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LMA Handovers for Proxy Mobile IPv6
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Abstract

This document describes a mechanism for context transfer between Local Mobility Anchors (LMAs) in a large Proxy MIPv6 domain to provide the IP ongoing session continuity of mobile nodes. In order to enhance the performance of the LMA handover, a bi-directional tunnel between a previous LMA and a new target LMA is established.

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1. Requirements notation

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].

2. Introduction

The Proxy Mobile IPv6 (PMIPv6) [RFC5213] domain refers to the network where the mobility management of a Mobile Node (MN) is handled using the Proxy Mobile IPv6 protocol. The Proxy Mobile IPv6 domain includes Local Mobility Anchors (LMAs) and Mobile Access Gateways (MAGs). This document describes a mechanism to provide the ongoing session continuity to a MN during the handover from one LMA to another LMA in a Proxy Mobile IPv6 domain.

This specification addresses the following problems:

- Who and when to trigger the LMA handover.
- Who and how to select a new target LMA.
- How to transfer the context information between LMAs.
- Table updates of network entities.
- Other considerations.

When a previous MAG and a new MAG share the same LMA, the previous MAG transfers the context information of a MN to the new MAG via the bi-directional tunnel between them by using a MAG handover mechanism, such as the Fast Handovers for Proxy Mobile IPv6 (PFMIPv6) [PFMIPv6] protocol. This document provides a mechanism for transferring the context information of a MN from a Previous LMA (PLMA) to a new LMA (NLMA) by establishing a bi-directional tunnel.

3. Terminology

This document reuses the terminology from [RFC5213] and [RFC3775]. The following terms and abbreviations are additionally used in this document.

Boundary Mobile Access Gateway (bMAG):
: The MAG that has connections from more than one LMA. The bMAG decides when it triggers the LMA handover and requests a previous LMA to initiate the LMA handover.

Previous Local Mobility Anchor (PLMA):
: It is the topological anchor point that manages the MN's binding state before the LMA handover. The PLMA initiates to hand over the

IP mobility session and forwards the context information of the MN to the new target LMA.

New Local Mobility Anchor (NLMA):
The LMA that receives the context information of the MN from the PLMA and maintains the MN's binding state after the LMA handover.

4. LMA Handovers for PMIPv6 Overview

To deliver the context information of the MN from the PLMA to the NLMA efficiently, a LMA Handover Request (LMA_HO_Req) and a LMA Handover Response (LMA_HO_Resp) messages are exchanged between the bMAG and the PLMA. In the messages, MN'Identifier (MN ID), MN Link-layer Identifier (MN-LL-ID) and MN's Home Network Prefix (MN-HNP) are included.

The reference network is illustrated in Figure 1.

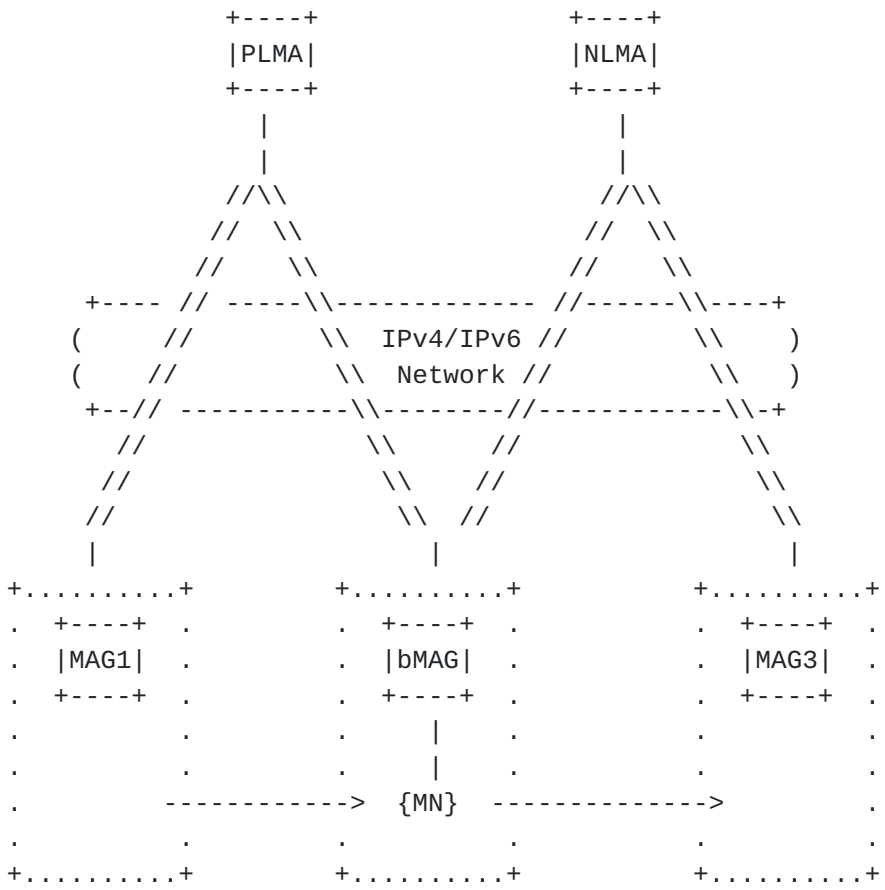

Figure 1: Reference network for the LMA handover

4.1. Extended Policy Profile

A MN's policy profile is stored in a local or a remote policy store. The mandatory fields of the policy profile are the MN ID and the LMA Address (LMAA). In this document, the LMAA field includes the address (NLMAA) of the LMA currently serving the MN. The optional fields of the policy profile is extended with the PLMAA field to include the address of the PLMA.

4.2. Protocol Operation

The sequence of events illustrating the LMA handover is shown in Figure 2.

The detailed description is as follows:

(a) The MN detects a new link and reports the identifications of itself (MN ID) and the access point (New AP ID) to which the MN is most likely to move. The detection mechanism of a new subnet link of a MN is specific to the access link between the MN and the MAG and it is out of the scope of this document.

(b) The bMAG sends a LMA_HO_Req message to the PLMA to initiate the LMA handover.

(c) The PLMA selects the NLMA and sends a LMA_HO_Init message with the context information of the MN to the NLMA. The PLMA is assumed to maintain the information on the other LMAs in the same PMIPv6 domain, such as the message exchanges between LMAs, the external information input and the reception of the information from the AAA/Policy store. However, this is out of the scope of this document.

(d) The NLMA received the LMA_HO_Init message creates a bind cache entry (BCE) of the corresponding MN and, then, a bi-directional tunnel is set up between the PLMA and the NLMA by sending a LMA_HAck message to the PLMA.

(e) The PLMA notifies bMAG of the completion of the context transfer regarding the MN from the PLMA to the NLMA by sending a LMA_HO_Resp message to the bMAG.

(f) The bMAG initiates the tunnel setup between the bMAG and the NLMA by sending a Proxy Binding Update (PBU) message to the NLMA.

(g) The NLMA sends an Update message to the remote policy store to

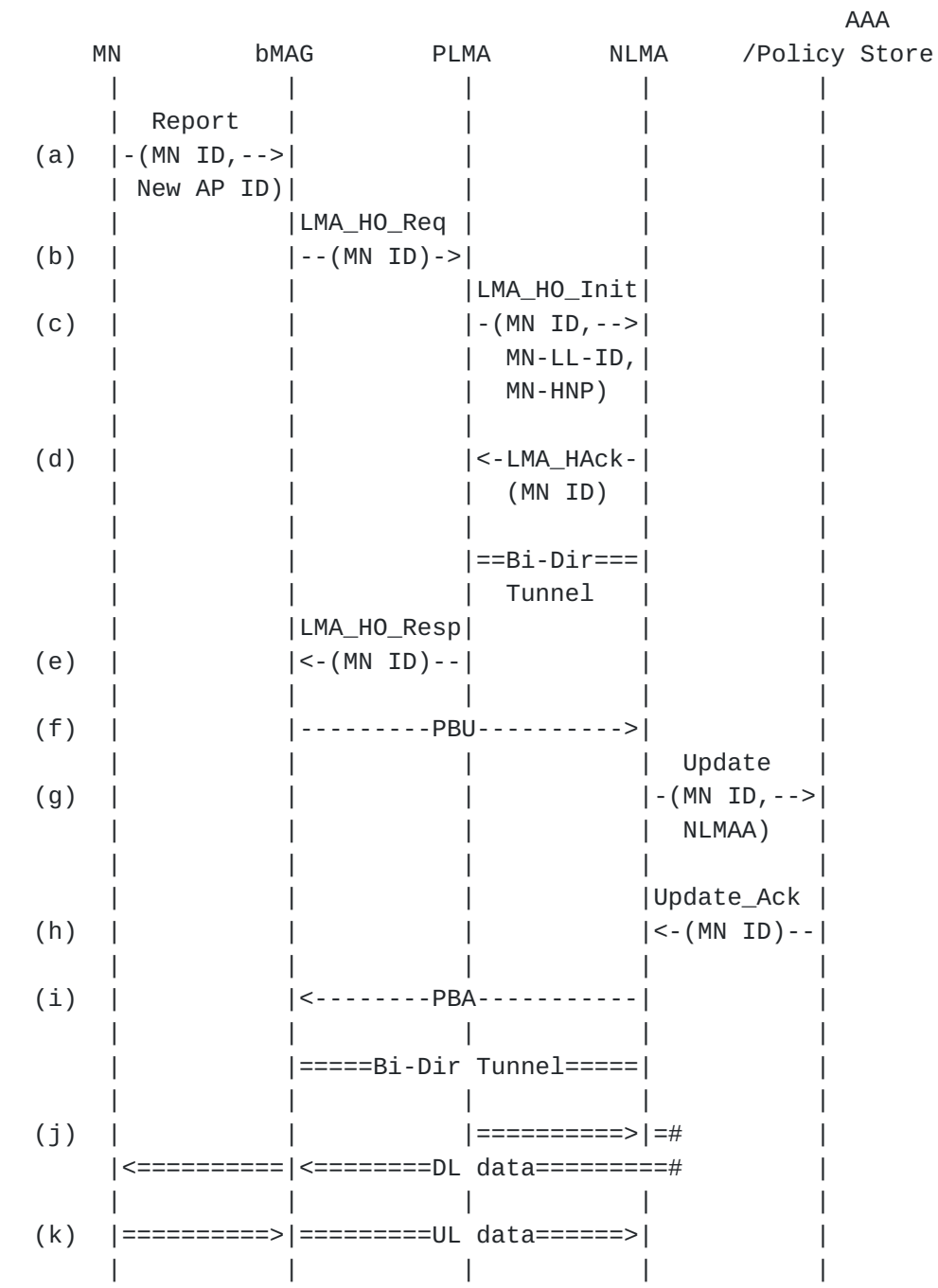

Figure 2: LMA handover for PMIPv6

inform the policy store of the fact that the NLMA is the new LMA currently serving the MN.

(h) The remote policy store sends an Update_Ack message to the NLMA in order to let the NLMA know that the LMAA field in the policy profile of the MN is set to the NLMA.

(i) The bi-directional tunnel between the bMAG and the NLMA is completely established by the NLMA's sending a Proxy Binding Acknowledgement (PBA) message to the bMAG.

(j) The data downloaded from the correspondent node (CN) arrives at the PLMA which is the topological anchor point of the MN, and the PLMA forwards the downloaded data to the NLMA through the tunnel between them. Then, the NLMA sends the data to the MN via the bMAG. For the efficiency of the data delivery, it is possible to consider the route optimization additionally.

(k) The data uploaded from the MN to the CN are delivered to the CN via the bMAG and the NLMA in that order.

5. Other Considerations

Security issues for this document follow those for PMIPv6 [RFC5213]. In PMIPv6, the MAG and LMA are assumed to share security associations. This document also assumes that the LMAs that participate in handover have adequate prior agreement and trust relationship between each other.

6. References

6.1. Normative References

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

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

[RFC3775] Johnson, D., "Mobility Support in IPv6", RFC 3775, June 2004.

6.2. Informative References

[PFMIPv6] Yokota, H., Chowdhury, K., Koodli, R., Patil, B., and Xia, F., "Fast Handovers for Proxy Mobile IPv6", draft-ietf-mipshop-pfmipv6-09.txt, Sep. 2009.

Appendix A. Routing State Update

The following section explains the routing state update for a MN on the MAG. The below example identifies the routing state update for a MN, MN1, with its local mobility anchors, the PLMA and the NLMA. After the LMA handover, for all traffic from the MN1 to _ANY_DESTINATION_ route via the interface tunnel1 toward the NLMA.

Packet Source	Destination Address	Destination Interface
MAC_Address_MN1, (IPv6 Prefix or Input Interface)	_ANY_DESTINATION_	Tunnel0
	Locally Connected	Tunnel0

(a) before the LMA handover

Packet Source	Destination Address	Destination Interface
MAC_Address_MN1, (IPv6 Prefix or Input Interface)	_ANY_DESTINATION_	Tunnel1
	Locally Connected	Tunnel1

(b) after the LMA handover

Example - Policy-Based Route Table

Interface	Source Address	Destination Address	Encapsulation
Tunnel0	Proxy-CoA	PLMAA	IPv6-in-IPv6
Tunnel1	Proxy-CoA	NLMAA	IPv6-in-IPv6

Example - Tunnel Interface Table

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