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Handover Technique using Mobile Ipv6

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Abstract: **Mobile IP is a solution for mobility support in the global Internet scenario. However, it suffers from the problem of long hand off. The process of changing a Mobile Node's point of attachment or its relocation from one network to another is called the handover. In the upcoming mobile network technologies, when the MN usually changes its point of attachment to the Internet, the handover performance requires the needed improvement, especially the latency. Many solutions have been proposed to reduce the handoff delay of Mobile IP. In this paper we propose to add further utility on mobile node.**

Key words: Mobile IPv6, Fast Handover, IP mobility, MIPv6, FMIPv6.

I. INTRODUCTION

IPv6 is recommended as the next generation wireless Internet Protocol as it permits connectivity of a Mobile node to the Internet, regardless of its location. This is mainly achieved using CoA (Care of Address) to indicate the location of the MN. Despite the promising characteristics of the Mobile IPv6 and its elegant mechanism to support mobility, it too faces the era of its Pro's and Con's [16]. Its major drawback is that, during the handover process, there is a short period when the mobile node is unable to send or receive packets because of link switching delay and IP protocol operations. Handover is the process by which an MN keeps its connection active when it moves from one access medium to another.

The handover process happens when the MN moves from one access medium to another, and it should accomplish three operations: movement detection, new CoA configuration, and binding update (BU). During handover period, the MN is unable to send or receive packets. The length of this period is called handover latency.

A scheme has been introduced to reduce the handover latency by anticipating the handover and performing some operations prior to a break of the link. This is known as the fast handover scheme. It includes two problems namely:

- How to allow an MN to send packets as soon as it detects a new subnet link
- How to deliver packets to a mobile node as soon as its attachment is detected by the new access medium.

The solution to these problems is a fast handover scheme for Mobile IPv6. In this scheme, the movement detection latency is reduced by providing the MN with the information about the new access point and the associated subnet prefix information when the connection between the MN n the current subnet is sustained.

The new CoA (Care of Address) configuration latency is reduced by neglecting DAD (Duplicated Address Detection) and by generating and configuring new CoA by MN itself.

A bidirectional tunnel between the previous access router (PAR) and the new access router is established to reduce the binding update latency.

In the fast handover scheme, it is noted that the DAD procedure is very time consuming, especially if the DAD begins after the link is created to the new access router.

If duplicate CoA occurs, the service quality for users will decrease greatly. At the same time, the binding updates to the HA (Home Agent) and CN (Correspondent Node) are performed after the time point when the MN is IP-capable on the new subnet link. Because of this, the MN communicates with the CN directly via the NAR without using tunnel. Thus the packet delay for some packets sent during the handover will be enlarged.

II. MOBILE IP

When the mobile nodes initiation to moves its send router

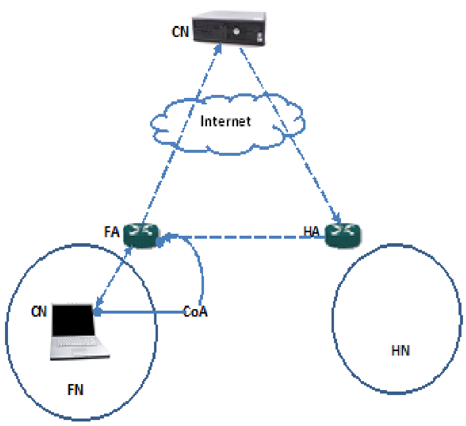

Fig.1: Mobile IP processer

solicitation message to request access router (AR) to replay router advertisement (RA) [11]. When MN receives RA, it compares the IP address in RA with its Home Address (HA) to detect that whether it has in the local network or moved away from its home. The MN configures new CoA using information in RA [1].

The MN needs to verify the uniqueness of its new CoA on the new link through DAD procedure. In order to perform DAD, the MN has to send one or several NS (Neighbor Solicitation) to its new CoA and wait for a response for at least one second. This produces important additional time to handover latency. Then the MN must update the binding cachein HA and CN [2].

III. HANDOVER IN MOBILE IP

Whenever an MN moves to a new FN it knows nothing about the new network or the new router (FA). There are two methods of solving this, agent advertisement and agent solicitation. In both methods the MN eventually receives a new CoA from the new FA. Now that the MN has a new CoA it has to register the new address with the HA. If the location of the CoA is at the MN the new address will be registered directly with the HA. If the CoA is at the FA the registration with the HA will go via the FA. To register a registration request message is sent by the MN to the HA, the HA then replies with a registration reply message **[4][7]**.

A. Problems

To support the mobility of nodes mobile IP has implemented handover mechanisms. However, that this handoff mechanism was contains some of gaps, and could often become the problems in the performance of the overall protocol, especially in a situation where handovers frequently occur [4].

c. Classifications of Handover

There are a various categories of Handover.

The Handover can be classified in two categories, (Horizontal Handover and Vertical Handover) related to the type of network.

Horizontal handover: The main concern of horizontal handover is to maintain ongoing service although the change of IP address due to the movement of a mobile node. Maintaining on-going service is done by hiding the change of IP address or dynamically updating the changed IP address.

Vertical handover: is happened when a mobile node moves across heterogeneous access networks. Differently from horizontal handover, the used access technology is also changed as well as IP address, because the mobile nodes moves different access network which uses different access technology [8]

In this case, the main concern of vertical handover is to maintain on-going service although not only the change of IP addresses but also the change of network interfaces, QoS characteristics, and etc.

B. Mechanisms for Handover in Mobile IP

The purpose of most of the solutions is to reduce the total handoff latency.

The IP latency is the time it takes before an MN can send messages from its new CoA.

This IP latency in turn consists of the movement detection latency, the time it takes to detect that the MN has moved to another subnet, and the CoA configuration latency, the time it takes to configure a new CoA.

The mobile IP latency represents the time it takes to send the binding update message to the HA and to receive the confirmation message [9] [15].

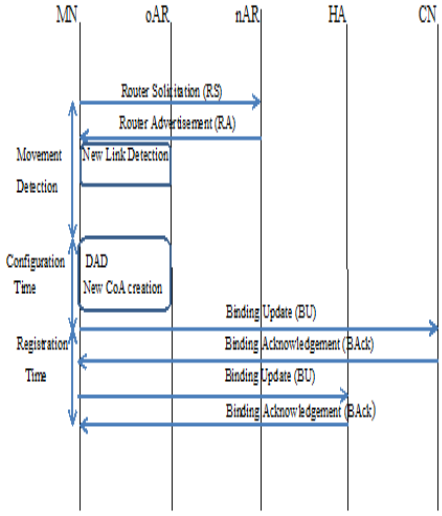

Fig.2. Mobile Handoff

D. The Discovery of Handover process

There are three steps for processesfor handover are, Initiation, Decision, and Execution process [5] [6].

1st Initiation Handover: For route discovery, the source node starts by broadcasting a route request packet that can be received by all neighbor nodes within its wireless transmission range. The route request contains the address of the destination host, referred to as the target of the route discovery, the source's address, and a unique identification number.

2ndDecisionHandover: At the end, the source host should receive a route reply packet containing a list of network nodes through which it should to move, supposed the route discovery process was successful.

3rdDecisionHandover: At the final, the source host (MN) should receive a route reply packet containing a list of network nodes through which it should propagate the packets, supposed the route discovery process was successful, and in the final we can make sure that in that way no loops will occur during send the packets.

IV. HANDOFF DELAY ANALYSIS

Under the MIPv6 protocol, the handoff delay is defined as the time duration from the MN receives the Fast Binding Acknowledgment (F-Back) from the oAR with which it is currently associated until the MN receives the Fast Neighbor Advertisement Acknowledgment (F-NAack) from the nAR **[7][12]**.

The total handoff delay of MIPv6, can be represented as

$TMIPv6 = {}^{T}MN-AR + {}^{T}AR-MN + {}^{T}dis$

(1)

${}^{T}MN-AR$ = Time delay for sending a signaling message from an Mobile Node to an Access Router,

${}^{T}AR-MN$ = Time delay for sending a signaling message from an Access Routertoan Mobile Node,

T_{dis} = Time for disconnection.

Signaling Delay from MN to AR (${}^{T}MN-AR$)

Before an MN sends a signaling message to a corresponding AR; it spends some time on generating the message, accessing the wireless channel, and transmitting the message out.

Hence, T_{MN-AR} consists of the following delay components:

$T_{MN-AR} = T_{MN-serv} + T_{MN-col} + T_{MN-prop}$ (2)

$T_{MN-serv}$: is message service delay time which includes the message processing and transmission delay,

T_{MN-col} is random delayed time due to collision avoidance for an MN to access the wireless channel,

$T_{MN-prop}$ is propagation delay of the signaling message over the wireless link.

Signaling Delay from AR to MN (T_{AR-MN}):

After receiving the signaling message from the MN, the AR processes the message and generates a response. Similar to the above analysis, T_{AR-MN} can be expressed as:

$T_{AR-MN} = T_{AR-serv} + T_{AR-col} + T_{AR-prop}$. (3)

Disconnection Delay (T_{dis}):

Disconnection time refers to the time when the connection between the MN and oAR is released and before the MN sets up the new connection with the nAR. During this disconnection time, packets destined to the MN will be forwarded from the oAR to the nAR and buffered at the nAR.

There are two L_2 triggers used by ARs as a reference to break or start a link. The first trigger is the layer 2 link down trigger (L_2-L_D) which indicates that the L2 link between the MN and oAR is broken.

When the oAR receives this trigger, it starts to forward the packets to the nAR through a tunnel.

The second trigger is the layer 2 link up trigger (L_2-L_U) which occurs when the L_2 link between the MN and nAR is established.

When the nAR receives this trigger, it begins to forward the buffered packets to the MN.

V. PROPOSAL

In this paper we suggest a handover technique to solve the problem of latency in handover, by extended mobile IPv6.

We propose an additional procedure on the mobile node called the access router buffering memory (ARb) to store all the information about the access router that it connected to in the past. Each record in ARb contains information of AR to which it was previously connected i.e., CoA address, connection instant, and connection interval.

When the MN moves, it will Read the data stored in AR buffering to discover the direction of movement.

The discovered direction is the path towards the most frequently connected AR because whenthe priority is maximum the connection is instant. At that time, MN sends RS message to the nAR where it's receiving and source is detected.

If MN receives RA message from nAR, it will search the corresponding CoA in AR buffering memory Rather than re-configuring the CoA based on RA as in basic Mobile IPv6.

In this case, CoA and DAD configuration procedures are skipped so the latency is reduced visibly.

Therefore, a MN usually moves through a certain number of routers and the movement direction of MN depends heavily on travel time.

As a result, we can use the movement history of MN to predict its movement direction. In this mechanism, we propose to add a buffer memory to MN to store the information about all of its past connections which is known as AR buffering.

When MN moves, it will query AR buffering to determine then AR to which it connected often based on time of travel. The query result is a list of ARs arranged in order of the number of times that the MN connected.

These are ARs where MN predicted the coming. Then, MN sends RS message to ARs in the list in order of priority. The

AR accepts the request of MN by sending RAmessage to MN. Thus, MN can discover AR during its movement hence, movement detection delay is reduced.

Duplicate Address Detection

Once the MN discovers a new router and creates a new CoA it tries to find out if the particular address is unique. This process is called Duplicate Address Detection and itis a significant part of the whole IPv6 process, with very little room for improvement. **In this work we evaluate MIPv6 Handovers when this feature is disabled.**

VI. SIMULATION OF PROPOSAL

In this simulation we suppose the collision is equal to zero by using the Broadcast domain on the topology network.

The mobile node starts by broadcasting route request packet that can be received by all neighbor nodes within its wireless transmission range.

Then the mobile node receives the RAs from the routers for which route of the movement is visible.

The information of these new routers (path selected) are stored in the ARb.

When the mobile node moves it will be predict the destination path.

Hence, when the MN receives RA message from new Access router (nAR), the MN compares the information with stored data in ARb.If the information is found in AR buffering memory, the mobile node can reuse care of address (CoA) and can reuse connection in “AR Caching” instead of re-configuring theCoA; in this case CoA and DAD are skipped.

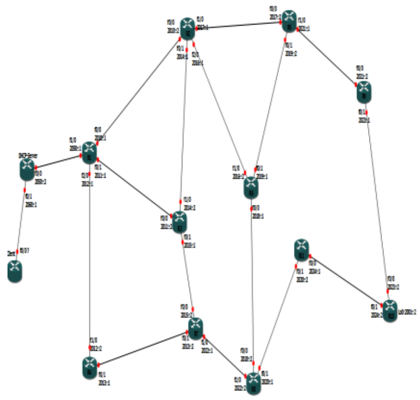

Fig.3. simulation network

VII. EVALUATION OF PROPOSAL MECHANISM

To evaluate the delay performance of the proposed scheme and to compare the Mobile IPv6 schemes, we used GNS3. The network topology in the simulation is shown in figure 5.

Overall performance of a Fast Mobile IPv6 Handover is affected by many parameters such as knowledge model. Under the MIPv6 protocol, the handoff delay is defined as the time duration from the Mobile Node (MN) initiate to move from its attachment point to the correspondent node (CN) at another network.

Through this technique with use the addition to Mobile Node a buffering memory called access router buffering memory we skipped the Duplicate Care of Address (DCA) stage. By GNS3 simulation software we measure the real delay handover time when the MN moves to CN through a numbers of routers using ARb memory and comparing the result with another schemes.

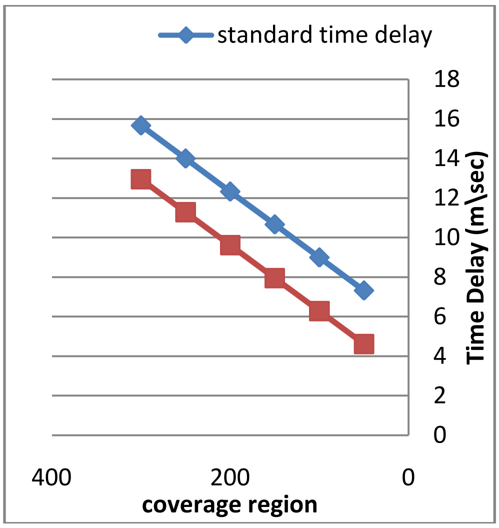

Fig.4. handover Delay of Mobile IPv6

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By this simulation we can see that the handover delay is decreased and packets loss is prevented.

VIII. CONCLUSION

Mobile IPv6 is a network technique of future, as it contains various new features. Mobile IPv6 handover is an important problem in future mobile network technology. The most prominent issue in this problem is the minimizing of the handover delay time. This Issue of the handover has attracted the attention of various researchers and has urged them to work on its correction and development.

There are several papers which were published earlier which proposed a huge number of techniques to rectify this problem.

This paper has presented different Mobile IPv6 handover techniques that are faster from what the previous research groups had proposed and left us with various ideas.

We tend to continue this research further in a similar and efficient way to find out more about how to improve the speed of Mobile IPv6's handover and make it faster.

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