Mechanism to Reduce Handover Delay in HMIPV6

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ABSTRACT

Numerous researches about Mobile IPv6 (MIPv6) have been proposed recently and the handover delay of the Mobile Nodes (MNs) among different networks is surely a worthy noticing issue.In order to configure the IP address and optimize the routes Mobile IPv6 has been proposed by the Internet Engineering Task Force(IETF). There are three major reasons for the MIPv6 handover delay: Movement Detection, Duplicate Address Detection (DAD), and Binding Update(BU), in which DAD occupies most of the MIPv6 handover delay and influences real-time services greatly. DAD also results in packet loss, reducing the throughput, during the handover. To avert the problems that worsen the handover latency and the packet loss, this paper presents Address Reconfiguration Mechanism to generate a unique CoA rapidly when duplicate address occurs.This avoids the need of DAD. The proposed scheme indeed reduces the handover delay and the packet loss when the CoA is duplicated.

Keywords

HMIPV6,MIPv6,FRAM

1. INTRODUCTION

Connectivity to the Internet while in motion is becoming an extremely important part of computing research and development.Mobility support plays an important role in all IP based wireless networks. Mobile IP is active approach to support the enhanced user mobility. Mobile IP, created by the Internet Engineering Task Force (IETF), is a standard protocol that builds on Internet Protocol by making mobility of a user transparent to applications and higher-level protocols.

Mobility is divided into two main categories[7]. Macro mobility and micro mobility. Macro mobility which means the movement among heterogeneous networks, and micro-mobility, which denotes the movement in the same network. Mobile IP can handle both local area and wide area movement in both wired and wireless networks.

IP addresses are typically associated with a fixed non-mobile location such as a router or a client computer. IP routes packets from a source to a destination by allowing routers to forward packets from incoming network interfaces to outbound interfaces according to routing tables.Thus, the IP address specifies the node's point of attachment.

Changing point of attachment increases the risk of packet loss which can have a considerable impact on the ongoing session and cause disruptions. Proper handover mechanism is needed to maintain connectivity and minimize the disruption of ongoing transfers. During the handover process, the handover latency inevitably happens, and affects the handover efficiency badly.Three major reasons for handover delay are,

1.1Movement detection delay time:

It is the time delay taken for the handover process performed within the same network.

1.2.Duplicate Address detection delay (DAD)time:

It is the time delay taken to check the uniqueness of address within the network. DAD occupies most of the delay and affects the handover efficiency badly.

1.3. Binding Update:

A binding update is a message that supplies a new binding to an entity that needs to know the new care-of address for a mobile node. The binding update contains the mobile node's home address, instead of being one offered by a foreign agent.

Among these delays,the delay due to DAD is the severe one. To solve this problem, this paper proposes a new mechanism based on HMIPv6 architecture (Hierarchical MobileIPv6)[1][2][8], An address table is established in the Mobility Anchor Point (MAP) to store all addresses that access to the network. When a MN accesses to a new network, a nCoA is generated and its uniqueness can be confirmed by the address table. Therefore, DAD is not necessary in our approach. Whenever the duplicate address occurs, the address is reconfigured to guarantee the uniqueness of the nCoA. In such a manner, even when the address is duplicated, the handover latency can be limited.

The rest of this paper is organized as follows: Section II introduces DAD procedure, previous techniques used and some related problems.Section III describes the proposed scheme and the conclusion is given in Section IV.

2. RELATED WORKS

When the MN keeps moving or connecting to new networks, due to its constant changes of the address, the duplicate address is very possible to occur repeatedly. Hence duplicate address detection is necessary to check the uniqueness of IP address.DAD takes more time and duplicate address detection occupies most of delay and affects the handover efficiency badly. Hence it is necessary to avoid DAD or the delay must be reduced. Previous papers proposed some approaches to reduce the delay caused by DAD.

2.1 Duplicate Address Detection Mechanism:

To operate DAD, the MN sends a message to the neighboring nodes to ask if the address is available. The node that is using the address will send aresponse to the asking node to defend its address.Consequently, the MN has to generate a nCoA and repeat DAD. If there is no response for a while, the MN first waits .If there is no response still, the addressmust be unique and available. Waiting for reply message occupy most time of DAD.

2.2 Hierarchical mobileIPV6(HMIPV6)

In HMIPV6[1][2][8]the central element of the framework is the inclusion of a special conceptual entity called Mobility Anchor Point (MAP), which replaces Foreign Agent (FA) and helps to decrease the handover latency as a local MAP can be updated more quickly than remote home agent (HA). It is well suitable for micro mobility. One disadvantage here is for macro-mobility, HMIPv6 did not give more effective resolutions.

2.3 Fast Duplicate Address Detection for Mobile IPv6 (F-DAD)

F-DAD [4] proposes that when a MN detects strong signals from a neighbor AP and it is about to move to the neighbor AP, it transmits an association request frame to the current AP. In the association request frame, the MN specifies the ID of the target neighbor AP. The current AP contacts the neighbor AP and requests for addresses that can be used within the APs. Because the addresses are generated uniquely by the AP, the mobile node can use an address directly without DAD.

2.4 Advance DAD(A-DAD)

In Advance DAD approach[6] in order to reduce standard DAD delay, a list of duplicate-free IPv6 addresses at an AR pool is maintained. Each AR generates an address randomly and performs DAD. After checking the uniqueness of the address, the AR stores the address in Passive Proxy Cache . If the AR monitors that another node performs DAD on the same address in its pool, the AR removes that address in its cache, generates a new address, and performs DAD to keep the list of unique addresses constant. The main drawback of this approach is managing the pool of candidate addresses becomes a great burden to the AR.

2.5 Optimistic DAD

In Optimistic DAD process [5], proposed that the MN can use the nCoA before DAD, but if the DAD result finds that this address is already in use, the address will not be available to the MN.The advantage here is ,it can provide interoperability with standard DAD. The disadvantage here is when the size of the network is larger the address collision will be higher.

3. PROPOSED SYSTEM

The proposed scheme is based on hierarchical mobile IPv6.Hierarchical schemes separate mobility management into micro mobility and macro mobility or otherwise known as intra-domain mobility and inter-domain mobility respectively.

3.1 Mobility Anchor Point (MAP)

It act as the central element. It is a router or a set of routers that maintains a binding between itself and mobile nodes currently visiting its domain. MAP is normally placed at the edges of a network, above the access routers (AR), to receive packets on behalf of the mobile nodes attached to that network. When a mobile node attaches itself to a new network, it registers with the MAP serving that network domain.

The MAP acts as the local home agent (HA) for the mobile node. It intercepts all the packets addressed to the mobile node, it serves and tunnels them to the corresponding on-link CoA of the mobile node. If the mobile node changes its current address within a local MAP domain, it only needs to register the new on-link address with the MAP since that the global CoA does not change.

If a mobile node moves into a new MAP domain, it needs to acquire a regional address (RCoA) and an on-link address(LCoA). The mobile node then uses the new MAP's address as the RCoA. After forming these addresses, the mobile node sends a Binding Update (BU) to the MAP, which will bind the mobile node's RCoA to its LCoA.

Based on HMIPv6 architecture (Hierarchical MobileIPv6), An address table is established in the Mobility AnchorPoint (MAP) to store all addresses that access to the network. When a MN accesses to a new network, a nCoA is generated and its uniqueness can be confirmed by the address table. Therefore, DAD is not necessary in our approach.Figure 1 shows the assumed network environment.Ihe status of the access router and the status of mobile nodes that are connected to the MAP is displayed in MAP. The below diagram shows the mobility of mobile nodes in both heterogenous and homogeneous environment.

3.1 Handover Procedure:

When a MN changes its point of attachment to the network, it moves from one network to another new network.This process is known as handover. During this process, the MN usually has disconnected from the old network and get connected to the new network.

The handover procedure includes the following steps:

1) While connecting to a new network, the MN sendsRouter Solicitation (RS) to NAR to notify its participation and to require the return of the prefixof NAR and the prefix information of the MAP.

2) After receiving the signal of RS, NAR will respond to the MN through Router Advertisement (RA),which offers the MN the prefix of the AR and the available MAP prefix in the current network.

3) With the prefix of the AR and the MAP, the MN combines the L2 address with the received prefix to generate NCoA.

4) The MN sends BU to the address table in the MAP to check whether the NCOA is unique. If yes, the MAP records the connecting information and registers the information and address in the table.

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5) If the address is duplicated, move to F-RAM for the purpose of reconfiguring the address.

6) After checking the uniqueness of the generated NCoA, the MN sends BU to the MAP.

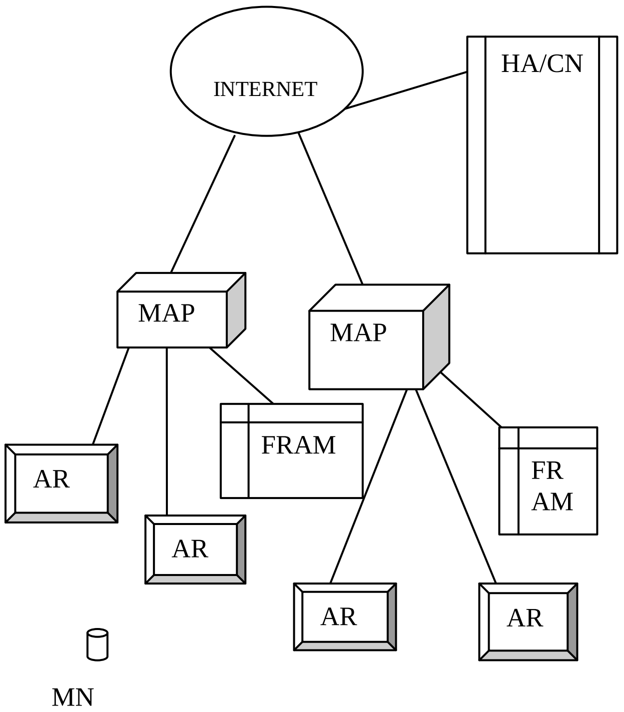

Figure 1. Assumed Network Environment

7) After confirming the uniqueness of the NCoA, the MAP sends BA to the MN.

8) At the same time, the MN sends BU to HA.

9) After conforming the updates, HA sends BA to the MN to notify the completion of the handover.

3.2 Address Reconfiguration:

When the MN enters a new network,a nCOA is generated. If the generated address is duplicate, then the duplicate address is reconfigured .This is by means of generating another unique address for the MN. This can be done by inserting a random numeric to the duplicate section to generate a unique nCoA. After generating the unique address, this address is forwarded to the MAP. With the reconfigured nCoA, the MN skips DAD and continues the other procedure.

4 .CONCLUSIONS AND FUTURE WORK

The proposed scheme reduce the handover latency. This eliminates the need for DAD which is the most important factor that causes the handover delay. The proposed scheme reduces the packet loss and improves handover efficiency. The future work is to optimize the scheme by performing the handover among different MAPs and analyzing traffic overhead.

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