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Fast Handover for Multicast in Proxy Mobile IPv6
draft-hui-multimob-fast-handover-02

Abstract

This document specifies the predictive fast handover mechanism to solve the problem of handover latency and packet loss in Proxy Mobile IPv6 Multicast. Necessary extensions are specified for Handover Initiate (HI) and Handover Acknowledgement (HAck) messages to support multicast handover procedure.

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1. Introduction

Proxy Mobile IPv6 (PMIPv6) protocol provides local mobility management to a mobile node without requiring any modification of the mobile node. The Local Mobility Anchor (LMA) and Mobile Access Gateway (MAG) perform the mobility management signaling on behalf of the mobile node. Extensions for LMA and MAG are specified in [1] to support IP multicast in PMIPv6. Nevertheless, the basic performance including handover latency and packet loss is not considered different form that of PMIPv6.

Fast handover for Mobile IPv6 is specified in [2]. [3] extends the FMIPv6 and applies it to the PMIPv6 in order to decrease handover latency and packet loss as well as transfer of network-resident contexts. However, IP multicast is not considered in fast handover for PMIPv6.

We propose a fast handover mechanism to support multicast for PMIPv6. Necessary extensions are specified in HI and HAck message to transfer the multicast node’s context information and deliver the multicast data before the set up of tunnel between n-MAG and LMA.

2. Problem Statement

The existing solution for PMIPv6 multicast [1] specifies that, only after the bi-directional tunnel is built between n-MAG and LMA using extended PBU (PBU-M) message, the multicast packet can be continuously delivered to MN. It inevitably causes the latency and loss of packet during handover process.

The solution presents two ways to acquire the MN's profile, which includes MN' ID and multicast state information. One way is to use the Context Transfer Protocol (CXTP) [4] to transfer MN's profile from p-MAG to n-MAG. In the other way, if MN's profile is stored in a policy store [5], n-MAG obtains MN's multicast state by the same mechanism used to acquire MN' ID and profile during MN's attachment process [5].

In another PMIPv6 multicast solution [6], the author proposes normal handover and fast handover for proxy mobile multicast service. There is no any optimization in normal handover, the handover involves MN by running the MLDv2 [7] protocol with n-MAG to receive the related multicast packet. In the fast handover procedure, similar to the first method used in [1],the context transfer is used to provide multicast information. Although n-MAG can acquire the MN' multicast information before MN handovers to it, only after n-MAG joins the multicast group, it can receive the multicast data.

3. Terminology

This document refers to [1] [2] [3] for terminology. The following terms and abbreviations are additionally used in this document. The reference network is illustrated in Figure 1.

Previous Mobile Access Gateway (p-MAG):

The MAG that manages mobility related signaling for the MN before handover.

New Mobile Access Gateway (n-MAG):

The MAG that manages mobility related signaling for the MN after handover.

HO-Initiate:

A generic signaling that indicates the handover of the MN sent from the MN to the p-MAG. It is assumed that HO-Initiate can carry the information to identify the MN and to assist the p-MAG to resolve the n-MAG.

4. Protocol Operation

The architecture of fast handover for multicast in Proxy Mobile IPv6 is shown in Figure 1. A multicast tunnel is established to transfer the multicast data from p-MAG to n-MAG before the n-MAG joins the multicast group, so that whenever the MN handovers to the n-MAG, it can receive the multicast data from n-MAG.

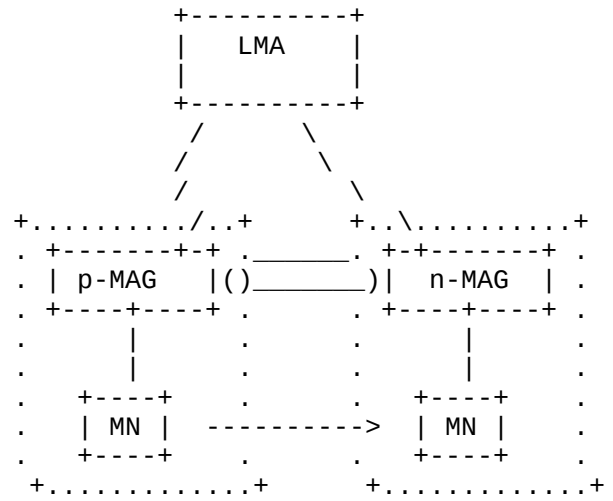
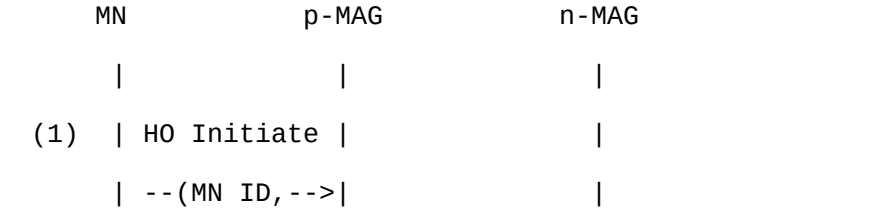
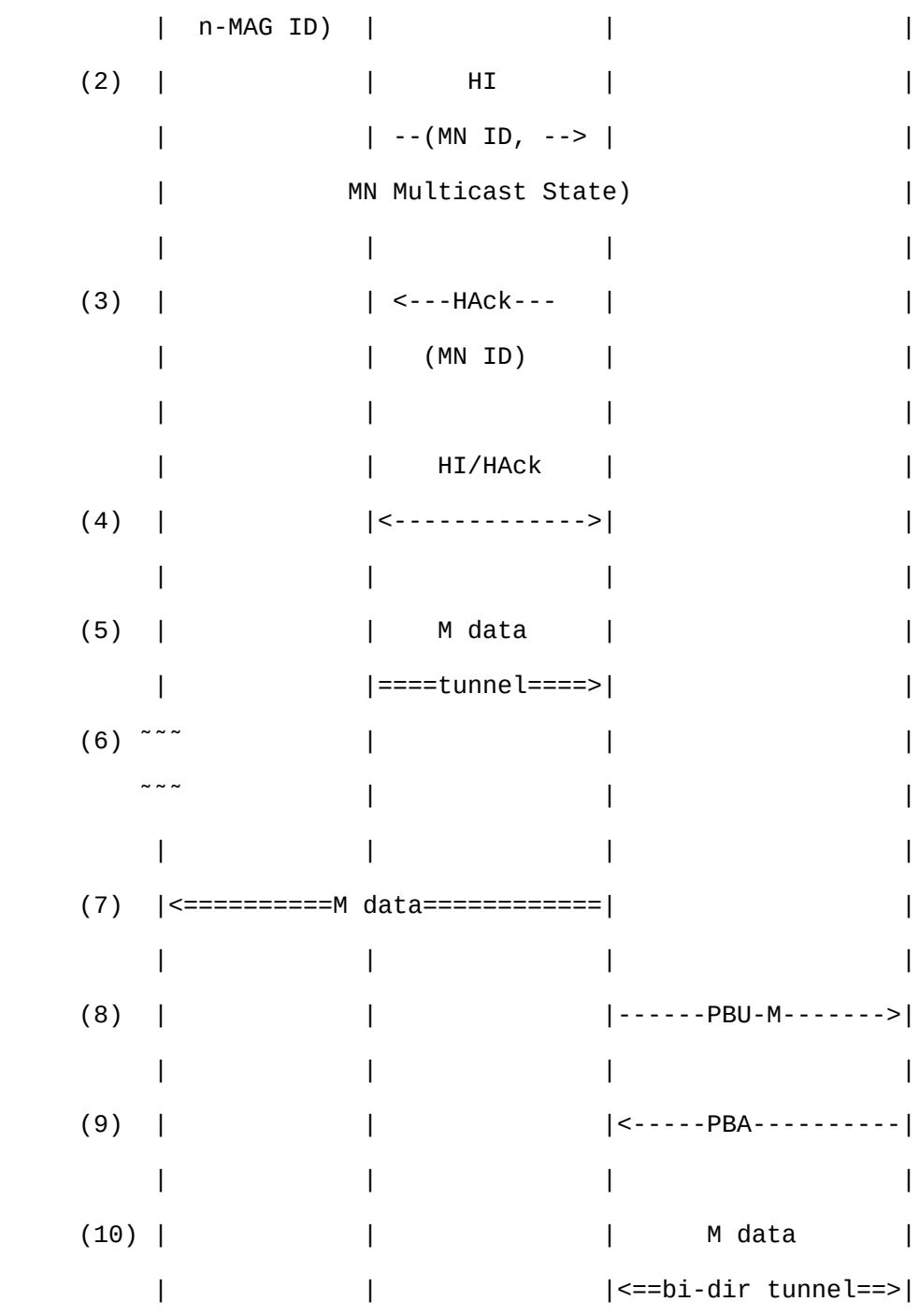


Figure 1: Reference network for fast handover

In order to decrease the handover latency and packet loss, this document specifies a bi-directional tunnel between the Previous MAG (p-MAG) and the New MAG (n-MAG). As the n-MAG needs the multicast node's context information to set up a bi-directional tunnel to continuous deliver multicast packet to mobile node, the HI and HAck messages are extended to support mobile multicast node's context transfer, in which parameters such as MN ID, MN Multicast State, are transferred from the p-MAG to the n-MAG. The sequence of events illustrating the fast handover for multicast is shown in Figure 2.




| n-MAG ID) |
(2) | HI |
| --(MN ID, --> |
MN Multicast State)
(3) | <---HAck--- |
| (MN ID) |
HI/HAck
(4) |<----------->|
(5) | M data |
|====tunnel====>|
(6) ~~~
~~~
(7) |<==========M data============|
(8) |------PBU-M------->|
(9) |<-----PBA----------|
(10) | M data |
|<==bi-dir tunnel==>|
~~~

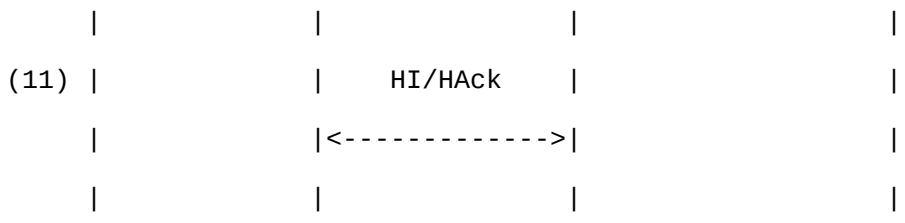


Figure 2: Fast handover for PMIPv6 multicast

The detailed descriptions are as follows:

(1)The MN detects that a handover is imminent and reports the MN ID and n-MAG ID.

(2)The p-MAG sends the HI to the n-MAG. The HI message includes MN ID and MN Multicast State.

(3)The n-MAG sends the HAck back to the p-MAG.

(4)The n-MAG requests the p-MAG to forward multicast packets by setting F flags in the HI message.

(5)A tunnel is established between the p-MAG and n-MAG and multicast packets destined for the MN are forwarded from the p-MAG to the n-MAG over this tunnel.

(6)The MN undergoes handover to n-MAG.

(7)The n-MAG starts to forward multicast packets destined for the MN.

(8)The n-MAG sends the Proxy Binding Update with multicast extension (PBU-M)(proposed in [1]) to the LMA.

(9)The LMA sends back the Proxy Binding Acknowledgment (PBA) to the n-MAG.

(10)A bi-directional tunnel is set up for forwarding corresponding multicast data.

(11)Multicast packet forwarding is completed between p-MAG and n-MAG.

5. Message Format

This document defines new Mobility Header messages for the extended HI and HAck and new mobility options for delivering context information.

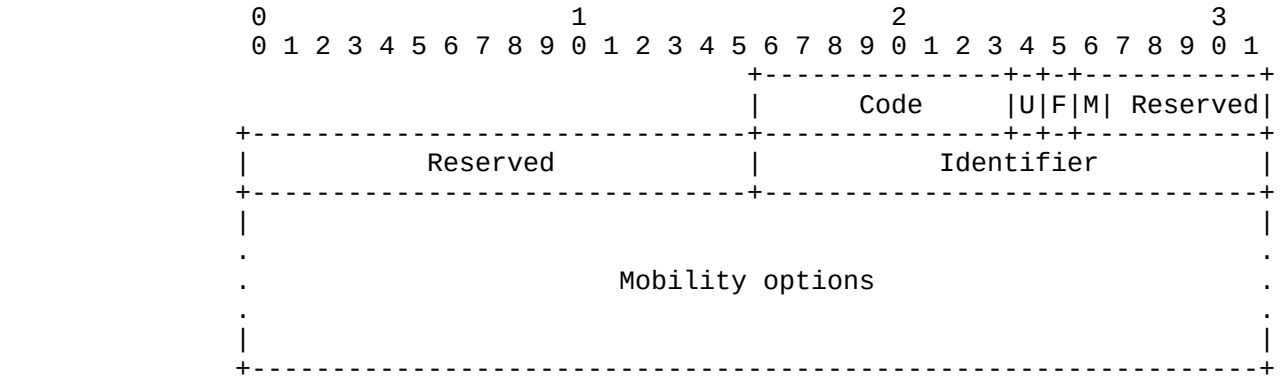
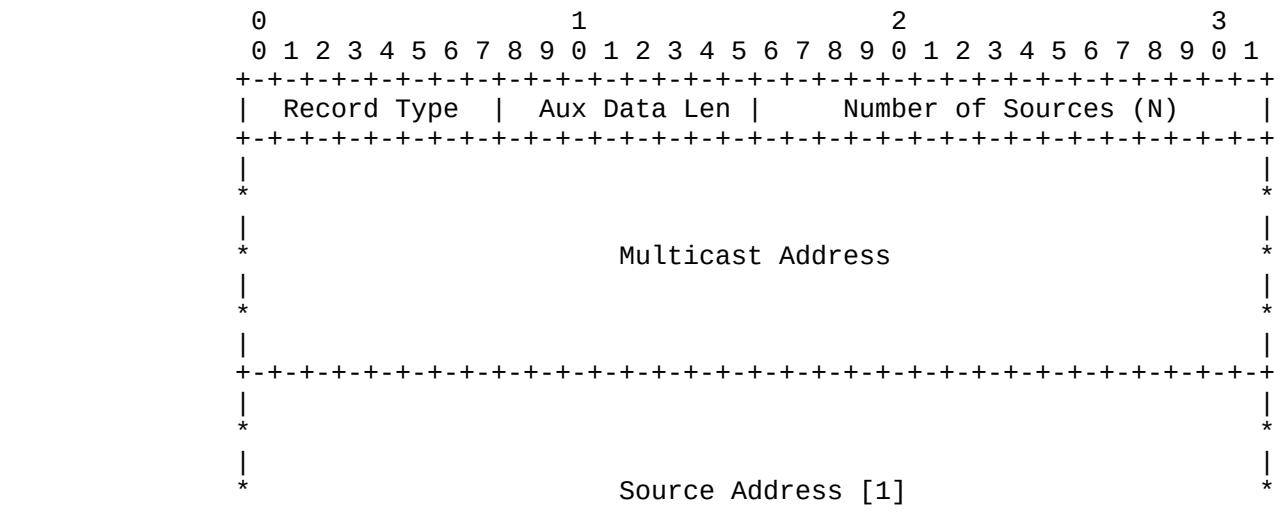
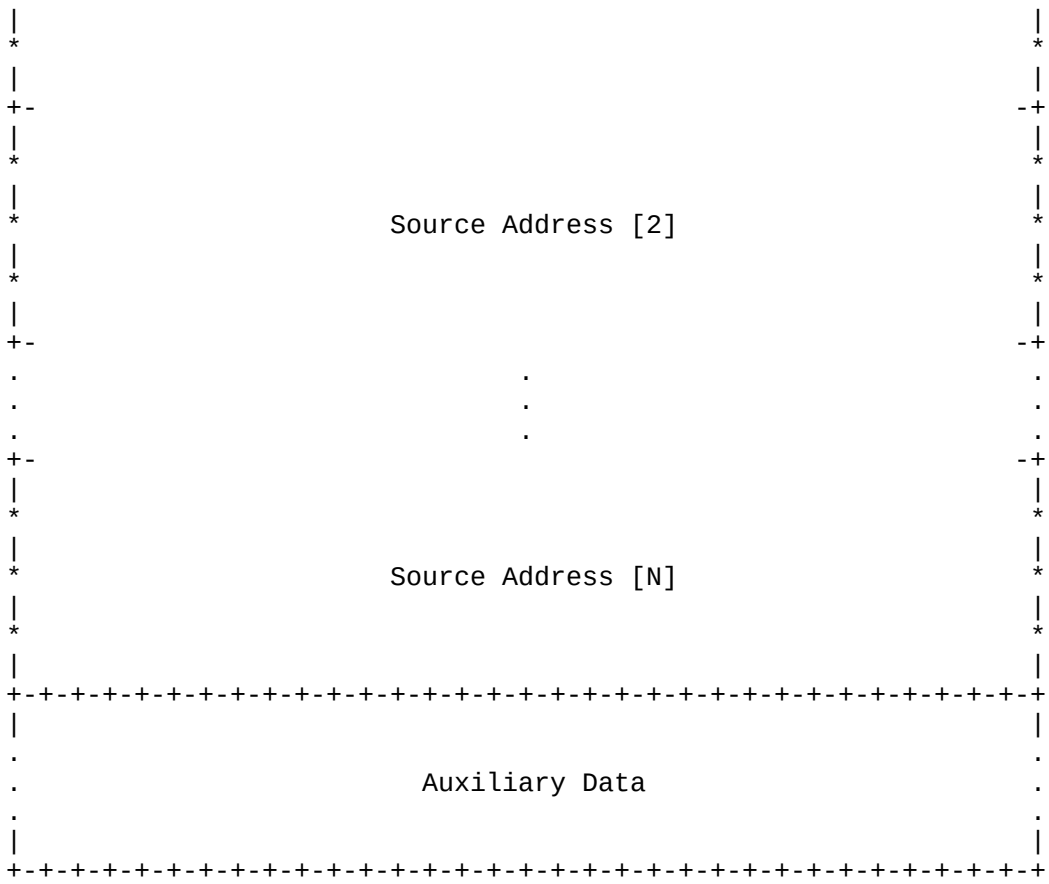


Figure 3: HI Mobility Header message with multicast extension

A new flag (M) is included in the HI Mobility Header message with multicast extension. The rest of the message format remains the same as defined in [3].

When (M) flag is specified in HI Mobility Header message, the mobility options field needs to be extended to include the multicast addresses.




Source Address [2]
Source Address [N]
Auxiliary Data

6. Security Considerations

TBD.

7. IANA Considerations

This document does not require any IANA action.

8. References

8.1. Normative References

[1] H. Asaeda, P. Seite, J. Xia, "PMIPv6 Extensions for Multicast", draft-asaeda-multimob-pmip6-extension-01.txt (work in progress), July 2009.

[2] Koodli, R., Ed., "Mobile IPv6 Fast Handovers", RFC 5268, June 2008.

[3] H. Yokota, K. Chowdhury, R. Koodli, B. Patil, F. Xia, "Fast Handovers for Proxy Mobile IPv6", draft-irtf-mipshop-pfmipv6-00.txt (work in progress), October 2008.

[4] Loughney, Ed., J., Nakhjiri, M., Perkins, C., and R. Koodli,"Context Transfer Protocol (CXTP)", RFC 4067, July 2005.

[5] Gundavelli, S, Ed., Leung, K., Devarapalli, V., Chowdhury, K.,and B. Patil, "Proxy Mobile IPv6", RFC 5213, August 2008.

[6] Y K. ZHAO, P. Seite, "The Solution for Pmipv6 Multicast Service", draft-zhao-multimob-pmipv6-solution-02.txt (work in progress), November 2008.

[7] Vida, R. and L. Costa, "Multicast Listener Discovery Version 2 (MLDv2) for IPv6", RFC 3810, June 2004.

8.2. Informative References

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