TOPICS IN INTERNET TECHNOLOGY

Khaled Elsayed   Michah Lerner

The objective of this series is to update the readers of *IEEE Communications Magazine* on the latest developments in the exciting technologies driving the evolution of the Internet. This series began in 1996, and its first contribution was published in 1997. The series appears two or three times a year. An expedited yet thorough review process ensures relevance and technical accuracy without imposing undue delays to publication. All articles should be tutorial in nature. In 1999 we received a total of 21 papers. Five articles have been selected and appeared in June 1999, January 2000, and this issue. All submissions, reviews, and other communications related to this series depend on the Internet.

We would like to extend our thanks to Dr. Laurent Toutain of ENST-Bregtane (France) who was a co-editor for the series from November 1998 to November 1999. He has devoted a large portion of his time and effort to make this series continue. We would also like to thank our many reviewers who have helped a great deal in selecting the best papers and providing insightful comments to the authors of the articles. We invite other colleagues to join the reviewing team. If you are interested, please send your coordinates to the series editors' e-mail addresses listed below.

As editors of the Internet Technology Series, we feel privileged to bring articles on the developments in this exciting field to the readers of *IEEE Communications Magazine*. One of us (K.E.) is active in research on Internet quality of service and in implementing a futuristic telecom backbone in Egypt. This issue also welcomes Michah Lerner as a series editor. He is active in architecture and development of the next-generation service-oriented Internet. Together we plan to cover a wide range of topics ranging from all-optical backbone and wireless Internet to new applications and services on the Internet. Our plan for 2000 is to have another issue with two or three articles. The Call for Papers should appear this summer through select mailing lists. We are currently working on enhancing the submission and review process through a Web-based system.

This issue presents articles on two timely and important topics. The article by Baldi and Risso discusses packet-based voice transmission requiring deterministic delay on an IP network. The authors compare IP methods to circuit switching of voice with pulse code modulation (PCM) encoding at 64 kb/s. They analyze an integrated services model (IntServ, RFC 1633) under a generalized network topology. They find that *bandwidth overallocation* supports deterministic delay voice, and concurrent best-effort traffic exploits "reserved but not used" capacity. The authors analyze several methods that optimize the network performance in the presence of best-effort traffic.

In "World Wide Web Caching: Trends and Techniques," Barish and Obraczka survey the topic of Web caching. As a general technique, caching improves specific performance characteristics by substituting memory for bandwidth. Caching is widely viewed as an essential infrastructure element to the Internet. Conceived as a bandwidth reduction method and spurred as a scalability mechanism that improves content availability, caching also accelerates communications networks through routing, content selection, and specialized devices at layers 2–7. These gains may sacrifice neither the application semantics nor the network characteristics such as security or delivery sequence. The design of Web caches introduces the essential question of "correct" behavior in a heterogeneous distributed network. As the authors point out, correctness often relies on some form of global synchronization, and encourages development of active caching for dynamic content. Indeed, the URL is increasingly perceived as a content identifier independent of the underlying storage and communication mechanisms. The recent surge in secure personalized services adds substantial complexity to the challenges of caching over best-effort TCP networks. As an introduction to this rapidly changing industry, the authors survey state-of-the-art techniques and designs. They also present a valuable taxonomy of architectures and performance metrics.

We welcome article contributions, feedback, and suggestions for future topics. Please contact us at the e-mail addresses given below.

BIOGRAPHIES

KHALED M. F. ELSAYED (khaled@ieee.org) received his B.Sc. (honors) in electrical engineering and M.Sc. in engineering mathematics from Cairo University in 1987 and 1990, respectively. He received his Ph.D. in computer science and computer engineering from North Carolina State University in 1995. His thesis dealt with performance modeling of ATM networks. He is now an assistant professor in Cairo University and has been adjunct professor with the American University in Cairo and the National Telecom Institute. Previously, he was with Nortel Wireless Systems Engineering. His current research interests are performance modeling and design of communications networks, quality of service in packet networks, traffic modeling, and congestion control.

MICHAH LERNER (michah@ieee.org) received a Ph.D. in computer science from Columbia University in 1993, where his thesis developed an energy-based solution to the ill-posed problem of surface segmentation and reconstruction from sparse range data. He is now a technology consultant in the AT&T Laboratories IP Technology organization, with interests in adaptation methods for diverse Internet-based essential services. He also serves as an adjunct associate professor at Columbia University, where he recently developed a graduate course "Programming and Design of Modern Internet Platforms." He is co-author of the new book *Middleware Networks: Concept, Design and Deployment of Internet Infrastructure*.