

QoS AND MOBILE TECHNOLOGIES

EDITORS:

AISHA-HASSAN ABDALLA HASHIM

OMER MAHMOUD

RASHEED SAEED

**DEPARTMENT OF ELECTRICAL AND COMPUTER
ENGINEERING
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA**



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

ISBN: 978-967-418-142-0

Member of Majlis Penerbitan Ilmiah Malaysia -- MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN.BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan
Tel: +603-6188 1542 / 44 / 45 Fax: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

TABLE OF CONTENTS

	TITLE	No
PART 1:QoS APPROACHES		
CHAPTER 1:	Introduction to QoS Approaches	2
CHAPTER 2:	Internet Quality Of Service Architectures	11
CHAPTER 3:	Integrated Services	17
CHAPTER 4:	Differentiated Services	21
CHAPTER 5:	Quality Of Service (QoS) Ad-Hoc On-Demand Distance Vector (AODV)	27
CHAPTER 6:	QoS Routing In Ad-Hoc Wireless Networks	33
CHAPTER 7:	MPLS And Traffic Engineering	41
PART 2: MOBILITY MANAGEMENT APPROACHES		
CHAPTER 8:	Introduction to Mobility Management	47
CHAPTER 9:	Nested Mobile Networks	53
CHAPTER 10:	Evaluation of NEMO Extensions	59
CHAPTER 11:	Handoff Process In Micromobility Protocols	65
CHAPTER 12:	Comparison Between Network Simulators	71
PART 3: WIRELESS TECHNOLOGY		
CHAPTER 13:	Introduction to Local Area Network (LAN) Communication Protocols	77
CHAPTER 14:	MANET routing protocols	85
CHAPTER 15:	VANET Applications	95
CHAPTER 16:	Vehicle To Vehicle Routing Protocols	101
CHAPTER 17:	Wi-Fi Mesh Network	111
CHAPTER 18:	Overview Of Wimax Mesh	117
CHAPTER 19:	Current Trends On WIMAX Using MIMO Technology	129
CHAPTER 20:	Self-Organized Femtocell Networks	141
CHAPTER 21:	Self-Organized Synchronization For Femtocell Network	155
CHAPTER 22:	Spectrum Management In Femtocell	169
CHAPTER 23:	Smart Grid Communication	179
CHAPTER 24:	UWB Overview	189
CHAPTER 25:	ZIGBEE Applications	197

CHAPTER 26:	Improvement Of Vertical Handover In GPRS/WIFI Seamless Convergence	205
CHAPTER 27:	The Application Of Sensor Network And Routing Protocols In Wireless Communication	215
CHAPTER 28:	A Study Of Channel Assignment Approach To Reduce Frequent Reassignment	227
CHAPTER 29:	Association Management Schemes For Wireless Mesh Network	231
CHAPTER 30:	Challenges In Multi-Radio Multi-Channel Wireless Mesh Network	237
CHAPTER 31:	Mobility Support in Diffserv and MPLS network	243
CHAPTER 32:	Mobility Management And Context Transfer	247
CHAPTER 33:	LTE -Advanced Overview	251
CHAPTER 34:	Time Synchronization Protocols And Approaches	261
CHAPTER 35:	MPLS Architectures	265

CHAPTER 23

SMART GRID COMMUNICATION

HIKMA SHABANI, MUSSE MOHAMUD AHMED, RASHID A. SAEED

Electrical and Computer Engineering Department Kulliyah of Engineering, IUM

23.1 INTRODUCTION

The rapidly growing populations over the past decades have generated increasing demands for abundant, sustainable, and clear electric energy on a global basis. The increasing electricity demand, together with the complex and nonlinear nature of the electric power distribution network, has caused serious network congestion issues which have become the main causes of several major blackouts that happened in recent years. In addition to the overstressed situations, the existing power grid also suffers from the lack of pervasive and effective communications, monitoring, fault diagnostics, and automation, which further increase the possibility of region-wide system breakdown due to the cascading effect initiated by a single fault [1].

Therefore, to tackle these challenges, a new concept of next generation electric power system “*a Smart grid*”, which refers to a modernization of the electricity delivery system, has emerged. In smart grid, the electricity delivery system monitors, protects and automatically optimizes the operation of its interconnected elements from the central or power plant to customers (residential and industrial user automation systems) through the high-voltage/medium-voltage transmission networks and the low-voltage distribution system.

In smart grid, reliable and online information become the key factor for reliable delivery of power from generation units to end users. The impact of equipment failures, capacity limitations, and natural accidents and catastrophes which cause power disturbances and outages, can be largely avoided by online power system condition monitoring, diagnostics, and protection. Hence, several wired and wireless communication technologies are available for smart grid. However, the advanced wireless systems offer the benefits of inexpensive products, rapid deployment, low cost installations, widespread access which wired technologies cannot provide [2]. In Fig 23.1, the conventional electrical network and ICT network is illustrated and the potential bridge for the two network is shown to be represented by smart grid.

Therefore, the collaborative and low-cost nature of wireless sensor networks (WSNs) bring significant advantages over traditional communication technologies used in today’s electric power systems. Hence, WSNs provide a feasible and cost-effective sensing and communication solution for remote system monitoring and diagnosis systems. Efficient monitoring systems constructed by large-scale deployment of smart sensor nodes can provide complete information on the conditions of system components,