Chapter 17
Design and Performance Evaluation of a Proactive Micro Mobility Protocol for Mobile Networks

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ABSTRACT

This chapter introduces the Proactive Micro Mobility *(PMM) Protocol for the optimization of network load. We present a novel approach to design and analyze IP micro-mobility protocols. The cellular Micro Mobility Protocol provides passive connectivity in an intra domain. The PMM Protocol optimizes miss-routed packet loss in Cellular IP under* handoff *conditions and during time delay. A comparison is made between the PMM Protocol and the Cellular IP showing that they offer equivalent performance in terms of higher bit rates and optimum value. A mathematical analysis shows that the PMM Protocol performs better than the Cellular IP at 1 MHz clock speed and 128 kbps down link bit rate. The simulation shows that a short route updating time is required in order to guarantee accuracy in mobile unit tracking. The optimal rate of packet loss in the PMM Protocol in a Cellular IP are analyzes route update time. The results show that no miss-routed packets are found during handoff.*

INTRODUCTION

Micro mobility protocols aim to improve the handoff delay and packet loss performance of Mobile IP (Yair A., Claudiu D., Hilsdale M., (2006)). Most micro mobility protocols expose to the home agent, and a single IP address for a mobile node (MN) as long as it remains within a particular foreign domain (Campbell, A. T. & Gomez-Castellanos, J. (2000)). The main losses in mobile communications are of two types: "wireless losses", due to white Gaussian noise in the wireless channel; and "handoff losses", due to the time delay in making a connection to new base station (BS). Handoff losses occur during the allocation of resources

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and packet re-transmission. These losses can be reduced by using an efficient routing protocol on the network layer, in order that a good handover technique minimizes the handoff delay When comparing existing routing protocols, their Mobile IP should be considered first as it provides roaming capability for mobile users in macro-level networks. Problems with conventional tunneling phenomena are faced in small cellular networks, where fast handoff environments can exist due to the high speed of mobile users; in addition mobile tracking consumes lots of signal (Campbell A.T., Gomez J., Kim, Chieh-yih Wan, Zoltán R. T., András G. Valkó. (2002)). To overcome the problem of Mobile IP for fast handoff networks, a new mobile communication technology known as "Micro Mobility" has evolved. Micro Mobility is a field where the domain is divided into pages. The domains can be large WLAN networks such as campuses, etc., and for the best results the domain should be made as large as possible. Micro Mobility Protocols (MMPs) put the responsibility of communication at the page level and Mobile IP operates on the pages so as to extend the scope of macro-level networks.

Background

Lots of work has been done in wireless network in the field of routing protocols. Some initial work went into supporting the roaming of mobile users among cellular areas. Various handoff techniques were proposed and their performance analyzed (Yan Z., Hee S.B., (2004)). Much of the current work is concentrating on intra domain networks, using many *ad hoc* routing protocols for WLAN 802.11b and 802.11a. These *ad hoc* protocols are designed for different physical and mobile environments, such as: DSR for intra domain networks, for slow speed mobile devices and for dynamic networks; AODV for on demand basis networks; and TORA for time dependent networks. Once Macro and Micro Mobility Protocols had been successfully integrated into mobile user systems, various micro mobility protocols were designed on the back bone of the mobile IP. These protocols have been compared, based on their performance and other issues.

Researchers have followed different approaches to give connectivity to a mobile user when the user is roaming. The conventional approach is based on the "prediction of mobile unit in mobile environment". The losses in wireless and mobile environments are very high compared to wired networks; this is one of the main reasons behind the low bit rates used in the wireless and mobile domain. The various different losses existing in wireless and mobile communication networks are:

1. Wireless losses
2. Handoff losses
3. Control message losses

The second types of loss are handoff losses. When a mobile unit leaves the coverage area of the home base station and enters the area of a new base station, the new base station needs to get connected to the network.

In previous work, the Global System for Mobile communications (GSM) provided a roaming facility to mobile units based on a centralized data base, HLR, a switching center, MSC and BSC, and a signaling system, BTS. The process of letting go of the connection of one base station and getting the connection to another base station while roaming is called handoff or handover, depending on the way that connectivity is established (Joachim Tisal, (May 2001)).

- **Network controlled handoff** (NCHO): Delay varies from 200 to 500 ms.
- **Mobile assisted handoff** (MCHO): Provides a handover delay of approximately one second.
- **Softer handoff**: Delay is variable.
- **Mobile controlled handoff**: Provides a delay of the order of 100 ms.