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MINIMIZATION OF HANDOFF FAILURE BY INTRODUCING WLAN

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Abstract: 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.

Keywords:- WLAN, IEEE 802.11, Handoff, Handoff latency, MS (mobile station).

INTRODUCTION

In recent years, different wireless technologies have been implemented starting from 2G and 3G cellular system (e.g. GSM/GPRS, UMTS, CDMA 2000), metropolitan area networks (e.g., IEEE 802.16,WiBro), wireless local area networks WLANs (e.g., IEEE 802.11a/b/g, Hiper-LAN), and personal area networks (e.g. Bluetooth). All these wireless networks are heterogeneous in sense of different radio access technologies, the communication protocols that they use and the different administrative domains that they belong to [1]. The actual trend is to integrate complementary wireless technologies with overlapping Coverage so as to provide the expected ubiquitous coverage and to achieve the Always Best Connected (ABC) concept [2]. IEEE 802.11b standards have become increasingly popular and are experiencing a very fast growth upsurge as it is cheap, and allow anytime or anywhere access to network data.

HANDOFF

When a MS moves out of reach of its current AP it must be reconnected to a new AP to continue its operation. The search for a new AP and subsequent registration under it constitute the handoff process which takes enough time (called handoff latency) to interfere with proper functioning of many applications.

Hard & soft handoff: Originally hard handoff was used where a station must break connection with the old AP before joining the new AP thus resulting in large handoff delays. However, in soft handoff the old connection is maintained until a new one is established thus significantly reducing packet loss as shown in figure

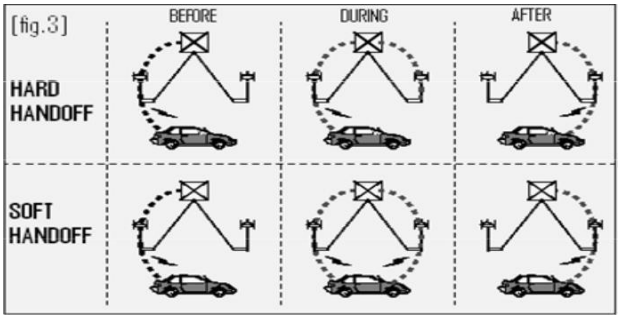

Figure [1] Hard handoff & Soft Handoff

In NGWS (next generation wireless system),two types of handoff scenarios arise: horizontal handoff, vertical handoff.

RELATED WORKS

In recent times, a large amount of research is done in improving the handoff technologies of cellular as well as IEEE 802.11 based networks. In the past few years, many methods based on neighbor graph [9] and geo -location on APs [4] has been proposed, where the authors have proposed selective channel mechanisms. In [10] Li Jun Zhang et a. proposes a method to send probe requests to the APs one after the other and perform handoff immediately after any AP sends the response. This allows us to scan fewer channels. All these processes involve scanning of APs, it may be selective or all APs may be scanned. These methods are therefore time consuming as well as have a certain probability of handoff failure in [11] and [12], authors use GPS based access point maps for handoff management. Handoff using received signal strength (RSS) of BS has been proposed previously. Using dynamic threshold value of RSS for handoff management for MSs of different velocities has been described in [13].

PROPOSED WORK

Here, we propose to reduce the handoff failure probability by placing a WLAN router in effective handoff region. A high traffic density increases the probability of handoff failure. Thus by integrating a WLAN with cellular networks, the traffic density of the cellular network (CN) is partially reduced, thereby minimizing the handoff failure probability to a great extent. In an idealized model we approximate the overlapping circular cell areas by hexagonal cells that cover the entire service region through frequency reuse concept where every cell marked similarly can use the same frequencies being out of range from each others' signal strength. Now let us consider two adjacent hexagonal cells. We define threshold signal strength of a cell as the signal strength after which the handoff is initiated. We place a WLAN router between the threshold signals of either cell i.e. with the router being at the midpoint of the line of the two AP's as shown in Figure 3.

CHANGE OF BASE STATION IN CELLULAR NETWORK

Now the mobile station is under WLAN network coverage in the handoff region between the two cells. As it is in the WLAN coverage area, it is still connected and the mobile station user can enjoy seamless connectivity. When the mobile station is to move into a particular base station, it starts the scanning process for the channels in the new base station, being under the coverage area of WLAN.

SIMULATION RESULTS

We made simulation of our proposed method using the algorithm in the subsection of the proposed work. For justifying the practicability of our method in real models we made an artificial environment considering a seven cell cluster, that is seven APs at the centre of seven closely packed cells whose hexagonal structure provides an approximation of its signal sweeping region and we implemented Poison's Distribution Function for incorporation of memory less property in the generation of calls in the environment.

CONCLUSION

Thus by our proposed method, we can reduce handoff failure as well as handoff latency quite a remarkable amount as we can reduce the traffic in the cellular network by introducing a WLAN AP. The various advantages of incorporating the WLAN AP in the CN thus can be enlisted as follows. This facility will relieve congestion on the GSM or UMTS spectrum by removing common types of calls and routing them to the operator via the relatively low cost Internet. This scheme allows carriers to add coverage using low cost 802.11 access points. Subscribers enjoy seamless coverage. This handoff procedure cuts out the scanning delay from the handoff latency components by scanning the channels while in the WLAN coverage. The handoff failure probability tends to zero. However, future works can be done on improving the traffic distribution between the CN and WLAN, so that handoff failure can be eliminated completely.

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