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RESEARCH ARTICLE

AVOIDING PACKET LOSS AND MINIMIZING DELAY DURING FAST HANDOVER IN PROXY MOBILE IPV6

Mrs. M.Umamaheswari[1], Mr. R.Dharmaraj[2]
[1]PG Scholar, Sri Vidya College of Engineering and Technology, Virudhunagar
E-mail: umaprabhu.cse@gmail.com
[2]Research Scholar, M.S.University, Tirunelveli
E-mail: dharmacse2002@gmail.com

Abstract: Mobility management with consistent handover is decisive for a support of roaming mobile nodes (MN). Mobile IPV6 (MIPV6) is proposed for IP layer mobility management, the extension of MIPV6 is Proxy mobile ipv6 (PMIPV6). Fast handover is a protocol for Proxy Mobile IPv6 (FPMIPv6) to resolve handover latency but cause the packet loss problem. The existence of two paths between the local mobility anchor (LMA) and mobility access gateway (MAG), when data is transmitted from Correspondent Node (CN) to mobile node(MN) in FPMIPv6 is the cause of packet loss problem. It establishes the path between LMA to pMAG and LMA to nMAG. In this paper, a tunnel is established for handover between the pMAG and the nMAG to reduce the handover delay and packet loss problem. With the help of the last packet indicator technique helps to identify the end of packet delivery in the old path and making buffer to data delivered in the new path.
Keywords: PMIPV6, Fast handover, Packet loss, last packet identifier.

1. INTRODUCTION

All around the world, IPV6, high speed Internet, smart phone technologies and the communication between devices have very fast growth. The network researches have focused on Internet Protocol mobility management. The Internet Task Force (IETF) developed Mobile IPv6 (MIPv6) [1], a host-based mobility management protocol in which the mobility protocols stack is to handle IP mobility with the support of Mobile Node (MN) of MIPv6. Deployment of MIPv6 is practically inefficient because of MN awareness of mobility.

FMIPv6 protocol gives support for buffering data packets at the time of MN's handover. This is done by transmitting the Handover Initiate (HI) and Handover Acknowledge (HAck) messages with response to the FBU message from an MN. FMIPv6 protocol provides a mechanism that minimizes the data packet loss and improves handover latency. Packet loss occurs when one or more data packets moving across a computer network fail to touch their destination. There are lots of reasons for data packet loss such as low bandwidth, network connection problems, routing problems, router configuration, hardware failure and others.

The extension of MIPV6 is Proxy Mobile IPv6 (PMIPv6) [2]. It does not involve MN in any mobility signalling. It is a network-based mobility management protocol, which is practically efficient. To handle mobility signalling, PMIPV6 have two entities, one is Local Mobility Anchor (LMA), and the other is Mobility Access Gateway (MAG). The LMA acts as a view for the MN's home network and maintains the Mobile Nodes reachability state. MAG registers MN details to the LMA and finds the MN's movement.

MIPv6 is implemented in the Linux environment using Unique Mobile Internet Protocol [UMIP] [3] is an open source. On top of UMIP, Open Air Interface Proxy Mobile IPv6 (OAI PMIPv6) [4], is built. It is an open source for the implementation of PMIPv6. OAI PMIPv6 reuses the mobility functions. The mobility management is to avoid packet loss in communication between an MN and a correspondent node (CN) when the MN travels into the PMIPv6 domain.

One of the basic issues for mobile networking is the multi-homing, in which MN has multiple network interfaces. The current PMIPv6 was designed without consideration of multi-homing. An extensive handover scheme of PMIPv6 with transient binding for multi-homing and mobility support was researched [11].

Fast handover for Proxy Mobile IPv6 (FPMIPv6) [5] was developed by IETF to provide uninterrupted services in the PMIPv6 domain. However, FPMIPv6 does not evaluate the Out-of-Order Packet problem because FPMIPv6 carry on two paths for data transmit from CN to MN at the time when MN has just fixed to new MAG. The OoOP problem causes loss of data in applications using the UDP protocol or boost retransmission of the TCP protocol that minimizes overall network performance of the network.

2. FAST HANDOVER FOR PMIPV6

The issues in handover latency and packet loss can be reduced when an MN travels inside a PMIPv6 domain with help of FPMIPv6 mechanism, which uses the proactive approach. In this approach it performs the handover initiation process to create the bi-directional tunnel between the old path and the new path to send the packets to the nMAG by the pMAG. Otherwise, data packets will be lost, when the MN roams to the nMAG. The nMAG buffers received packets, after the MN attaches to it so that the buffered packets are flushes to the MN. The nMAG is already aware of MN's details. Therefore, the nMAG immediately flushes data packets after MN's attachment, so that it minimizes handover latency. When the bi-directional tunnel is established between the nMAG and the LMA, the packets forwarded to the MN are transferred to the new path at the LMA. At this time, two paths exist. One is the old path where the data packets transferred via the tunnel between the LMA and the pMAG, and to the MN. Another one is new path that the data packets transferred via the tunnel between the LMA and the nMAG, and to the MN. The packets for the MN are transferred via the two paths, incurring the packet loss problem.

3. PACKET LOSS

Packet loss is the missing of data packets in a network when a network device is overloaded and cannot accept additional packets at a given moment due to handover. The loss is usually buffer overflows on the end-systems. A buffer is a temporary holding place for data that is being transmitting from an external device. It is a portion of a computer's memory. Handover embrace link switching, which may not be perfectly coordinated with fast handover signalling. Hence, packets may arrive at the nMAG before the MN which is able to establish its link there. These data packets will be lost unless they are buffered by the nMAG. Similarly, if the MN binds to the nMAG and then sends an PBU message, data packets arriving at the pMAG until the PBU is processed will be lost unless they are buffered.

4. PACKET LOSS SCENARIO

1. Packets may arrive at nMAG before the MN is able to establish its link there. These data packets will be lost unless they are buffered by the nMAG.

2. If MN attaches to the nMAG and then sends an PBU message, data packets arriving at the pMAG until the PBU are processes will be lost unless they are buffered.

5. REDUCING PACKET LOSS

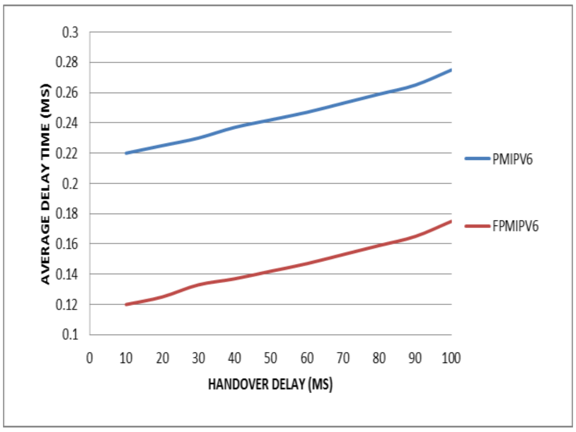
To reduce packet loss a tunnel is established between the pMAG and nMAG before MN getting transaction from the nMAG . Tunnel between the pMAG and nMAG is considerate to receive all the packets transmitted via the old path before MN receiving the packets from the new path. Tunnel establishment also reduces the delay time because of its pre-determined connection. The packets received from the new path is waiting in the buffer of nMAG until the nMAG received the packet from pMAG . with the help of last packet indicator the nMAG knows that all the packets are received from the pMAG .

Using last packet indicator method the nMAG changes to LI when received all the packets from pMAG in the result of network simulator . The result of trace file in NS-2 shows that there is no loss in transformation of packets .All forwarded packets from correspondence node to mobile nodes are received without loss.

6. RESULT ANALYSIS

ANALYZING DELAY

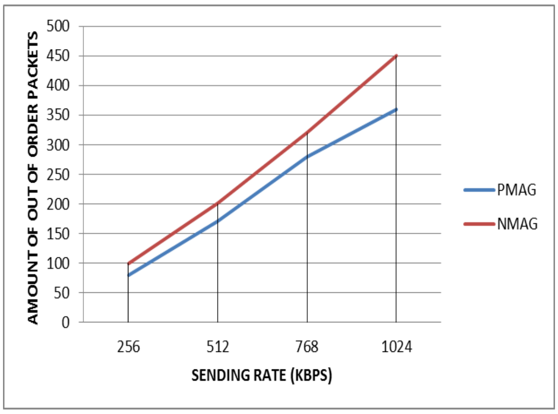
FPMIPv6 is proposed to deal with the handover delay when an MN travels in a PMIPv6 domain. It uses the proactive approach. In which, according to the variable Received Signal Strength (RSS) of MN with the previous MAG (pMAG), FPMIPv6 predicts that MN's handover is essential. It then performs the handover initiation process to establish the bi-directional tunnel between the LMA and the new MAG (nMAG) to forward the data packets to the MN by the nMAG. Thus, it reduces handover delay.



The measurements handover delay and average delay time was taken between the PMIPV6 and FPMIPV6.The graph shows that the handover delay time is reduced in the FPMIPV6.

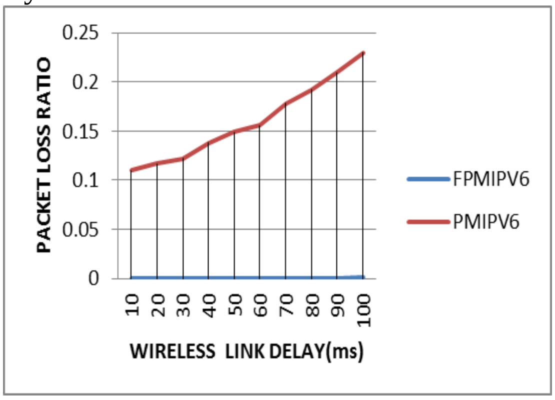
ANALYZING PACKET LOSS RATIO

The data packets for the MN are delivered via the two paths, creates the Out of Order Packets problem.



The measurements are taken between the sending rate and amount of Out of Order Packets. The graph shows the amount of Out of Order packets in pMAG and nMAG .

Last packet indicator method was established to solve the OoOP problem. LPI used to avoid packet loss at the time of handover delay time.



The taken measurements shows there is no packet loss at the time of handover in the simulation result.

7. CONCLUSION

Mobile Network technology is increasingly being used by each and every people in the world. In Mobile Paradigm, an effective transmission of packets in mobile networks is required for achieving without loss and delay less transmission. This work summarizes and describes the method for avoiding packet loss and minimizing delay at the time of handover in Fast Handover Proxy Mobile IPV6 (FPMIPV6). Future work includes to avoid delay during Fast handover in proxy mobile ipv6

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