

# **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
<b>PART 1:QoS APPROACHES</b>		
<b>CHAPTER 1:</b>	Introduction to QoS Approaches	2
<b>CHAPTER 2:</b>	Internet Quality Of Service Architectures	11
<b>CHAPTER 3:</b>	Integrated Services	17
<b>CHAPTER 4:</b>	Differentiated Services	21
<b>CHAPTER 5:</b>	Quality Of Service (QoS) Ad-Hoc On-Demand Distance Vector (AODV)	27
<b>CHAPTER 6:</b>	QoS Routing In Ad-Hoc Wireless Networks	33
<b>CHAPTER 7:</b>	MPLS And Traffic Engineering	41
<b>PART 2: MOBILITY MANAGEMENT APPROACHES</b>		
<b>CHAPTER 8:</b>	Introduction to Mobility Management	47
<b>CHAPTER 9:</b>	Nested Mobile Networks	53
<b>CHAPTER 10:</b>	Evaluation of NEMO Extensions	59
<b>CHAPTER 11:</b>	Handoff Process In Micromobility Protocols	65
<b>CHAPTER 12:</b>	Comparison Between Network Simulators	71
<b>PART 3: WIRELESS TECHNOLOGY</b>		
<b>CHAPTER 13:</b>	Introduction to Local Area Network (LAN) Communication Protocols	77
<b>CHAPTER 14:</b>	MANET routing protocols	85
<b>CHAPTER 15:</b>	VANET Applications	95
<b>CHAPTER 16:</b>	Vehicle To Vehicle Routing Protocols	101
<b>CHAPTER 17:</b>	Wi-Fi Mesh Network	111
<b>CHAPTER 18:</b>	Overview Of Wimax Mesh	117
<b>CHAPTER 19:</b>	Current Trends On WIMAX Using MIMO Technology	129
<b>CHAPTER 20:</b>	Self-Organized Femtocell Networks	141
<b>CHAPTER 21:</b>	Self-Organized Synchronization For Femtocell Network	155
<b>CHAPTER 22:</b>	Spectrum Management In Femtocell	169
<b>CHAPTER 23:</b>	Smart Grid Communication	179
<b>CHAPTER 24:</b>	UWB Overview	189
<b>CHAPTER 25:</b>	ZIGBEE Applications	197

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

## CHAPTER 25

### ZIGBEE APPLICATIONS

HIKMA SHABANI, MUSSE MOHAMUD AHMED, RASHID A. SAEED

*Electrical and Computer Engineering Department  
Kulliyah of Engineering, IIUM*

#### 25.1 INTRODUCTION

Apparently, the traditional power grid has shown signs of inefficient operation and has been experiencing difficulties in meeting the requirements of the 21st century. As a result, the Energy Independence and Security Act of 2007 gave a start for the smart grid implementation in the United States [1]. The smart grid is a modern electric power grid infrastructure using intelligent transmission and distribution networks to deliver electricity. The smart grid aims to improve the efficiency, reliability and safety of the electric system through modern communication technologies, automated control, and dynamic optimization of electric system operations, maintenance, and planning [2]. The cornerstone of a Smart Grid is the ability for multiple entities to interact via bidirectional communication networks.

Hence, the development of a reliable and pervasive communication infrastructure represents a crucial issue in operating smart networks. To address this problem, the deployment of Wireless Sensor Network (WSN) appears to be particularly suitable since it could make possible the realization of advanced and highly valuable communication services (sophisticated metering, remote control and supervision) without requiring the construction of complex and expensive infrastructure, and by assuring at the same time, a set of intrinsic advantages such as wide area coverage, easy access to remote sites, no leasing cost and adaptability to changing network patterns. Moreover, the collaborative nature of WSNs brings several advantages over traditional wired industrial monitoring and control systems, including self-organization, rapid deployment, flexibility, and inherent intelligent-processing capability.

Some of the typical Zigbee applications that can be provide redundant, self-configuring and self-healing capabilities of wireless mesh and ad-hoc networks. These applications include:

1. Smart grid technology, which is mainly to provide greater information and control of energy usage, provide customers with better service and more choice, better manage resources, and help to reduce environmental impact.
2. Smart home, which provides more flexible management of home appliances i.e. lighting, heating and cooling, security, and home entertainment systems from anywhere in the home.
3. Building control, to integrates and centralize management of lighting, heating, cooling and security in medium distance and range.