TC-HMIPv6: A Study of HMIPV6 Handover Management for Packet Transmission Analysis

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Abstract. Recently, the Wireless internet user increased drastically due to the increase of concerns about the performance improvement of the mobile device and Smart phone. Wireless device users required the service which has a higher and the Mobile Communication traffic of the voice was expanded to a various multimedia services which includes various forms of voice data service-centered including wireless internet, SMS, MMS, and etc. The significant importance of Mobile IPv6 stood out as the user of the wireless internet increased and various of mobile service rapidly developed such as 3G and WIBRO. In Mobile IPv6, when the mobile device moves it possible creates a controversial issue between the base station, the packet loss according to the handover generates a delay time and it reverse the handover of packets and it's process. In this paper, we present a novel method of solving the problems packet handover. We based our proposed packet handover scheme on the existing handover process. Our proposed scheme has several features such as a buffer installation, Look-Up and Reverse Binding in the beacon Messages, and each Access Point in the existing Hierarchical Mobile IPv6 based was shown.

Keywords: MIPv6, HMIPv6, Reverse Binding, Look-Up.

1 Introduction

Recently, Wireless internet user increased drastically due to various mobile device technologies developed such as Smart Phone, Lap-top, PDA and etc. Accordingly, Developed of technology wireless network offer network service in mobile device such as WIBRO, Wireless LAN and 3G system.

Standard Mobile IPv6 when mobile node moves to other base station. Standard mobile IPv6 in the event of a handover needs more time to process. For these reason, many problems happen such as Packets Loss and Out-of-sequence. So, wireless network users can't provide seamless service. Much research is progressing to solve those problems, such as Fast Handover for Mobile IPv6, Hierarchical Mobile IPv6, Proxy Mobile IPv6 and etc. But wireless network still has problems.

In this paper a solution for solving problems such as long delay time handover in standard Hierarchical Mobile IPv6. We used Reverse Binding mechanism and Look-Up process.

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2 Related Work

This section discussed the detailed information about standard Mobile IPv6, Hierarchical Mobile IPv6 operation and Handover procedure.

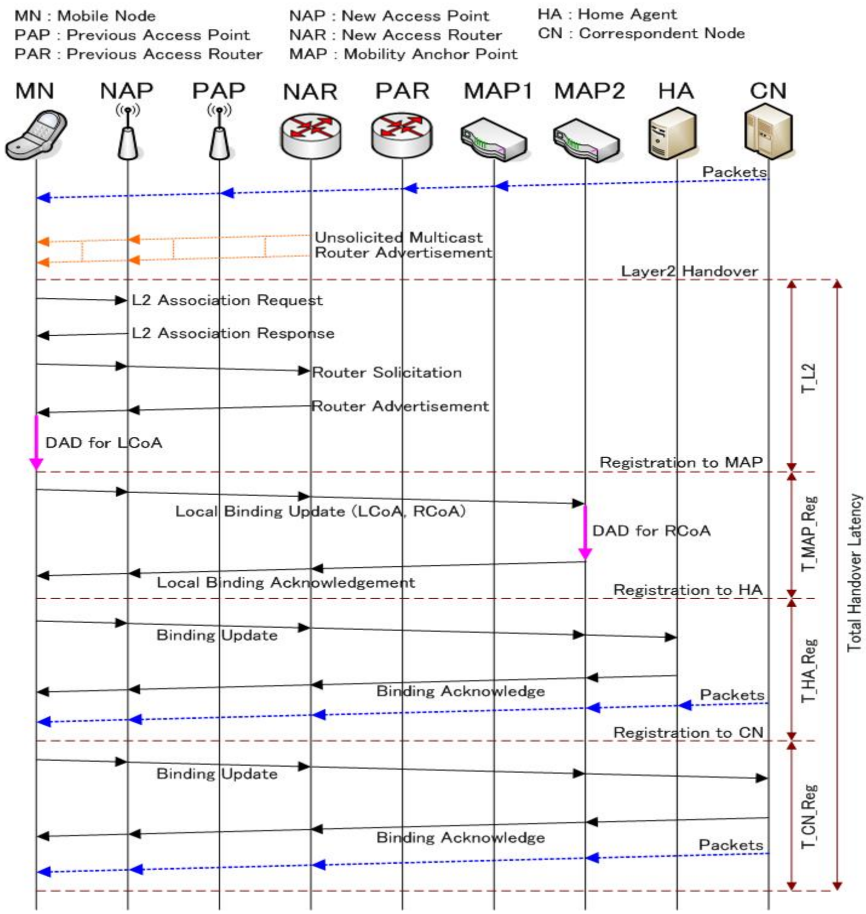

Fig. 1. HMIPv6 handover procedure scheme

2.1 Standard Mobile IPv6 (MIPv6)

In MIPv6 Mobile Node (MN) the communication will start with the address of its own Home Address (HoA) in a Home Network. However, When the MN moves to a different base station, the MN can't maintain communication. Therefore, after moving out from the home network, the MN can maintain communication with Care-of-Address (CoA). CoA can be automatically created by combining router prefix and the MN's interface address. When MN moves to another base station, it informs own moves to New Access Point (NAP) and New Access Router (NAR). After creating New CoA (NCoA), the MN starts Duplicate Address Detection (DAD) process. The MN starts registration of NCoA to Home Agent (HA) and Correspondent Node (CN) through Binding Update (BU) message.

2.2 Standard Hierarchical Mobile IPv6 (HMIPv6)

Figure 1 shows the processing procedure for handover in standard HMIPv6. HMIPv6 uses the top of the hierarchy of router to manage the MN mobility. Mobility Anchor Point (MAP) is the top of router. It is handle process certification and registration. In case when the MN moves in the same MAP domain, the HA and CN is not concerned MN's mobility.

3 New Proposed Scheme TC-HMIPV6

Each Access Point (AP) in TC-HMIPv6 has buffer. AR's (AR : Access Router) information periodically stored and updated in AP's buffer.

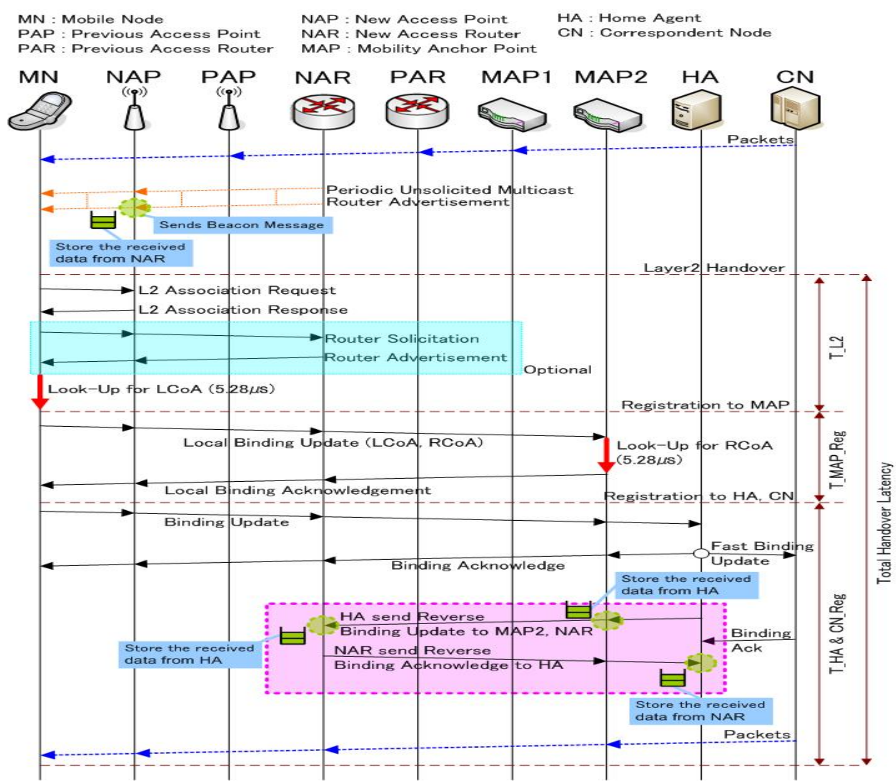

Fig. 2. TC-HMIpv6 Handover procedure scheme

3.1 Layer 2 Handover

Figure 2 shows the processing procedure for handover in TC-HMIPv6. NAR's information stored buffer in the NAP. So, the MN can know NAR's information by process that inform own position to the NAP. Router Solicitation message and Router Advertisement message aren't need. When the MN creates the NCoA, Standard MIPv6 uses DAD process to confirm for duplicates of addresses. However, it needs 1000ms to perform a DAD process. It is largest proportion in total handover latency. DAD process time should decrease to reduce total handover delay time. In this paper, DAD process was replaced with a Look-Up Process. Look-Up process examines the Cache if the MN receives NAR's information. If there is a duplicate address, the MN can use address after store to Cache's entry, but, if the isn't a duplicate address, the MN can use already created address in stored address table. Look-Up process takes time to performed process for best case $3.36\mu s$ or the worst case $5.28\mu s$.

3.2 Registration to MAP, HA and CN

The MN sends the Local Binding Update message to the MAP2. The MAP2 performs Look-Up process for RCoA. The MAP2 send the Binding Acknowledge message to the MN. MN's CoA registers to the HA by sending the Binding Update message (BU). The HA sends the Binding Acknowledge message (BA) to the MN at the same time the CN receives the Fast Binding Update message (FBU) from the HA. In standard HMIPv6, the MN registers the the CN after registers the HA. The HA sending the Reverse Binding Update message (RBU) to the MAP2. The MAP2 sending the RBU to the HA. The HA receives the Reverse Binding Acknowledge message (RBA) from the NAR. RBU and RBA have MN's information such as LCoA, RCoA and received packet information.

4 Performance Analysis

4.1 Handover Latency Analysis

TC-HMIPv6 happens at the same time that Registration messages are sent to HA and CN procedure, we calculated longer time message. Table 1 shows Performance Analysis Parameters. Equation 1 shows the formulation of standard MIPv6. Equation 2 shows the formulation of standard HMIPv6. Equation 3 shows the formulation of proposed TC-HMIPv6.

Standard MIPv6 (1)

$$= \alpha t_{L2} + t_{CoA} + t_{HA\_REG} + t_{CN\_REG}$$
$$= \alpha(4t_1+2t_2) + t_{CoA} + 4t_1 + 4t_2 + 2t_4 + 2t_5 + \beta(t_1 + t_2 + t_5)$$

Standard HMIPv6 (2)

$$= \alpha t_{L2} + 2t_{CoA} + t_{MAP\_REG} + t_{HA\_REG} + t_{CN\_REG}$$
$$= \alpha(4t_1+2t_2) + 2t_{CoA} + 6t_1 + 6t_2 + 6t_3 + 2t_4 + 2t_5 + \beta(t_1 + t_2 + t_5)$$

Proposed TC-HMIPv6 (3)

$$= \alpha t_{L2} + 2t_{Look\text{-}Up} + t_{MAP\_REG} + t_{HA\_REG} + t_{CN\_REG}$$
$$= \alpha 2t_1 + 2t_{Look\text{-}Up} + 4t_1 + 4t_2 + 4t_3 + 4t_4 + \beta(t_1 + t_2 + t_5)$$

4.2 Performance Comparison

Figure 3 shows a graph comparing the changes in the value of α. In case of same the value of β, proposed TC-HMIPv6 is efficient more than Standard MIPv6 and HMIPv6.

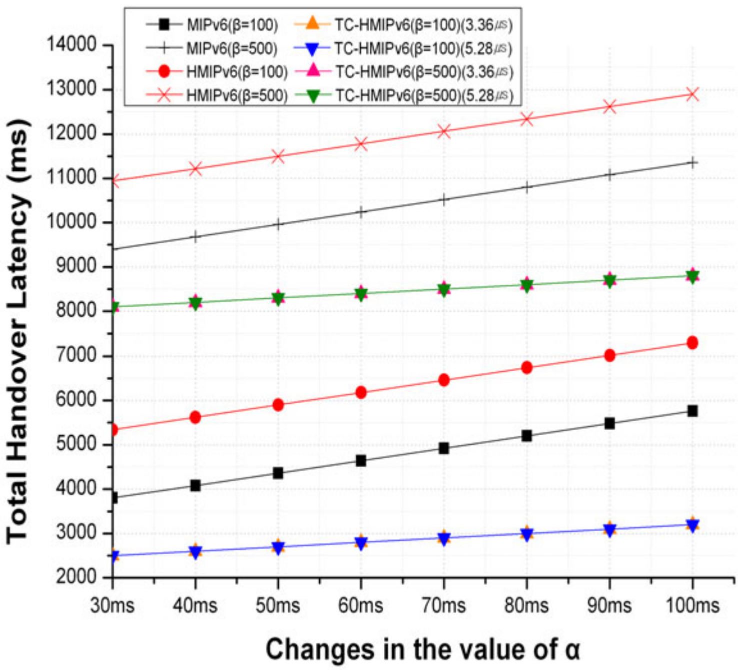

Fig. 3. Handover Latency Comparison at time α

5 Conclusion

In this paper, we Proposed TC-HMIPv6 over Standard HMIPv6. TC-HMIPv6 protocol is efficiently management Handover. Each AP's buffer stored AR's information. AR's information is periodically updated. It is replaced from DAD process to Look-Up process on TC-HMIPv6. If the MN moves to a previous AR, the NAR, MAP2, and HA already know MN's Information by RBU message. So, Handover delay time is reduced.

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