AND LI ZHANG, IBM T.J.WATSON RESEARCH CENTER
- 2.1.3 JVM TIMING PROBES - A STUDY OF OBJECT LIFE SPAN AND GC  
QIAN YANG, ILLINOIS INSTITUTE OF TECHNOLOGY; WITAWAS SRISA-AN, ILLINOIS INSTITUTE OF TECHNOLOGY AND IOWA STATE UNIVERSITY; THERAPON SKOTINIOTIS, ILLINOIS INSTITUTE OF TECHNOLOGY; J. MORRIS CHANG, IOWA STATE UNIVERSITY

SESSION 2.2: MEDIA-SPECIFIC PROTOCOLS

SESSION CHAIR: LARRY XUE

- 2.2.1 TCP-CM: A TRANSPORT PROTOCOL FOR TCP-FRIENDLY TRANSMISSION OF CONTINUOUS MEDIA  
YONGXIANG LIU, K. N. SRIJITH, L. JACOB, AND A. L. ANANDA, NATIONAL UNIVERSITY OF SINGAPORE
- 2.2.2 COMPARISONS OF ERROR CONTROL TECHNIQUES FOR WIRELESS VIDEO MULTICASTING  
PENG GE AND PHILIP K. MCKINLEY, MICHIGAN STATE UNIVERSITY
- 2.2.3 OPTIMAL REPLICATION PLACEMENT ON TRANSPARENT REPLICATION PROXIES FOR READ/WRITE DATA  
JIANLIANG XU, DIK L. LEE AND BO LI, HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

LUNCH (SUITE D): 12:30 P.M. - 1:45 P.M.

SESSION 3: 1:45 P.M. - 3:00 P.M.

SESSION 3.1: COMPUTER ARCHITECTURE

SESSION CHAIR: ALAN GEORGE

- 3.1.1 DATA-TYPE DEPENDENT CACHE PREFETCHING FOR MPEG APPLICATIONS  
RITA CUCCHIARA, UNIVERSITY OF MODENA AND REGGIO EMILIA; MASSIMO PICCARDI, UNIVERSITY OF FERRARA; AND ANDREA PRATI, UNIVERSITY OF MODENA AND REGGIO EMILIA
- 3.1.2 INCREASING TLB REACH WITH MULTIPLE PAGES SIZE SUBBLOCKS  
CHEOL HO PARK AND DAEYEON PARK, KOREA ADVANCED INSTITUTE OF SCIENCE AND TECHNOLOGY
- 3.1.3 FILE ACCESS PREDICTION WITH ADJUSTABLE ACCURACY  
AHMED AMER, DARRELL D. E. LONG, UNIVERSITY OF CALIFORNIA, SANTA CRUZ; JEHAN-FRANCOIS PÂRIS, UNIVERSITY OF HOUSTON; AND RANDAL C. BURNS, JOHNS HOPKINS UNIVERSITY

SESSION 3.2: DIFFERENTIAL SERVICE NETWORKS

SESSION CHAIR: ERIC JOHNSON

- 3.2.1 SUSTAINING TCP THROUGHPUT USING ASSURED FORWARDING AND ECN IN A DIFFERENTIATED SERVICES NETWORK  
JOGESH MUPPALLA AND IVAN KAI-KIN LEUNG, HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY
- PROVIDING PACKET-LOSS GUARANTEES IN DIFFSERV ARCHITECTURES  
HOSSAM HASSANEIN, HAIQING CHEN AND HUSSEIN MOUFTAH, QUEEN'S UNIVERSITY
- 3.2.3 VARIABLY WEIGHTED ROUND ROBIN QUEUEING FOR CORE IP ROUTERS  
YOSHIHIRO ITO, SHUJI TASAKA AND YUTAKA ISHIBASHI, NAGOYA INSTITUTE OF TECHNOLOGY

BREAK: 3:00 P.M. - 3:15 P.M.

SESSION 4: 3:15 P.M. - 4:30 P.M.

SESSION 4.1 SECURITY

SESSION CHAIR: JIM DAVIS

- 4.1.1 A DENIAL-OF-SERVICE RESISTANT PUBLIC-KEY AUTHENTICATION AND KEY ESTABLISHMENT PROTOCOL  
C.K. FUNG AND M.C. LEE, THE CHINESE UNIVERSITY OF HONG KONG
- 4.1.2 MAINTAINING CONSISTENCY OF THE SECURITY POLICY IN DISTRIBUTED ENVIRONMENT  
SUDSANGUAN NGAMSURIAROJ, PENNSYLVANIA STATE UNIVERSITY; THOMAS F. KEEFE, ORACLE CORPORATION; ALI R. HURSON, PENNSYLVANIA STATE UNIVERSITY
- 4.1.3 COST MINIMIZATION IN REDUNDANT TREES FOR PROTECTION IN VERTEX-REDUNDANT OR EDGE-REDUNDANT GRAPHS  
GUOLIANG XUE, ARIZONA STATE UNIVERSITY; LI CHEN, UNIVERSITY OF VERMONT; AND K. THULASIRAMAN, UNIVERSITY OF OKLAHOMA

SESSION 4.2: NETWORK ARCHITECTURE 1

SESSION CHAIR: KARAMVIR CHATHA

- 4.2.1 ARCHITECTURE ALTERNATIVES FOR INTEGRATING CELLULAR IP AND MOBILE IP  
DANIEL WONG, TELCORDIA TECHNOLOGIES
- 4.2.2 ENHANCING A WEB-SERVER CLUSTER WITH QUALITY OF SERVICE MECHANISMS  
VALERIA CARDELLINI AND EMILIANO CASALICCHIO, UNIVERSITY OF ROMA TOR VERGATA; AND MICHELE COLAJANNI AND MARCO MAMBELLI, UNIVERSITY OF MODENA
- 4.2.3 TRANSIENT ANALYSIS FOR PRIORITIZED FAILURE RECOVERY IN COMMUNICATION NETWORKS  
HAIRONG SUN, JAMES J. HAN, HAIM LEVENDEL, HIGH AVAILABILITY AND RELIABILITY TECHNOLOGY CENTER

BREAK: 4:30 P.M. - 4:45 P.M.

PANEL SESSION I (SUITE C) 4:45 P.M. - 6:00 P.M.  
"APPLICATIONS FOR THE UBIQUITOUS HIGH-PERFORMANCE NETWORKS OF TOMORROW"  
PANEL CHAIR: JOHN SANGIOVANNI, MICROSOFT

RECEPTION (SALON DE) 6:00 P.M.

TECHNICAL PROGRAM SCHEDULE  
FRIDAY, APRIL 5TH, 2002

TRACK 1 (SUITE A)

SESSION 5: 8:30 A.M. - 9:45 A.M.

TRACK 2 (SUITE B)

**SESSION 5.1: WIRELESS 1**  
*SESSION CHAIR: HASAN CAM*

**5.1.1 ON OPTIMAL CELL ASSIGNMENTS IN PCS NETWORKS**  
WILLIAM N.N. HUNG, INTEL CORPORATION, AND XIAOYU SONG, PORTLAND STATE UNIVERSITY

**5.1.2 BANDWIDTH ALLOCATION FOR DATA DISSEMINATION IN CELLULAR MOBILE NETWORKS**  
JIANLIANG XU, DIK L. LEE AND BO LI, HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

**5.1.3 DISTRIBUTED MOBILITY-AWARE ROUTE SELECTION FOR WIRELESS Ad HOC NETWORKS**  
SACHIN ABHYANKAR AND DHARMA P. AGRAWAL, UNIVERSITY OF CINCINNATI

**SESSION 5.2: ADAPTIVE PROTOCOLS**  
*SESSION CHAIR: AHMED AMER*

**5.2.1 DESIGN AND PERFORMANCE EVALUATION OF A RATE FEEDBACK CONTROL ARCHITECTURE IN TCP/IP NETWORKS**  
ABDUL AZIZ MUSTAFA, MAHBUB HASSAN AND SANJAY JHA, UNIVERSITY OF NEW SOUTH WALES

**5.2.2 AN ADAPTIVE QUERY MANAGEMENT TECHNIQUE FOR EFFICIENT REAL-TIME MONITORING OF SPATIAL REGIONS IN MOBILE DATABASE SYSTEMS**  
YING CAI AND KIEN A. HUA, UNIVERSITY OF CENTRAL FLORIDA

BREAK: 9:45 A.M. - 10:00 A.M.

SESSION 6: 10:00 A.M. - 11:15 P.M.

**SESSION 6.1: WIRELESS 2**  
*SESSION CHAIR: DANIEL BURROUGHS*

**6.1.1 MOBILE VOICE OVER IP (MVOIP)**  
AYORKOR MILLS-TETTEY AND DAVID KOTZ, DARTMOUTH COLLEGE

**6.1.2 CROSS-LAYER PERFORMANCE EFFECTS OF PATH COUPLING IN WIRELESS Ad HOC NETWORKS**  
YUE FANG AND A. BRUCE McDONALD, NORTHEASTERN UNIVERSITY

**6.1.3 A FLEXIBLE SCATTERNET-WIDE SCHEDULING ALGORITHM FOR BLUETOOTH NETWORKS**  
WENSHENG ZHANG AND GUOHONG CAO, PENNSYLVANIA STATE UNIVERSITY

**SESSION 6.2: NETWORK ARCHITECTURE 2**  
*SESSION CHAIR: ARUNABHA SEN*

**6.2.1 A PERFORMANCE COMPARISON BETWEEN STOP-THE-WORLD AND MULTITHREADED CONCURRENT GARBAGE COLLECTION FOR JAVA**  
CHIA-TIEN DAN LO, WITAWAS SRISA-AN, AND J. MORRIS CHANG, ILLINOIS INSTITUTE OF TECHNOLOGY

**6.2.2 BRADIO: A VERSATILE WIRELESS INFRASTRUCTURE IN SUPPORT OF PERVASIVE COMPUTING ENVIRONMENTS**  
BILLIBON H. YOSHIMI, G. BRAD BOLAM, NOI SUKAVIRIYA, JEFF ELLIOTT, AND BOAZ CARMELI, JIM MORGAN, HERB DERBY, IBM T. J. WATSON RESEARCH CENTER

**6.2.3 A DISTRIBUTED CALL CONNECTION PROTOCOL FOR WDM NETWORKS WITH WAVELENGTH CHANGERS**  
MICHAEL R. FREY AND JAMES HUTTON, BUCKNELL UNIVERSITY

BREAK: 11:15 A.M. - 11:30 A.M.

PANEL SESSION II (SUITE C) 11:30 A.M. - 12:45 P.M.  
"PERFORMANCE AND QUALITY OF SERVICE REQUIREMENTS IN EMBEDDED SYSTEMS"  
PANEL CHAIR: BEN HUEY, ARIZONA STATE UNIVERSITY

LUNCH (SUITE DE): 12:45 P.M. - 2:00 P.M.

SESSION 7: 2:00 P.M. - 3:15 P.M.

**SESSION 7.1: SHORT PAPERS 1**  
*SESSION CHAIR: LINDA WILSON*

**7.1.1 ANALYSIS OF DISTRIBUTED INTRUSION DETECTION SYSTEMS USING BAYESIAN METHODS**  
DANIEL BURROUGHS, LINDA F. WILSON AND GEORGE V. CYBENKO, DARTMOUTH COLLEGE

**7.1.2 AN ANALYSIS OF THE GARBAGE COLLECTION PERFORMANCE IN SUN'S HOTSPOT/M JVM**  
LUKE DYKSTRA, ILLINOIS INSTITUTE OF TECHNOLOGY; WITAWAS SRISA-AN AND J. MORRIS CHANG, IOWA STATE UNIVERSITY

**7.1.3 SPEEDING UP TCP/IP: FASTER PROCESSORS ARE NOT ENOUGH**  
EVANGELOS MARKATOS, FOUNDATION FOR RESEARCH AND TECHNOLOGY

**7.1.4 A LOCATION TRANSPARENT & COST EFFECTIVE ROUTING ALGORITHM FOR MOBILE COMPONENTWARE INTERACTION AND COORDINATION**  
JAMES CI, UNIVERSITY OF MINNESOTA AND WEI-TEK TSAI, ARIZONA STATE UNIVERSITY

**7.1.5 VIRTUAL-JOIN: A QUERY EXECUTION TECHNIQUE FOR JOIN QUERIES IN DISTRIBUTED DATABASES**  
SAM YUAN SUNG, PENG SUN, ZHAO LI, AND CHEW LIM TAN, NATIONAL UNIVERSITY OF SINGAPORE

**SESSION 7.2: EESD WORKSHOP – DIFFERENTIATED SERVICES APPLICATIONS**  
*SESSION CHAIR: HOSSAM HASSANEIN*

**7.2.1 AN ADAPTIVE IP TELEPHONY APPLICATION OVER DIFFERENTIATED SERVICES**  
MATTHIAS SCHEIDEGGER AND TORSTEN BRAUN, UNIVERSITY OF BERN

**7.2.2 INTEGRATING NETWORK QoS TO PROVIDE DIFFERENTIATED SERVICE IN A WEB SERVER**  
VENKATA R. SUBRAMANIAM AND CHEN-KHONG THAM, NATIONAL UNIVERSITY OF SINGAPORE

**7.2.3 DIAGNOSING QUALITY OF SERVICE FAULTS IN DISTRIBUTED APPLICATIONS**  
HANAN L. LUTFIYYA, THE UNIVERSITY OF WESTERN ONTARIO

BREAK: 3:15 P.M. - 3:30 P.M.

SESSION 8: 3:30 P.M. - 4:45 P.M.

**SESSION 8.1: SHORT PAPERS 2**  
*SESSION CHAIR: MATT DIETHELM*

**8.1.1 AN EFFICIENT CORE MIGRATION PROTOCOL FOR QoS IN MOBILE Ad HOC NETWORKS**  
MANISH KOCHHAL AND LOREN SCHWIEBERT, WAYNE STATE UNIVERSITY; SANDEEP K. S. GUPTA, AND CHANGLI JIAO, ARIZONA STATE UNIVERSITY

**8.1.2 xDFS: A SERVERLESS DISTRIBUTED FILE SYSTEM UTILIZING DISK SPACE ON WORKSTATION CLUSTERS**  
YONG CHEN, LIONEL M. NI AND PRASANT MOHAPATRA, MICHIGAN STATE UNIVERSITY

**8.1.3 AN ADMISSION CONTROL SCHEME TO PROVIDE END-TO-END STATISTICAL QoS PROVISION IN IP NETWORKS**  
BIN PAN, CHINESE ACADEMY OF SCIENCES; HUAI RONG SHAO AND WENWU ZHU, MICROSOFT RESEARCH CHINA; AND WEN GAO, CHINESE ACADEMY OF SCIENCES

**8.1.4 DESIGN AND PERFORMANCE EVALUATION OF NEW CHANNEL RESERVATION SCHEMES FOR SUPPORTING MULTI-CLASS TRAFFICS**  
AKKARAPAT CHAROENPANICHKIT, AKKARAPOL THANASORRAVIT, SUPAVADEE ARAMVITH, AND LUNCHAKORN WUTTISITTIKULKIJ, CHULALONGKORN UNIVERSITY

**8.1.5 A RATE ADAPTATION SCHEME FOR LAYERED MULTICAST USING MSS IN MOBILE NETWORKS**  
SEUNGKIL LEE, DONGMAN LEE AND WONYONG YOON, INFORMATION AND COMMUNICATIONS UNIVERSITY

**SESSION 8.2: EESD WORKSHOP – DIFFERENTIATED SERVICES**  
*SESSION CHAIR: HANA LUTFIYYA*

**8.2.1 FAST BACKWARD CONGESTION NOTIFICATION MECHANISM FOR TCP CONGESTION CONTROL**  
FEI PENG AND VICTOR C.M. LEUNG, THE UNIVERSITY OF BRITISH COLUMBIA

**8.2.2 QUALITY OF SERVICE BASED END-TO-END SiMO ROUTING FRAMEWORK IN DIFFERENTIATED SERVICES NETWORKS**  
JIAN ZHAO, HOSSAM HASSANEIN, QUEEN'S UNIVERSITY; JIEYI WU, GUANQUN GU, SOUTHEAST UNIVERSITY

## TUTORIAL 1, SUITE A AD HOC NETWORKING

### INSTRUCTORS:

ELIZABETH M. BELDING-ROYER  
UNIVERSITY OF CALIFORNIA, SANTA BARBARA

SUNG-JU LEE  
HEWLETT-PACKARD LABORATORIES

### ABSTRACT:

Ad hoc networking, while not a new idea, has received a lot of attention in the past few years. As such, numerous new protocols have been developed that are revolutionizing the way this communication works. This tutorial will educate the attendees on the fundamentals of ad hoc networking technology and research, as well as the state of the art in this area. We will begin the tutorial with a description of the characteristics of wireless ad hoc networks that distinguish them from their wired and cellular network counterparts. We will then cover recent unicast and multicast routing approaches in great detail. In addition, we will cover Bluetooth and enabling technologies such as IEEE 802.11. We will conclude with recent implementation and standardization efforts, as well as directions for future research. Attendees will gain an in-depth understanding of ad hoc networking issues, as well as of many of the proposed solutions that are likely to be, or have already been, adopted by industry.

### INTENDED AUDIENCE

This tutorial is intended for researchers and engineers in both industry and academia, as well as for anyone who would like a deeper understanding of mobile networking and the current state of research in this area. The tutorial is designed to provide an overview of the issues related to mobile networking, as well as in-depth coverage of current efforts in enabling communication, at both the network and MAC layers, in these networks.

### BIOGRAPHIES OF THE SPEAKERS:

Elizabeth M. Belding-Royer is an Assistant Professor in the Department of Computer Science at the University of California, Santa Barbara. She completed her Ph.D. in Electrical and Computer Engineering at UC Santa Barbara in 2000. Elizabeth's research focuses on mobile networking, specifically routing protocols, security, scalability, address autoconfiguration, and adaptability. Elizabeth is the author of numerous papers related to ad hoc networking, and is an active participant of the IETF working group for Mobile Ad hoc Networks. Elizabeth serves on the technical program committee and organizing committee for various networking related conferences. She is a member of the ACM, ACM SIGMOBILE, IEEE, and IEEE Communications Society. See <http://www.cs.ucsb.edu/~ebelding> for further details.

Sung-Ju Lee is a research scientist/engineer at the Internet Systems & Storage Lab (ISSL) of Hewlett-Packard Laboratories. S.-J. received his M.S. and Ph.D. in Computer Science at the University of California, Los Angeles, and B.S. at Hanyang University, Korea. S.-J. published over twenty papers in the field of mobile networking and content delivery networks. He is a co-guest editor of the Wireless Communications & Mobile Computing's special issue on Mobile Ad Hoc Networking, and serves as a technical program committee and organizing committee member of various networking related conferences. He is a member of IEEE, IEEE Communications Society, IEEE Computer Society, ACM, ACM SIGCOMM, and ACM SIGMOBILE. His research interests include mobile networking & computing, wireless networks, ad hoc networks, content distribution networks, personal area networks, streaming media, and performance evaluation. See [http://www.hpl.hp.com/personal/Sung-Ju\\_Lee](http://www.hpl.hp.com/personal/Sung-Ju_Lee) for further details.

## TUTORIAL 2, SUITE B DISTRIBUTION PROTOCOLS FOR VIDEO-ON-DEMAND

### INSTRUCTOR:

JEHAN-FRANÇOIS PÂRIS  
UNIVERSITY OF HOUSTON

### ABSTRACT:

This tutorial provides a global overview of the various techniques that can be used to reduce the cost of video-on-demand services. Despite all the appeal of its concept, video-on-demand has yet to succeed in the marketplace. The main reason behind this lack of success is the high bandwidth requirements of the service, which necessitate huge server farms and a costly network infrastructure.

The last five to ten years have seen many proposals aiming at reducing the bandwidth requirements of video-on-demand services. All these proposals attempt to share as much data as possible among overlapping requests to the same video. They differ in many ways including the role played by the customer set-top box and the quality of service being provided.

We will introduce video-on-demand, discuss its bandwidth requirements and their impact on the different components of a video-on-demand service (server, network and various types of customer set-top boxes). We will then present some early distribution that do not require any changes to the set-top-box such as batching, piggybacking, staggered broadcasting and mention their limitations.

The remainder of the tutorial will be dedicated to the more recent distribution protocols, among which: Reactive protocols such as stream tapping, patching dynamic skyscraper broadcasting, hierarchical multicast stream merging; Proactive protocols such as pyramid broadcasting, skyscraper broadcasting, fast broadcasting, harmonic broadcasting, GEBC, pagoda broadcasting, and recursive frequency-splitting; Hybrid protocols such as the universal distribution protocol and dynamic heuristic broadcasting. We will conclude by discussing partial preloading and how to implement interactive commands.

### INTENDED AUDIENCE:

This tutorial should appeal to students, developers, and researchers interested in video-on-demand. A basic computer science background is the sole prerequisite.

### BIOGRAPHY OF THE SPEAKER:

Jehan-François Pâris is associate professor of computer science at the University of Houston. He has authored papers on video-on-demand, the management of replicated data, the optimization of memory hierarchies and distributed systems in general. His current research on distribution protocols for video-on-demand is supported by the Texas Advanced Research Program and the National Science Foundation.

Dr. Pâris obtained his Ph. D. from the University of California, Berkeley. Before joining the University of Houston, he was with Purdue University and the University of California, San Diego. He is a member of the Association of Computing Machinery and a senior member of the IEEE Computer Society.

TUTORIAL 3, SUITE A  
QoS IN NEXT GENERATION OF WIRELESS NETWORKS

INSTRUCTOR:  
PASCAL LORENZ  
UNIVERSITY OF HAUTE-ALSACE

ABSTRACT:

Emerging Internet Quality of Service (QoS) mechanisms are expected to enable widespread use of real time services; for example, VoIP and video conferencing. "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, and 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 OF THE SPEAKER:

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, SUITE B  
PERVASIVE AND MOBILE COMMERCE APPLICATIONS

INSTRUCTORS:  
MARISA VIVEROS AND JONATHAN MUNSON  
IBM WATSON RESEARCH CENTER

ABSTRACT:

As technology continues its dramatic progress, making possible new and improved applications, we experience the creation of new paradigms and changes in the way technology impacts every day's life. Always-on connectivity, location-awareness, and environment-aware products are among those new paradigms. Smart devices, portable devices, wireless communications, and sophisticated sensors, appear to be the underlying principles of a new revolution in technology. This tutorial will explore research issues in the intersection of pervasive and mobile computing and electronic commerce. Pervasive computing deals with a broad range of information access methods enabled by mobility, wireless, small embedded systems, and broadband technologies. At the same time, electronic commerce is redefining the way business is carried out creating new business models and novel interactions with end users.

The topics to be discussed are as follows:

- Evolution of Pervasive Infrastructure
- Transactional interactions
- Software componentry for building mobile applications
- Security for mobile commerce applications
- Location-based services
- Emerging eCommerce Frameworks
- Case studies

INTENDED AUDIENCE:

This tutorial is intended for students, developers, and researchers interested in the technical advancement of mobile applications and obtaining a global perspective of the field. Programming methodologies and standards will be covered.

BIOGRAPHY OF THE SPEAKER:

Marisa Viveros is a Senior Manager of the Pervasive Computing Solutions group at IBM Thomas J Watson Research. She is responsible for the creation of emerging applications in the areas of wireless technology, pervasive devices, and their seamless integration in business environments. Examples of such work include applications in mobile commerce, using sensing technologies to bridge the gap between the digital and physical world, and multi-modal applications for knowledge workers. A common theme is enabling end users with easy-to-use computing solutions. Ms. Viveros holds an MS degree in Computer Science and a BS degree in Electrical Engineering.

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**IEEE INTERNATIONAL PERFORMANCE, COMPUTING,  
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**IPCCC 2002 PANEL SESSIONS**

**PANEL SESSION I**

**"APPLICATIONS FOR THE UBIQUITOUS HIGH-PERFORMANCE NETWORKS OF TOMORROW"**

PANEL CHAIR: JOHN SANGIOVANNI, MICROSOFT

SUITE C, THURSDAY, APRIL 4, 4:45 P.M. - 6:00 P.M.

Abstract: In the coming years, high-performance networking technologies such as IPv6, 3G Wireless, and reliable QoS will transform human communication, education, and entertainment. The panelists represent various industrial and academic disciplines, and each

will offer a vision into the ways that high-speed ubiquitous networking will transform our lives. After a brief overview from each panelist, floor will be open for an interactive dialog about some of the new applications that we may see in this high-speed, wired world of tomorrow.

**PANEL SESSION II**

**"PERFORMANCE AND QUALITY OF SERVICE REQUIREMENTS IN EMBEDDED SYSTEMS "**

PANEL CHAIR: BEN HUEY, ARIZONA STATE UNIVERSITY

SUITE C, FRIDAY, APRIL 5, 11:30 A.M. - 12:45 P.M.

Abstract: Panelists from Honeywell, Motorola, Intel and Arizona State University will provide their perspectives on what are the most important performance and quality of service attributes for

embedded systems now and in the future, how current hardware and software meet today's requirements, and what research is required to assure that future embedded systems will meet tomorrow's requirements.

**IPCCC 2002 TUTORIALS SESSION**

**FOUR HALF-DAY TUTORIALS**

WEDNESDAY, APRIL 3RD, 8:00 A.M. - 5:00 P.M.

MORNING, , 8:00 A.M. - 12:00 NOON

TUTORIAL 1, SUITE A  
AD HOC NETWORKING

TUTORIAL 2: SUITE B

DISTRIBUTION PROTOCOLS FOR VIDEO-ON-DEMAND

AFTERNOON, 1:00 P.M. - 5:00 P.M.

TUTORIAL 3, SUITE A  
QoS IN NEXT GENERATION OF WIRELESS NETWORKS

TUTORIAL 4, SUITE B

PERVASIVE AND MOBILE COMMERCE APPLICATIONS

FOR DETAILS ON THE FOUR HALF-DAY TUTORIALS SEE PAGES 6 AND 7

**IPCCC 2002 WORKSHOP ON END-TO-END SERVICE DIFFERENTIATION**

FRIDAY, APRIL 5, 2002, 2:00 P.M. - 4:45 P.M. (SESSIONS 7.2 & 8.2)

There has been relatively little work on end-to-end service differentiation. Most work focusses on one aspect (e.g., web servers). The reality is that management is needed for service differentiation on an end-to-end flow. The

purpose of the workshop is generate discussion and a research agenda on the topic. EESD is held in conjunction with IPCCC 2002.

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