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Proposal of PMIPv6 Handover delay improvement with eMAG

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Abstract: The Internet Engineering Task Force (IETF) proposed proxy mobile ipv6 (PMIPv6) is a very promising network based mobility management protocol. PMIPv6 is not yet fully implemented in most of the recognized network simulator. There are three entities LMA MAG and AAA server required for the proper functioning of PMIPv6. This paper proposes implementation of architecture of PMIPv6 along with eMAG to minimize the hand over delay in PMIPv6.

Keywords: AAA server, LMA, MAG, Proxy care of address, eMAG

I. INTRODUCTION

In the current era of technology mobility gained a lot of popularity in terms of allowing the users to access the resource while roaming. The roaming facility is provided to the users using mobile IP. The challenging issue for the industry is to maintain the connectivity during the change of Point of attachment (PoA). There are two models to support the mobility, i.e Network-based and Host based. Network based mobility models allow Mobile Node (MN) to continue their IP sessions as they move from one PoA to another without the involvement of MN in the signaling or management of their movement. This makes the MN unaware of its mobility. This reduces the complexity and cost of MN. IP mobility for nodes that have mobile IP client functionality in the IPv6 stack as well as those nodes that do not, would be supported by enabling Proxy Mobile IPv6 protocol. Therefore it increases compatibility and interoperability between various systems and user equipments. In contrast, in host-based mobility model MN should support Mobile IP to continue their IP sessions as they move from one PoA to another. In this mobility model MN actively involved in the handover management, which includes detecting the new point of attachment, sending binding updates to Home Agent (HA) and correspondent Node (CN) and so on. In comparing to network based mobility model, host based model increases the complexity of Mobile node and compatibility with other network entities.

Example of Host based mobility management protocol is Hierarchical Mobile IPv6 and Fast Handover for Mobile IPv6. Example of Network based mobility management protocol is PMIPv6.

The rest of the paper is organized as follows. Section II describes PMIPv6.Section III describes Existing Architecture of PMIPv6 in ns-2. Section IV describes Proposed Architecture of PMIPv6 in ns-2. Section V describes implementation of AAA server in NS-2 Section VI describes Simulation setup. Section VII describes Simulation results and analysis. Section VIII presents Conclusion.

II. PMIPV6

A. *Brief about PMIPv6:*

Proxy Mobile IP (PMIP) is a network-based mobility management protocol. It achieves this by using MIPv6's signaling and the reuse of the home agent functionality through a proxy mobility agent in the network. The entire network (Proxy mobile IPv6 domain) within which the MN is authorized to roam is under the same administrative management. Thus, PMIPv6 is called as localized network based mobility management protocol.

PMIPv6 relies on the proxy mobility agents in the network to detect the MN's attachments and detachments and then signal this information, in the form of binding updates without the active participation of the MN itself. This scheme defines two core functional elements; Local Mobility Anchor (LMA) and the Mobile Access Gateway (MAG).

B. *Operation of Proxy MIPv6:*

Every MN in a proxy mobile IP domain is assigned an MN-Identifier which it (MN) presents as part of access authentication when it attaches to MAG in the domain. With this identifier, both the MAG and the LMA can obtain the MN's policy profile from the AAA server. The moment an MN enters its Proxy Mobile IPv6 domain and is authenticated and assigned a home link (address), the network ensures that this home link conceptually follows the MN as it roams within the domain.

The MAG uses this MN-Identifier to look up the MN's policy profile from the AAA server so as to obtain the MN's LMA address. Upon obtaining this address, the MAG will

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generate and send a PBU message on behalf of the MN to the MN's LMA via the obtained address. This PBU message is intended to update the LMA with the current location of the MN. Obtaining the MN's policy profile also provides the MAG with parameters necessary for emulating the MN's home agent. This means making the MN believe that it's still connected to its HA. After authenticating the request, the LMA will send a PBA response message back to the MAG. If the response that the LMA sent is positive, the LMA will also set up a route for the MN over a tunnel to the MAG. The MAG on receiving the PBA would establish a bi-directional tunnel with the LMA, add a default route through the tunnel to the LMA and finally grant the MN permission to transmit data. All traffic from the MN as well as all other MNs connected to the same MAG and LMA will be routed through this tunnel to the LMA and then to their CNs. On receiving the PBA, the MAG also sends a Router Advertisement to the MN advertising the MN's home network prefix. If the MN has not obtained an IP address by this time, it will generate one using the obtained home network prefix.

The method of obtaining or generating an IP address can be by either stateless or stateful auto configuration and is determined by the MN's stored policy profile. The established tunnel hides the topology and enables an MN to use an IP address that is topologically anchored at the LMA, from any attached access link in the proxy mobile IPv6 domain. An LMA also ensures that only authorized MAGs send PBUs on behalf of MNs. MAGs do not only send PBUs when they detect the presence of an MN on their ANs, they also send PBUs when they detect that an MN has left their AN or when the lifetime of the binding update for an MN that is still attached to it, expires. The MAG can detect this detachment of an MN from its AN via an L2 Link Down trigger; the MN's complete silence over a period of time exceeding a defined threshold (usually the binding update lifetime); or by any other access specific methods. When the LMA receives such a PBU message with the lifetime set to 0, it deletes the Binding Cache entry it had earlier created for reaching this MN through the sending MAG. It also brings-down the established tunnel.

Before bringing down the tunnel, it will first check (for shared tunnels only) to confirm that other active MNs are not still reachable through the tunnel. Then it will generate and send a PBA in response to the MAG's binding request. Upon receiving this, the MAG in turn, deletes the entries it had created for the MN in its tables and also takes-down the tunnel from its end. This is similarly done if, and only if, no other MNs are currently using the tunnel. These bring-up and takedown of tunnels also only applies to non-static tunnels.

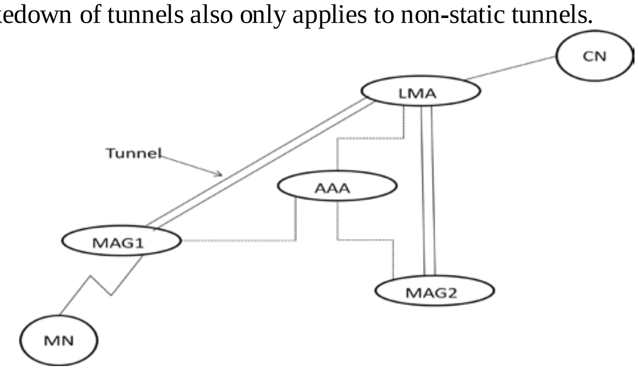

Figure 1: Operational diagram for PMIPv6

III. EXISTING ARCHITECTURE

Figure 2 shows the current signaling call flow when the mobile node enters the Proxy Mobile IPv6 domain in ns-2. The Router Solicitation message from the mobile node may arrive at any time after the mobile node's.

After acquiring MN ID, MAG send query packet to AAA server. At AAA server, authentication of MN is done using MN ID. AAA server search MN ID in list maintained. If AAA server finds the MN ID is present in list, it means MN is authenticated. If AAA server finds that MN is authenticated, it sends LMA address to MA. For updating the local mobility anchor about the current location of the mobile node, the mobile access gateway sends a Proxy Binding Update message to the mobile node's local mobility anchor. Upon accepting this Proxy Binding Update message, the local mobility anchor sends a Proxy Binding Acknowledgement message including the mobile node's home network prefix. It also creates the Binding Cache entry and sets up its endpoint of the bi-directional tunnel to the mobile access gateway.

The mobile access gateway on receiving the Proxy Binding Acknowledgement message sets up its endpoint of the bi-directional tunnel to the local mobility anchor and also sets up the forwarding for the mobile node's traffic. At this point, the mobile access gateway has all the required information for emulating the mobile node's home link. It sends Router Advertisement messages to the mobile node on the access link advertising the mobile node's home network prefix as the hosted on-link prefix.

The mobile node, on receiving these Router Advertisement messages on the access link, attempts to configure its interface. The local mobility anchor, being the topological anchor point for the mobile node's home network prefix, receives any packets that are sent to the mobile node by any node in or outside the Proxy Mobile IPv6 domain. The local mobility anchor forwards these received packets to the mobile access gateway through the bi-directional tunnel. The mobile access gateway on other end of the tunnel, after receiving the packet, removes the outer header and forwards the packet on the access link to the mobile node.

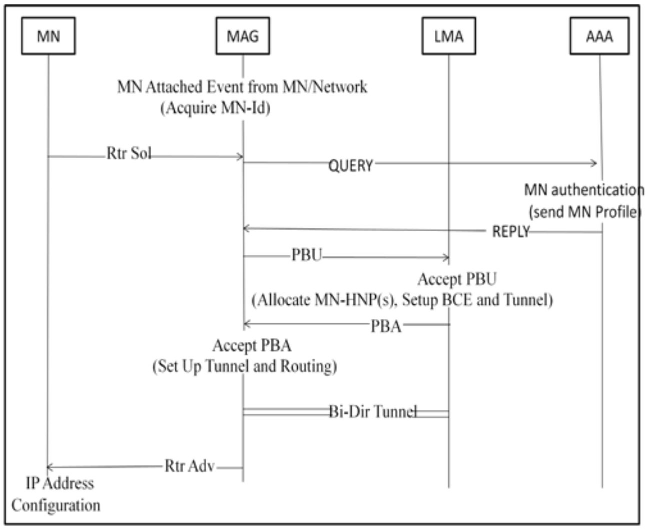

Figure 2: Mobile Node Attachment - Signaling Call Flow

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Before Relation diagram of MAG and AAA server is as follows

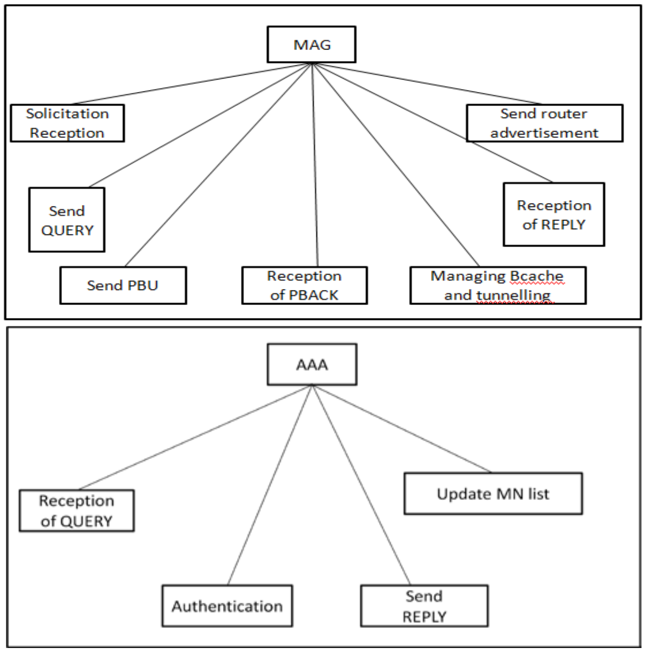

Figure 3: Relation between AAA and MAG

Following figure shows messages involved in PMIPv6 including AAA server in NS-2.

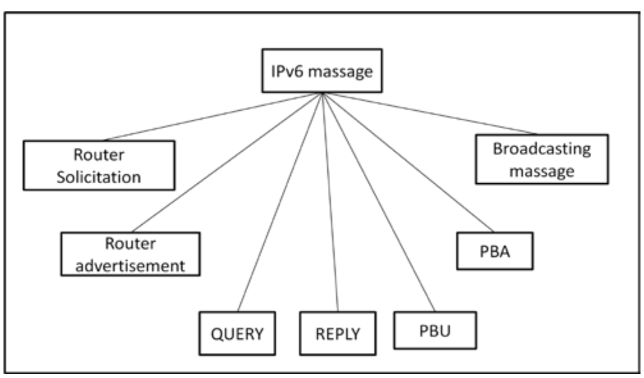

Figure 4: Messages involved in PMIPv6 after AAA server

IV. PROPOSED EXTENDED MAG

So every time MN moves to new point of attachment, MAG has to send QUERY message to AAA server. This increases handoff delay.

Proposed Solution

Instead of sending QUERY message every time, MAG can send LMA address along with MN_ID to MAGs which are near to current MAG. This type of MAG is called as eMAG. Probability of MN changing point of attachment to nearer MAG is more than to MAG which is far away from current MAG. Fig.5 shows handoff procedure in PMIPv6 with eMAG. Packet format is same as REPLY packet.

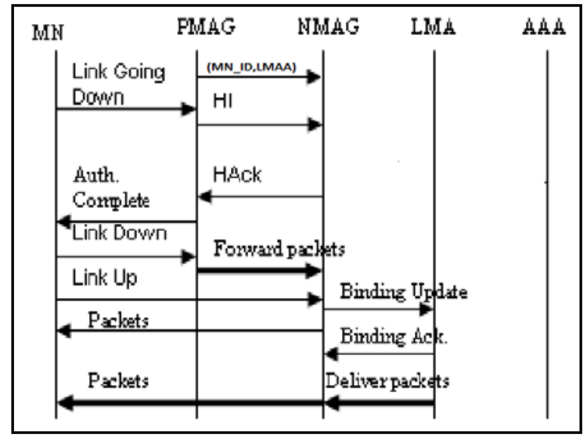

Figure 5: Mobile node handoff signaling call flow with eMAG

V. CONCLUSION

In this paper we have proposed implementation of emag in ns-2. Emag is the entity which performs functions of standard mag along with functions proposed in this paper. Presence of emag may reduce hand over delay in pmipv6.

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