



## Editorial

Rapid progress in computer hardware technology has made computers compact (e.g., laptop, palmtop), powerful, and low cost. Furthermore, recent advances in wireless data communications technology have spawned an increasing demand for various types of services. As a result, we are witnessing an explosive growth of research and development efforts in the field of mobile and wireless communication and computing systems. It is envisioned that tomorrow's communication networks will routinely employ wireless communications in local and wide areas. This wireless technology will allow users to travel within an office building, from office to home, around the country and the world with portable computer at their hands. Disconnection will no longer be a network fault, but a common event intentionally caused by the user in order to preserve power or a consequence of mobility.

The complexity of these systems make the analysis and evaluation of capacity and performance of wireless systems very difficult, if it is not impossible. Simulation is a frequently used as an approach to evaluate wireless and mobile systems. This issue will focus on all aspects of wireless and mobile telecommunication systems, particularly modeling analysis and simulation in wireless and mobile systems.

This special issue is a collection of selected papers that were presented at the 2nd ACM MSWiM'99, modeling analysis, and simulation of wireless and mobile systems (MSWiM'99) held in Seattle, WA, USA. While the first 5 papers deal with the modeling and analysis of important issues for wireless communication systems such as TCP performance over wireless network, radio link control level in GPRS QoS and routing protocols in mobile and wireless systems, the three next papers deal with modeling and simulation of large scale wireless communications systems.

The first paper "Hyper-Erlang Distribution Model and its Applications in Wireless Mobile Networks" by Y. Fang presents new results for the hyper-Erlang model, and shows how it can be applied to wireless and mobile networks. It is observed that the hyper-Erlang distribution is a natural choice for network modeling with integrated services supported in the future telecommunications networks. The second paper, "Use of TCP Decoupling in Improving TCP Performance over Wireless Networks" by S.Y. Wang and H.T. Kung, proposes a TCP decoupling approach to improve TCP's performance over lossy wireless networks without any support. The third paper "Acknowledgment Procedures at Radio Link Control Level in GPRS" by W. Ajib and P. Godlewski investigates the current acknowledgment mechanism used in GPRS RLC/MAC level, and proposes a complementary ACK scheme to improve the RLC layer. The new scheme helps to reduce significantly the number of control blocks used for RLC acknowledgment mechanism, and thereby reduces the delay requested for a packet delivery.

The fourth paper "A Model for Enhancing Connection Rerouting in Mobile Networks" by K.-W. Chin et al. studies the problem of connection rerouting in mobile networks. The authors propose a new model, which they refer to as active connection rerouting (ACR). As opposed to previous work, their model uses a two-stage optimization process, i.e., path extension and lazy optimization states. The main advantages of their scheme is the elimination of loops within switches/routers and incremental optimization which minimizes buffer requirements and maximized path reuse. Their simulation results show that the ACR is efficient and scalable.

The fifth paper "Adaptive Rate Control and QoS Provisioning in Direct Broadcast Satellite Networks" by F. Alagoz et al. describes a rate control system of an adaptive resource allocation and management system to support multimedia traffic when used in a broadcast satellite systems (DBS). The proposed mechanism attempts to simultaneously minimize frame losses due to congestion and channel impairments yet taking into account the relative impact of sources and Forward Error Correction (FEC) rates on QoS at the applications layer. The results obtained indicate that significant throughput and/or quality gains are possible when FEC/source pairs are adjusted properly in co-ordination with the source rate changes.

The sixth paper "Survivable Load Sharing Protocols: A Simulation Study" by T.A. Dhalberg and J. Jung addresses the utilization of overlapping coverage areas in wireless networks. Overlapping areas are proposed for dealing with possible hardware faults. Several algorithms are proposed for channel allocation, and a simulation and performance studies of these algorithms using various traffic conditions and faults are presented.

The next two papers investigate the use of parallel simulation techniques for wireless networks. The paper "Efficient Wireless Network Simulations with Detailed Propagation Models" by M. Takai et al. describes the impact of different channel propagation models on simulation results using GloMoSim library developed at UCLA. The authors show how conservative parallel simulation techniques can be used to reduce the execution time of the simulation of large scale wireless networks. The next paper, "Partitioning WCN Models for Parallel Simulation of Radio Resource Management" by

M. Liljenstam et al., investigates the impact of partitioning the parallel simulation system for wireless communication systems to achieve a high performance result.

Many people have contributed to the creation of this special issue. Thanks are due to Prof. Imrich Chlamtac, Editor-in-Chief, for his support, his encouragement and patience. Special thanks to all referees for their excellent contributions. Their hard work, their comments and suggestions really helped to improve the quality of the papers and this issue.

**Azzedine Boukerche and Yi-Bing Lin**  
Guest Editors



**Azzedine Boukerche** is an Assistant Professor of Computer Sciences at the University of North Texas. Prior to this, he was working as a Senior Scientist at the Simulation Sciences Division, Metron Corporation, located in San Diego. He was employed as a Faculty at the School of Computer Science (McGill University) from 1993 to 1995. He also taught at Polytechnic of Montreal during the academic year 1993–1994. He spent the 1991–1992 academic year at the JPL-California Institute of Technology where he contributed to a project centered about the specification and verification of the software used to control interplanetary spacecraft operated by JPL/NASA Laboratory. His current research interests include distributed systems, parallel and distributed simulation (PADS), distributed interactive simulation, wireless networks and mobile computing, distributed computing, and VLSI designs. Dr. Boukerche has published several research papers in these areas. He was the recipient of the best research paper award at PADS'97; he was nominated for the best paper award at PASD'99; and he received the 3rd Collocation Award for Telecommunication Software in 1999. He was the General Co-Chair of the principle symposium in Modeling Analysis, and

Simulation of Computer and Telecommunication Systems (MASCOTS), in 1998; the Program Co-Chair of the Second and Third International Workshop on Distributed Interactive Simulation and Real Time Applications (IEE-DIS-RT), the Program Co-Chair of the 2nd ACM MSWiM (Modeling, Analysis and Simulation of Wireless and Mobile Systems); a Guest Editor for VLSI Design, Special Issue on "Current Advances in Parallel Logic Simulation", Guest Editor for the Journal of Parallel and Distributed Computing (JPDC), Special Issue on "Wireless and Mobile Computing", a Guest Editor for ACM MONET/WINET, special issue on "Modeling and Analysis of Wireless and Mobile Systems", and a Guest Editor for the International Journal on Interconnection Networks (JOIN). Dr. Boukerche serves as the General Chair of the 3rd ACM International Workshop on Modeling and Simulation of Wireless and Mobile Systems (MSWiM); and the General Co-Chair of the 4th IEEE Distributed Simulation and Real Time Applications (DS-RT) Conference. He has been a member of the Program Committee of several Conferences including PADS, WoWMoM, ICPP, BioSP3, ICCL, and MASCOTS. Dr. Boukerche is also an Associate Editor for SCS Transactions, and a member of IEEE and ACM.



**Yi-Bing Lin** received his BSEE degree from National Cheng Kung University in 1983, and his Ph.D. degree in computer science from the University of Washington in 1990. From 1990 to 1995, he was with the Applied Research Area at Bell Communications Research (Bellcore), Morristown, NJ. In 1995, he was appointed as a Professor of Department of Computer Science and Information Engineering (CSIE), National Chiao Tung University (NCTU). In 1996, he was appointed as a Deputy Director of Microelectronics and Information Systems Research Center, NCTU. Since 1997, he has been elected as Chairman of CSIE, NCTU. His current research interests include design and analysis of personal communications services network, mobile computing, distributed simulation, and performance modeling. Dr. Lin is an associate editor of IEEE Network, an editor of IEEE Journal on Selected Areas in Communications: Wireless Series, an editor of IEEE Personal Communications Magazine, an editor of Computer Networks, an area editor of ACM Mobile Computing and Communication Review, a columnist of ACM Simulation Digest, an editor of International Journal of Communications Systems, an editor of Wireless Networks, an editor of Computer Simulation

Modeling and Analysis, an editor of Journal of Information Science and Engineering, Program Chair for the 8th Workshop on Distributed and Parallel Simulation, General Chair for the 9th Workshop on Distributed and Parallel Simulation. Program Chair for the 2nd International Mobile Computing Conference, Guest Editor for the MONET special issue on Personal Communications, a Guest Editor for IEEE Transactions on Computers special issue on Mobile Computing, and a Guest Editor for IEEE Communications Magazine special issue on Active, Programmable, and Mobile Code Networking. Dr. Lin received 1997 Outstanding Research Award from National Science Council, ROC, and Outstanding Youth Electrical Engineer Award from CIEE, ROC.

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