A Survey on Efficient Handover Procedure in Proxy Mobile Ipv6 Networks

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Abstract: **Proxy Mobile IPv6 (PMIPv6) is the Network-based Localized Mobility Management (NETLMM) protocol where access network supports the mobility of a mobile node on behalf of the mobile nodes. Yet PMIPv6 decreases the signalling overhead and handover latency, however it suffers from a packet loss issue and extend authentication latency through handoff. There are several security threats to PMIPv6. In this survey several extensions of the Mobile IPv6 is examined for enhancing the performance. As an outcome, the different extensions of Mobile IPv6 like hierarchical Mobile IPv6 (HMIPv6) and fast handover for Mobile IPv6 (FMIPv6) has mainly focused for performance upgrading of MIPv6. In this survey, to avoid the packet loss issue which is carrying a bicasting scheme and to decrease the signalling overhead, the piggyback method is used. A secure password authentication mechanism (SPAM) in PMIPv6 networks protects a valid user from attacks, . SPAM presents high security assets including secrecy, location privacy, mutual authentication, stolen-verified attack protection, no clock synchronization difficulty, adaptation attack protection, forgery attack protection, replay attack protection, choose and adjust password free, fast error discovery, and session key agreement. SPAM is a proficient authentication method that executes the authentication procedure locally with minimum computational cost. Thus the study of SPAM shows that this scheme can resist different attacks and offers efficient performance than previous schemes**.

Keywords: **Bicasting, Authentication, piggyback, handover, Proxy Mobile IPv6 (PMIPv6).**

I. INTRODUCTION

There is an extensive growth in the wireless and mobile devices because the majority of the people use mobile devices to access a variety of services such as browsing the internet, multimedia applications, file sharing and video conferencing at anytime. Even though, the wireless networks provide huge wireless services, there exists some problems like insufficient channel capacity, low computing power of mobile terminals, complex security problems.

A. MOBILE IP

Mobile IPv4 (MIPv4) is an admired mobility internet protocol utilized in several IPv4 networks and Mobile IPv6 (MIPv6) has appeared in agreement with mobility for enhanced version of IP i.e. Internet Protocol version6.

B. MOBILE IPV4

Mobile IPv4 initiated four efficient entities such as Home Agent (HA), Foreign Agent (FA), Mobile Node (MN) and Correspondent Node (CN). Each MN is local in its home network where it obtains a stable Home Address (HoA).While an MN shift away of its home network and visits a foreign network, it acquires a temporary address which is identified as Care-of-Address (CoA) by the FA in to facilitate foreign network. In home network the MN registers its new CoA to the HA, when the MN progress from one foreign network to a new foreign network. The HA maintains the track of the HoA and CoA in a combined manner for all MN. A packet from CN intended to MN is sent to HoA of MN. The HA captures all the IP packets intended to the MN and tunnels them to the CoA of the MN [1].

C. MOBILE IPV6

Mobile IPv6 (MIPv6) is the next generation internet protocol and offers a number of improvements over MIPv4. MIPv6 supports mobility in both homogeneous (from one LAN to another LAN) and heterogeneous media (node movement from LAN to 3G network). In MIPv6, MN should assign three IPv6 addresses (i) Permanent home address, (ii) Current link local address, (iii) Care-of-Address (CoA), which associated with the mobile node only when visiting a particular foreign network [12]. MN's CoA is co-located CoA in MIPv6 which allow MN to encapsulate and decapsulate packets and connect to HA directly on any foreign link without notifying FA. The FA function is not there in MIPv6. While the MN moves from one network (or subnet) to another, CoA is automatically allocated to it in the foreign network due to the address auto-configuration feature which are (i) Statefull Address Auto-configuration – MN sends a CoA Request message to the local router and it allocates a new IPv6 address (ii) Stateless Address Auto-configuration - MN combines IPv6-prefix which it received with its MAC address to create new IPv6 address using neighbour discovery. The HA keeps a binding between MN's HoA and its CoA. The central data structure collected by each IPv6 node is used as a binding cache. In MIPv6 route optimization is in-built function so MN periodically sends binding update messages not only to the HA but also to CN. So, CN adds this binding to the binding cache and thereafter CN directly sends packets directly to MN's CoA indicated in the binding. In MIPv6, DAD (Duplicate Address Detection) procedure is invoked to determine the uniqueness of the new MN's CoA in which a MN sends a neighbour solicitation message with a set timer to ask that this address is being used or not. If no node replies with-in the set time then MN can assume that this address is unique in that network and it could use this address.

II. RELATED WORKS

Handover latency is one of the significant factors for the next-generation all-IP mobile networks.

Ki-Sik Kong et.al suggested network-based localized mobility management (NETLMM) protocol which is called as Proxy Mobile IPv6 [10]. The network based MM

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(Mobility management) for the MN is used to design proxy mobile IPv6. The main functionalities of the proxy Mobile IPv6 are the mobile access gateway (MAG) and the local mobility anchor (LMA). By using the access router, the mobile access gateway (MAG) runs. Host-based mobility management protocols such as MIPv6, HMIPv6 and FMIPv6 and handover latency in PMIPv6 networks are analyzed in this work.

Pyung-Soo Kim et.al suggested a fast handover scheme for Proxy Mobile IPv6 Networks [15]. It does not need the mobile node to be involved in the L3 signaling needed for handover procedure. The L3 signaling for the handover procedure is performed by the mobility access gateway (MAG) on behalf of mobile nodes. At the same MN moves between different MAGs which are in PMIPv6. So the handover latency cannot be avoided.

Kheya Banerjee et.al evaluates an effectual handover scheme in order to avoid the packet loss problem in the proxy mobile IPv6 [17]. In this scheme the problem of packet transfer delay from one access point to another access point within a PMIPv6 domain is considered in the WiMAX network. When compared to the host based mobility management protocols, a network based mobility management protocol is better.

Linoh A. Magagula et.al [7] suggested handover optimization in Heterogeneous Wireless Networks. This work evaluates the performance of the proxy Mobile IPv6. Handover delay and packet loss are observed during the process of Handover among the heterogeneous networks in the localized environments. The simple and effective way to calculate the handover latency is discussed in [3]. In this method, the MAG handles the entire mobility-related signaling instead of the MN.

Julien Freudiger et.al proposed the generation of mix-zones at suitable places of the vehicular node. Vehicular networks include the vehicles and the road-side units which is equipped with radios [8]. In this work first a protocol is proposed to generate cryptographic mix-zones at road intersections. In order to prevent the computationally bounded eaves droppers, the functionality of safety messages is preserved . Second merge the mix-zones into mix-networks in the vehicle nodes in order to achieve location privacy.

Adnan J Jabir et.al proposed a cluster based proxy mobile IPv6 for IP-wireless sensor networks [18]. In this work, cluster based sensor Proxy Mobile IPv6 solves the problem like handoff latency and the route optimization problems. Cluster based Sensor proxy Mobile IPv6 is used to group the mobility access gateways into clusters where each and every cluster is differentiated with a cluster head mobility access gateways. It is used to reduce the load on the local mobility anchor by performing intra-cluster handoff signaling and presenting an optimized path for data communications. The main disadvantage of this method is there is need of load balancing and scheduling.

Jun Lei et.al suggested that the recent localized mobility method and gives the benefits of the proxy Mobile IPv6. IPv6 networks use the host oriented mobility management scheme called Mobile IPv6 [11]. Proxy Mobile IPv6 is a network based mobility management method and it avoids both the tunneling overhead and stack update processes in the host. This PMIPv6 can decrease the delay by limiting the mobility management within the PMIPv6 domain. The home addresses of MN's are kept unchanged over the proxy Mobile Ipv6 domain decreases the chance considerably. So the attacker can realize the exact location of the mobile node.

PMIPv6 considerably minimizes the handover latency of MIPv6 since its handover process obtains over the movement detection and DAD process from the handover methods of layer 3 for MIPv6. **In Charles, Johnson** [4], considered protocol enhancements of IPv6, identified as Mobile IPv6 that permits transparent routing of IPv6 packets to mobile nodes. Every mobile node is recognized by using home address in mobile IPv6 for the connectivity of Internet. While away from its home 1P subnet, a mobile node is also related with a care-of address, which locates the current position of the mobile node. Some IPv6 node are allowed by mobile IPv6 to discover and cache the care-of address linked with a mobile node's home address and to send packets destined for the mobile node directly to it at this care-of address using an IPv6 Routing header.

In **Hyon and Lee** [5], introduce Fast Handover method in Mobile IPv6 to maintain real-time and throughput-sensitive functions. Fast wireless association between MN and NAR is recognized by allowing for both handovers layers to minimize handover latency. The First triggers in wireless LAN discussed the Fast Handover. The analyzing process of both handover timeliness latency and accuracy determines the performance of triggers. Approximately same performance is acquired by three pre-handover-triggers in the real environment.

Tin, Chieh Chao and Hsiang [14], presents innovative technologies to resolve bandwidth, security issues. First, a Security Access Gateway (SAG) is planned to resolve the security problem. SAG not simply presents high calculating power to encrypt the encryption require of SAG's domain. But it also assists mobile terminals to found a multiple safety tunnel to keep a secure domain. Second, Robust Header Compression (RoHC) technology is assumed to improve the utilization of bandwidth. Access Gateway (AG) replaces Access Point (AP) for packet header compression and de-compression from the wireless end.

D. Simon *et al*. [9] introduced the packet lossless PMIPv6 (PLPMIPv6) that utilizes a buffer mechanism to avoid packet loss during handover, long handover latency is caused by ineffective authentication process of PL-PMIPv6. In addition, the PL-PMIPv6 still suffers from the packet loss problem before the bidirectional tunnel is build among the LMA and the new MAG. The main issues on PMIPv6 as man-in-the middle attack, message replay attack and impersonation attack. EAP-TLS can also be functional to the PMIPv6 networks. But EAP-TLS has serious problems. These drawbacks result in high signaling overhead and long authentication latency. Lee and Kong et al [10] present two secure authentication methods for PMIPv6, but they did not acquire the handover process into consideration.

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Janne lundberg [2] analyzed the reason for the packet loss occurred in mobile Ipv6 and way to solve those problems. To resolve those problems Fast handovers for mobile IPv6 is proposed. Change of link, Movement detection, address acquisition, Home agent update etc…are the reasons for the delay in mobile IPv6. This fast hand over method for mobile IPv6 reduces a registration delay by gathering the information required for the link connection for new nodes before eliminating the old connections. By focusing on the properties of protocol implementations, it is very easy to make proper assessments for effectiveness of the protocol.

Lebajoa A et al [16] introduces an Enhanced Bicasting Proxy Mobile IPv6 (EB-PMIPv6) scheme where the packet loss and handover is reduced by utilizing the network resources effectively. This is achieved by the algorithm called signal strength prediction algorithm which is used to predict the trustiness of the link when a handover is about to happen. In EB-PMIPv6 timely link layer is used which is used to execute the Bicasting process, hand off and a predictive layer handover 3 processes accurately. Packet loss is reduced by stopping a routing packet which is destined for a Mobile Node (MN) and maintaining the signal strength below some threshold value.

Sangheon et al [3] introduces a two analytic model for the performance analysis of the HMIPv6 in IP based cellular networks. Those two analytic models are named as random walk model and fluid flow model. Random walk mobility model is built based on the markov chain model where the next positions of mobile nodes are found by adding the previous position of mobility nodes and random value. This random value is chosen independently from an arbitrary distribution. In Fluid flow mobility model, the directions of mobile nodes are distributed uniformly in an MAP domain within the range of $(0, 2\pi)$. The final conclusion of the analysis of these analytic models shows that location update cost and packet delivery ration is reduced considerably.

Mahmood M et al., [6] introduced an user mobility model which is used to characterize the different types of mobility related traffic parameters which is gathered from analysis of the cellular phone systems. There are two types of cell residence times based on the origination of the call. Those are new call cell residence time and handover call cell residence time. This mobility model proves that increase in mobile drift in a cell can be treated as contributing to an effective increase in the cell radius.

Solimen H et al [13] proposed an Hierarchical mobile IPv76 mobility management in order to address the problems like binding updates whenever the mobile nodes move from one place to another place, and the additional delays occurred when utilizing route optimization.

III. ANALYSIS OF THE METHODS

S. No	TITLE	AUTHORS	METHODS	ADVANTAGES	DISADVANTAGES
1	Mobility Support in IPv6 [4]	Charles E. Perkins & David B. Johnson	Mobile IPv6 Mechanism: 1.Error handling 2.Security handling	(1) Ease of scalability (2) Integrated Security	Even though it is efficient but from technical side not all problems are solved.
2	Providing Efficient Secured Mobile IPv6 by SAG and Robust Header Compression[14]	Tin-Yu Wu, Han-Chieh Chao, and Chi-Hsiang Lo	Security Access Gateway (SAG) Mechanism	(1) The SAG offers transmitted data encryption by calculating a long bit encryption key to establish a secure tunnel between the Mobile Node (MN) and the Corresponding Node (CN). (2) The SAG can fulfil the requests from all MN header compressions for the wireless terminal under the same wireless network signals	Handover latency is not taken into consideration
3	Handover Latency Analysis of a Network-Based Localized Mobility Management	Ki-Sik Kong and Wonjun Lee, Youn-Hee Han,	Proxy Mobile IPv6 (PMIPv6) protocol is designed.	(1) The handover latency of PMIPv6 becomes lower than	It only works on networks within the same domain and/or provider.

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	Protocol[10]	Myung-Ki Shin		that of FMIPv6 when wireless link delay is greater than the delay between mobile access gateway (MAG) and local mobility anchor.	
4	A Fast Handover Scheme for Proxy Mobile IPv6 using IEEE 802.21 Media Independent Handover [15]	Pyung-Soo Kim and Jeong Hun Choi	Fast handover Proxy Mobile IPv6 (PMIPv6)	(1) Support fast handover for the MN irrespective of the presence or absence of MIH functionality (2) It can reduce burden and power consumption of MNs with limited resource and battery power	Since the MN moves between different two MAGs in PMIPv6, the handover latency cannot be avoided.
5	An Efficient Handover Scheme for PMIPv6 in IEEE 802.16/WiMAX Network [17]	Kheya Banerjee, Sheikh Md. Rabiul Islam, Zulkernine Ibne Tahasin, Rokon Uddin	PMIPV6 Handover Scheme	(1) This handover scheme reduces the handover latency by sending the MN-profile using a ND message of IPv6 at	It suffers from handover delay or latency which may cause serious distortions in video or sound signal during handover.
				the beginning of handover.	
6	Mix Zones for Location Privacy in Vehicular Networks [8]	Julien Freudiger, Maxim Raya, Márk Félegyházi, Panos Papadimitratos and Jean-Pierre Hubaux	CMIX Protocol (Cryptographic MIX-zones)	(1) The accumulated unlinkability of the mix-networks is generally very high.	Successful identification is achieved only with some significant probability.
7	A cluster-based proxy mobile IPv6 for IP-WSNs [18]	Adnan J Jabir, Shamala K Subramaniam, Zuriati Z Ahmad and Nor Asilah Wati A Hamid	Clustered SPMIPv6 (CSPMIPv6)	(1) CSPMIPv6 achieves better LMA load, local handoff latency, and transmission cost than PMIPv6 and SPMIPv6.	Scalability is not achieved in CSPMIPv6.
8	Evaluating the Benefits of Introducing PMIPv6 for Localized Mobility Management [11]	Jun Lei, Xiaoming Fu	1. Fast handovers for PMIPv6 (F-PMIPv6), 2. 802.21 assisted PMIPv6	(1) F-PMIPv6 reduces the handover latency (2) PMIPv6 can achieve fairly good performance	Higher handover signalling overhead in the network, Lacking in sufficient scalability and efficiency of delivery.
9	Handover Optimization in Heterogeneous Wireless Networks : PMIPv6 vs. PMIPv6 with MIH [7]	Linoh A. Magagula, Olabisi E. Falowo and H. Anthony Chan	PMIPv6 enhanced with MIH handover	(1) In PMIPv6 with MIH services, the handover performance in terms	Only analytical results are proved

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				of handover delay and packet loss is even better.	
10	Fast Handover Based on Mobile IPv6 for Wireless LAN [5]	Hyon G. Kang and Chae Y. Lee	Fast hand over in WLAN	(1) Handover timeliness and handover accuracy are reduced. (2) Reduces the route reestablishment delay	Pre-handover-triggers cannot be guaranteed in normal system.
11	An Analysis of The Fast Handovers for Mobile IPv6 Protocol [2]	Janne Lundberg	Fast handover in Mobile IPv6	(1) Reduced registration delay (2) Eliminate the packet loss completely	Decision about the effectivity of the protocol is very difficult to make.
12	An Enhanced Bicasting Scheme for Proxy Mobile IPv6 with Buffering [16]	Lebajoa A. Mphatsi, and Olabisi E. Falowo	Enhanced Bicasting Proxy Mobile IPv6 (EB-PMIPv6)	(1) Reduced packet loss (2) Reduced handover delay	When PMAG uses backhaul bandwidth efficiently it affects the mobile nodes negatively.
13	The EAP-TLS Authentication Protocol[9]	D. Simon, B. Aboba, and R. Hurst	(1) Random walk mobility model (2) Fluid flow mobility model	(1) Reduced update cost and (2) Increased packet delivery ratio	Its not taken consideration of the signalling overhead and power consumption.
14	User Mobility Modeling and Characterization of Mobility Patterns [6]	Mahmood M. Zonoozi and Prem Dassanay	User Mobility model	The proposed user mobility model can handle	It's not efficient in the case of large area networks.
		ake		the different street orientations and traffic flows	
15	Hierarchical mobile IPv6 management RFC 5380 [13]	H.Soliman, C.Castelluccia, K. El Malki, L. Bellier	HMIPv6	By using regional care of address it can hide the location of mobile nodes	Packet collision may occur packets destined for RCoA (Regional Care of Address).

IV. CONCLUSION

Mobile IPv6 is the most widely used IP protocol. In the mobility management protocols there are two types such as host-oriented mobility management protocols and the network-oriented mobility management protocols. Hierarchical Mobile IPv6 and fast handover in Mobile IPv6 are included by host based mobility management protocols. The network-based mobility management protocols include proxy Mobile IPv6. The proxy Mobile IPv6 is a network based mobility management protocol which is being dynamically standardized and is starting to attract important attention among the telecommunication and internet communities. The most important intend is to minimize the packet loss and minimize the delay. The mobility management protocols are investigated to minimize the packet loss problem. In this research study, packet loss and out of sequence problem is addressed by a novel secure handover mechanism in PMIPv6 networks method. It achieves a local authentication process to minimize the handover latency, and employed the piggyback technique to minimize the signaling overhead. At the end of this survey, it is concluded that effective mechanism is proposed to improve the handoff performance and it concentrates on reducing latency, packet loss and also for rectifying security issues.

REFERENCES

[1]. Yi-an Chen, "A Survey Paper on Mobile IP," available at: http://www.cis.ohio-state.edu/ıjain/cis788-95/mobile ip, 1996.
[2]. Janne Lundberg, "An Analysis of the Fast Handovers for Mobile IPv6 Protocol", Proceedings of the Mobile networks based on IP protocols and unlicensed radio spectrum Seminar on Internetworking, Espoo, May. 2003.
[3]. P. Sangheon, and C. yanghee, "A Study on performance of hierarchical mobile IPv6 in IP based cellular networks", IEICE TRANS.COMMUN., Vol. E87, No. 3, Mar. 2004.

ISSN: 2278 – 1323

[4]. D. Johnson, C. Perkins and J. Arkko, "Mobility Support in IPv6", RFC 3775, Jun. 2004.

[5]. Hyon G. Kang and Chae Y. Lee, "Fast Handover Based on Mobile IPv6 for Wireless LAN", Asia Pacific Management Review, Vol. 10, Feb. 2005.

[6]. M. Mahmood Zonoozi and Prem Dassanayake, "User mobility modelling and characterization of mobility patterns", IEEE Journal on Selected Areas in Communications, ISSN: 0733-8716, Vol.15, No. 7, Sep. 2006.

[7]. Linoh A. Magagula, Olabisi E. Falowo and H. Anthony Chan, "Handover Optimization in Heterogeneous Wireless Networks: PMIPv6 vs. PMIPv6 with MIH", RFC 4830, Apr 2007.

[8]. J. Freudiger, M. Raya, and M. Feleghhazi, "Mix zones for location privacy in vehicular networks," in Proceedings of the 1st Int. Workshop Wireless Networking Intel. Transportation Syst., Aug. 2007.

[9]. D. Simon, B. Aboba and R. Hurst, "The EAP-TLS Authentication Protocol", Internet RFC 5216 , Mar. 2008.

[10]. K-S. Kong, W. Lee, Y.-H. Han and M.-K. Shin, "Handover latency analysis of a network-based localized mobility management protocol," in Proc. IEEE Int. Conf. Commun., May. 2008.

[11]. J. Lei and X. Fu, "Evaluating the benefits of introducing PMIPv6 for localized mobility management", Proceedings of the IEEE Int. Wireless Commun. Mobile Computing Conf., Aug. 2008.

[12]. S. Gundavelli, K. Leung, V. Devarapalli, K. Chowdhury, and B. Patil, *Proxy Mobile IPv6*, RFC 5213, Aug. 2008.

[13]. Soliman H, Castelluccia C, El Malki K, Bellier L. "Hierarchical mobile IPv6 mobility management (HMIPv6)". IETF rfc-5380, Oct. 2008.

[14]. Tin-Yu Wu, Han-Chieh Chao, and Chi-Hsiang Lo, "Providing Efficient Secured Mobile IPv6 by SAG and Robust Header Compression", Journal of Information Processing Systems, Vol.5, No.3, ISSN 1976-913X, Sep. 2009.

[15]. Pyung-Soo Kim and Jeong Hun Choi, "A Fast Handover Scheme for Proxy Mobile IPv6 using IEEE 802.21 Media Independent Handover," World Academy of Science, Engineering and Technology, Vol. 4, Jul. 2010.

[16]. Lebajoa A. Mphatsi, and Olabisi E. Falowo , "An Enhanced Bicasting Scheme for Proxy Mobile IPv6 with Buffering", Journal of Communications, vol. 6, Feb. 2011.

[17]. Kheya Banerjee, Sheikh Md. Rabiul Islam, Zulkernine Ibne Tahasin and Rokon Uddin, "An Efficient Handover Scheme for PMIPv6 in IEEE 802.16/WiMAX Network," International Journal of Electrical & Computer Sciences, Vol. 11, No. 05, Oct 2011.

[18]. Adnan J Jabir, Shamala K Subramaniam, Zuriati Z Ahmad and Nor Asilah Wati a Hamid, "A cluster-based proxy mobile IPv6 for IP-WSNs," Jabir et al. EURASIP Journal on Wireless Communications and Networking, ISSN: 1687-1499, vol. 173, May. 2012.

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