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Mobile Multicasting Support in Proxy Mobile IPv6
draft-sijeon-multimob-mms-pmip6-02.txt

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Abstract

To support IP multicasting in PMIPv6 domain, [I-D.ietf-multimob-pmipv6-base-solution] has been submitted as a base solution that locates MR on the LMA and uses the PMIPv6 tunnel between LMA and MAG for MLD messages. In this draft, we present the direct routing solution that uses the direct connection between MAG and MR, and locates the MLD forwarding proxy function on MAGs. The proposed direct routing solution is compared with the base deployment solution.

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1. Introduction

To support multicasting service in PMIPv6 domain, it is required to determine which multicasting function should be placed on which PMIPv6 component. From such a point of view, mobile multicasting solutions could be classified into two categories: a MR co-located LMA approach and a MR separated LMA approach. In the former case, the MR function is placed on LMA and the IGMP/MLD forwarding proxy function [RFC4605] is located on MAG. The MR co-located LMA approach is proposed a base solution [I-D.ietf-multimob-pmipv6-base-solution] without any modifications of [RFC5213]. But it introduces the tunnel convergence problem that a MAG may receive same multicast packets from several LMAs, which leads to waste of network bandwidth usage. In this draft, we propose a MR separated LMA approach without any load on LMA, which allows MAGs to receive multicast packets directly from MRs. So, it has not tunnel convergence problem and reduces the complexity on the LMA. Moreover, this solution could be also used in the environment that is not applied with PMIPv6 protocol.

2. Terminology and Functional Components

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119]

- Mobile Node (MN)
- Previous Mobile Access Gateway (P-MAG) - The MAG that manages mobility related signaling for a MN before handover.
- New Mobile Access Gateway (N-MAG) - The MAG that manages mobility related signaling for the MN after handover
- Multicast Router (MR)
- MLD Forwarding Proxy (MF-Proxy)

3. Direct Routing Solution

3.1. Architecture

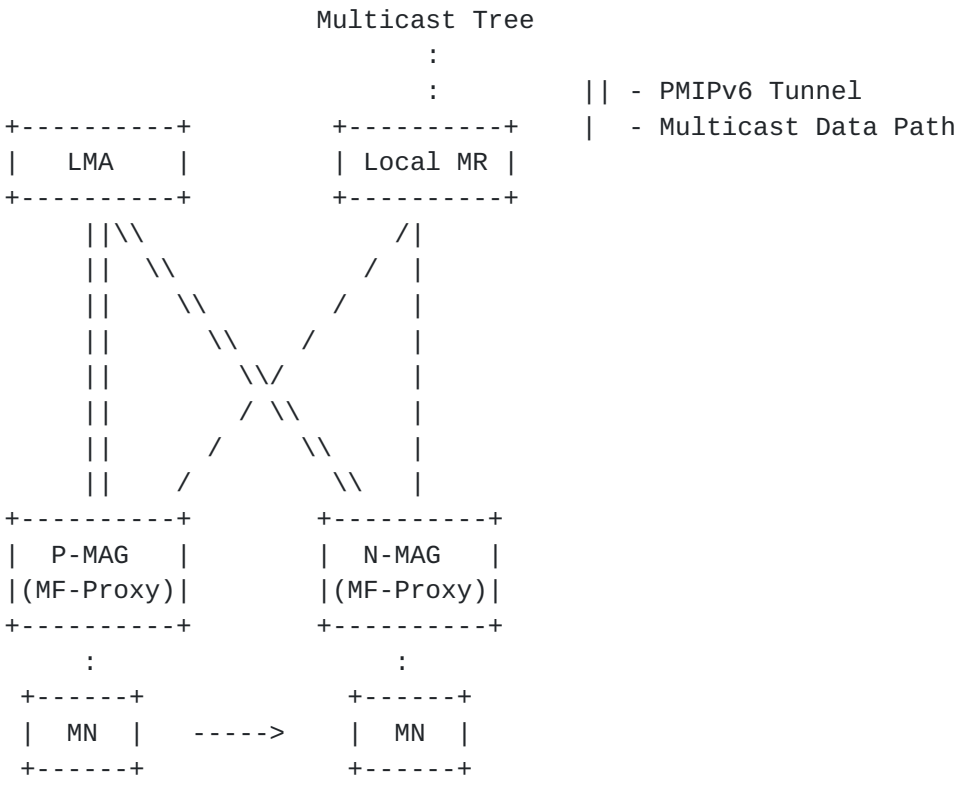

Figure 1. Direct Routing Solution for PMIPv6 Multicasting

Figure 1 shows the proposed mobile multicasting solution for Proxy Mobile IPv6. There is no multicast routing function on the LMA. We call it the direct routing solution based on local routing scenario described in [I-D.deng-multimob-pmip6-requirement]. This solution has not tunnel convergence issue caused by a MAG receives the same multicast packets from several LMAs. To forward IGMP/MLD signaling and multicast packets, a MAG needs only the MLD forwarding proxy function defined in [RFC4605]. This solution is more simple than the base deployment solution and easy to deploy because LMAs are separated from multicast operation.

3.2. Handover Operation

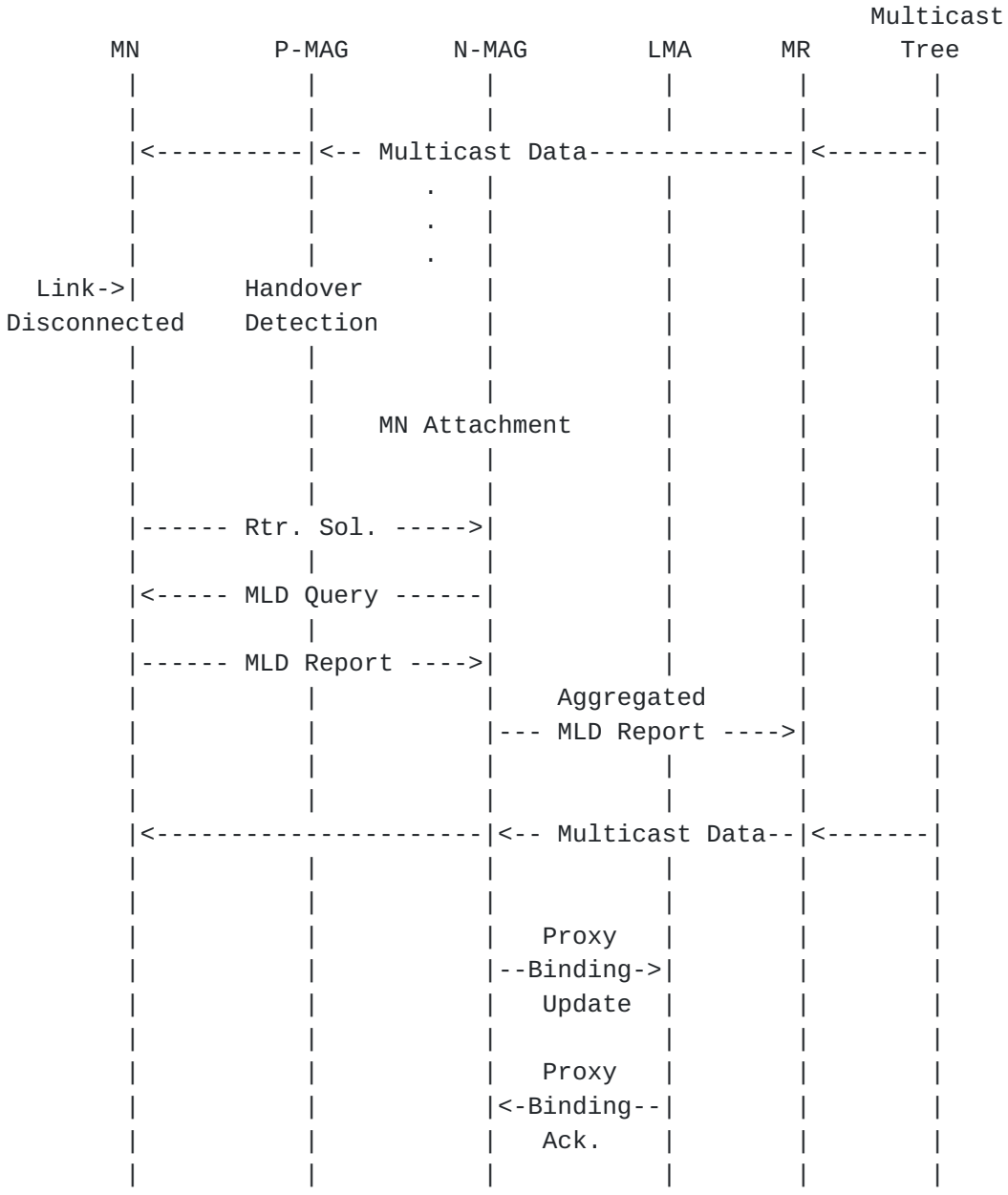

Figure 2. Handover Operation for Direct Routing Solution

Figure 2 shows the handover operation for direct routing solution. When an MN hands off to the N-MAG from the P-MAG, the N-MAG detects

the newly arrived MN and transmits an MLD Query message to the MN. After receiving the MLD Query message, the MN sends an MLD Report message that includes the multicast group information. The N-MAG then sends an aggregated MLD Report message to the MR. When the N-MAG receives the multicast packets from the MR, it then simply forwards them without tunnel encapsulation. The N-MAG needs to update the MN's location information to the LMA by exchanging PBU/PBA signaling messages.

4. Comparison with Base Deployment Solution and Direct Routing Solution

In this section, we compare the direct routing solution with the base deployment solution [I-D.ietf-multimob-pmipv6-base-solution] in terms of performance, easiness in deployment and others.

4.1. Tunnel Convergence Problem

In the base deployment solution, the MR function is combined with LMA. Thus, all the packets are delivered to MNs through PMIPv6 tunnel between MAG and LMA, which raises the tunnel convergence problem because a MAG may receive the same multicast packets from several LMAs. The proposed direct routing solution does not introduce tunnel convergence problem because a MAG is directly connected to only one MR.

4.2. Complexity in LMA

In the base deployment solution, the MR function is combined with LMA that should process the MLD messages and perform the join/leave procedure with other multicast routers accordingly. The complexity will increase as the number of multicast channels increases.

4.3. Other Advantage

When we consider the MN's handover case from PMIPv6 domains to non-PMIPv6 domains as described in [I-D.von-hugo-multimob-future-work], we could also use the direct routing solution because it does not depend on PMIPv6 tunnel for multicasting operation.

5. Message Formats

This section describes source and destination address of MLD signaling messages. The interface A-B means that an interface on node A, which is connected to node B.

5.1. MLD Query

Interface	Source Address	Destination Address
MR-MAG	MR link local	[RFC2710], [RFC3810]
MAG-MN	MAG link local	[RFC2710], [RFC3810]

5.2. MLD Report

Interface	Source Address	Destination Address
MN-MAG	MN link local	[RFC2710], [RFC3810]
MAG-MR	MAG link local	[RFC2710], [RFC3810]

5.3. Multicast Packets

Interface	Source Address	Destination Address
MR-MAG	Streaming Source Addr.	Multicast Group Addr.
MAG-MN	Streaming Source Addr.	Multicast Group Addr.

6. IANA Considerations

TBD.

7. Security Considerations

This document does not discuss any special security concerns in detail. The protocol of this document is built on the assumption that all participating nodes are trusted each other as well as there is no adversary who modifies/injects false messages to corrupt the procedures.

8. References

8.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC2710] S. Deering, W. Fenner, B. Harberman, "Multicast Listener Discovery (MLD) for IPV6", IETF RFC 2710, October 1999.

[RFC3810] R. Vida, and L. Costa, "Multicast Listener Discovery Version(MLDv2) for IPv6", IETF RFC 3810, June 2004.

[RFC5213] S. Gundavelli, K. Leung, V. Devarapalli, K. Chowdhury, and B. Patil, "Proxy Mobile IPv6", IETF RFC 5213, Augurst 2008.

[RFC4605] B. Fenner, H. He, B. Haberman, and H. Sandick, "Internet Group Management Protocol (IGMP) / Multicast Listener Discovery (MLD)-Based Multicast Forwarding ("IGMP/MLD Proxying")", IETF RFC 4605, August 2006.

8.2. Informative References

[I-D.deng-multimob-pmip6-requirement]
H. Deng, T. Schmidt, P. Seite, and P. Yang, "Multicast Support Requirements for Proxy Mobile IPv6", draft-deng-multimob-pmip6-requirement-02.txt (work in progress), July 2009.

[I-D.ietf-multimob-pmipv6-base-solution]
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[I-D.von-hugo-multimob-future-work]
D. von Hugo, H. Asaeda, B. Sarikaya, P. Seite, "Evaluation of further issues on Multicast Mobility: Potential future work for WG MultiMob", draft-von-hugo-multimob-future-work-01.txt (work in progress), February 2010.

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