

Performance modelling and evaluation of telecommunication systems

Lin Guan · Xingang Wang · Irfan Awan

Published online: 29 December 2009
© Springer Science+Business Media, LLC 2009

Due to the tremendous growth in the evolution of telecommunication system and wireless networks, recent developments in telecommunication system and wireless communication technologies and mobile networks has posed various challenges to the researchers in the field of performance modelling. These challenges require effective performance evaluation tools, techniques and methodologies to design new protocols and robust solutions before a global and wide-scale integrated broadband infrastructure of convergent multi-service networks can be established towards the next generation of telecommunication system with efficient support of multimedia applications. As a result, performance modelling and evaluation has gained increasing importance.

This special issue solicits papers on advances in the analytical and simulation based modelling and evaluation of new challenges in the telecommunication systems. Papers in this special issue were selected from the IEEE International Workshop on Performance Modelling and Evaluation in Computer and Telecommunication Networks (PMECT2008) in conjunction with the 17th IEEE International Conference on Computer Communications and Networks (ICCCN 2008), held in August 4–7, 2008 at Virgin Islands, USA. These papers were selected by the scientific

program committee and extended and revised before undergoing a rigorous period of peer-review. Contributions of these papers are summarised as follows:

Ribeiro et al. has proposed a Call Admission Control—based on Reservation and Diagnosis (CAC-RD) for 3G UMTS based telecommunication system. The idea of the CAC is to use the channel reservation and network diagnosis information and give priorities to handovers and real-time audio applications. This is achieved with the expense of blocking some new calls. The simulation results have demonstrated the reduction of blockings while guarantying performance levels. This paper also introduced an artificial neural network approach for CAC-RD in UMTS 3G networks as an extension of the work.

Frequency reuse has been utilised in many wireless telecommunication systems to increase number of users supported by the system. Baloch et al. has presented a mathematical model for analytical study on complete and partial channel allocation schemes, which can be used for analysis of multiple call categories like new calls, handoff calls, delay tolerant or delay sensitive calls. Most existing studies depend upon simulation experiments to investigate the performance of their proposed algorithms, but the mathematical model presented here can really help to evaluate such proposals from an analytical perspective.

Network coding has been applied recently in wireless networks as a means to reduce the energy consumption where energy consumption is a crucial issue for battery operated wireless nodes. In the third paper, Li et al. introduced a timing control into network coding and an adaptive energy-efficient timing control algorithm called AEETC is proposed which can automatically adjust local node's transmission behaviour on the basis of the network traffic conditions. Simulation results have demonstrated some considerable gains in performance.

L. Guan (✉)
Loughborough University, Loughborough, UK
e-mail: l.guan@lboro.ac.uk

X. Wang
University of Plymouth, Plymouth, UK
e-mail: xingang.wang@plymouth.ac.uk

I. Awan
University of Bradford, Bradford, UK
e-mail: I.U.Awan@Bradford.ac.uk

Thangaraj et al. have discussed in their paper a potential performance hole in the IEEE 802.11e standard with TCP protocol. It was reported the throughput of TCP is less than UDP caused by TCP acknowledgement packets queued up at the access points. The authors proposed two TCP acknowledgement prioritizing schemes to improve the overall throughput of TCP while maintaining the QoS requirements.

In the fifth paper, Guan et al. have proposed a load balancing algorithm that classifies the sensor nodes into different layers and clusters them into zones according to their distance to the sink node. Routing tables are then calculated according the energy metric and communication cost. Analytical and simulation results show that the algorithm can prolong the lifetime of sensor networks.

Cheng et al. in their paper have studied and evaluated the performance of eXplicit Control Protocol (XCP) especially its response function which is usually a measure of the scalability of a protocol. They demonstrated that unlike response functions of other protocols, the response function of XCP is related to not only the loss event rate, but also the per-flow

bandwidth furthermore an upper bound for the throughput of XCP with given loss event rate and per-flow bandwidth is presented in the simulation results.

And at last but not at least, Kim et al. have investigated the forward error correction (FEC) delay using Reed-Solomon (RS) code related to the temporal behavior of Rayleigh fading under the domain of Broadcast and Multicast Services (BCMCS) in cellular networks. In particular, they implemented an evaluation framework to estimate the various performance data required for QoS delay and seamless roaming for multimedia services.

Finally we would like to take this opportunity to many thanks the Editor-in-Chief, Professor Bezalel Gavish, for his guidance and support. We would also like to express our deepest gratitude to the PMECT08 programme committee members and the invited reviewers for their valuable and timely comments.

Guest Editors