Research Issues in Wireless

Communications and Networking

Farhat Anwar
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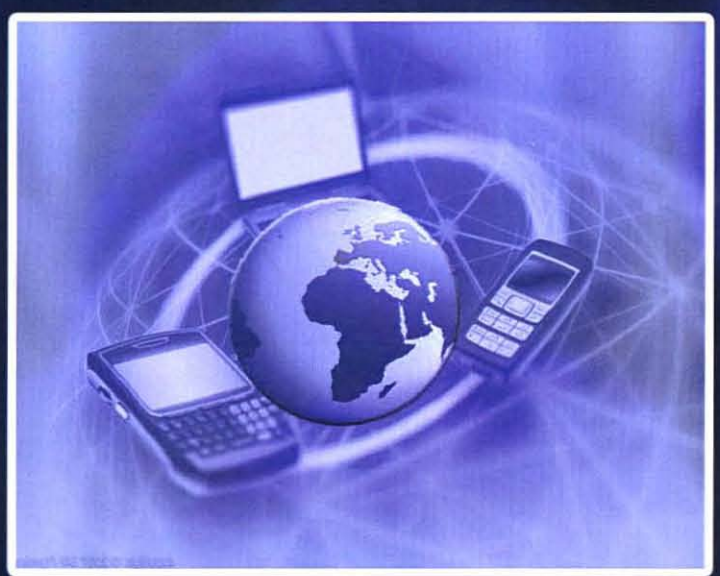

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CHAPTER 28

FEMTOCELL NETWORK SYNCHRONIZATION

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28.1 INTRODUCTION

Currently, Femtocell technology emerged for cellular wireless networks, which has rapidly engrossed cellular industry. The principle of femtocell to the mobile operators is to reduce cost and improve signal quality in indoor coverage which is also considered a possible path to the fixed–mobile convergence (FMC) goal. Femtocell extends network coverage and delivers high-quality mobile services inside residential and business buildings through broadband network i.e. ADSL. Femtocell access point (FAP) or home base station (HBS) intends to serve small number of users i.e. 4 users and covers about 30 meter square similar to existing WiFi access points. However, femtocell introduces new challenges to the telecom industries in terms of handoff between femto and macrocells, interference management, localization and synchronization. Among all of these challenges, synchronization is considered corner stone for proper working for femtocell. The problematic issue in femtocell synchronization is that all the data and control traffics travel through IP broadband network. The IP broadband network is usually owned and managed by third party and not by the mobile operator, which is complicated the synchronization. Unsynchronized FAPs may cause harm interferences and wrong handover dictions. In this study we investigate and overview the current femtocell synchronization techniques and compare between them. Possible improvements and recommendation for each method is identified. Future research areas and open issues were also discussed.

Cognitive 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, 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. 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. Figure 28.1 represents that femtocells provide excellent 3G coverage and capacity in the home which are connected to the public broadband IP service, femtocells are integrated into core network by a concentrator (RAN Gateway) and femtocells are manageable by remotely the fundamental entities of femtocell network.