

Next generation switching and routing - Guest Editorial

Original

Next generation switching and routing - Guest Editorial / Atiquzzaman, M; Bianco, Andrea; Kuo, G. G.. - In: IEEE COMMUNICATIONS MAGAZINE. - ISSN 0163-6804. - STAMPA. - 43:1(2005), pp. 86-87.
[10.1109/MCOM.2005.1381879]

Availability:

This version is available at: 11583/1532029 since:

Publisher:

IEEE

Published

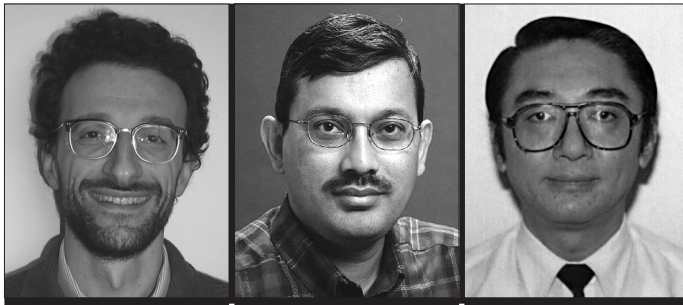
DOI:10.1109/MCOM.2005.1381879

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NEXT GENERATION SWITCHING AND ROUTING

The High Performance Switching and Routing (HPSR) workshop is the flagship meeting of the IEEE Communication Society's Technical Committee on Communication Switching and Routing. HPSR 2003 (<http://www.tlc-networks.polito.it/HPSR2003>) took place in Torino, Italy, June 24–27, 2003 under the technical co-sponsorship of IEEE, and was financially supported by a number of other organizations.

HPSR 2003 attracted 112 submissions from 29 countries; among those, 53 papers were selected for presentation at the conference. One hundred thirty participants from 24 countries attended the workshop.

The technical program covered a wide spectrum of research topics, such as switch architectures, wavelength-division multiplexing (WDM) networks, scheduling algorithms, quality of service (QoS) issues, metro ring networks, optical burst switching networks, resilience, protection and restoration, traffic engineering, packet lookup, classification and forwarding, and routing.

This Feature Topic of *IEEE Communications Magazine* features extended versions of five of the best papers presented at the conference; these papers represent the state of the art in terms of research in the field of high-performance switching and router architectures. The articles span a wide range of technical issues, including architectural, algorithmic, and performance issues. We believe these articles will be a valuable source of reference for years to come.

A lot of attention was devoted in HPSR 2003 to switch architecture. Sapunjis and Katevenis address the issue of efficient implementation of a backpressure mechanism in multistage buffered switches based on the Benes network architecture.

Traffic engineering is a hot topic that is tightly related to routing. Multipoint-to-point label switched path (LSP) trees has been proposed as a technique to reduce label space usage. Given a set of precomputed point-to-point LSPs, Bhatnagar, Ganguly, and Nath propose an efficient heuristic for multipoint-to-point LSP creation.

Although advances in WDM provide large amounts of bandwidth, most of today's end-to-end applications require only sub-wavelength bandwidth. This bandwidth mismatch makes wavelength circuits inefficient in many cases unless traffic grooming is adopted (i.e., multiple traffic flows are

time multiplexed together on the same wavelength). The article by Cerutti and Fumagalli addresses the fundamental problem of achieving efficient traffic grooming in static WDM networks.

Oki, Shiimoto, Shimazaki, Imajuku, Yamanaka, and Takigawa describe and study the performance of two dynamic multilayer routing policies that are implemented in the photonic multiprotocol label switching (MPLS) router developed by NTT for IP+GMPLS (generalized MPLS).

Zhang and Mouftah propose a protocol to introduce the idea of recursive unicast into an existing multicast routing protocol. The protocol, multicast extension to Open Shortest Path First (MOSPF), achieves scalable multicast while reducing computational overhead and forwarding state at routers.

We wish to acknowledge the hard work of the authors, the reviewers, and Editor-in-Chief Roch Glitho in the preparation of this Feature Topic. We wish to thank all of them for their cooperation and timeliness. We hope that these best papers from HPSR 2003 will create enough interest among readers to contribute to the success of future HPSR workshops (please check <http://www.cs.ust.hk/hpsr05/> for HPSR 2005).

BIOGRAPHIES

ANDREA BIANCO [M] (Andrea.Bianco@polito.it) is an associate professor at the Dipartimento di Elettronica of Politecnico di Torino. He holds a Dr. Ing degree in electronics engineering (1986) and a Ph.D. in telecommunications Engineering (1994), both from Politecnico di Torino. He participated in several national and European projects such as the Italian projects on optical networks, Ringo and IPPO, the IST European project DAVID, and the European ACTS projects on a single-layer optical network, SONATA. He was deeply involved in management of the Italian project QoS Techniques in Multiservice Telecommunication Networks (MQOS). Presently, he is involved in the Italian project on open router architectures, EURO, and the European Network of Excellence on Optical Networks, e-PHOTON/ONE. He has also been involved in several consulting and research project with private industries, including BT, Lucent, TILAB, and Alcatel. His current research interests are high-speed switching and all-optical networks. He has co-authored over 100 papers published in international journals and presented at leading international conferences in the area of telecommunication networks. He was Technical Program Co-Chair for HPSR 2003. He was a member of the TPC of IEEE INFOCOM 2000, QoS-IP 2001, IFIP Optical Networks Design and Modeling (ONDM) 2002, ONDM 2003, ONDM 2004, Networking 2002, Networking 2004, HPSR 2004, and the Workshop on Optical Burst Switching (WOBS) 2004. He was co-editor of two books: *LNCS vol. 1989, QoS in Multiservice IP Networks*; and *Next Generation Optical Network and Modelling* (Kluwer, 2003), and of two Special Issues: Special Issue of *Computer Networks Journal* on QoS for IP Networks (2002), and Special Issue of *Optical Networks Magazine* on Dynamic Optical Networking (2003).

MOHAMMED ATIQUZZAMAN [SM] (atiq@ieee.org) received M.Sc. and Ph.D. degrees in electrical engineering from the University of Manchester, England. Currently he is a professor in the School of Computer Science at the University of Oklahoma. He is Co-Editor-in-Chief of *Computer Communications Journal*, and serves on the editorial boards of *IEEE Communications Magazine*, *Telecommunications Systems Journal*, *Wireless and Optical Networks Journal*, and *Real Time Imaging Journal*. He has guest edited many special issues in various journals, and organized special sessions in conferences. He was technical co-chair of HPSR 2003 and the SPIE Quality of Service over Next-Generation Data Networks Conference (2001, 2002, and 2003). He also serves on the technical program committee of many national and international conferences including IEEE INFOCOM, IEEE GLOBECOM, and IEEE International Conference on Computers and Communication Networks. His current research interests are in wireless, satellite, and mobile networks, QoS for next-generation Internet, broadband networks, multimedia over high-speed networks, TCP/IP over ATM, multiprocessor systems, and image processing. He is a coauthor of the book *TCP/IP over ATM Networks*. He has taught many short courses to industry in the area of computer and telecommunication networking. His research has been supported by state and federal agencies like NSF, NASA, U.S. Air Force, Ohio Board of Regents, and DITARD (Australia). He has over 130 refereed publications in the above areas, most of which can be accessed at <http://www.cs.ou.edu/~atiq>

GENG-SHENG (G.S.) KUO (gskuo@ieee.org) received his Ph.D. degree in systems engineering from Case Western Reserve University, Cleveland, Ohio, in 1982. He then worked with R&D laboratories in the communications industry in the United States, such as AT&T Bell Laboratories. In 1990 he returned to Taiwan and joined the Department of Information Management, Information Technology Group at National Central University, where he was a professor. On August 1, 2000, he joined National Chengchi University, Taipei, Taiwan as a professor. He has been named Chair Professor of Beijing University of Posts and Telecommunications. His current research interests include optical MEMS-based optical switching, broadband switching routers, broadband IP networks, and mobile communications. From 1999 to 2001 he was Chair of the Communications Switching & Routing Technical Committee, IEEE Communications Society. From 2001 to 2002 he was Editor-in-Chief of *IEEE Communications Magazine*. Currently, he is Area Editor for Networks Architecture of *IEEE Transactions on Communications*, Editor of IEEE Communications Surveys & Tutorials, Editor of IEEE Internet Computing, Editor of *Wireless Communications & Mobile Computing*, and Editor of *Wireless Personal Communications: An International Journal* (WIRE). Furthermore, he was the IEEE Communications Society Representative to the IEEE NanoTechnology Council from 2002 to 2003.