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Kane Kim, University of California - Irvine, USA
Annie Combelles, Objectif Technologie, France
Iwao Toda, Fujitsu Limited, Japan
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Foreword

Stephen S. Yau
Chair
COMPSAC Standing Committee

This year is significant; not only because it is the 20th anniversary of COMPSAC (the Annual International Computer Software and Applications Conference), but also because 1996 marks the 50th anniversary of the IEEE Computer Society. In particular, during the past few years, computer technology and applications have developed at such a lightning pace that they have dramatically changed almost every aspect of our daily lives, and every organization has come to rely on the latest computer technology to improve its competitive edge. Innovative software has emerged as the dominant factor in the success of these applications.

COMPSAC '96 continues the long tradition of high-quality, broad international participation from industry, academia, and government. This year, the conference will consist of three keynote addresses, 23 regular paper sessions, nine panel sessions, one plenary closing panel session, and four one-day professional development seminars covering various important and timely topics such as software development and re-engineering, distributed and multimedia databases, network software engineering, information highways and infrastructures, software engineering education, and emerging trends in software technology and the software industry.

It is meaningful for COMPSAC '96 to be held in Seoul because it provides excellent opportunities for COMPSAC participants from around the world to observe first-hand the dramatic achievements of the Korean high-technology industry and learn about the exciting initiation of their information superhighway project.

The detailed planning and organization of this conference required the talent and dedication of many volunteers and strong organizational support. On behalf of the Standing Committee, I would like to thank the 1996 Conference Chair, Gil C. Kim, for his leadership and support in hosting the conference. The top-quality technical program — with its broad international participation — is due to the leadership of the Program Co-Chairs, Carl Chang and Sukho Lee, in addition to significant contributions from the Program Vice Chairs and the program committee members. The well-organized logistical support for the conference depended on the special efforts of the Operations Committee, especially Chair Jung Wan Cho. Finally, we would like to thank the continuing strong support we have received from our sponsors, the IEEE Computer Society and the Korea Information Science Society, as well as this year's host, the Korea Advance Institute of Science and Technology.

We sincerely hope you will find that your participation in COMPSAC '96 is both valuable and memorable. Welcome to COMPSAC '96.
Preface

Gil C. Kim
Conference Chair

It is an honor to host the Twentieth International Computer Software and Application Conference in Seoul. Recently, application software developments have been very active in Korea both in private and public sectors. Initiation of the information superhighway project will further enhance the software industry and technology, and we are looking forward to sharing our experience with the COMPSAC 96 participants.

These new application will have a significant impact on our lives, industry, and institutions. COMPSAC 96 provides a forum for software researchers and practitioners to share and communicates their ideas and experiences for the purpose of meeting new challenges in application software development. In this conference, diverse areas in software technology will be covered with special emphasis on network applications.

I would like to thank Stephen S. Yau, COMPSAC Standing Committee Chair, and Carl Chang and Suk Ho Lee, COMPSAC 96 Program Co-Chairs, who have put together a wonderful program. I would also like to thank members of the Operations Committee and Program Committee, whose devoted efforts were instrumental in setting up the conference. Finally, I am grateful to all COMPSAC 96 participants who made this conference a successful one. I would like to welcome you to Seoul, Korea and I hope that the conference will be a meaningful experience for you.
Program Overview

Several key achievements have been made at the Twentieth Annual International Computer Software and Applications Conference (COMPSAC 96). First, of course, is that this popular conference has sustained for two decades and continues to be one of the most dominant software-oriented conferences. Second, we strive to maintain a genuine balance in industrial and academic participation, not only in terms of the composition of program committee, but, more importantly, through the active solicitation of industrial contributions by all program committee vice chairs and members. In addition to the regular paper presentations, we are also excited that our efforts resulted in eleven panel sessions that will definitely generate a lot of excitement and heated discussion among the audience.

Overall we received 147 paper submissions: 3 from Australia; 14 from Europe; 35 from North America; 95 from Asia. After a rigorous review process, 73 were accepted for inclusion in the program and presentation. We delegated to six program vice chairs to solicit a minimal of three reviews per paper before coming to the program committee meeting held February 23-25, 1996, in Chicago, Illinois. All program committee members’ own submissions were handled with extreme care and fair treatment. We are grateful to the many external reviewers who contributed to the success of this year's program in an invaluable way.

In addition, we have 44 panelists participating in eleven panel sessions. As you can see from the program, this represents a truly international flavor with balanced perspective between practitioners and researchers.

We are very fortunate to have three keynote speakers, all leaders from the industry: “Information Technology and GI1 Visions” by Jung Uck Seo from Korea Mobile Telecommunications Corp.; “Autonomous Decentralization of Society Structures and Information Systems” by Yasutsugu Takeda from Hitachi, Inc.; and “Revolutionalize Software Development” by Robert L. Martin from Lucent Technologies. We trust that you will be inspired by their rich experience and insight into the state-of-the-art and future trends of the software technology.

On behalf of the program committee, we would like to express our sincere gratitude to all speakers, session chairs, reviewers, and those who contributed to the program development but not in any official capacity. We could not complete this task without the constant encouragement and guidance of Stephen Yau, Chairman of the Standing Committee. We personally are indebted to all program vice chairs whose faithful service and unfailing support assisted us in every phase of the program development. Also, Jung W. Cho provided local arrangements information on a continuous and timely basis.

Finally, we would like to thank you all, our supportive audience! No conference can prevail without your enthusiastic participation. Welcome to COMPSAC 96 and hope you enjoy our program.
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H.Y. Chen
Yaw-Chung Chen
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Seung-Min Yang
Stephen S. Yau
Kwangkeun Yi
Hyunsoo Yoon
Akira Yoshizawa
Richard Yu
Keynote Address:

Information Technology and Gil Visions

Jung Uck Seo
Korea Mobile Telecommunications Corporation, Korea
Information Technology and GII Visions

Jung Uck Seo

President of Korea Mobile Telecom

Information technology (IT) is the result of fusion of computers - once stand-alone number crunchers - and telecommunications - once the passive conduits of voice traffic. It shrunk the world and made all the nations interdependent. It converts information to the new global currency or the new wealth creator. IT moves very fast and brings incredible turbulence, change and progress in the lives of individuals, organizations, nations and regions. It also transforms international politics and socioeconomic relations and presents the world with new market opportunities. The manner in which these opportunities are seized is becoming an increasingly important issue facing all economies.

Improvement in the efficiency of information management has preoccupied mankind since the start of intelligent life and has led to incredible innovations: Alexander Graham Bell invented the telephone, Charles Babbage invented a machine that eventually developed into today's computer and William Burt invented the typewriter.

Bell, Babbage and Burt invented indigenous machines to improve the management of information. They were the pioneers of telecommunications, data processing and factory/office automation. They are the basis of today's IT. The pace of change in technology has been speeding up and shrunk time scales. One hundred generations for the agrarian revolution, ten for the industrial revolution and one for the information revolution.

Satellites, digital systems and optical fibers mean not just low cost but the capacity to offer new services and improve overall quality, changing human lifestyle on a global scale. Microelectronics has also created greater volume, higher speeds and larger memory; yet the components and costs are getting smaller and cheaper.

New products and services as new industries has been generated through IT for recording and replaying sound, light images on records, audio and video tapes, and laser discs. Multi-billion dollar industry has been emerged from the creation, processing and accessing of databases. These digital warehouses of information contain everything from stock prices to weather forecasts plus various encyclopedia of current and historical information.

Hundreds of businesses have sprung up to service clients who need information and virtually every company that wants to operate in today's global economy needs access to a database. IT brings definite, demonstrable benefits to every sector.

One can imagine not just the socioeconomic effects but the cultural impact brought about in an isolated village with the installation of the first telephone line. And then one may go a little step further and imagine the socioeconomic effects of a village telephone line connected via satellite relay and small-scale earth stations.
to the tens of million Internet participants and the thousands of Internet Web sites.

Effective access to information accelerates economic growth, creates wealth, enlarges markets, fosters new relationships, encourages innovation, and makes change happen. The possibilities are limitless. Information exchanged becomes commerce, information accumulated becomes knowledge, and it creates opportunity.

The real creativity is in the content of the communication. Information technology should be, like oxygen or the ozone layer, necessary but invisible. It never has been and never will be an end in itself. It also enables other things to happen through catalytic effect with perhaps ordinary items that become extraordinary.

IT already has become a central concern of international trade policy for many nations. The expansion of the information and telecom sector serves to integrate the domestic economy more easily into the global economy by means of globalized information and telecom networks. IT will unite mankind in an interdependent world. It has the power to strengthen economies, tighten the bond between nations and improve the quality of life for individuals.

The international banking and finance industries already have restructured their organization and methods of operation in light of the enhanced opportunities for transferring money and data instantaneously around the world. Many transnational corporations have been able to improve their organizational efficiency and control by centralizing more decisions at their world headquarters, while maintaining flexibility in decentralized production. This has raised the possibility that significant decision-making power, as well as research and development and information services activities, will be removed from national subsidiaries that in some cases have been reduced to the status of branch plants.

Medical, tax, credit, and professional information relating to individuals and institutions of one nation is being stored with increasing frequency in another. This trend raises important policy questions in a number of areas, including for example, the terms and conditions of access to information, privacy of personal information, and the scope and limitations of national and regional sovereignty.

The flow of data across borders raises questions of the vulnerability of a nation's economic and political decision-making systems to losses of essential information because of breakdowns in crucial information and telecom networks that occur outside the nation.

The most essential information system for individuals, perhaps, is that which deals with medical information necessary to provide cradle-to-grave health care. A well-built medical information network will enable sharing of limited medical resources within and among hospitals thereby equalizing the standards between rural and urban public health service. A databank of medical cases would promote speed and quality of medical services providing timely donation of blood or organs.

IT will not only generate efficiency and advancement on a national level but also contribute to the welfare of even the smallest cell of a community. The distribution of administrative/education/medical network, value added network, cable television, and home banking/shopping system through computers and television sets at home will promote the social participation of senior or handicapped citizens, making human life happier and more diverse.

A new term sweeps over the telecom industry about every ten years. In the 1970s it was the integrated services digital networks(ISDN). And then it was the fibre-optic broadband networks in the 1980s. In the 1990s it is now the information superhighway and global information infrastructure(GII).
What makes the new term different from old one is that it is more concerned with the services and applications running over the network than the network itself. Furthermore, the discussion is taking place as much outside the relatively closed world of telecom experts as within it.

The term, GII, is sufficiently amorphous to allow several different groups to lay claim to it: the entertainment sector, computer network users, and politicians as well as telecom policy-makers. This does not imply that the term is being used incorrectly, rather that there are several competing definitions.

GII is a sort of high performance computer network which will facilitate high-speed data access and retrieval. Internet is sometimes seen as the precursor for a GII. If it can be successfully extended from the academic and research communities to a broader commercial marketplace, without losing the openness and innovation that have been a critical part of its success, then perhaps it could form the basis for a new model of network development.

From 1990 to mid-1995, the number of computers connected to the Internet rose from 130 thousands to 5 millions. Each computer can represent from one to thousands of individual users. However, Internet suffers from the problems often found in resources that are in common ownership: potential misuse, security problems and lack of structure. It is also a narrowband rather than a broadband or high capacity network. It may, therefore, be more useful as a testbed for network evolution rather than being the network itself.

GII could be envisaged as a multimedia network, the primary use of which will be conveying video in conjunction with data, image, text and voice. According to this vision, many of the potential applications will encompass the entertainment, education and health care sectors as well as the business market. In public policy statements, it is providing access to schools, universities, hospitals and public libraries which predominates.

It is also understood that residential and business users will be the major market, but the emphasis is on achieving universal service goals with the public sector participating alongside the private sector.

Another possible viewpoint sees it as a medium for interactive television, in which the intelligent television set rather than the home computer or the video telephone becomes the main communication channel with a rich diet of multiple new television channels, video-on-demand, home shopping and other services. Teenagers playing video games could be using the network alongside multinational corporations holding videoconferences. Entertainment would be the key service, but many other education and business services could come aboard for the ride.

These visions of a GII from different parts of the information industry as it currently exists: the computer industry, the telecom industry and the entertainment industry. But the beauty of IT is that a single network of networks can, theoretically, accommodate each of these different applications. There are certain common elements to each vision.

First, the network will be digital. The process of digitization began in the computer industry, is already well-advanced in the telecom industry and is now spreading to the broadcasting sector. It will become increasingly difficult, and unnecessary, to distinguish between the different parts of the bit business. Information should, in theory, be able to flow from any source to any destination, providing the network is digital, and some form of transmission and switching is available.

Second, the capacity will be abundant. The obstacle of scarcity, which has shaped the network architectures
and history of the information industry to date, could be largely overcome. Data compression technologies, the development of high capacity fibre-based networks, and the use of digital transmission is eroding capacity constraints. Until now, scarcity has dictated the number of TV channels that can be transmitted, the number of mobile communication users that can be accommodated and the rate at which new telecom users can be added to the network. As these constraints disappear, attention will shift to demand stimulation rather than demand management. This will require fresh approaches to the way services are tariffed, marketed and regulated.

Third, the services will be personal. This implies that the basic user will be the individual rather than the residential unit or the work unit. The process of personalization happened in the computer sector with the arrival of personal computers; it is happening in the telecom sector with the development of personal mobile communications; it will happen in the broadcasting sector as individually-tailored viewing or narrowcasting increasingly supersedes program schedules.