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Fast Handovers in heterogeneous Wireless Networks

Sneha Vurrakula
3rd Year, Dept. Of Electronics And Communication Engineering
snehavurrakula@gmail.com

Abstract— The main challenge presently faced in the sector of wireless communication is to provide a continuous connectivity to the Internet when the mobile node moves from one point to the other. This, in other words, is defined as handover and the length of period that the mobile node cannot send or receive data packets is called handover latency. It is one of the major problems in wireless mobile networks since it prevents users from seamless mobility. When a mobile node moves from one wireless access point to another in a heterogeneous network environment, it has to perform vertical handover. During the handover procedure the mobile node can neither send nor receive any data packets. This results in packet loss. Mobile IP Fast Handover scheme helps in reducing handover delay that avoids loss of packets.

Keywords— FMIPv6, Fast Handover, Packet Loss

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I. INTRODUCTION

A communication network (either public or private) which doesn't depend on any physical connection between two communication entities and have flexibility to be mobile during communication. The current GSM and CDMA technology offers mobile communication. So from the basic definition we can understand that mobile communication takes place through wireless media. It is thus necessary to understand what wireless communication means. Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor and cellular phone is the major application in which transfer of data in the form of packets takes place through wireless communication. A handy telephone that goes with us, instead of us having to go to it, offers extraordinary convenience and can even save lives, especially during emergencies.

II. PROBLEM AT HAND

The widespread acceptance of cellular telephony has caused a huge expansion in wireless infrastructure to support the necessary circuit-switched voice calls, with tightly engineered radio access networks (RANs) and base stations becoming a fact of life. This development complicates the network architecture, making it difficult to see just how or when the envisioned network convergence may occur, and yet most engineers assume that it eventually will happen. A major challenge which lies here is the mobility management. It is believed that the converged network will use Mobile IP for this purpose, suitably instrumented with interfaces into the existing subscriber profile management and authorization processes. All services of interest to us depend upon Internet connectivity. Thus, re-establishing routing paths to the Internet (i.e IP connectivity) in the presence of user mobility becomes a crucial problem. Once a mobile node establishes basic IP network connectivity, we can also take steps to make sure that transport protocols, such as TCP and RTP, do not suffer performance degradation due to mobility. Our goal is to enable the network state information relevant to the mobile node to follow it. We assume that the network access nodes share security associations, so that the necessary signals between them will not be vulnerable to intervention by malicious third parties.

III. BACKGROUND

Internet Protocol version 4 (IPv4) is the fourth version in the development of the Internet Protocol (IP) Internet, and routes most traffic on the Internet. IPv4 is a connectionless protocol for use on packet-switched networks. It operates on a best effort delivery model, in that it does not guarantee delivery, nor does it assure proper sequencing or avoidance of duplicate delivery

For many network operators, IPv4 is beginning to grind away at the nerves. The protocol is inferior to IPv6, from a technical perspective, and requires a number of potentially frustrating complementary systems to make it work well, according to a recent Register report.

Internet Protocol version 6 (IPv6) is the latest version of the Internet Protocol (IP), the communications protocol that provides an identification and location system for computers on networks and routes traffic across the Internet. IPv6 was developed by the Internet Engineering Task Force (IETF) to deal with the long-anticipated problem of IPv4 address exhaustion.

In current implementation, Mobile IPv6 allows nodes to remain reachable while moving around in the network. While moved away from its home and attached to another network, Mobile Node (MN) will inform the Home Agent (HA) about its new address through exchanging Binding Update (BU) and Binding Acknowledgement (BA) messages. After the handover process, the incoming packets from Correspondent Node (CN) will be either forwarded to MN using its new IPv6 address (care-of-address) or directly send to the MN from CN if the route optimization is supported.

- *Fast Handover Mobile IPv6 (FMIPv6)*

During handover, there is a period during which the mobile node is unable to send or receive packets because of link-switching delay and IP protocol operations. This "handover latency" resulting from standard Mobile IPv6 procedures is often unacceptable to real-time traffic such as Voice over IP (VoIP). Reducing the handover latency could be beneficial to non-real-time, throughput-sensitive applications as well. Fast Handover Mobile IPv6 is to support fast handover latency [1]. During MN's handover we can reduce the comparative latency and data losing with the FMIPv6 mechanism.

There are two types of Fast Handover, the Predictive Fast Handover and the Reactive Fast Handover.

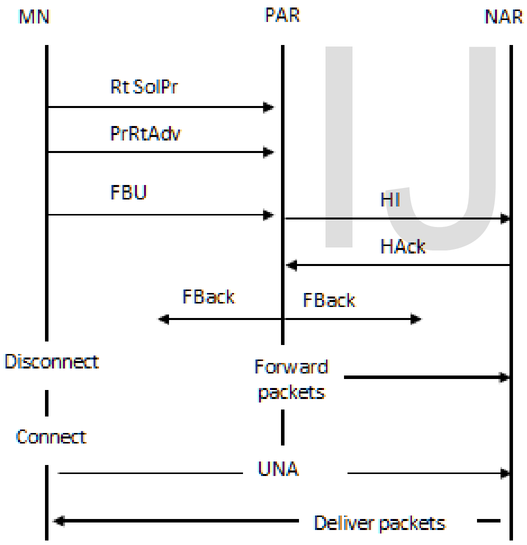

Figure1. Predictive Fast Handover

Predictive Fast Handover is the fast handover in which an MN is able to send an FBU when it is attached to the PAR, which then establishes forwarding for its traffic (even before the MN attaches to the NAR)

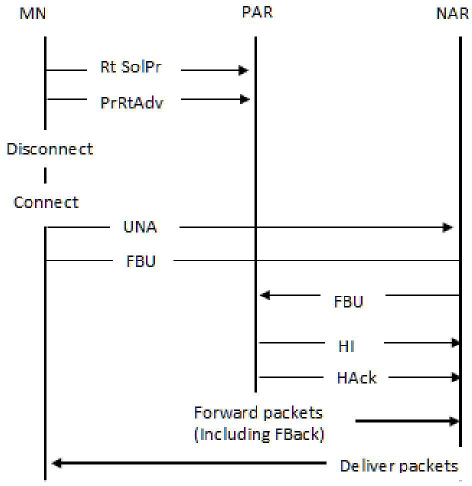

Figure 2. Reactive Fast Handover

Reactive Fast Handover is the fast handover in which an MN is able to send the FBU only after attaching to the NAR. The scenario in which an MN sends an FBU and receives an FBack on PAR's link is illustrated in Figure 2.

IV. *SOLUTION*

A number of solutions have been proposed to overcome packet loss problem in MIPv6 during handover. Some of the studies proposed to reduce the number of packet loss through reducing latency of handover procedure which causes the packet loss. Whilst other researches proposed to reduce loss of packets using buffer by duplicating buffers on the access routers. Fast handover of MIPv6 uses nticipation to obtain new address for the mobile node from the new access router even it is still connected to the previous link.This procedure reduces handover latency time which then reduces packet loss.

There is a proposed scheme called Tunnel Buffering(TB),which is an interoperable enhancement to MIPv6 to reduce packet loss during movement. TB does that by holding the packets (in a buffer) which are to be sent over MIPv6 tunnel until MN's movement is complete.

In the proposed scheme, the CN has two-tier buffers to retain the forwarded real time traffic packet. While MN is moving to a new location, incoming packets may be lost or may arrive out of order. Therefore, this study proposed to use the first tier of buffer on the CN to retain the packets that were already sent before MN handover procedure starts. When the MN is attached to a new location and is sending binding updates(BU) to the corresponding node, the CN will send the first buffer contents to the MN. The contents of this buffer will be cleared after MN receives them and substituted with new packets that CN wants to send to the MN and so on until the real-time session finished between the two nodes. The size of the buffer depends upon the amount of packets that are to be sent.

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