

## Special Issue on Performance Evaluation of Communication Networks and Systems

## Guest Editorial

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This special issue of the Journal of Networks includes mainly extended versions of selected papers accepted and presented at the 2009 International Symposium on Performance Evaluation of Computer and Telecommunication Systems (SPECTS 2009). Only papers with excellent review scores were invited to submit extended versions to this Special Issue, which have undergone a second review process. The selected papers address a variety of topics related to the performance evaluation of communication networks and systems.

In the first paper, “Analysis of a Buffered Optical Switch with General Interarrival Times”, by Conor McArdle, Daniele Tafani and Liam P. Barry, the authors developed a relatively simple model for the analysis of an OBS (Optical Burst Switching) node with FDLs (Fiber Delay Lines) by applying circuit switching analysis methods. The model may be used to evaluate performance under any general independent (GI) traffic stream that may be expressed in terms of the LST (Laplace-Stieltjes transform) of the interarrival distribution. The analysis is formulated in terms of virtual traffic flows within the optical switch from which expressions for burst blocking probability, fiber delay line occupancy and mean delay are derived.

The second paper, “Comparison of the Design Characteristics of MMI Wavelength Demultiplexers Using Different Approaches by Computing the Effective Index”, authored by M. Najjar, R. Rejeb, H. Rezig and M. S. Obaidat, investigates the design characteristics of a wavelength demultiplexer using the effective index method in order to determine the propagation constants and field distributions. In order to analyze the impact of computation method on the design characteristics of the demultiplexer, the effective index is computed by an analytic approach. A new algorithm for developing an analytic model is proposed.

In the third paper, “Design and Performance Evaluation of Service Overlay Networks Topologies”, authored by Davide Adami, Christian Callegari, Stefano Giordano, Gianfranco Nencioni and Michele Pagano, the topology design problem of a Service Overlay Network is addressed from a performance point of view, taking into account both the traffic demand and the overhead. The performance of a limited set of well-known topologies is investigated. Additionally, three new traffic demand-aware overlay topologies are proposed based on heuristics, which are also evaluated through extensive simulations.

The fourth paper is “An empirical Evaluation of Multi-Step Prediction Performance”, by Mohamed Faten Zhani, Halima Elbiaze and Farouk Kamoun. In this paper, the authors perform an analysis of Multi-step Internet traffic prediction performance of the ARIMA (*AutoRegressive Integrated Moving Average*) and the LMMSE (*linear minimum mean square error*) models. Two multi-step prediction techniques are compared: the *Iterating Multi-Step technique* (IMS) and the *Direct Multi-Step technique* (DMS). The analysis is based on two sets of real Internet measurements.

In the fifth paper, “A Visualization Tool for Exploring Multi-scale Network Traffic Anomalies”, by Romain Fontugne, Toshio Hirotsu and Kensuke Fukuda, an interactive tool is presented that takes advantage of several graphical representations highlighting the different aspects of network traffic and anomalies. The proposed tool, available at <http://www.fukuda-lab.org/~romain/mulot/>, allows for exploration of network traffic at any temporal and spatial (address and port) scales. The usefulness of this tool is verified by evaluating it using several traffic traces.

The sixth paper, “Interference Reduction in Overlaid WCDMA and TDMA Systems”, by Maan A. S. Al-Adwany and Amin M. Abbosh, evaluates the performance of WCDMA uplink system for UMTS mobile communications and investigate the possibility of increasing mobile communication cell capacity through merging WCDMA and TDMA systems in one cell. An interference canceller is proposed to reduce, or even completely cancel, the interference between WCDMA and TDMA, hence enabling them to work together. This coexistence is proven to be possible via computer simulations.

Finally, the seventh paper is: "GCAD: A novel Call Admission Control algorithm in IEEE 802.16 based Wireless Mesh Networks", by Floriano De Rango, Andrea Malfitano and Salvatore Marano. In this paper, a new call admission control algorithm for 802.16 distributed mesh networks named GCAD-CAC (Greedy Choice with Bandwidth Availability aware Defragmentation) is proposed. The algorithm is characterized by an initial greedy choice, by a preemption and a defragmentation process. The performance of the proposed GCAD algorithm is evaluated in terms of throughput, average end-to-end delay, average delay jitter, number of refused requests and packet loss percentage. GCAD is also compared with another two CAC algorithms in literature, giving the best performance due to the presence of a defragmentation process.

The guest editors would like to thank all the authors and reviewers for their valuable contributions to this special issue. We hope that the papers selected in this special issue will become useful resources for researchers and practitioners in the area of performance evaluation of communication networks and systems.

## GUEST EDITORS' BIOGRAPHY



**Prof. Mohammad S. Obaidat** is an internationally well known academic/researcher/ scientist. He received his Ph.D. and M. S. degrees in Computer Engineering with a minor in Computer Science from The Ohio State University, Columbus, Ohio, USA. Dr. Obaidat is currently a full Professor of Computer Science at Monmouth University, NJ, USA. Among his previous positions are Chair of the Department of Computer Science and Director of the Graduate Program at Monmouth University and a faculty member at the City University of New York. He has received extensive research funding and has published Ten (10) books and over Four Hundred and Fifty (450) refereed technical articles in scholarly international journals and proceedings of international conferences, and currently working on three more books. Prof. Obaidat is the author of a new upcoming book: *Wireless Sensor Networks* (Cambridge University Press). He is also the editor to 2 new upcoming books: *Cooperative Networking*

(John Wiley & Sons 2010) and *Pervasive Computing and Networking* (John Wiley & Sons 2010). Prof. Obaidat is the author of the book entitled: "Fundamentals of Performance Evaluation of Computer and Telecommunications Systems," by John Wiley & Sons in 2010. Dr. Obaidat is the Editor of the Book entitled, "E-business and Telecommunication Networks", published by Springer in 2008. He is the co-author of the book entitled, "Security of e-Systems and Computer Networks" published by Cambridge University Press in 2007. He is the co-author of the Best Selling Book, "Wireless Networks" and "Multiwavelength Optical LANs" published by John Wiley & Sons (2003). Obaidat is the editor of the book, *APPLIED SYSTEM SIMULATION: Methodologies and Applications*, published by Kluwer (now Springer) in 2003. Professor Obaidat has served as a consultant for several corporations and organizations worldwide. Mohammad is the Editor-in-Chief of the International Journal of Communication Systems published by John Wiley. He served as an Editor of IEEE Wireless Communications from 2007-2010. Between 1991-2006, he served as a Technical Editor and an Area Editor of *Simulation: Transactions of the Society for Modeling and Simulations (SCS) International, TSCS*. He also served on the Editorial Advisory Board of *Simulation*. He is now an editor of the *Wiley Security and Communication Networks Journal*, *Journal of Networks*, *International Journal of Information Technology, Communications and Convergence*, *IJITCC*, *Inderscience*. He served on the International Advisory Board of the *International Journal of Wireless Networks and Broadband Technologies*, *IGI-global*. Prof. Obaidat is an associate editor/ editorial board member of seven other refereed scholarly journals including two IEEE *Transactions*, *Elsevier Computer Communications Journal*, *Kluwer Journal of Supercomputing*, *SCS Journal of Defense Modeling and Simulation*, *Elsevier Journal of Computers and EE*, *International Journal of Communication Networks and Distributed Systems*, *The Academy Journal of Communications*, *International Journal of BioSciences and Technology* and *International Journal of Information Technology*. He has guest edited numerous special issues of scholarly journals such as *IEEE Transactions on Systems, Man and Cybernetics*, *SMC*, *IEEE Wireless Communications*, *IEEE Systems Journal*, *SIMULATION: Transactions of SCS*, *Elsevier Computer Communications Journal*, *Journal of C & EE*, *Wiley Security and Communication Networks*, *Journal of Networks*, and *International Journal of Communication Systems*, among others. Obaidat has served as the steering committee chair, advisory Committee Chair and program chair of numerous international conferences including the IEEE Int'l Conference on Electronics, Circuits and Systems, IEEE International Phoenix Conference on Computers and Communications, IEEE Int'l Performance, Computing and Communications Conference, IEEE International Conference on Computer Communications and Networks, SCS Summer Computer Simulation Conference, SCSC'97, SCSC98-SCSC2005, SCSC2006, the International Symposium on Performance Evaluation of Computer and Telecommunication Systems since its inception in 1998, International Conference on Parallel Processing, Honorary General Chair of the 2006 IEEE Intl. Joint Conference on E-Business and Telecommunications, ICETE2006. He served as General Co-Chair of ICETE 2007-ICETE 2010. He has served as the Program Chair of the International Conference on Wireless Information Networks and Systems from 2008-Present. He is the co-founder and Program Co-Chair of the International Conference on Data Communication Networking, DCNET since its inception in 2009. Obaidat has served as the General Chair of the 2007 IEEE International Conference on Computer Systems and Applications, AICCSA2007, the IEEE AICCSA 2009 Conference, and the 2006 International Symposium on Adhoc and Ubiquitous Computing (ISAHUC'06). He is the founder of the International Symposium on Performance Evaluation of Computer and Telecommunication Systems, SPECTS and has served as the General Chair of SPECTS since its inception. Obaidat has received a recognition certificate from IEEE. Between 1994-1997,

Obaidat has served as distinguished speaker/visitor of IEEE Computer Society. Since 1995 he has been serving as an ACM distinguished Lecturer. He is also an SCS distinguished Lecturer. Between 1996-1999, Dr. Obaidat served as an IEEE/ACM program evaluator of the Computing Sciences Accreditation Board/Commission, CSAB/CSAC. Obaidat is the founder and first Chairman of SCS Technical Chapter (Committee) on PECTS (Performance Evaluation of Computer and Telecommunication Systems). He has served as the Scientific Advisor for the World Bank/UN Digital Inclusion Workshop- The Role of Information and Communication Technology in Development. Between 1995-2002, he has served as a member of the board of directors of the Society for Computer Simulation International. Between 2002-2004, he has served as Vice President of Conferences of the Society for Modeling and Simulation International SCS. Between 2004-2006, Prof. Obaidat has served as Vice President of Membership of the Society for Modeling and Simulation International SCS. Between 2006-2009, he has served as the Senior Vice President of SCS. Currently, he is the President of SCS. One of his recent co-authored papers has received the best paper award in the IEEE AICCSA 2009 international conference. He also received the best paper award for one of his papers accepted in IEEE GLOBECOM 2009 conference. Dr. Obaidat received very recently the Society for Modeling and Simulation International (SCS) prestigious McLeod Founder's Award in recognition of his outstanding technical and professional contributions to modeling and simulation.

He has been invited to lecture and give keynote speeches worldwide. His research interests are: wireless communications and networks, telecommunications and Networking systems, security of network, information and computer systems, security of e-based systems, performance evaluation of computer systems, algorithms and networks, high performance and parallel computing/computers, applied neural networks and pattern recognition, adaptive learning and speech processing. Recently, Prof. Obaidat has been awarded a Nokia Research Fellowship and the distinguished Fulbright Scholar Award. During the 2004/2005, he was on sabbatical leave as Fulbright Distinguished Professor and Advisor to the President of Philadelphia University in Jordan, Dr. Adnan Badran. The latter became the Prime Minister of Jordan in April 2005 and served earlier as Vice President of UNESCO. Prof. Obaidat is a Fellow of the Society for Modeling and Simulation International SCS, and a Fellow of the Institute of Electrical and Electronics Engineers (IEEE).



**Dr. José Luis (Sevi) Sevillano** received his degree in Physics (electronics) and his Ph.D. from the University of Seville (Spain) in 1989 and 1993 respectively. From 1989 to 1991 he was a researcher supported by the Spanish Science and Technology Commission (CICYT). After being Assistant Professor of Computer Architecture at the University of Seville, since 1996 he is Associate Professor at the same University. He has served as Vice Dean of the Computer Engineering School (2004-7) and as Director of Innovations for Teaching (2007-8) at the University of Seville. Currently, he is Coordinator of the Telefónica Chair on Intelligence in Networks, University of Seville, Spain.

Since 2007 Prof. Sevillano is Associate Editor of the International Journal of Communication Systems, published by John Wiley. He is also Associate Editor of the SCS Modeling & Simulation Newsletter. Since 2009, he serves as Vice-President for Membership of The Society for Modeling & Simulation International (SCS). He also has served on several international conferences: ACS/IEEE AICCSA 2009, DCNET 2010, SPECTS-2009 and SPECTS-2010 (as Program Co-Chair), SPECTS 2008 (as Program Vice-Chair) as well as in the TPC of many conferences like ACS/IEEE AICCSA 2007, IEEE ICC 2008, IEEE Globecom 2008 and 2010, DSAI 2009 and 2010, etc. He is also a member of the Steering Committee of the International Symposium on Performance Evaluation of Computer and Telecommunication Systems (SPECTS). One of his recent co-authored papers received the Best Paper award of the 13th Communications & Networking Simulation Symposium (CNS 2010). He is author/co-author of more than 60 research reports and papers in refereed international journals and conferences, and has participated in more than 20 research projects and contracts.