Welcome to the 2003 IEEE International Performance, Computing and Communications Conference (IPCCC 2003). This is the 22nd year that IPCCC has brought together researchers and practitioners in the fields of performance, computers, and communications for lively and productive discussions. We are grateful for the continuing sponsorship by the IEEE Computer Society and the IEEE Communications Society that supports this forum.

The keynote speakers will challenge us to consider new issues in our rapidly converging fields, ranging from gauging the performance of gargantuan networks of computers to applying computing to solve the challenges of wireless networks.

This year's technical tracks offer a selection of rigorously refereed papers presented in 14 sessions, plus two workshop tracks addressing cutting-edge research in Energy-Efficient Wireless Networks and End-to-End Service Differentiation. The program committees for these tracks received many more high-quality papers than we could accept: 100 papers were submitted for the general tracks, of which we accepted 36 as full papers and 10 more as short papers; only half of the papers submitted for the workshops were accepted. The technical tracks also include three panel sessions that we hope will stimulate discussion of new ideas in sensor networks, freedom versus security on the Internet, and realizing the dream of ubiquitous multi-platform programming.

The technical program is preceded by a day of tutorial sessions that will provide the latest information on topics of current interest, taught by global experts from industry and academia. Tutorials competing for your interest span the broad range of topics covered by this conference, including IP-Oriented QoS in Next Generation Networks, Wireless Sensor Network Protocols, Network Awareness for Heterogeneous Data Networks, Pervasive Computing, Java Database Applications and Security, E-commerce and Java Cryptography, and Application Scalability.

The organization of this conference is the fruit of long hours of volunteer work by the program and executive committees. I extend my thanks to the committee members and paper referees whose diligent work has ensured the quality of IPCCC 2003. It is a rare privilege to work with such talented and dedicated professionals.

The setting for the conference is the beautiful Embassy Suites Phoenix North Resort. We hope you enjoy the renowned climate and natural beauty of the Valley of the Sun, and invite you to extend your stay to go on one of the tours of scenic and historical Arizona that we have arranged for your convenience. Welcome to Phoenix, and thank you for your support of IPCCC.

Eric Johnson
General Chair, IPCCC 2003

IPCCC 2003

General Chairs’ Message

Thursday, April 10, 8:00 A.M. - 9:00 A.M.

Neil J. Gunther
"Gauging Gargantuan Computers: Benchmarking Prats and Pitfalls"

In 1987 a paper appeared in IEEE Spectrum entitled “Computer Benchmarking: Paths and Pitfalls.” The complexity of computer systems has increased exponentially since 1987, principally through the advent of distributed applications. Has benchmarking kept up? Today we are entering the era of terra-, or is it terti(?)-, or is it really ter(?)-scale distributed computing. One of the best working examples is SETI@Home where relatively tiny workloads are partitioned across a gargantuan number of FLOPs in the guise of desktop CPUs. The so-called "Computing GRID" has the goal of extending a similar approach to more complex computers running more complex workloads. How are we to assess the performance and scalability of such large systems? What sort of benchmarks are appropriate for these emerging computer technologies?

Arguably, benchmarking is a form of institutionalized cheating. Nonetheless there is a genuine need to measure system performance in both development procurement cycles, and it behooves us to understand the prats and pitfalls of benchmarking large-scale computer systems already in existence.

Friday, April 11, 8:00 A.M. - 9:00 A.M.

C-K Toh
“Research Challenges For Ad Hoc Mobile Wireless Networks”

Increasingly, we have seen many research papers published in the area of ad hoc wireless networking. Over a decade, research in this field is still striving but few knew HOW or WHY it evolves, not to mention about its FUTURE. This technology is also playing an important role in defense and academia. The former enhances war-fighting capability, be it ground, sea, or air. The latter, however, produces quite a few PhDs! This talk will present the ad hoc research momentum wheel (from the perspective of 10 years' experience), a brief preview of current research and a vision of future research challenges for ad hoc wireless networks: ad hoc naming and addressing; mobile power management; high capacity ad hoc communications; ad hoc packet forwarding models and incentives; ad hoc route precedence and pre-emptions; ad hoc service discovery; ad hoc distributed computing; and other exhausting issues (security, QoS, multimedia, spectrum, etc.). The talk will conclude with a discussion of the factors that govern the future success of ad hoc technology and the research lifespan that remains.
Tours will be conducted by Southwest Custom Tours on Saturday, April 12. 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.southwesttours.com. When registering for a tour, mention IPCC to ensure the correct discounted price. For more information, check with THE IPCC 2003 registration desk.

If you have any questions, please contact Southwest Custom Tours. Toll-Free, 24 hour reservation and information line: (800) 513-1381. Fax: (602) 992-5596. E-mail info@southwesttours.com. http://www.southwesttours.com/
TECHNICAL PROGRAM SCHEDULE, THURSDAY, APRIL 10, 2003

SESSION 1: 9:15 - 10:30

SESSION 1.1: PERFORMANCE EVALUATION I

1.1.1 IMPACT OF REQUEST ROUTING ALGORITHMS ON THE DELIVERY PERFORMANCE OF CONTENT DELIVERY NETWORKS
Mirco Masa and Emanuele Papparicci, CEFREI/Politecnico di Milano

1.1.2 PERFORMANCE EVALUATION FOR PENALTY-BASED RESOURCE MANAGEMENT: AN ADAPTIVE QoS SCHEME FOR SERVICE DIFFERENTIATION AND ADAPTATION IN HETEROGENEOUS WIRELESS NETWORKS
Chi-Hsiang Yeh, Queen’s University

1.1.3 A NOVEL ARCHITECTURE AND COEXISTENCE METHOD TO PROVIDE GLOBAL ACCESS TO/FROM BLUETOOTH WPANS BY IEEE 802.11 WLANs
Carlos Cordeiro, Sachin Ahityankar, Nishi Toshiwal, and Dharma P Agrawal, University of Cincinnati

SESSION 1.2: MULTICAST ROUTING

1.2.1 GROUP AGGREGATION FOR SCALABLE ANYCAST ROUTING
Zhbin Mai, Shengquan Wang, Dong Xuan, and Wei Zhao, Texas A&M University

1.2.2 TMRECC: A CONGESTION CONTROL MECHANISM FOR TREE-BASED MANY-TO-MANY RELIABLE MULTICAST PROTOCOLS
Je-young Yu, Kyungnan Kang, and Dongman Lee, Information and Communications University, Korea

1.2.3 BOTTOM-UP CONSTRUCTION OF DYNAMIC MULTICAST TREES IN WDM NETWORKS
Guoliang Xue and Rakesh Banka, Arizona State University

SESSION 1.3: NO SESSION

BREAK: 10:30 - 10:45

SESSION 2: 10:45 - 12:00

SESSION 2.1: HIGH-PERFORMANCE COMPUTING

2.1.1 AUTONOMIA: AN AUTONOMIC COMPUTING ENVIRONMENT
Xiangdong Dong, Salim Hariri, Lizhi Xue, Huoping Chen, Ming Zhang, Sathija Pavuluri, and Soujanya Rao, University of Arizona

2.1.2 PERFORMANCE ANALYSIS OF HP ALPHAserver ES80 vs. SANE-based CLUSTERS
Burt Gordon, Sarp Oral, Gen Li, Hung-Hsun Su, and Alan George, University of Florida

2.1.3 HIGH-PERFORMANCE EMBEDDED COMPUTING FOR CONVENTIONAL MATCHED-FIELD PROCESSING
Keonwook Kim, Florida A&M University and Florida State University; and Alan George, University of Florida

SESSION 2.2: MOBILE AD-HOC NETWORKS

2.2.1 ENERGY-EFFICIENT BROADCAST AND MULTICAST ROUTING IN AD HOC WIRELESS NETWORKS
Maggie Cheng, J Ianhua Sun, Manik Man, and Ding-Zhu Du, University of Minnesota

2.2.2 ACHIEVING FAIRNESS IN DISTRIBUTED SCHEDULING IN WIRELESS AD-HOC NETWORKS
Arun Somani and J Ianwei Zhao, Iowa State University

2.2.3 FAIR SCHEDULING IN WIRELESS AD-HOC NETWORKS OF LOCATION DEPENDENT CHANNEL ERRORS
Jirran Chen and Arun Somani, Iowa State University

SESSION 2.3: EWCN – VIRTUAL BACKBONES AND CROSS-LAYER DESIGNS

2.3.1 A NOVEL ARCHITECTURE AND CONSTRUCTION METHOD TO PROVIDE A POWER CONSTRAINTED ENVIRONMENT
Dan Marinescu, Gabriela Marinescu, Yongchang Ji, and Ladislau Boloni, University of Central Florida

2.3.2 OPTIMAL CROSS-LAYER DESIGNS FOR ENERGY-EFFICIENT WIRELESS AD HOC AND SENSOR NETWORKS
Ahmed Sufaat, Hossein Hassanein and Hussein Mouftah, Queen’s University

2.3.3 POWER-EFFICIENCY CLUSTERING METHOD WITH POWER-LIMIT CONSTRAINT FOR SENSOR NETWORKS
Jian-Shing Liu, Providence University, and Chun-Hung Lin, National Sun Yat-Sen University

LUNCH: 12:00 - 1:15

SESSION 3: 1:15 - 2:30

SESSION 3.1: PERFORMANCE EVALUATION II

3.1.1 ADJUSTABLE MULTI-CONSTRAINED ROUTING WITH A NOVEL EVALUATION METHOD
Yong Cui, Ke Xu, and Jianping Wu, Tsinghua University

3.1.2 A QoS ENABLED MAC PROTOCOL FOR MULTIHOP AD HOC WIRELESS NETWORKS
Zhou Ying, A.L. Ananda, and Lilibukkyt J acob, National University of Singapore

3.1.3 MINIMAL CONNECTED DOMINATING SET ALGORITHMS AND APPLICATION FOR A MANET ROUTING PROTOCOL
Tao Lin, Scott Midkiff, and J ahng Park, Virginia Polytechnic Institute and State University

SESSION 3.2: NETWORK SECURITY

3.2.1 IDENTIFYING FLAWS IN THE SECURE ROUTING PROTOCOL
John Marshall, Vikram Thakur, and Alec Yasinsac, Florida State University

3.2.2 AN IMPROVEMENT ON SECURITY COMMUNICATIONS IN PCS
Nawal El-Fishawy, Mostafa Nofal, and Albert Tadros, Faculty of Electronic Engineering, Menouf, Egypt

3.2.3 HIGH-SPEED ROUTER FILTER FOR BLOCKING TCP FLOODING UNDER DDoS ATTACK
Yooohon Kim and J u Yeon J o, Case Western Reserve University; J onathan Chao, Polytechnic University; and Frank Merat, Case Western Reserve University

SESSION 3.3: EWCN – PERFORMANCE IMPROVEMENT FOR ENERGY-EFFICIENT COMMUNICATIONS

3.3.1 AN ENERGY-EFFICIENT TCP QUICK TIMEOUT SCHEME FOR WIRELESS LANs
Song Ci, Stephen Turner and Hamid Sharif, University of Michigan-Flint

3.3.2 ADAPTIVE MANAGEMENT OF BLUETOOTH MASTER SLAVE BRIDGE
J elena Misic and Vojislav B. Misic, The Hong Kong University of Science and Technology

3.3.3 A SIMPLIFIED AND EFFICIENT IMPLEMENTATION OF FPGA-BASED TURBO DECODERS
Sanjay Sharma, Sanjay Attiri, and R.C. Chauhan, SLIET

BREAK: 2:30 - 2:45

SESSION 4: 2:45 - 4:00

SESSION 4.1: PERFORMANCE EVALUATION III

4.1.1 A FRAMEWORK FOR DYNAMIC SLA MANAGEMENT UNDER HETEROGENEOUS TRAFFIC CONDITIONS IN MPLS NETWORKS
Brikena Statovci-Halimi, Artan Halimi, Karl Hendling, and Harmen van As, Vienna University of Technology

4.1.2 REDUCING LOAD DISTRIBUTION OVERHEAD WITH MESSAGE AGGREGATION
Vasil Hnatyshin and Adarshpal Sethi, University of Delaware

4.1.3 A CLIENT SIDE MEASUREMENT SCHEME FOR REQUEST ROUTING IN VIRTUAL CONTENT DELIVERY NETWORKS
Rami Mukhtar and Zvi Rosberg, University of Melbourne

SESSION 4.2: SURVIVABLE NETWORKS AND TRAFFIC

4.2.1 LONG-TERM DATA RESILIENCE USING OPINION POLLS
Nikoas Michalakis, Dah-Ming Chiu, and David Rosenthal, Sun Microsystems Laboratories

4.2.2 HARTS: HIGH AVAILABILITY CLUSTER ARCHITECTURE WITH REDUNDANT TCP STACKS
Zhiyuan Shao, Hai J in, Bin Chen, J ie Xu, and J ianhu Yue, Huazhong University of Science and Technology

4.2.3 NETWORK ANALYSIS OF COUNTER-STRIKE AND STARCRFT
Mark Claypool, David LaPoint, and J osh Winslow, Worcester Polytechnic University

SESSION 4.3: EWCN – ROUTING IN WIRELESS MULTI-HOP NETWORKS

4.3.1 MINIMUM-ENERGY BROADCAST ROUTING IN WIRELESS MULTI-HOP NETWORKS
Song Guo and Oliver Yang, University of Ottawa

4.3.2 AN ROUTING ALGORITHM FOR MOBILE AD HOC NETWORKS (ARAMA)
Osama Hussein and Tarek Saadawi, City University of New York

4.3.3 A COMPARATIVE STUDY OF ON-DEMAND AND CLUSTER-MARKED Protocols in MANETS
Tarek Sheltami and Hussein Mouftah, Queen’s University

BREAK: 4:00 - 4:15

Panel 1: 4:15 - 5:30
SENSOR NETWORKS; THE CROSS-DISCIPLINARY RESEARCH CHALLENGE
Panel Chair: Karam S. Chatha

IPCCC RECEPTION: 6:00 P.M. - 8:00 P.M.
PERVCOMP: A NEW COMPUTING PARADIGM FOR THE 21ST CENTURY

INSTRUCTORS: Debasis Saha, MIS Group, IIM

Amata Mukherjee, Sc of CSE, UNSW, Sydney, Australia

Abstract: Pervasive Computing (PervComp) is "omni-computing". It is "all-pervasive" by combining open standards-based applications with everyday activities. In the vision of PervComp, the environment is saturated with a host of computing and communication capabilities which are graceful-integrating with daily life so that user will be able to exchange information and control their environments from everywhere using a seemingly invisible infrastructure of various wireline and wireless networks. The advent of the complexity of new technologies, enables us to be more efficient in our work and leaves us with more leisure time. Thus, PervComp is about four things: users, applications, middlewares, and networks. First, it concerns the way people move, mobile computing, and communication devices, and use them within their environments to perform tasks. Second, it concerns the environment where the network is used and deployed to enable such tasks to be performed. Third, it concerns the environment, which comprises interfaces between the applications and the network. Fourth, it concerns the underlying network that supports pervasiveness. In this tutorial, we sketch the evolutionary path for this new paradigm of computing, discuss its nature and infrastructural properties, and suggest requirements that this infrastructure must meet to become a "technology that disappears", vis-a-vis the shortcomings of the currently existing architectures. While doing so, this tutorial also describes the current research initiatives on PervComp, highlighting some common requirements for the intelligent environment that PervComp demands.

Biography: Debasis Saha is an Associate Professor in the IS & Computer Science group of Indian Institute of Management (IIM) Calcutta. He received B.E. degree in Electronics & Telecommunication Engineering in 1988 from Jadavpur University, Calcutta, India, in 1988, and his M. Tech. and Ph. D. degrees, both in Information Management Engineering, from the Indian Institute of Technology (IIT) at Kharagpur, India, in 1987 and 1995, respectively. He was a senior research scholar at IIT Kharagpur between 1988 and 1990 while conducting research on protocol engineering. He was with Jadavpur University as a faculty member in the Computer Science & Engg Department from 1990 to 2001. His research areas are: Network protocols, WDM optical networks, Wireless Networking & Mobile Computing, and Pervasive Communication & Computing. He has published more than hundred papers in refereed journals and conferences. He has delivered several invited talks and tutorials in networking conferences/workshops. He is currently the principal investigator of two major govt. funded projects on the Networking Research Group initiatives. He has co-authored four books and a monograph. His most recent co-authored book is on Networking Infrastructure for Pervasive Computing published by Kluwer Academic Publishers, Boston USA. Dr. Saha is a life-member of Computer Society of India (CSI), a member of IFIP WG 6.8 and 6.10, a Senior Member of IEEE, and a life member of Computer and Systems Society of IEICE Communication Society. He is a recipient of the prestigious Career Award for Young Teachers from the All India Council for Technical Education (AICTE) and the BOYCAST Fellowship (2000) of Dept. of Science & Technology (DST), Govt. of India.

Amata Mukherjee is currently visiting University of New South Wales (UNS WU) at Sydney in Australia from Jan 2003. He received his Ph.D. degree in Computer Science from Jadavpur University, Calcutta, India, in May 1995. He was a Principal Consultant in erstwhile PWCC, India, which is now IBM Business Consulting Services, part of IBM Global Services India. He is a member of Electronics and Telecommunication Engineering at Jadavpur University, Calcutta, India from 1983 to 1995. His research interests are in the areas of Mobile Computing and Communication, Pervasive Computing and Mobile Commerce, Optical Networks, Combinatorial Optimization and Distributed Systems. His interests also include the M Mathematical Modeling and its applications in the fields of Societal Engineering and International Relations. He has delivered several tutorials and invited talks in both India and abroad and is the author of over 75 technical papers, one monograph and four books. His most recent co-authored book is on Networking Infrastructure for Pervasive Computing published by Kluwer Academic Publishers, Boston USA. He is a member of IEEE, IEEE Communication Society.

JAVA APPLICATIONS AND SECURITY

INSTRUCTOR: Dr. Sub Ramakrishnan

Abstract: Java was introduced as an OOP language less than a decade ago. It is already becoming the preferred language of choice for e-commerce and database applications. However, there are two important aspects of Java that are less well understood, namely, (1. Java Applications and Security and (2) E-commerce and Java Cryptography. We believe however, that these two issues have significant relevance to the design and deployment of secure database (stand-alone or web enabled) applications for e-commerce. This half-day tutorial will be devoted to the first topic. We expect to address the second topic in a separate half-day tutorial at this conference.

Java Applications and Security: The security features of Java applications and applets are at two extremes; applets use a sandbox model, whereas native applications are run outside of the sandbox and enforce no security at all. There are several motivating factors for the development of secure Java applications and applets. First, there is a need to ensure that malicious code cannot be delivered from elsewhere. Second, there is a need to ensure that users can be trusted. Finally, there is a need to ensure that Java applications are not exposed to security vulnerabilities. This tutorial will provide an overview and classification of a number of security issues for applets and applications. We will discuss the security implications of the use of the two popular web browsers, Netscape and IE.

Biography: Please see the following Tutorial

E-COMMERCE AND JAVA CRYPTOGRAPHY:

INSTRUCTOR: S.B. Ramakrishnan

Bowling Green State University

Java was introduced as an OOP language less than a decade ago. It is already becoming the preferred language of choice for e-commerce and database applications. However, there are two important aspects of Java that are less well understood, namely, (1. Java Applications and Security and (2) E-commerce and Java Cryptography. We believe however, that these two issues have significant relevance to the design and deployment of secure database (stand-alone or web enabled) applications for e-commerce. This half-day tutorial will be devoted to the first topic. We expect to address the second topic in a separate half-day tutorial at this conference.

E-commerce and Java Cryptography: The cryptographic features of Java are very attractive for building e-commerce applications. For example, one may be interested in the secure transport of database query results between application and database servers. Java Cryptography Extension (JCE) promises plug-in cryptographic libraries and seamless addition of a number of security components and services such as message digests, digital signatures, random number generators and algorithms for symmetric and public key cryptography. This
tutorial provides an overview of the Java cryptographic libraries and examines the components that are required to build secure application systems using the Java Secure Socket Extension framework. JSE provides a security layer (SSL) extension to the standard socket paradigm. While SSL is widely used over the web, non-web client server applications using these features are less prevalent.

Biography: Dr. Sub Ramakrishnan is a Professor of Computer Science at Bowling Green State University, Bowling Green, OH, USA. He has applied computer science interests include computer security and web-to-database connectivity, three-tier architectures and secure internet technologies, and data warehousing. Dr. Ramakrishnan’s work on distributed systems was supported by the National Science Foundation. He has published widely in the area of distributed systems and complexity of algorithms. He has had consulting opportunities on E-commerce solutions.

**Network Awareness for Heterogeneous Data Networks**

**Instructor:** Liang Cheng

**Abstract:** Network awareness, which is defined as the capability of network devices and applications to be aware of network characteristics, is the basis for network quality-of-service (QoS) provisions and network management. Data networks today, in general, are heterogeneous. Advances in data networking, wireless communications, and sensor systems are creating new heterogeneities into existing data networks. The necessity of network awareness in heterogeneous data networks will be illustrated by several experimental studies, such as multimedia collaboration, QoS provision, and cluster computing in heterogeneous data networks. Existing techniques for network awareness include computer security and web-to-database connectivity, three-tier architectures and secure internet technologies, and data warehousing. The above network awareness techniques could be implemented as services for network devices and applications. We will also study existing frameworks that integrate these services together to provide network awareness service. Network awareness mechanisms are required for applications in the mobile ad hoc networks. The above network awareness techniques could be implemented as services for network devices and applications. Thus, we will also study existing frameworks that integrate these services together to provide network awareness service. Network awareness mechanisms are required for applications in the mobile ad hoc networks.

**Wireless Sensor Network Protocols**

**Instructor:** Krishna Sivalingam, Ph.D., Associate Professor Department of Computer Science and Electrical Engineering, University of Maryland

**Abstract:** Tremendous technological advances have been made in the development of low-cost sensor devices equipped with wireless networking technologies. These advances have resulted in a large number of sensor networks connecting several thousand to a few thousand sensor nodes that have attracted recent research attention. Such sensor networks may be used for applications spanning several domains including military, medical, industrial, and home networks. The purpose of the tutorial is to present an introduction to wireless sensor networks - basic concepts, challenges, recent research, and further possibilities. The topics covered will be based on fundamental concepts and up-to-date material in the literature, as listed below:

- Introduction to wireless sensor networks, and evolution of protocols for sensor networks.
- Data dissemination and aggregation
- Routing Protocols
- M ultiple Access Protocols
- Energy-efficient protocol design
- Localization
- Exposure and Coverage problems
- Security
- Testbeds and application scenarios
- Security

**Biography:** Prof. Krishna M. Sivalingam (IEEE Senior Member) is an Associate Professor in the Dept. of CSEE at University of Maryland, Baltimore County with a joint appointment in the School of EECS at Washington State University. He received his B.S. degree from the Indian Institute of Technology, Madras in 1989, his M.S. degree in Computer Science from the State University of New York at Buffalo in 1994, and his Ph.D. degree in Computer Science from the University of Maryland in 1998. He is an Associate Editor of ACM Trans. on Sensor Networks.

**ASAP: Assuring Scalability for Application Performance**

**Instructor:** Neil J. Gunther

**Abstract:** Application scalability is key to success for most organizations. Hardware has become relatively inexpensive, while software developments are the new and more complex performance determinant. Developers and QA testers use tools such as Mercuri-Interactive’s LoadRunner (tm), and Microsoft’s WAS (Web Application Stress) to predict the scalability of application functions under virtual user loading. Under the pressure of shortened development schedules that typify the modern business environment, the focus tends to be on functionality first. New functionality, however, is often overemphasized because it is perceived without the organization has the time to conduct competitive differentiator. At the same time, the motivation of the development time tends to be absorbed by measuring, user requirements (functional testing) and user requirements (functional testing) and further possibility. The question naturally arises, Can we do better and can we do it quickly (ASAP)? That’s the subject of this half-day tutorial.

**Summary**

The question will be answered in the affirmative by examining the following points (among others):

- How many load points should you measure?
- How do you know you have a consistent set of measurement data?
- What additional performance data should you collect?
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Mail completed form with check or fax with complete credit card information to:
Dr. Brian Grayson
7700 West Parmer Lane
MD: PL30
Austin, TX  78729
Tel: (512) 996-4956
Fax: (512) 996-7439
Email: Brian.Grayson@motorola.com

### Tutorial Choices

If you are registering for tutorials, please indicate your morning and afternoon choices here.
For descriptions of the tutorials, you may consult the IPCCC web page at: http://www.ipccc.org/

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### Payment Information

**Fees (US Dollars)**

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*A full-day of tutorials is composed of two half-day tutorials, breakfast, lunch and copy of handouts.  
• Technical registration includes 2 breakfasts, 2 lunches, 1 proceedings and reception.  
• Tutorial registration includes 1 breakfast, 1 lunch and 1 copy of handouts.  
• Student registration does not include the proceedings. An extra set of proceedings is $25.00.

**Fees (US Dollars)**

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Please fax your payment authorization, along with the credit card information form. No wire transfers or invoices will be accepted. Each attendee must use a separate registration form. Registrants not using a credit card must include a check or money order payable to IPCCC 2003 and drawn on a U.S. bank, or a U.S. branch of a foreign bank for the total amount in US$.  
**Group Discount**: Discounts are available for group registration. To be eligible, all registrations for the group must be included at the same time with the fax being sent for all in the group at once (or sent in one envelope by mail). Groups of 5 to 9 receive a 5% discount; groups of 10 or more receive a 10% discount. See the payment information below.

### Group Discount

Discounts are available for group registration. To be eligible, all registration forms for the group must be received in the same fax or same envelope by mail. Groups of 5 to 9 receive a 5% discount; groups of 10 or more receive a 10% discount.

**Conference Site**

The conference site will be:

**Embassy Suites Phoenix North**
2577 West Greenway Rd
Phoenix, AZ 85023-4222

Telephone for reservations: (800) 527-7715
Other phone: (602) 375-1777

**To guarantee these rates**, request “IEEE IPCCC” reservation rates when making your reservation.
Free cooked breakfast is included for each occupant. More details about the hotel can be found at: www.embassy-suites.com/en/es/hotels/index.jhtml?ctyhocn=PHXNOES

**Embassy Suites Rates are**:

- Single/Double occupancy (King bed or two double beds) - $129+12.07% tax per night
- Triple/Quad occupancy - $139+12.07% tax per night