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Enhanced Dynamical Hierarchical Mobile Internet Protocol for Mobile IP Networks

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Abstract- **In the wireless networks proficient Mobility management is a vital concern that supports mobile users. Multicast Hierarchical Mobile Internet protocol (MHMIP) is a commonly accepted standard to tackle mobility of mobile hosts (MHs) in Networks. However, MHMIP may cause service delay and supplementary network resources. To solve this problem, The proposed protocol named as an Enhanced Dynamic Hierarchical Mobile Internet Protocol (EDHMIP) which uses the concept of Least recently used algorithm, which eliminates the path reestablishment between GFA's and FAs and uses only path extension phenomenon .The key contribution of the paper is proficient mobility management protocol.**

Keywords- **Wireless Networks, Mobility Management, Multicast Hierarchical Mobile Internet Protocol, Enhanced Dynamic Hierarchical Mobile Internet Protocol, Path reestablishment, path extension.**

I. INTRODUCTION

The Current fast increasing demand for wireless access to Internet applications is fueled by the remarkable success of wireless communication networks and the sudden growth of the Internet. The user mobile devices, such as wireless palmtops, mobile phones, and laptops, make it possible for mobile users to access the Internet applications that are primarily based on Internet protocol (IP). The attractiveness of the Internet provides strong motivation to service providers to support seamless user mobility.However, many telecommunication systems such as first and second generation wireless cellular systems were designed mainly for voice services, and the integration with data networks becomes the major push for third and future generation wireless systems. Mobile IP (MIP) is the protocol developed by the Internet Engineering Task Force (IETF) to support global mobility in IP networks. This standard has become the solution to solve the user mobility in almost all packet-based wireless mobile systems.

MIP enables mobile nodes to maintain ongoing communications with the Internet while moving from one subnet to another. In the MIP protocol, mobile nodes that can change their points of attachment in different subnets are called mobile nodes (MNs). An MN has a permanent address (home address) registered in its home network and this IP address remains unchanged when the user moves from subnet to subnet. This address is used for recognition and routing purpose, which is stored in a home agent (HA). An HA is a router in a mobile node's home network, which can intercept and tunnel the packets for the mobile node and also maintains the current location information for the mobile node. If an MN roams to a subnetwork other than the home network, this subnetwork is a foreign network for that user. In the current MIP protocol, the MN can obtain a new IP address from a router [foreign agent (FA)] in the visited network or through some external means. An MN needs to register with the FA or some one-hop router for the routing purpose. The care-of-address (CoA) for the MN will change from subnet to subnet. In order to maintain uninterrupted services while the user is on the move, MIP requires the MN to update its location to its HA whenever it moves to a new subnet so that the HA can intercept the packets delivered to it and tunnel the packets to the user's current point of attachment.

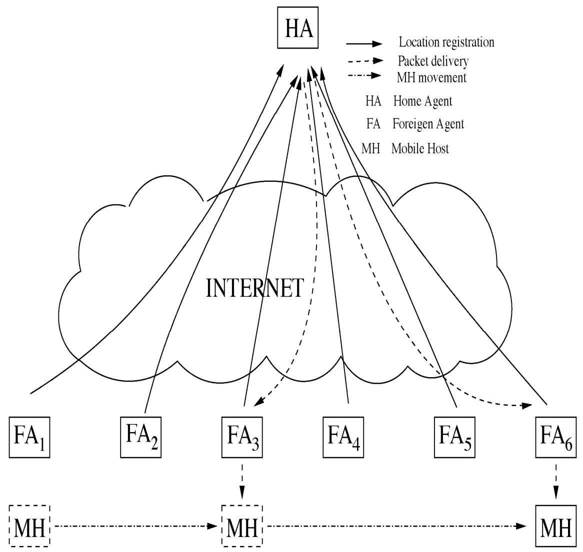

Fig.1.MIP location registration and packet routing

Thus, the MIP can provide uninterrupted Internet access services for the mobile user and does provide a simple and scalable solution to user mobility.

However, MIP is not a good solution for users with high mobility. Its mechanism requires every MN to update its new CoA to the HA every time the MN moves from one subnet to another, even though the MN does not communicate with others while moving. As shown in Fig. 1, the location update cost in MIP can be excessive, especially for the mobile users with relatively high mobility and long distance to their HAs. This problem becomes worse with the increase of the mobile user population. Moreover, if a user is far away from his/her HA or the HA processing capability is overwhelmed by the huge volume of update messages, the signaling delay for the location update could be very long, which will result in the loss of a large amount of in-flight packets and the degradation of quality-of-service (QoS).

IP mobility in wireless networks can be classified into global mobility and local mobility. The global mobility is the MN mobility through different administration domains. The local mobility is the MN movements through different subnets belonging to a single network domain. For local mobility where the MN movement is frequent, the MIP concept is not suitable and needs to be improved. Indeed, the processing overhead related to location update could be high specifically under high number of MNs and when MNs are distant from the HAs yielding to high mobility signaling delay.

Hierarchical Mobile IP (HMIP) has been proposed to reduce the number of location updates to HA and the signaling latency when an MN moves from one subnet to another. In this mobility scheme, FAs and Gateway FAs (GFAs) are organized into a hierarchy. When an MN changes FA within the same regional network, it updates its CoA by performing a regional registration to the GFA. When an MN moves to another regional network, it performs a home registration with its HA using a publicly routable address of GFA. The packets intercepted by the HA are tunneled to a new GFA to which the MN is belonging (e.g., GFA2 following MN handoff from FA3 to FA5 in Fig. 2). The GFA checks its visitor list and forwards the packets to the FA of the MN (FA5 in Fig. 2). This regional registration is sensitive to the GFAs failure because of the centralized system architecture. Moreover, a high traffic load on GFAs and frequent mobility between regional networks degrade the mobility scheme performance. In order to reduce the signaling load for interregional networks, mobility dynamic location management approaches for MIP have been proposed: A Hierarchical Distributed Dynamic Mobile IP (HDDMIP) and Dynamic Hierarchical Mobile IP (DHMIP).In the HDDMIP approach, each FA can act either as an FA or GFA according to the user mobility. The traffic load in a regional network is distributed among the FAs. The number of FAs attached to a GFA is adjusted for each MN. Thus, the regional network boundary varies for each MN.

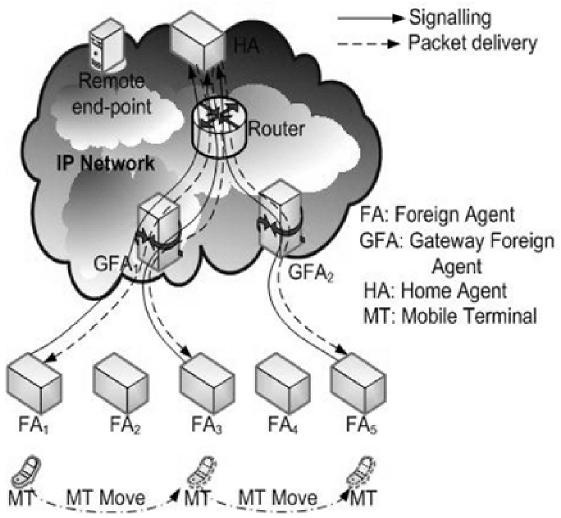

Fig.2.HMIP

This number is computed according to the MN mobility characteristics and the incoming packet arrival rate. This number is adjustable from time to time according to the variation of the mobility and the packet arrival rate for each MN. Nevertheless, this approach requires that each FA is able to act as an FA and a GFA. Moreover, it adds processing load on the MN to estimate the average packet arrival rate and the subnet residence time. Hence, the main advantage of this approach is the system strength enrichment since the GFA failure affects only the packets routing to MNs belonging to this GFA. The disadvantages are the system infrastructure and MNs costs which could be high.

The DHMIP approach has been proposed to reduce the location update messages to the HA by registering the new CoA to the previous FA and building a hierarchy of FAs .Hence, the user's packets are intercepted and tunneled along the FAs hierarchy to the MN.

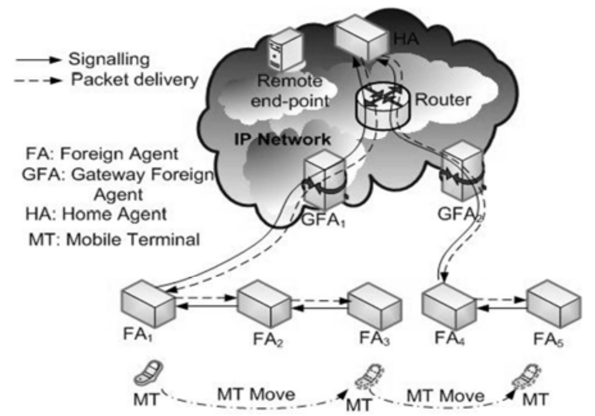

Fig.3.DHMIP

The hierarchy level numbers are dynamically adjusted based on mobile user's mobility and traffic load information. Fig. 3 illustrates an example of DHMIP approach with a maximum of hierarchy level number equal to 3. When MN is attached to FA2, FA3, FA5, or FA6, the CoA update is sent to the previous FAs. If the MN becomes attached to FA4 the level number reach the threshold and the MN will set up a new hierarchy. The MN registers its new CoA directly to the HA. In this approach, the location update to the new FA, which is close to the previous FAs, could be less expensive than that to the HA.DHMIP approach still requires the new location update and packet route processing in FAs belonging to the hierarchy increasing the mobility signaling and packet delivery delay. Moreover, the path extension through the FAs hierarchy increases the network resources used for packet delivery and location update signaling for an ongoing communication.

In inter-FAs tunneling approach has been proposed to optimize the route between the remote end point and the MN. This approach enables remote end point to get the CoA associated to the MN and to use it to reach the MN through the foreign network without passing through the home network. When the MN moves from one foreign network to another, it communicates its new CoA to its preceding FA through its new FA. The previous FA tunnels the received traffic from the remote end point to the MN's new location. At the same time, it sends a message to the HA requesting that the remote end point be notified of the MN's new CoA. Upon receiving this new CoA, the remote end point uses it to reach the MN through the new foreign network without passing through its previous foreign network. This approach requires to restore an optimized route after each CoA change. It aims to transfer packets through the resulting route with smaller delay than that experienced when these packets transit through the home network. However, this may not be always the case, and such performance will depend on the route optimization mechanism used and a set of influencing factors such as remote end point to FAs distance, the loads of the networks the optimized route should pass through, and the MN inter-FAs mobility frequency.

Another approach is MHMIP; in this FAs are arranged as hierarchical multicast groups. In each group, FAs are connected to each other through a GFA. A set of GFAs are connected to an HA. When an MN moves through FAs belonging to the same group, the GFA of this group multicasts the received packet (coming from the HA) to the MN. When the MN moves outside a group, the new CoA is registered to the GFA of the new group to which the MN is currently belonging. This GFA sends this CoA to the HA. This latest tunnels the packet to the new GFA which will multicast the received packets within the new FAs group.

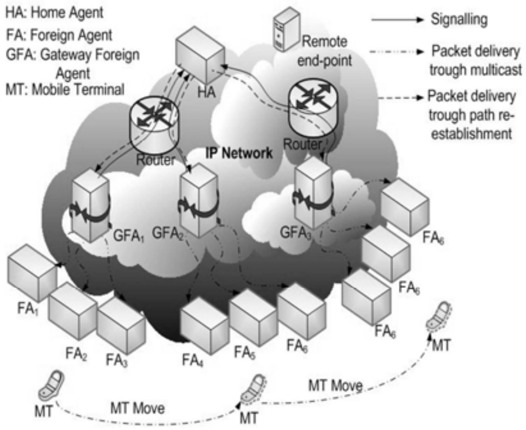

Fig.4.MHMIP

This approach reduces the frequency of the location update to the HA. This update is performed every inter-GFAs mobility rather than every inter-FAs mobility limiting the location update processing only at the GFA. In this example, the group creation is static in the sense that the numbers of groups and FAs do not change and remain fix. In Fig. 4, when the MN moves from FA2 to FA5, the location registration is performed between HA and GFA2.GFA2 multicasts packets to FA4, FA5, and FA6. Thus, when MN moves to FA6 or FA4 there is no need for the MN location registration. Hence, this approach allows reducing the mobility signaling delay compared to the HMIP and DHMIP mobility approaches specifically for high-mobility MNs. However, it is network resources consuming approach due to multicast protocol use.

II. ENHANCED DYNANIC HIERARCHICAL MOBILE INTERNET PROTOCOL (EDHMIP)

The EDHMIP approach has been proposed to reduce the location update messages to the HA by registering the new CoA to the previous FA and building a hierarchy of FAs Hence, the user's packets are intercepted and tunneled along the FAs hierarchy to the MN. The hierarchy level numbers are dynamically adjusted based on mobile user's mobility and traffic load information.

As per DHMIP approach either a maximum of hierarchy level of 3, when MN is attached to FA2 andFA3 update is sent to previous FA's when MN move from FA3 to FA6 the threshold value is reached therefore the update is done through GFA which is similarly appearing as HMIP which is not giving best performance and degrades performance with frequent update through GFA. EDHMIP solves this problem.

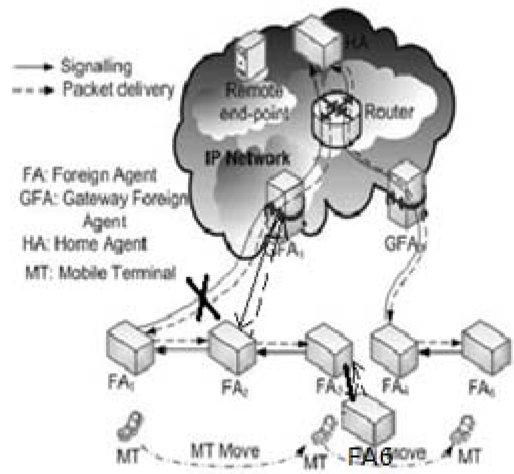

Fig.5. EDHMIP

LRU (least recently used) algorithm is used for maintaining hierarchy among FA,s . That is whenever mobile node moves from one FA to another FA and threshold value reaches to its maximum value then the least recently used FA is removed from the hierarchy which setup by the model. And new hierarchy is formed by updating GFA link to next least recently used FA .this algorithm efficiently manage with in intraregional network. In inter regional network it is quite same as DHMIP.

A. Example

As shown fig.5 when MN is move from FA3 to FA6 then as per DHMIP updation is sent through GFA but in EDHMIP hierarchy is adjusted as

GFA->next=FA1->next

FA2->prev=GFA

Delete the link between FA1 and GFA

That is a hierarchy set as GFA to FA2, FA2->FA3, FA3->FA6 .FA1 is least recently used so it is removed from hierarchy As and when MN moves frequently through FA.the hierarchy is set by LRU algorithm

B.Managing EDHMIP

EDHMIP performs well than DHMIP, but when it uses hierarchy level threshold value as a minimum value (eg: 2) then frequent updating through FA and frequently usage of LRU makes the system complex. So In order to manage the EDHMIP an optimum value of threshold value is maintained which strengthen the EDHMIP.

III.CONCLUSIONS

As compared to DHMIP, HMIP, MHMIP the delay of EDHMIP is less because it localizes registration process 100% within GFA. Basically in EDHMIP, registration process done at FAs only .So we cannot expect more delay but it can expect in DHMIP when threshold value is reached due to the registration through GFA. which takes long time than EDMIP for updating process .So EDMIP is ready to use.

We can expect same bandwidth for both DHMIP and EDHMIP. But for proficient managing mobility we have to choose the protocol with less delay.

EDHMIP is more enhanced than MHMIP. Since the MHMIP is resource consuming .Even MHMIP has zero possible registration with in GFA as worst EDHMIP also possessing same order complexity. Since EDHMIP is just extending one link and removing one link. The complexity of EDMIP is not more than MHMIP. So as per software and hardware restrictions EDHMIP is an another possible solution.

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REFERENCES

[1].Nadjia Kara," Mobility Management Approaches for Mobile IP Networks: Performance Comparison and Use Recommendation", 2009.

[2]. E. Fogelstroem, A. Jonsson, and C. Perkins, "Mobile IPv4 Regional, 2007.

[3]. M. Song, J. Huang, R. Feng, and J. Song, "A Distributed Dynamic Mobility Management Strategy for Mobile IP Networks,"2006

[4].Wenchao Ma, Yuguang Fang, "Dynamic hierarchical mobility Management Strategy for Mobile IP Networks ", 2004.

[5].C.E. Perkins," IP Mobility Support for IPv4", 2002.

[6]. A. T. Campbell, J. Gomez, S. Kim, C.-Y. Wan, Z. R. Turanyi, and A.G. Valko, "Comparison of IP micromobility protocols," 2002.

[7]. F. M. Chiussi, D. A. Khotimsky, and S. Krishnan, "Mobility management in third-generation all-IP networks," 2002.