Understanding LTE

(Half-day tutorial)

Abstract

Long Term Evolution (LTE) is emerging as a strong contender towards wireless broadband. Through, the Third Generation Partnership Project (3GPP) champions a flat all IP-architecture and exploits the latest advances in physical layer technologies including Single Carrier Frequency Division Multiple Access (SC-FDMA), Orthogonal Frequency Multiple Access (OFDMA) and Multiple Input Multiple Output (MIMO). These exploits target maximizing spectrum utilization, realizing high bandwidth potential and latencies in the order of 5ms. Meanwhile, the flat IP architecture provides a simplified and more efficient network architecture, further enabling ease and flexibility of deployment and operation. This tutorial will present a solid and updated understanding of LTE, covering the major aspects of LTE from the physical layer involving OFDMA and SC-FDMA, through the MAC layer, and spanning the air interface, scheduling and the LTE architecture. The tutorial will also cover LTE's support of multimedia services and applications, and highlight their impact on system performance. In addition, we will review the co-existence of LTE with other 4G wireless access technologies, covering the similarities and differences of technical aspects and economic merits of these technologies. The tutorial will be geared towards giving a technical insight into LTE protocols, services and techniques for technical engineers and managers, and providing business analysis with the latest updates of LTE market trends. It will also offer academic and industry researchers a solid overview of the recent advances, and outline the relevant open issues.

Biographies

Hossam Hassanein is a leading researcher in the School of Computing at Queen's University in the areas of broadband, wireless and variable topology networks architecture, protocols, control and performance evaluation. Before joining Queen's University in 1999, he worked at the department of Mathematics and Computer Science at Kuwait University (1993-1999) and the department of Electrical and Computer Engineering at the University of Waterloo (1991-1993). Dr. Hassanein obtained his Ph.D. in Computing Science from the University of Alberta in 1990. He is the founder and director of the Telecommunication Research (TR) Lab http://www.cs.queensu.ca/~trl in the School of Computing at Queen's. Dr. Hassanein has more than 300 publications in reputable journals, conferences and workshops in the areas of computer networks and performance evaluation. He has delivered numerous invited talks and tutorials at key international venues, including Unconventional Computing 2007, IEEE ICC 2008 and IEEE CCNC 2009. Dr. Hassanein has organized and served on the program committee of a number international conferences and workshops. He also serves on the editorial board of a number of International Journals. He is a senior member of the IEEE and is currently vice-chair of the IEEE Communication Society Technical Committee on Ad hoc and Sensor Networks (TC AHSN). Dr. Hassanein is the recipient of Communications and Information Technology Ontario (CITO) Champions of Innovation Research award in 2003. In 2007, he received best paper awards at the IEEE Wireless Communications and Networks and the IEEE Global Communication Conferences (both flagship IEEE communications society conferences). Dr. Hassanein is an IEEE Communications Society Distinguished Lecturer.

Najah Abu Ali received her B.S. and M.S. degrees in Electrical Engineering in 1989 and 1995 respectively from University of Jordan, Amman, Jordan and her PhD degree in 2006 in Computer Networks in Electrical Engineering department at Queen's University, Kingston, Canada. She joined the College of Information Technology, United Arab Emirates University (Al Ain, UAE), as an Assistant Professor with the Computer Networks Engineering track. She had a postdoctoral fellowship at the School of Computing, Queen's University from January 2006 to August 2006. She is currently a collaborator member within the research team

of the telecommunications research at the same School. She worked as an instructor and the head of the Engineering Department at Queen Noor College in Jordan from 1995 to 2003. Her research interests comprise wired and wireless communication networks. Specifically, analytical and measurement based network performance management and Quality of Service and resource management of single and multihop wireless networks. Dr. Abu Ali is an expert on Broadband Wireless Networks architecture, design, QoS provisioning and performance and has published extensively in the area. She delivered a Tutorial on Resource Management in WiMax Networks at ICC 2008, and another at CCNC 2009.

The organizers are currently writing a book, together with AbdElhamid Taha, titled “LTE vs. WiMAX: The Race towards Broadband Wireless Services”, John Wiley and Sons (expected early 2010).