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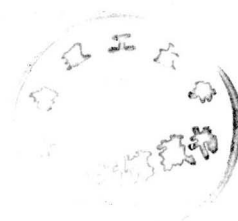
IEEE INFOCOM '99

The Conference on Computer Communications

Volume 1

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of the IEEE Computer and Communications Societies

The Future Is Now



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Message from the General Chair



Bharat Doshi

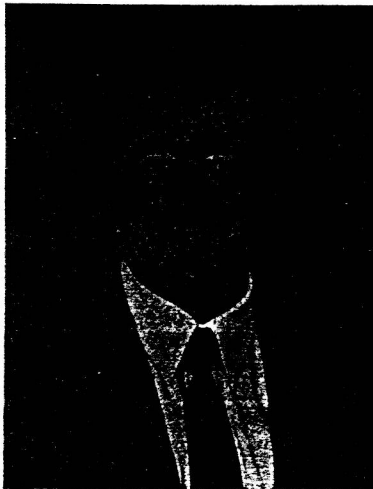
After many years of hype, the promise of true multi-service networks with any media, anywhere, and any time connectivity is on the verge of becoming a reality. Advances in photonics allow 400 Gbps on a single fiber strand in commercial products today and Tbps capacity is on the horizon. A single fiber optics cable can now bundle 432 fibers. Each such cable can carry the daily volume of the total wide area traffic in the whole world in 60 seconds! Similarly, advances in electronics permit switches and routers with capacities in the range of several hundred Gbps, and Tbps switches are approaching soon. New access technologies using copper loop, hybrid fiber-coax (HFC), hybrid fiber wireless, and fiber-to-the home (FTTH) are promising several hundred Kbps to Gbps access, thus relieving the curse of the 'last mile' for residential and small business users. Improvements in wireless technologies and capacities are nothing short of revolutionary. Of course, it is the intelligence of the humans that is exploiting these advances to bring new software, user interfaces, signal processing algorithms, protocols, and traffic controls to introduce exciting new services with ever decreasing cost and increasingly more user friendly access.

Over a billion users are connected to the global public telephone network. Starting from almost nothing in 1990, we have over 200 million cellular users and close to 100 million Internet hosts. And these numbers, especially for the last two, are growing at a phenomenal pace. Services once considered in the realm of science fiction are becoming common place and new ones are being introduced every day.

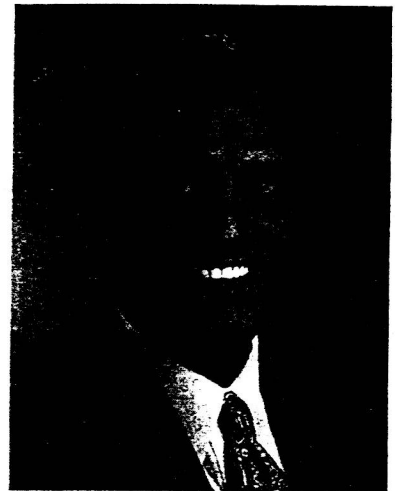
The future is certainly here. Of even greater importance, what is future today is becoming past in just a few months. We are in an era of tremendous excitement for professionals working in many aspects of the converging networking, information retailing, entertainment, and publishing industries. If the reactions of the end users and financial community in the last two years are any guide, this excitement is shared by both.

With this backdrop, it is a pleasure to welcome you to INFOCOM'99 in Sheraton Hotel, New York City. For many years, INFOCOM has been a premier conference bringing state-of-the-art research and applications related to networking and information technologies to the academic and industrial audience. The 1999 version has a very exciting technical program consisting of 184 very high quality papers, 8 tutorials and 4 panels on exciting current topics, and a keynote talk reflecting the commercial success of packet networking and issues it is raising on pricing strategies. We could not have had a better venue. This financial capital of the world has not only welcomed the arrival of the networking future, it has also become a premier user community. Of course, New York City continues to offer great entertainment and dining. The conference hotel is within walking distance of Broadway shows, Rockefeller Center, and fine restaurants. The conference Web site (<http://www.comm.utoronto.ca/~infocom99/>) describes a myriad of exciting places to see and enjoy. Recent efforts have made this exciting city cleaner and safer. I hope you will extend your stay to enjoy both the conference and the city.

Message from the Technical Program Chairs



Anthony Ephremides



Satish Tripathi

We are proud to present to you the technical program of the IEEE INFOCOM'99. Of course, the main credit goes to the authors who contributed their work to the conference. They are the ones who set the standard of quality that INFOCOM enjoys. The technical program committee (which consisted of 71 members representing over 10 countries and drawn from academia, industry, and government) helped us go through 573 papers of which we selected 184 that were included in the final technical program. Collectively we are grateful to the several hundred reviewers who responded to our call for help and assisted with the evaluation of the papers.

The contributions to the conference came from 32 countries. In the final program 20 of these countries are represented. There is also a healthy mix of contributions from universities, industry, and government laboratories.

We selected as the "theme" of this year's INFOCOM the motto "The Future is Now." We did this because we believed that networking has come of age and does not represent exotic or futuristic technologies anymore. It is in the mainstream of everyday life and affects directly millions of people around the world. The maturation of our technology is evidenced by the composition of the program. In addition to the traditional areas that represent the basis of networking (such as traffic management, protocols, switching, etc.) we see an increasing presence of new application areas such as wireless networks, active networks, pricing issues, and others. In particular, the problems of pricing (and related economic issues) are very timely and

topical, especially as we gather in New York City which is in a sense the financial capital of the world. To highlight this convergence we featured a keynote address by Professor Pravin Varaiya of the University of California, Berkeley, on questions of service pricing and a preconference tutorial by Paul Stripe of Reuters Information Technology, Inc. again on economic issues that relate to networks.

Our approach this year has been to integrate the tutorials and panel discussions with the technical sessions and to adopt a flat technical program committee structure. Thus, we worked closely with the tutorial and panel chairs in selecting topics and individuals and we conducted the review process by fielding out each paper to a member of the technical program committee, who, then obtained three external reviews from experts of his/her choice. Based on these reviews and on his/her own reading of the paper, the TPC member made a recommendation to accept, reject, or discuss the paper. To provide an additional check and balance we had each paper reviewed by an additional TPC member who made an independent accept, reject, or discuss recommendation. On October 24, 25 of 1998, 41 of the 71 committee members joined us in College Park, MD for a final grueling review of the papers and came up with final recommendations. It was, of course, our responsibility to make the final decisions and we followed the committee's recommendations in all but a handful of cases. We believe that such a rigorous review process is the best guarantee for the maintenance of the highest standard of quality.

There was a great deal of hard work involved in this process but in the end it was an enjoyable experience. It would be a terrible omission if we did not, from this forum, acknowledge the invaluable help (and concurrent intense work) by Professor Henning Schulzrinne of Columbia University who was responsible for developing the elaborate software that enabled us to handle the entire submission and review process electronically. The system he has developed will actually form the basis not only for future INFOCOMs but for many other meetings and conferences across IEEE. We wish you well for next year Henning! The technical program of INFOCOM "2000" is in the able hands of him and of his co-chair, Rafael Rom. Again, our thanks to all who helped us put the program together and our warmest welcome to the participants in the conference and to the readers of these proceedings.

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