# CHAPTER

# 6

## SUMMARY OF PAPERS PUBLISHED IN CONJUNCTION WITH THIS THESIS

**In this chapter the papers are summarized and the contribution of the author of this thesis is specified.**

**Paper A:**

**A Handoff Management for Next Generation Wireless Systems**
**International Conference on Parallel, Distributed and Grid Computing, IEEE-2010**

Next Generation Wireless Systems (NGWS) include co-existence of current wireless technologies such as WLANs, WiMAX, General Packet Radio Service (GPRS) and Universal Mobile Telecommunications System (UMTS). The important and challenging issue in NGWS is seamless handoff during the mobility of mobile node between different integrated networks. In this article, we propose a received signal strength measurement based handoff technique to improve handoff probability. By calculating the speed of MN (Mobile Node) and signaling delay information we try to take the right decision of handoff initiation time. Our theoretical analysis and simulation results show that by taking the proper decision for handoff we can effectively reduce false handoff initiation probability and unnecessary traffic load causing packet loss and call blocking.

**Paper B:**

**Minimization of Handoff Failure by Introducing a New Cell Coverage Area in the Handoff Region**

**IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 3, No. 2, May 2011.**

Presently, IEEE 802.11 based wireless local area networks (WLAN) have been widely deployed for business and personal applications. The main issue regarding wireless network technology is handoff or hand over management, especially in urban areas, due to the limited coverage of access points (APs) or base stations (BS). When a mobile station (MS) moves outside the range of its current access point (AP) it needs to perform a link layer handover. This causes data loss and interruption in communication. Many people have applied efficient location management techniques in the literature of next generation wireless system (NGWS). However, seamless handover management still remains an open matter of research. Here we propose a method to minimize the handoff failure probability by effectively placing a wireless local

area network (WLAN) AP in the handoff region between two neighboring cells. The WLAN coverage, on one hand, provides an additional coverage in the low signal strength region, and on the other hand, relieves the congestion in the cellular network. Moreover, we perform the channel scanning (required for horizontal handover between the two base stations) within the WLAN coverage area, thus minimizing the handoff failure due to scanning delay.

**Paper C:**

**Minimization of Handoff Failure Probability by using Mother Cell Child Cell concept**
**CiiT International Journal of Programmable Device Circuits and Systems Vol. 3, No.10, pp. 542-549, August 2011.**

Presently, IEEE 802.11 based wireless local area networks (WLAN) have been widely deployed for business and personal applications. The main issue regarding wireless network technology is handoff or hand over management, especially in urban areas, due to the limited coverage of access points (APs) or base stations (BS). When a mobile station (MS) moves outside the range of its current access point (AP) it needs to perform a link layer handover. But handoff failure probability provides a serious barrier for such services to be made available to mobile platforms. Throughout the last few years plenty of research works had been done to reduce the hand off failure probability. Whereas, some of them have applied efficient channel allocation techniques, keeping the total number of channels constant. In this paper we also propose a method to minimize the handoff failure probability by increasing the total number of channel with help of Mother Cell Child Cell concept. Here we consider a larger hexagonal cell which almost covers up the whole region of a seven cell cluster. We will say this larger cell as the Mother Cell and the smaller cells are the Child Cells. The Mother Cell AP has a higher signal range than that of Child Cell as it covers larger area than the Child Cell. The Mother Cell AP will only perform the handoff job whereas the Child Cell AP will perform both the originating and the handoff calls. Thus the total number of channel increases without any channel interference. This in turn, reduces the handoff failure probability. Simulation results yield that the proposed mechanism outperforms the usual channel allocation technique.

**Paper D:**

**Reducing Handoff Latency in IEEE 802.11b with the Help of Neighbor Graph Using Carrier to Interference Ratio**

**International Conferences, NeCom2010, WiMoN 2010, WeST 2010 Chennai, India, July 2010, Proceedings Springer, pp. 421-430.**

IEEE 802.11wireless networks have gained ever greater popularity nowadays. Handoff is a critical issue in IEEE 802.11 based wireless networks and latency in the handoff process is a major concern.

In this paper, we propose to reduce handoff latency for IEEE 802.11 wireless networks with Neighbor Graphs (NG) pre-scanning mechanisms. IEEE 802.11 uses 11 channels of which channels 1, 6 and 11 do not mutually overlap. So these channels are expected to have a lower carrier-to-interference ratio (CI) compared to the other channels present under the same base station, which increases the channel‘s availability during handoff. Based on the NG prescaning mechanism, when handoff criterions have been met, we design an algorithm to first scan the channels 1, 6 and 11, if present under the next Access Point (AP), to reduce the scanning delay. We also introduce pre-authentication mechanism, which will effectively reduce the message processing delay.

**Paper E:**

**Signal to Interference Ratio Based Handoff Management for Next-Generation Wireless Systems**

**Debabrata Sarddar et. al. / International Journal of Engineering and Technology Vol.2 (2), 2010, pp. 124-130.**

Next-generation wireless systems (NGWS) integrate different wireless networks, each of which is optimized for some specific services such as WLANs, WiMAX, General Packet Radio Service (GPRS) and Universal Mobile Telecommunications System (UMTS). The most important and challenging issue is seamless handoff management in NGWS to ensure the Quality of Service (QoS). In this paper, we propose a handoff management architecture using signal to interference ratio of the present and neighboring base stations. This handoff management scheme uses mobile's speed, handoff signaling delay information and also the size of the present and neighboring cell to enhance the handoff performance. In our proposed work we use the signal to interference ratio threshold values between present base station in which the mobile terminal is served and its neighboring stations. The simulation results show that our proposed mechanism supports mobility management in wireless IP networks and significantly enhances the handoff performance for both intra and intersystem handoffs reducing false handoff initiation and unnecessary call blocking probability.

**Paper F:**

**A RSS Based Adaptive Hand-Off Management Scheme in Heterogeneous Networks**

**IJCSI International Journal of Computer Science Issues, Vol. 7, Issue 6, November 2010.**

Mobility management, integration and interworking of existing wireless systems are important factors to obtain seamless roaming and services continuity in Next Generation Wireless Systems (NGWS).So it is important to have a handoff scheme that takes into account the heterogeneity of the network. In this work we propose a handoff scheme which takes handoff decision adaptively based on the type of network it presently resides and the one it is attempting handoff with through some predefined rules. It also relies on the speed of the mobile terminal to make a decision of the handoff initiation received signal strength (RSS) threshold value. Finally simulations have been done to show the importance of taking these factors into account for handoff decisions rather than having a fixed threshold value of handoff for different scenarios.

**Paper G:**

**Minimization of Handoff Latency by Co-ordinate Evaluation Method Using GPS Based Map International journal of VLSI design & Communication Systems (VLSICS), Vol.1, No.2, June 2010.**

Handoff has become an essential criterion in mobile communication system, especially in urban areas, owing to the limited coverage area of Access Points (AP). Handover of calls between two Base Stations (BSs) is encountered frequently and it is essentially required to minimize the delay of the process. Many solutions attempting to improve this process have been proposed but only a few use geo-location systems in the management of the handover. Here we propose to minimize the handoff latency by minimizing the

number of APs scanned by the Mobile Node (MN) during each handoff procedure. We consider the whole topographical area as a two dimensional plane. By GPS, we can note down the co-ordinates of the MN at any instant. The average rate of change of its latitudinal distance and longitudinal distance with a specific time period is evaluated at the end of the given time period. With the knowledge of the given parameter, it is possible to determine the latitude and longitude of the MN after a particular instant of time. Hence, the direction of motion of the MN can be determined, which in turns gives the AP towards which the MN is headings. This reduces the number of APs to be scanned. Thus, on an overall basis, the handoff latency can be reduced by almost half to one third of its value.

**Paper H:**

**Fast Handoff Mechanism in WLANs Based on Neighbor Graph Information**

**International Conference on Parallel, Distributed and Grid Computing, IEEE-2010**

According to IEEE 802.11 based WLAN standard, handoff at link layer (L2) consists of three distinct phases scanning, authentication and reassociation. Scanning process takes 90% of the total handoff execution time [7] which is known as handoff delay or handoff latency. So in this paper our main goal is to reduce scanning delay, as a small handoff delay results a seamless and successful handoff. And a successful handoff ensures an uninterrupted flawless connectivity when the mobile station (STA) moves out of its old base station's (BS) coverage area. In this paper we proposed selective scanning based on position, speed and direction of motion of the Mobile station using the neighbor graph to reduce the scanning delay.

**Paper I:**

**Fast Handoff Implementation Using Distance Measurements between Mobile Station and APs**

**Proceeding of the 2011 IEEE Students' Technology Symposium 14-16 January, 2011, IIT Kharagpur.**

The rapid growth in IEEE 802.11 based wireless LANs has led to new implementations like VoIP applications that require seamless handover. But handoff delays provide a serious barrier for such services to be made available to mobile platforms. Throughout the last few years there has been plenty of research aimed towards reducing the handoff delay incurred in the various levels of wireless communication. Here we propose new scanning method in which we determine the distance of nearest access points from the middle node to bypass the main processes involved in increasing MCA layer handoff latency.

**Paper J:**

**Minimization of Handoff Latency by Cell Sectoring Method Using GPS**

**International Journal of Computer Application (0975-8887) Vol. 25- No.4, pp. 22-29, July 2011.**

In this paper, we describe the formatting guidelines for IJCA Journal Submission. Presently, IEEE 802.11 based wireless local area networks (WLAN) have been widely deployed for business and personal applications. The main issue regarding wireless network technology is handoff or hand over management. When a mobile station (MS) moves outside the range of its current access point (AP) it needs to perform a link layer handover. This causes data loss and interruption in communication. According to IEEE 802.11, link layer2 (L2) handoff is performed in three phases – scanning, authentication and re-association.

Scanning process causes 90% of the total handoff delay. Throughout the last few years, plenty of researches had been done to reduce the hand off delay by reducing the scanning delay. Here we propose a new scanning technique in which we divide a cell in three sectors and thus reducing the number of APs to be scanned by fixing the neighbor APs with respect to each sector. Thus, we have two fixed APs for each sector. MS will choose the nearest one between them by means of distance measurement method. This process effectively reduces the handoff latency.

**Paper K:**

**A Handover Management in LEO Satellite Network Using Angular and Distance Based Algorithm**

**International Journal of Computer Applications (0975 – 8887), Vol 27 – No. 1, Octbor 2011.**

In satellite communication networks, low propagation delay and power requirements increase the plausibility of Low Earth Orbit (LEO) satellites over geostationary Earth Orbit (GEO) satellites. High relative speed and random direction of motion of LEO satellites provide a serious barrier for their applicability in global wireless communication. The spot beam dynamics of LEO satellites brings about frequent handover of connections between spot-beams for the Mobile Stations (MS). This paper introduces two handover initiation algorithms with connection control. The angle and the distance between the MS and satellite after a defined sample interval serves as a data set for decision making in these two algorithms. A threshold limit is set in each algorithm (threshold angle and threshold distance) which when crossed results in handoff initiation. The simulations were performed in MATLAB 7.8 where a virtual coded scenario with aid of available data was created and the algorithm was executed in it.