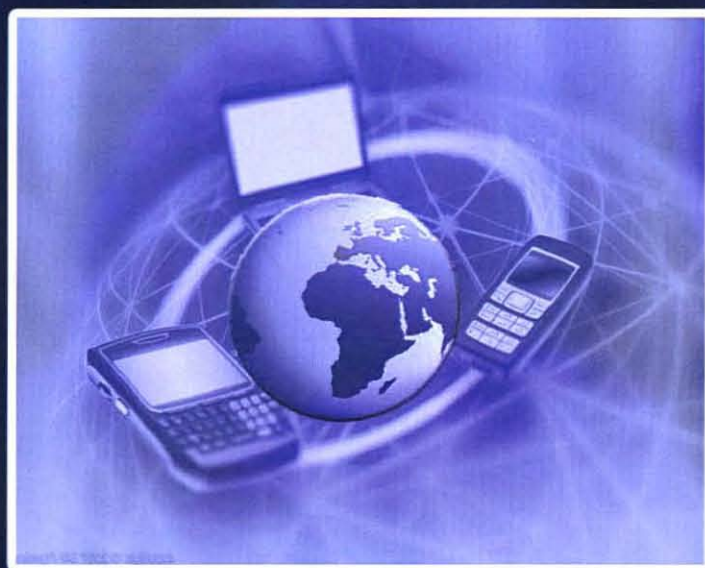


Research Issues in Wireless

Communications and Networking

Farhat Anwar
Wajdi Al-Khateeb



IIUM Press
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

Research Issues in Wireless Communications Networking

Farhat Anwar & Wajdi Al-Khateeb



HUM 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

Farhat Anwar & Wajdi Al-Khateeb: Research Issues in Wireless Communications
Networking

ISBN: 978-967-418-149-9

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

CHAPTER 26

Femtocell network: Challenges and Future Trends

Rashid A. Saeed^{1,a}

¹ECE Dept, Kulliyah of Engineering, International Islamic University Malaysia (IIUM)
Jalan Gombak, 53100, Kuala Lumpur, Malaysia

^arashid@iium.edu.my

26.1 INTRODUCTION

Currently, Femtocell technology emerged for cellular wireless networks, which has rapidly engrossed cellular industry. The principle of femtocell to mobile operators is to reduce the network operation cost and increase indoor coverage which is also considered a possible path to the fixed–mobile convergence (FMC) goal. Femtocell access point (FAP) or home base station (HBS) is a base station designed for use in user premises (home or small business). It intends to serve small number of users i.e. 4 users and covers about 30 meter square similar to existing WiFi access points. The uniqueness of femtocell in contrast with micro and macrocellular it connects to cellular network through broadband network i.e. xDSL. The motivation of femtocell is to improve signal quality in indoor environments and provide high speed wireless access mobile-Internet users. However, femtocell introduces new challenges to the mobile operators (MOs) in terms of handoff between femto and macrocells, interference management, localization and synchronization, security and network management. Accordingly, the objective of this chapter is to studies the challenges and future trends for femtocell communication, and summarize by explored some open issues as well.

Nowadays, mobile operator's principal thinking is to save the cost by reducing the macro cell traffic load and offloading it over public broadband connections to the core network. Potentially this technology reduces the cost and complexity of having to deploy higher-capacity links to the macrocell. The femtocell extends network coverage and delivers high-quality mobile services inside residential and business buildings with the better cellular network coverage. In order to meet the indoor coverage for higher data rates in wireless networks is insistent, and has triggered the design and development of new structured cellular standards such as WiMAX (802.16e), the Third Generation Partnership Project's (3GPP's) High Speed Packet Access (HSPA) and LTE standards, and 3GPP2's EVDO and UMB standards. The communication link of the Femtocell may be one of Wide Area Network (WAN) technologies such as Asymmetric Digital Subscriber Line (ADSL). Since a public network is used to establish the connectivity between the femtocell and core network elements that presents a set of problems for operators. Thousand of femtocells within a macrocell area create interference problem. Also due to huge number of possible target femtocell candidates for macrocell to femtocell handover need a large neighbor list and communication with many femtocells for the pre-handover procedure. The femtocell architecture is much more different than existing cellular networks. Thus the handover between macrocell and femtocell is one of the main issues for femtocell network deployment. The optimal solution of these two problems can improve the performance of femtocell networks. Therefore, the modifications of handover procedures for existing networks are needed.

When a Base Station (BS) operates with time division duplex mode (TDD), synchronization of the transmission time at the BS is important to avoid inter-slot interference with adjacent BSs. Since femto BSs are generally located indoor, they may not receive the global positioning system (GPS) signal which is used to synchronize the wireless cellular network. Today, it is strongly considered a practical solution required