

Reliability Society

N E W S L E T T E R

<http://www.ieee.org/society/rs>



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President's Message

Happy New Year (Y2000)

First, I'd like to wish all of you a very happy and prosperous Y2000. Some may debate if the start of the century is 2000 or 2001, but this is close enough for most purposes to also wish you a successful new century. I expect that the next decade will be a very dynamic one for engineering of all sorts.

New AdCom Members

We start the new century with a new AdCom class. The 1999 AdCom election results are in. The newly elected AdCom class is:

Joe Fragola
John Healy
Lori M. Kaufman
Sam Keene
Robert Loomis
Alan G. Street



Congratulations to the newly elected AdCom members! I welcome you to the Reliability Society and welcome your enthusiasm in helping to make the society a significant technical contributor to the forthcoming century. It will be a pleasure to work with you.

Y2K

No, this is not a report about the horrors of computer Y2K crashes or a report on huge efforts to ensure that such crashes do not occur. Instead, it is a view on directions for the Reliability Society during the year 2000 and for perhaps the first decade of the new century. With a distant similarity to the Y2K renovations in computer software, the Reliability Society has undertaken a major renovation to its architecture - namely, a reorganization of Technical Operations. The reorganization had the following objectives:

- Improve service to members in terms of useful on-the-job information,
- Focus on emerging technologies and go well beyond the "same old stuff."
- In summary, the reorganization results are:
 - There is an improved focus on emerging technologies by restructuring the technical committees into technology committees (e.g. Microelectronic Technologies) and system committees (Transportation Systems),
 - Inactive committees have been eliminated,

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Denver

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Japan Chapter

We had a meeting on November 19, Friday from 4 pm to 6 pm. There were two speakers from the University of Maryland. The first speaker was Prof. Dave Anand, Chairman of Mechanical Engineering who spoke about Current and Research Directions in Mechanical Engineering at the University of Maryland. He emphasized that they are doing a lot of research in electronic packaging, MEMS, smart structures, micro-fabrication, etc which are beyond the traditional ME area and calls for wider collaboration among many different principles.

The second speaker was Prof. Michael Pecht, Director of CALCE. His talk was titled "Competitive Electronic Product Development- Research Being Conducted by the CALCE EP&S Center to Assess Electronics Reliability More Efficiently and Effectively-". He discussed some of the future challenges and research opportunities, along with new methods of teaching.

There were about 10 people from the major Japanese industries, about 20 people from academia and about 10 students, including those from Macedonia, Yugoslavia and Sweden.

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Philadelphia Chapter

The Chapter's activities, below are the meetings held for this period:

21 September 1999 SEARCH OF DIAMONDS - Mr. Jim Watson

The ability of IEEE to successfully provide for members' needs in the 21st century depends to a great extent on recruiting and actively involving recent graduates. In Search of Diamonds is a new approach to achieve active membership growth by using existing programs. It identifies how to build stronger partnerships with student branches and to involve membership development activities and the GOLD Program resources to make positive impacts on students, identify recent graduates, and conduct successful recruiting activities. As recent graduates become more involved, they will play an important role in the administration of section, chapters and societies, and bring greater success to their careers and our profession.

APPLICATION OF EMI MODELING IN DESIGN - Mr. Jim Nadolny

With the advent of commercial electromagnetic field solvers, modeling of electromagnetic interference problems becomes more practical. In this presentation, a case study was presented which addressed the use of commercial code to understand a shielding problem. The case study centers on the shielding performance of a connector and correlates measured and modeled results. For some shielding problems, measurements are more suspect than the simulation and the combination of the two leads to confidence in the results.

19 October 1999 THE GOOD, BAD, AND UGLY OF A STARTUP - Dr. Gregory H. Olsen

The history of Sensors Unlimited and EPITAXX - optoelectronic device firms with roots in the RCA/SRI David Sarnoff Research Center - was reviewed from start-up to acquisition. Topics covered included business plans, venture capital, key employees, and R&D funding. Mistakes, pitfalls, and successes were included. Key issues included the environment of a small vs. large company and product quality. Resources to

help start companies and the financial climate for the 1990's was discussed, and a question-and-answer period followed.

TIME AND TIME AGAIN: THE INFLUENCE OF BIOLOGICAL RHYTHMS ON HUMAN HEALTH AND PERFORMANCE - Dr. Donald L. MacEachron

Endogenous or self-generated biochemical and physiological rhythms are among the most ubiquitous characteristics of biological systems. One of the most common frequencies is that of circadian rhythms, which have a period of close to 24 hours when the biological system generating them is exposed to constant environmental conditions. Under a range of temporal environmental cycles, circadian rhythms can be synchronized (entrained) to the period of that environmental cycle. Human physiology and behavior is regulated by these biological clocks leading to temporal variations in physiological and psychological performance. This discussion focused on the impact of these rhythms and how particular stimuli and environments could be designed to take advantage of biological clocks in order to maximize human health and performance.

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San Diego Chapter

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Singapore Chapter (ED/Reliability/CPMT Joint Chapter)

Report on 1999 Activities - IEEE Singapore, REL/CPMT/ED Chapter

The Chapter was honoured to receive two awards, EDS 1998 Year award and a prize from IEEE Reliability Society for the performance in 1997-1998. For the EDS Award, ED/CPMT/RL Singapore Chapter and the ED/MTT India Chapter have been selected as the 1998 co-recipients of the IEEE Electron Devices Society Chapter of the Year Award. Our Chapter Chairman, Dr. SH Ong, received

the EDS award at the presentation in the IEDM opening ceremony at San Francisco and Prof. Daniel Chan, past chairman of our chapter, received the Reliability Society award at the International Reliability Physics Symposium (IRPS) banquet in San Diego.

The Chapter organized two international conferences – the 2nd IEEE Electronic Packaging Technology Conference (EPTC) in December 1998 and the 7th International Symposium on the Physical & Failure Analysis of Integrated Circuits (IPFA'99) in July 1999.

The 2nd IEEE Electronic Packaging Technology Conference (EPTC) was organized by the Singapore REL/CPMT/ED Chapter and technically co-sponsored by the IEEE CPMT Society (from 8-10 December 1998 at Raffles City Convention Centre, Singapore). It was also supported by the American Society of Mechanical Engineers (Singapore Section), the Centre of IC Failure Analysis and Reliability (National University of Singapore), Gintic Institute of Manufacturing Technology, Institute of Materials Research and Engineering, Institute of Microelectronics and the Nanyang Technological University. They were 59 Technical Papers and 4 Keynote Papers presented (from 13 countries in Asia, Europe and USA). Along with the Conference, four half-day tutorials in the area of electronic packaging technology were conducted, which are attended by 180 participants.

The 7th International Symposium on the Physical & Failure Analysis of Integrated Circuits (IPFA'99) was organized by the IEEE Reliability/CPMT/ED Singapore Chapter from 5-7 July, 1999 at Orchard Hotel, Singapore. The symposium drew 160 participants from 16 countries from Asia, Europe and America. They were 42 papers (three of which are invited papers) presented in the symposium from participants of 15 countries across Asia, Europe and America. The papers were selected by peer review from among more than 90 papers received. Along with the Symposium, an expert in each area of failure analysis and reliability conducted four tutorials, which was attended by more than 120 participants. The equipment exhibition arranged along with IPFA has attracted a number of personnel from industry.

Singapore IEEE REL/CPMT/ED Chapter organized four technical talks and one short course. The first technical talk was presented by Prof. Roman Sobolewski from Rochester University, titled "Ultra Fast Supercomputing Electronics and Optoelectronics". They were 18 participants. Dr. Leo G. Henry of Oryx Instruments presented the second talk, titled "Transient Latch Up Testing of Integrated Circuits". They were 42 participants. The third one was presented by Dr Lam Tim Fai of AMD Singapore, titled "FEA Evaluation on Organic Substrate C4 structure". They were 9 participants. The fourth technical talk was presented by Dr. E. Suhir, Distinguished Member of Technical Staff, Physical Sciences and Engineering Research Division, Bell Laboratories, Lucent Technologies, Inc., titled "Modeling of the Mechanical Behavior of Materials in "High-Tech" Systems: Attributes and Review". They were 11 participants. The one-day short course was conducted by Dr. E. Suhir, titled "Modeling of Thermal Stress in Electronic Packaging". This short course is specially tailored for Packaging Engineers and they were 11 participants.

Finally, our Chapter donated a book prize to National University of Singapore as an Endowment Fund. The interest generated from this Fund will be used to sponsor an award of an annual Book Prize to the best student in the "Integrated Circuit Reliability Physics and Failure Analysis" course, offered at the Masters level at the University of Singapore. The book prize is set at S\$300 plus one year IEEE membership fee. This award is an encour-

agement of academic excellence and professional development in the area of Integrated Circuit Reliability Physics and Failure Analysis, which is in line with the objectives of the Singapore Reliability/CPMT/ED Chapter. It will also be useful as a means of membership development in promoting awareness of IEEE and its activities. The Book Prize "IEEE Singapore Reliability Book Prize Award" presentation was held on July 24th, 1999. Dr. SH Ong, Chapter's Chairman, presented the check to Prof. Daniel Chan, Departmental Head for Electrical Engineering Department, National University of Singapore. The invited guests at the presentation ceremony included Prof. Cary Yang, EDS Vice-President.

For more information on Chapter activities, please contact

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Report by: YC Ng,
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Switzerland

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Reliability Society AdCom Meeting

Saturday, October 2, 1999
Co-op Inn Kyoto, Kyoto, Japan

The meeting was called to order at 9:00 am. A quorum was present. After the meeting was called to order, we received a welcome and a special report from the Tokyo chapter.

The agenda was approved and the minutes were approved as amended.

President report:

Ken reported that the new financial model could impact RS. He and Dick K are closely monitoring the situation. The RS budget was submitted according to IEEE

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AdCom Meeting

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recommended guidelines, but could be impacted with the new financial model.

Past action items:

Dennis presented status on several of his former AI's. Discussion on the cost comparisons for publications resulted in action for Dick Doyle to provide Dennis with cost elements for him to include in comparisons. On-line publishing is due to start for RS in January.

Treasurers report

Ken and Dick K will research past meeting minutes to the agreed amount of RS contribution to the History center and Dick K will send a check. There will be a small projected surplus for 2000.

Meetings report:

Bob eliminated the Sunday AdCom in January and March to eliminate conflicts. AdCom meetings will be previous Saturdays to the conferences. Bob explained the sponsorship type and responsibilities. There was a desire to have a liaison to every conference. Bob will get active contacts for all conferences that we co-sponsor. He will get clarification of the new rules for life members reduced rates for IEEE conferences and provide a table

identifying all RS sponsored conferences, points of contacts, etc and provide at the upcoming ExCom meeting.

Bob reported that the budgets for RAMS, IRPS, and IRW were approved. There is still a need to evaluate the status of conference closeouts. Bob will arrange to get a room for Tech op meeting to be held Sunday preceding RAMS. He mentioned that the EDS annual conference training will be held in December in Wash DC.

Membership report:

Marsha will determine which societies qualify for affiliate membership.

Publications:

Dennis will determine what Bob Loomis needs in order to upload Newsletter onto Web. Dennis reported that we must issue 4 Newsletters per year in order to maintain our license. Dave is requesting input for 4th issue. AdCom recommended that a special issue be made highlighting the Japan AdCom and workshop meetings. All came up with an agenda and actions. Dennis will coordinate with Dave and all Japan participants.

Tech Op report:

Bud sent email request for articles in RSN on their areas of specialties.

Jr Past President report:

Nominations/Awards status was presented

Loretta will resend the Lucern tasks/Past President tasks groupings to AdCom

Miscellaneous actions:

Dennis to work with Dave to identify areas needing work on the Newsletter

Jeff to update Roster by Nov 15 and send to AdCom members

Ken to send out org chart to AdCom (in Black and White)

RS Display report

Phil reported that in order to have the display available for RAMS, we must start the order process by Dec 1. Phil showed examples of the proposed display and material to be posted. An expenditure of up to \$7K was approved to continue working details with the vendor, but start order no earlier than Dec 1. Phil plans will start paperwork Nov 10, to meet the Dec1 order date.

Branding

Phil reported on status and provided a webpage address where we can find the latest status.

IEEE-SA News

This article is to bring you up to date with some recent engineering standards developed in conjunction with the CALCE Electronic Products and Systems Consortium.

IEEE P1332, Standard Reliability Program for the Development and Production of Electronic Systems and Equipment was approved on June 30, 1998. The Society of Automotive Engineers (SAE) subsequently adopted a nearly identical reliability program standard JA1000. The IEEE standard provides guidance to suppliers to plan a program that suits their design philosophy, the product concept, and the resources at their disposal, so that every

activity adds value. The objective of the standard is to provide products that satisfy the customer.

IEEE 1413, Standard Methodology for Reliability Prediction and Assessment for Electronic Systems and Equipment establishes the framework around which a reliability prediction methodology must be developed. The standard identifies key required elements for an understandable, credible reliability prediction and provides the users of the prediction sufficient information for the evaluation of prediction methods and for the effective use of the prediction results. To benefit from the IEEE standard, customers must require that their suppliers

use IEEE 1413 compliant reliability predictions to provide reliability prediction results. The CALCE Consortium is currently evaluating various reliability prediction processes against the criteria established in IEEE 1413. Prediction processes that are currently under review include: Mil-Hdbk-217F SAE's Method, Siemens SN 29500, RAC s system reliability assessment method, British Telecom HRD 5, Physics of failure, Bellcore TR-332, CNET RDF 93, and Honeywell s top down similarity analysis method. A separate guideline document for implementation of the IEEE 1413 standard is currently under development.

The CALCE Consortium has also been an active participant in the Avionics Working Group (AWG) of the International Electrotechnical Commission Quality Assessment System for Electronic Components (IECQ) Certification Management Committee (CMC). CALCE has provided the technical input for the AWG guidebook QC001007-1-2 Guide for Using Semiconductor Devices Outside Manufacturers' Specified Temperature Ranges. This guidebook will be presented to the IEC for approval in the year 2000. CALCE is now working on the development of an avionics technology roadmap.

The CALCE Electronic Products and Systems Consortium, based at the University of Maryland is a consortium of the world's leading avionics, automotive, computer, semiconductor, and electronics manufacturers. It represents a successful international industry-government-academic partnership. The Consortium pro-

vides information and services that match industry needs and provides an organizational structure by which different sectors of the electronics industry supply chain can share information and influence practices and policies.

CLARIFICATION OF CONTINUOUS PROCESSING PILOT PROGRAM

In an effort to reduce the amount of time for PAR approval to less than the traditional three-month cycle, the New Standards Committee (NesCom) and the IEEE-Standards Association (IEEE-SA) Standards Board no longer have to wait for their quarterly meetings to review and approve new projects. Earlier this month, two IEEE Standards Project Authorization Requests (PARs) were approved without a face-to-face meeting. These two projects are: **PC37.116 (PE/PSR)**

Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks; and P1364 (C/DA) Verilog Hardware Description Language.

"Continuous processing is to standards development as e-commerce is to shopping. Instant access to a product or a process is today's mandate. The IEEE-SA applauds our volunteers for their cooperation and innovation in this effort!" stated Judy Gorman, IEEE-SA Managing Director.

For more information on this continuous processing program, please visit the IEEE Standards web site at <http://standards.ieee.org/announcements/pilotprog.html>.

For more information on PARs, please visit the IEEE Standards web site at <http://standards.ieee.org/db/status/> and enter the PAR number, i.e., 37.116 or 1364, in the search field.

IEEE Standards Association (IEEE-SA)—As Year Two Comes to a Close

Members of IEEE's Technical Societies need to be kept current on the latest news from the IEEE-SA. We are coming to the end of our second year and are better positioned to assess the SA's accomplishments, unresolved issues, and future challenges.

When the IEEE-SA was launched, our promises to you included: 1) an election of the governing body, 2) expanded opportunities for standards development under the Standards Board, and 3) even further standardization opportunities outside of the Standards Board. How are we doing?

We've given IEEE-SA members a voice in the governance.

The first election of the President of the SA and the members-at-large of the

IEEE-SA Board of Governors (IEEE-SA BOG) is underway. The IEEE Board of Directors approved the election process in November 1998. Members of the IEEE-SA can elect the members-at-large of the IEEE-SA BOG, and members of the IEEE-SA who are also IEEE members may elect the IEEE-SA President. The position of President-Elect was also created to allow for continuity of leadership.

Issues and challenges.

Some volunteer standards developers don't see the value of being part of a constituency with the above-mentioned electoral privileges. The goal of an election is to bring forward individuals with leadership abilities, industry involvement, and strong interest and experience in the standards activities of the Institute. The more vested the interest, the better are the results for the standards constituency.

IEEE standards developers have new voting options.

The IEEE Standards Board has approved entity and mixed balloting (e.g., corporate balloting and/or corporate with individual balloting, respectively) to add a new dimension and opportunity to the IEEE standards consensus process. It is important to remember that the IEEE-SA Bylaws include several new membership categories, such as company, government agency, and organization. Now, an IEEE committee can declare at the outset of its project (PAR) that it will proceed with a corporate-level ballot, a ballot including company representatives and individuals, or the traditional individual-based ballot. IEEE hosts a broad range of standards programs, coming from di-

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IEEE Standards Association

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verse industry sectors. IEEE's various industry groups require options for proceeding rather than a "one size fits all" policy.

Issues and challenges.

IEEE's standards developers cover a broad spectrum of industry types. What works for the power interests may not apply to the telecommunications groups or the design automation committees. Yet, we need to sensitize each sector to this fundamental fact, so that our participants experience the process options as a strength rather than a threat to the quality of the IEEE standards program.

A new organization has been formed that allows IEEE to provide a full range of standards services to its members and their industries.

Over the last several years, we have been keenly aware of the proliferation of industry groups that have formed for the purpose of developing industry standards and running related programs. These groups formed because they found that the IEEE was not able to respond adequately and quickly enough to the market demands of their technologies. We had to ask ourselves, Why shouldn't this work be done in the IEEE? These are IEEE technologies! And as a result the IEEE-SA developed the IEEE Industry Standards and Technology Organization (IEEE-ISTO), which was approved by the IEEE Board of Directors in November 1998 and launched on 1 January 1999.

The new organization's goals complement the activities of the IEEE-SA. The IEEE-ISTO provides a forum in which development processes and related activities can be tailored to the technology, market, and participants. It also offers support for industry-specific post-development activities, including marketing, certification, branding, and conformity assessment. The Medical Device Communications Industry Group was the first group to organize within the IEEE-ISTO.

Two more groups have signed up for services, and several more are in the negotiation phase.

Together, the IEEE-SA and the IEEE-ISTO enable the IEEE to offer industry an unprecedented level of choice through a complete menu of standards activities and services.

Issues and challenges.

The IEEE ISTO must provide proof of concept that it can function as a supplier to the Societies and the Standards Board, not a competitor.

Our goals for this year have included an aggressive globalization program, new product and service opportunities, and increased communication and improved relationships with the IEEE Technical Societies. We will keep you informed through this newsletter and other media, and we welcome your thoughts and comments.

Judy Gorman
Managing Director
IEEE Standards

Joint RS - CS System Assurance development proposal

Samuel Keene

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"Develop assurance and certification processes for development of Safety Critical Systems and their application with respect to its reliability, safety and fitness for use".

1. Project need: Systems are increasingly dependent on extensive software content including firmware and other "complex logic". Software development doesn't have the tools and disciplines to assure its trustworthiness. Problems abound. The Therac 25, radiation therapy machine, lethally radiated patients. The Arriene 5 lost its course due to mis-designed software. The main reason scuttling the Strategic Defense Initiative (SDI) was the system software was not deemed untrustworthy to support the mission. New missions and project applications in the new millennium will be gated by their capability of building trustworthy software.

2. Project objectives:

- Clarification of the problem so that it can attract the funding necessary from sources other than the IEEE Foundation to begin to search out real solutions including industry and government agencies such as NIH, DOD, FAA, NSF, etc.
- Research and define the present state of the art in developing Safety Critical Systems (SCS)

- Analyze SCS post mortems, identifying potential safeguards that would have mitigated these problem
 - Codify best practices
 - Classify the impact areas and their susceptibilities and defenses. Impact areas include: Medical, Nuclear, Terrestrial transportation, Air traffic navigation, Enterprise systems, Security and Environmental impact.
 - Develop a standard to certify developers of SCS', and for certifying SCS development processes and for certifying/validating SCS products
3. Those expected to be served by the project:
- **The IEEE:** It is an opportunity for the IEEE to fill a long standing technological need for assuring delivery of trustworthy systems and software.
 - **Profession and Society:** This research initiative will enable new applications requiring trustworthy software
 - **Education:** Codified practices will be developed and flowed down to University to teach the best practices for developing trustworthy software and systems.

Interested parties should contact Sam Keene.

R&M in CAE Applications Status CAE in CE Tech Ops Report

By Dennis R. Hoffman, Chair

Reliability and Maintainability computer-aided-engineering (CAE) applications are readily available from a number of software application suppliers. Many of these suppliers exhibit their capabilities at the RAMS Symposium each year to increase the awareness of these productivity-enhancing products to the practicing Reliability and Maintainability Engineers attending. Many of these suppliers also advertise their products in our Reliability Society publications.

Most of the mainline R&M tasks have CAE applications available. These capabilities include R&M predictions using several techniques, various R&M modeling methods, different ways to document FMEAs and FMECAs as well as Fault Trees, test planning and evaluation tools, failure reporting and corrective actions applications, etc. These tools can and do greatly enhance the productivity of the user.

As you can see from the listing, these applications are discipline specific and therefore are not totally useful in an integrated product development team environment. It is critical that the product development teams be able to share product and design information easily and that multi-discipline requirements can be traded-off easily. R&M are tied to just a

few of the product requirements within a large set of overall product requirements. All of these requirements are important but some are at odds with each other at times - just like reliability and maintainability requirements can be at odds with each other. Discipline tool-sets across the product team must easily interact or tools must be developed that can comprehend multiple requirements. This would allow the design solution to be an optimization across requirements. Progress has been made in design data sharing and tool application capabilities, but much more work is needed.

Today, failure modes and effects analysis tools are primarily documentation aids, and these techniques are very good at aiding the user, thus greatly increasing the user's productivity. However, the tools are still just that — documentation aids. Research is underway within universities and within industry to develop techniques allowing automated system level analysis. Automated FMEA analytical capabilities at the circuit level are possible today, but the difficult part comes from going up the product architecture tree — from the circuit card level to the box level to the subsystem level to the system level. Hopefully, the research be-

ing conducted will make a more automated FMEA possible in the not to distance future.

As a way of communicating R&M CAE needs to the suppliers, an R&M CAE Workshop was established and has been held annually since 1987. The targeted audience consisted of R&M practitioners, companies' engineering automation managers, and R&M CAE suppliers. In the mid-1990's, this stand alone Workshop was merged with RAMS. Within RAMS, the message of what R&M needs in terms of CAE capabilities is still being carried. By having university and industry researchers present their work at RAMS, both R&M practitioners and suppliers are made aware of what is needed and what is possible. These sessions within RAMS also allow the suppliers to make the attendees aware of what capabilities they have to offer to enhance productivity and to minimize routine task time requirements. R&M being a contributor within the integrated product development teams is critical, and therefore the need for timely inputs is crucial. R&M CAE is the critical ingredient in keeping R&M current and timely within the team. We will keep carrying the message.

IEEE Unveils New Video-on-Demand Service With Free Access Until February 2000

The IEEE has launched a new educational service that brings technical courses to the users desktops. IEEE Video-On-Demand, available from the IEEE Web site at <http://ieeemediaplatform.com>, streams entire video tutorials directly to viewers when they want them. The IEEE is offering a free trial period for any of the courses in the catalog from 1 December 1999 through 31 January 2000.

Segments of each video are available for preview before subscribing to the service. After registration, viewers will be able to watch the complete tutorials, with full motion video and audio, PowerPoint slides, presentation notes and an interactive table of contents that allows users to go directly to information or presentations of interest. IEEE education video tutorials take an in-depth look at critical technologies in the electrical engineering

fields. Available through the IEEE Video-On-Demand service will be tutorials on computer engineering, communications, reliability, power, signal processing, and more. Titles include:

- Real-Time Systems: An Engineer's Guided Tour
- Strategies and Planning for a Wireless Technology System

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RELEX Center Spread

RELEX Center Spread

New Video-on-Demand

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- Developing Software For Safety Critical Systems
- P.E. Review: Transmission and Distribution & Machinery and Applications
- Power Electronics and Motor Drives
- Video Signal Processors

IEEE Video-on-Demand uses SoftCom technology in conjunction with RealNetworks™ G2 Player, so that anyone with a computer and high-speed modem can access the growing list of IEEE video tutorials. SoftCom's Java-based, patent-pending technology makes Internet video an immersive, interactive viewing experience. Their streaming video technology allows for video to be

delivered from one point to another without a download period. Browsers with faster network connections will receive better quality video.

To experience this leading-edge technology during the free access period, log on to <http://ieeemediaplatform.com>. To speak with a representative from IEEE about Video-On-Demand, contact Alan Trembly, Business Development Manager, at a.trembly@ieee.org or 732.562.5488.

The Institute of Electrical and Electronics Engineers, Inc. (IEEE) is the world's largest technical professional society, serving the interests of more than 340,000 members in the information and electrotechnology communities in approximately 150 countries. Through its members, the IEEE is a leading authority on areas ranging from aerospace, computers and telecommunications to biomedicine, electric power and consumer electronics.

SoftCom, Inc. (www.softcom.com) was founded in 1994 by a team of veterans from Bell Labs and other Internet and software enterprises with foundations in software development, networking, telecommunications and digital video. Early on, SoftCom established a reputation for e-commerce and digital video solutions. Today, SoftCom includes an outstanding team of innovators in the technology, entertainment and design industries and is building upon its origins by offering content providers a compelling way to take full advantage of the Internet as a distribution outlet and e-commerce/marketing tool for their existing video.

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1999 ISRE Conference was a Great Success

I am at the 1999 International Software Reliability Symposium in Boca Roton, Florida, November 1-4. A record number of 245 attendees this year compared to 135 in 1998. ISRE is jointly sponsored by the Computer Society and the Reliability Society.

This years innovations included:

- Six of the best papers will be published in the Reliability Transactions
- 25 students attended on Corporate scholarships
- The industry papers were a big hit adding to the more academic papers
- ISRE being held the same week as the Software Metrics Symposium
- Two sessions of Fast Abstracts were held to announce the most recent advances
- IBM raffled away a new Palm Pilot computer and a number of neat IBM Research polo shirts.

Ram Chillerege of RS brought in a lot of these innovations.

2000 ISRE will be in San Jose with a targeted attendance of 350 folks.

Please advise Sam Keene (s.keene@ieee.org) if you are interested in participating in the conference organization.

Sam Keene

Congratulations on ISSRE 1999

Taghi and Jeff:

This ISSRE was a treat to be at, and I want to thank you for running a nice conference. We brought in a lot of innovation and had great results - the 245 registration - almost 100% growth from last year is something we can all be proud of. More importantly, I heard and felt the sparkle of enthusiasm from several respected colleagues.

Congratulations.

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Software and System Reliability Considerations for the 21st Century Outline of thoughts

IEEE Educational Activities Board Presents 1999 Awards

This year the IEEE Educational Activities Board recognized six individuals and one company for their efforts in promoting education excellence for the engineering community. The "Meritorious Achievement Award in Accreditation Activities" went to Theodore Bickart, President of Colorado School of Mines and Richard Painter, founder of Painter Engineering, Inc. Both men were recognized for their sustained efforts to ensure that the accreditation process in both engineering and engineering technology will promote excellence in engineering

education. Mohamed El-Hawary received the award for “Meritorious Achievement in Continuing Education.” Dr. El-Hawary, currently Associate Dean of Engineering at Dalhousie University in Nova Scotia, has worked tirelessly with the IEEE Power Engineering Society to promote the need for technical vitality through lifelong learning. Donna Brown, Associate Professor at the University of Illinois at Urbana-Champaign, was the recipient of the EAB “Major Educational Achievement Award”. Dr. Brown is the director and co-developer of Mallard™, an asynchronous, interactive learning environment for the World Wide Web. The “Meritorious Service Citation” was presented to David Green, faculty member of the University of Alabama at Birmingham and Forrest Staffanson, recently retired following 46 years as a physicist and engineer with industry, academia and government. This award is for “outstanding service in the aims and objectives of the Educational Activities Board.” The “Employer Professional Development Award”, established in 1995, went to Samsung Electronics Co., Ltd. This award recognizes companies that show outstanding commitment to employee development and continuing education. Mr. Bosoon Song accepted the award on behalf of Samsung. He is President & CEO, Samsung Electronics North America.

Dr. Samuel J. Keene
Dec 14, 1999

Y2k and IT shocks

- Problem prevention cost about 100B which is significantly less than predicted my many
- Imagine what would have happened if this problem caught us unawares and took its toll. Life as we know it would have been shocked, like the oil embargo of 1974.
- We now have an Information Technology layer that surrounds our life and which we depend upon.
- Our offices and businesses depend upon computer communications and what a hapless feeling we have when that service is not available.

- More importantly our common services depend upon computer controllers and communications. This includes power distribution, telephone, water supply, sewage disposal, financial transactions, as well as web communications. Shocks to these services disrupt our way of life in our global economy. We are dependent on these services being up and functioning.

Critical deployment areas or high impact areas

1. Nuclear power
2. Medical
3. Traffic control (Air, Train, auto controlled automobiles)
4. Environment
5. Business Enterprise
6. Distributed systems
7. Common services (water, sewer, communications)

Problem sources

- The main line code always does its job. **Breakdowns occur when with the software exception code** not properly handling an abnormal input or environmental conditions—or when an interface doesn’t respond in a desirable way.
- **The major cause of software problems lies in System Management problems.** These are requirements deficiencies or interface defects. The Martian probe failed in the Fall of 1999 because both metric and British units were inappropriately used in the control system. This tower of Babel situation misguided the \$150 million dollar space probe.
- **Beware that small changes can have grave consequence** [5]. The error proneness of effects of small changes is:

Defect rate:	1 line	50%
	5 lines	75%
	20 lines	85%

Small changes can have big impacts. “DSC Communications Corp., the Plano Texas company whose signaling systems were at the heart of an unusual cluster of outages (over a two month period of time following a)... software modification leading to the disruptions . It was re-

ported, “Three tiny bits of information in a huge program that ran several million lines were set incorrectly, omitting algorithms – computation procedures – that would have stopped the communication system from becoming congested, with messages...Engineers decided that because the change was minor, the massive program would not have to undergo the rigorous 13 week (regression) test that most software is put through before it is shipped to the customer”. Mistake!

The Arriene 4 code worked fine but it did not scale up satisfactorily to Arriene 5 due to Arriene 5 design changes that were not properly accounted for in the old code.

- Higher frequency operation typifies today’s systems, making them increasingly vulnerable to electro magnetic emissions. One manufacturer’s equipment experienced excessive failures in a Paris operating room. An engineer was sent to investigate and found a medical doctor using his cell phone in proximity to the failing equipment. Cell phones operate around 2 gigahertz with corresponding wavelengths small enough to impinge the surrounding medical equipment covers and interfere with operations.

Mitigating actions we can take

- Back up systems in case your main application crashes.
- Study near misses to understand how to prevent or mitigate failures, just like we do today in aircraft near misses
- Use lessons learned to improve and harden the system
- Perform a potential failure modes and effects analysis to harden the system against abnormal conditions
- Perform root cause failure analysis to trace problems down to the underlying cause. Then parse the remainder of the code to ferret out any other cases where this same fault can lie.
- Develop more effective testing techniques to cover the extensive number of program paths covering the possible input conditions

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Considerations

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- Think defensively. Look at how the code handles inappropriate inputs. Design to mitigate these conditions.
- Inject faults into systems under development to speed the maturity of the diagnostic and fault handling capability of the software.
- Build in diagnostic capability. Our electrical power is managed over a grid system, which has built-in atomic clocks. These clocks monitor time to better than a billionth of a second. This enables proper accounting of power usage and links the power source to the user. This also provides a significant reliability tool for failure events that used to appear simultaneous can be differentiated back to the source of failure.

The future

Most companies have back up capabilities for their mission critical applications. They use battery back up and Uninterruptable Power Systems (UPS). Each functional department typically uses cell phone to back up the phone line system. System ledgers and journals of transactions are maintained in real time or backed up daily. Mission critical data is stored in geographically diverse locations.

Best of all, y2k has quickened the awareness of systems vulnerability and the need to design in checks and safeguards, and to develop and follow best practices.

The biggest development challenge will be to improve our test capability to deal with the burgeoning amount of code that is being developed. Testing such code, with its explosive number of operating paths is a great challenge. Because

of this, safety critical code will probably be developed using “clean room development processes” which properly assure the path conditions as the code is developed. The code and the checking are developed simultaneously.

The US is mostly positioned to deal with y2k. There will be interruptions of some services but the interruptions should be limited in time and extent. The rest of the world may have more problems, which could also pose some problem for the US. Where the world is most weak is not the random failure modes but in the possibility of an organized attack directed at nations (or companies) economic, environmental or enterprise systems. It is conceivable that a well-organized attack could defeat the redundancies. This means that the potential threat of terror must also be included in the development of 21st century systems.

IEEE Releases Video Tutorial Oxide Wearout, Breakdown, & Reliability

PISCATAWAY, NJ, 19 November 1999 – Newly released from the IEEE is the video tutorial, *Oxide Wearout, Breakdown, & Reliability*. Carefully and concisely organized for the most effective utilization, this informative video covers the evolution, over the past thirty-five years, of concepts involved in oxide wearout, breakdown, and reliability.

Topics covered include:

- Brief history on oxide wearout
- Models for wearout and breakdown
- Characterization of wearout
- Physics, measurement, and consequences of trap generation
- Properties of the stress generated traps
- Coupling of trap generation to breakdown

- Differences between early electrical breakdowns
- Final thermal breakdown

The video includes an extensive compilation of references to literature significant within the field. Emphasis is placed on attempting to find the unifying physical and engineering principles that bind these different literary works together.

4 Hr. 30 Min.; List Price: \$775.00; Member Price: \$650.00

IEEE order #: HV7053-QVE (NTSC version); HV7054-QVE (PAL version)

Order from the IEEE Customer Service Department, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855-1331, USA; e-mail: customer-service@ieee.org; phone: 1.800.678.4333; Web: <http://www.ieee.org/eab>

The Institute of Electrical and Electronics Engineers, Inc. (IEEE) is the world's largest technical professional society, serving the interests of more than 330,000 members in the information and electrotechnology communities in approximately 150 countries. In keeping with its “Networking the World” slogan, the IEEE helps to foster technological innovation, enable members' careers, and promote worldwide professional community. **The Educational Activities Board (EAB)** of the IEEE recommends educational policy to the IEEE Board of Directors, and coordinates the Institute's educational activities, programs, and products.

Meeting Notice

IEEE INDUSTRIAL & COMMERCIAL POWER SYSTEMS TECHNICAL CONFERENCE

PANEL SESSION ON RELIABILITY OF ELECTRICAL EQUIPMENT

EXTENSIVE ELECTRICAL EQUIPMENT RELIABILITY DATA have recently been collected from industrial, commercial, and small electric utility installations. The results will be presented in a two part paper and then followed in the afternoon by a four hour panel session on May 9, 2000, in Clearwater, Beach, FL, at the IEEE INDUSTRIAL & COMMERCIAL POWER SYSTEMS TECHNICAL CONFERENCE. Leading experts in the industry will serve on seven separate panels in succession to discuss the data collected and compare it with their own experience and with results from other equipment reliability surveys. The equipment categories covered will include:

1. Power transformers,
2. Motors and motor starters, generators driven by gas turbines, Diesels, steam turbines, or reciprocating engines,
3. Circuit breakers, fuses, protective relays,
4. Disconnect switches (automatic and manual), static switches, switchgear bus,

inverters, rectifiers, uninterruptible power supplies, batteries,

5. Cable and bus duct, heating, ventilating, and air conditioning equipment (HVAC).

Oral discussions and questions will be encouraged. Written discussion will also be invited. It is planned to consider the use of this new reliability data in the next revision of IEEE Standard No. 493 "IEEE Recommended Practice for Design of Reliable Industrial & Commercial Power Systems" (Gold book). This standard has been widely used in

both the United States and in other countries. The 1997 version includes several IEEE surveys of equipment reliability in industrial & commercial installations since 1973. Some of this data are now "out of date." Past IEEE surveys have not included HVAC equipment; but the scope of IEEE Std 493 can include this in the future.

This new equipment reliability survey data were collected by the "Reliability Analysis Center" and was funded by the

US Army Corps of Engineers, "Power Reliability Enhancement Program" because of their interest in participating in future revisions of IEEE Std No. 493 and using it in the design of future military installations.

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Chairman Equipment Reliability
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Copies of the Advance Program for the IEEE Industrial & Commercial Power Systems Technical Conference, May 7-11, 2000, Clearwater Beach can be obtained after Feb. 20, 2000, from Jim Beall, j.beall@ieee.org, PO Box 1381, Tampa, FL 33601.

RSP-2000: Meeting Notice

Paris, France, June 21-23 2000

<http://www-src.lip6.fr/rsp>

General Description

The IEEE International Workshop on Rapid System Prototyping (RSP) presents and explores the trends in rapid prototyping of Computer Based Systems including, but not limited to, distributed, communication, information, and manufacturing systems. It aims to bring to-

gether researchers from both hardware and software communities to share their experience with rapid prototyping and related work. The 11th annual workshop aims to be opened to various visions and techniques related to Prototyping and to facilitate sharing of new vision and innovative techniques related to Prototyping.

It will focus on improved approaches to resolve prototyping issues and problems raised by incomplete specifications, increased system complexity and reduced time to market requirements for a multitude of products. The workshop will in-

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RSP-2000

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clude keynote presentations and formal paper sessions with a wide range of system prototyping topics including, but not limited to:

- System Emulation
- System Specification
- Tools for Software Prototyping
- Tools for Hardware Prototyping
- Methodologies for Software Prototyping
- Methodologies for Hardware Prototyping

- Prototyping in an engineering process
- Prototyping of embedded systems
- Prototyping Case Studies
- Very Large Scale System Engineering
- Integrated telecommunications systems
- Hardware/Configware Codesign and tradeoff
- Hardware-Software Codesign
- Very Large Scale System Engineering
- Hardware/Software Tradeoffs
- System Verification/Validation

- Prototype to Product Transition
- Prototyping of Real-Time Systems
- The Role of FPGAs in System Prototyping
- Virtual Prototyping

The IEEE Rapid Systems Prototyping Workshop is co-sponsored by the IEEE Computer Society Technical Committees on:

- Design Automation
- Simulation
- Test Technology

Call for Papers

Sixth ISSAT International Conference on RELIABILITY AND QUALITY IN DESIGN

AUGUST 9-11, 2000- ORLANDO, FLORIDA, USA

The International Society of Science and Applied Technologies (ISSA'1)

The ISSAT International Conference on Reliability and Quality in Design is an international forum for presentation of new results, research development, and applications in reliability and quality in design. Papers may address any aspect of reliability and quality in design. Papers dealing with case studies, experimental results, or applications of new or well-known theory to the solution of actual reliability and quality problems in engineering design are of particular interest.

Topics of Interest

- Reliability
- Modeling Analysis and Simulation
- Fault Tolerance
- Quality Assurance
- Optimization
- Software Reliability and Testing
- Quality Cost
- Maintainability and Availability
- Data Collection and Analysis
- Human Factors and Reliability

- Concurrent Engineering and Design
- Performance Analysis
- Experimental Design for Quality Control
- Software and Algorithms
- Methodologies for Quality Control
- Systems Design
- Safety-Critical Systems
- Risk Assessment Modeling
- Reliability Modeling and Testing
- Network Reliability
- Design Issues in Manufacturing
- Process Control and Management
- Quality Planning and Measurements
- Engineering Design Optimization
- Quality Engineering
- Total Quality Management Techniques

Three copies of the papers (maximum 15 double-spaced pages) should be submitted by March 1, 2000, to Program Chair:

Dr. Ming-Wei Lu
CIMS 484-04-10
Daimler Chrysler Corporation
800 Chrysler Drive East
Auburn Hills, MI 48326 U.S.A.
e-mail: MWL.6@Daimlerchrysler.com
Tel: (248) 576-0167
Fax: (248) 576-0173

All submitted papers will be reviewed for merit and contents. Accepted papers will be published in the Conference Proceedings. Outstanding papers will be considered for publication in a special issue of the International journal of Reliability, Quality and Safety Engineering.

Manuscript must be submitted no later than March 1, 2000

Notification of Acceptance/Rejection
April 15, 2000

Iss Camera Ready Papers Due May
15, 2000



Call for Papers

The Second International Workshop on ENGINEERING OF RECONFIGURABLE HARDWARE/SOFTWARE OBJECTS (ENREGLE)

<http://www.cs.rdg.ac.uk/~tpp/enr.html>

and

The 2000 International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA'2000)

<http://www.cps.udayton.edu/~pan/pdpta/>

June 26 — June 29, 2000

Monte Carlo Resort, Las Vegas, Nevada, USA

Scope

There has been a growing interest in using reconfigurable computing platform (FPGAs) for the design of application-specific computer systems in classical signal and image processing as well as in new emerging areas such as multimedia, telecommunication and security systems. The advance in reconfigurable increases the pressure for developing flexible high-level methods and tools for automatic mapping algorithms into hardware and software. It would be desirable to have possibilities to translate existing software packages, say, in video and image processing, into custom computing machines on FPGAs.

CAD tools and systems have been developed for designing correct circuits, mapping synchronous dataflow algorithms and regular algorithms into hardware, and for partitioning the system between hardware and software, i.e. Hardware/Software Co-design. Emerging reconfigurable computing platform adds one new aspect: the necessity for run-time partial reconfiguration of dynamic hardware, meaning that during the problem execution the hardware configuration can be partially changed by a program.

Other important aspects are (1) the parameterization of hardware/software solutions with respect to problem parameters (e.g. size of problem, word length); real-time parameters (e.g. latency, performance); hardware parameters (e.g. reconfiguration time, number of processors or available area, number and orientation of inputs/outputs), (2) the customization of solutions with respect to operations and values of constants, and (3) the methods and models for analyzing and measuring the efficiency of solutions.

This workshop focuses on the different approaches for specification and mapping algorithms into reconfigurable hardware environment, i.e. Engineering of Reconfigurable Hardware/Software Objects. Logical specification, refinement and verification; dataflow models; functional programming approaches; space-time mapping on polytope model and regular arrays could form a possible, but not exhaustive list of different approaches. We are also interested in applications and implementations that demonstrate the systematic way to develop hardware/software objects with the emphasis on parameterization and reconfiguration or which provide case studies in analyzing the trade-offs.

Important dates

Draft papers (about 4 pages): February 28, 2000

Notification of acceptance: April 3, 2000

Camera-Ready papers (7 pages): May 1, 2000

Conference and Workshop: June 26 - June 29, 2000

Submission

Prospective authors are invited to submit original, unpublished work to the Workshop Co-chair Toomas P. Plaks. An electronic copy of draft paper in Postscript format viewable and printable with Ghostview should be sent via email, otherwise three copies should be sent to arrive by the same deadline. Each submission should include the title of paper and the contacting authors name, full postal address and email address. All accepted papers will be published in the proceedings of conference. After the conference, authors of best papers will be invited to submit an extended version for publication in an International Journal (last year was The Journal of Supercomputing).

Editor's Column

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3. A proposed agenda for the future of R&M research
4. A critical evaluation of current R&M research and development, including recommendations for changing the emphases in the field
5. A report on current R&M research results
6. Unique R&M case studies
7. Any other perspective on R&M studies that you believe should be aired

We anticipate receiving practical papers that address problems / solutions on R&M design, statistical inference, software R&M, hardware R&M, human reliability, and R&M performance measures in the product or process life cycle. Although theoretical papers are welcome, application papers are strongly encouraged. Papers should be sent to:

Dr. Ralph Evans

Managing Editor
804 Vicker Ave.
Durham, NC 27701
Email: RAEVANS@prodigy.net

We look forward to receiving your papers.

Sincerely,
Way Kuo, Editor
Email: way@acs.tamu.edu

Call for Opinions

The editorial staff of the IEEE transactions on Reliability welcomes your comments on material published in the Transactions as well as on other topics of interest to our readers. If you comment on an item submitted by someone else, that person will be invited to present a reply or clarification. We will publish controversy, but we do not want to publish misunderstandings. In the interests of professional dialogue, we also encourage direct interaction between you and the person who made the submission. Opin-

ions submitted to the Transactions will be edited as to length and propriety-at the sole discretion of the editorial staff.

IEEE Senior Grade Elevations

Congratulations to the following on your elevation to Senior member, IEEE:

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Sujata Banerjee
Lori M. Kaufman
Koichi Inoue
Shuichi Fukuda

This is a significant professional honor that recognizes your engineering contributions during your career.

Ken LaSala
President

Share Your Knowledge

Send your articles for the July issue by April 8, 2000.

Thanks
Dave Franklin
Editor

President's Message

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- Committees with common interests have been combined,
- Liaison functions have been incorporated into committees,
- Technical Operations entities have been reduced from 30 to 19.

The technology committees are Reliability Design, Software Reliability, Microelectronic Technologies, Human Interface Technologies, International Reliability, Warranties, Testing and Screening, Standards, CAD/CAE, Mechanical, and Safety. The system committees are Aerospace and Defense Systems, Transportation Systems, Information Technology and Telecommunications Systems, Energy Systems,

Medical Systems, Consumer Electronics, Sensor Systems, and Industrial Systems. At the present time, we are

seeking chairs for Medical Systems, Consumer Electronics, Sensor Systems, and Industrial Systems. We are seeking new members for all of the committees. We're expecting these committees to provide you the up-to-date knowledge in the dynamic areas of technology.

Video/Web Education

In keeping with our "Improve service to members in terms of useful on-the-job information" objective and aligning our society with IEEE educational objectives, the Reliability Society is examining new modes of education and training in addition to our successful video tutorial program. Most of you already know that the Reliability Society supports the series of tutorials given at the annual Reliability and Maintainability Symposium and our video tutorial program. We are now examining the possibilities of offering CD-based and interactive Web-based courses. We expect that these additional

modes of education and training will make it easier for you to get the information you need by providing easier access and offering more subjects. We certainly would like your ideas on courses that would help you.

I've described some of the innovations that we've made or are considering to propel us into the next century. These will be successful only if you are part of them. Consequently, I'm inviting you to be part of what I believe to be a very exciting and rewarding set of activities. Please contact one of our vice presidents, AdCom members, or me to become actively involved. You'll find the involvement both stimulating and enjoyable!

Ken
Reliability Society President
Kenneth P. LaSala, Ph.D.
President, IEEE Reliability Society
k.lasala@ieee.org

ITSC-2000 Call for papers