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# Network Mobility Support using Mobile MAG in Proxy Mobile IPv6 Domain

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## Abstract

This draft specifies IP mobility support protocol for moving network including mobile nodes (MNs) over Proxy Mobile IPv6 network by introducing a new functional entity, mobile MAG (mMAG) on the moving network. The mMAG takes charge of MN's movement detection, binding update on behalf of MNs as a mobile access gateway (MAG) does in PMIPv6 infrastructure. This protocol also supports IP session continuity for a mobile node to move between mobile network and fixed MAG. This protocol does not require any modification or extension on the MN.

## Status of this Memo

This Internet-Draft will expire on April 16, 2013.

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## 1. Introduction

Network mobility is a novel concept for handling a group of nodes within a moving vehicular area. It provides an effective way for wireless hosts to access the Internet through an intermediate router connecting to an external wireless wide access network.

Proxy Mobile IPv6 (PMIPv6) is a network-based IP mobility protocol, taking charge of host movement detection, binding update on behalf of mobile nodes (MNs). It does not require any modification on mobile node and thus provides better mobility performance compared to host-based mobility protocol, e.g. Mobile IPv6 [RFC6275]. However, it does not support network mobility in the specification [RFC5213].

NEMO Basic Support protocol (NEMO-BSP) [RFC3963] addressed this issue for allowing a host within a moving vehicle to continue their IP sessions when the vehicle is moving between access routers. However, NEMO-BSP employs a mobile router (MR), which requires MIPv6 client function having host-based mobility protocol feature. According to this fact, a MR introduced in NEMO-BSP is not aligned with network-based PMIPv6 approach, thus it is not suited to be used in PMIPv6 domain.

This draft describes network mobility support over PMIPv6 domain by introducing a new entity, called mobile MAG (mMAG) [N-PMIPv6], which is responsible for detecting MN's movement, performing mobility management operation on behalf of MNs, and managing binding update list as a MAG does.

This draft is based on stateless IPv6 address configuration for mMAG and MNs to configure their IP addresses not by using DHCP. This idea does not require any modification or extension on the MN.

## 2. Conventions and Terminology

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 RFC 2119 [RFC2119].

This document uses the terminology defined in [RFC5213]. In addition to, we defined Mobile MAG (mMAG) as follow.

- Mobile MAG (mMAG): A mobile router, which has a similar function to MAG defined in PMIPv6 specification.

## 3. Overview

### 3.1. Initial Attach

This sub-section describes initial attach of mMAG and MN. The mMAG is not a mobile router (MR) having Mobile IPv6 client functionality presented in [RFC3963]. The mMAG is the entity that performs the mobility management on behalf of MNs within mobile network. It has upstream and downstream interfaces; upstream interface is seen as normal MN to a MAG and it is connected as a tunnel with a LMA over PMIPv6 tunnel between a MAG and a LMA. Downstream interface is seen as fixed MAG in PMIPv6 infrastructure to attached MNs. LMA sees mMAG as a normal MN and then process initial attach process specified in [RFC5213] for normal MN.

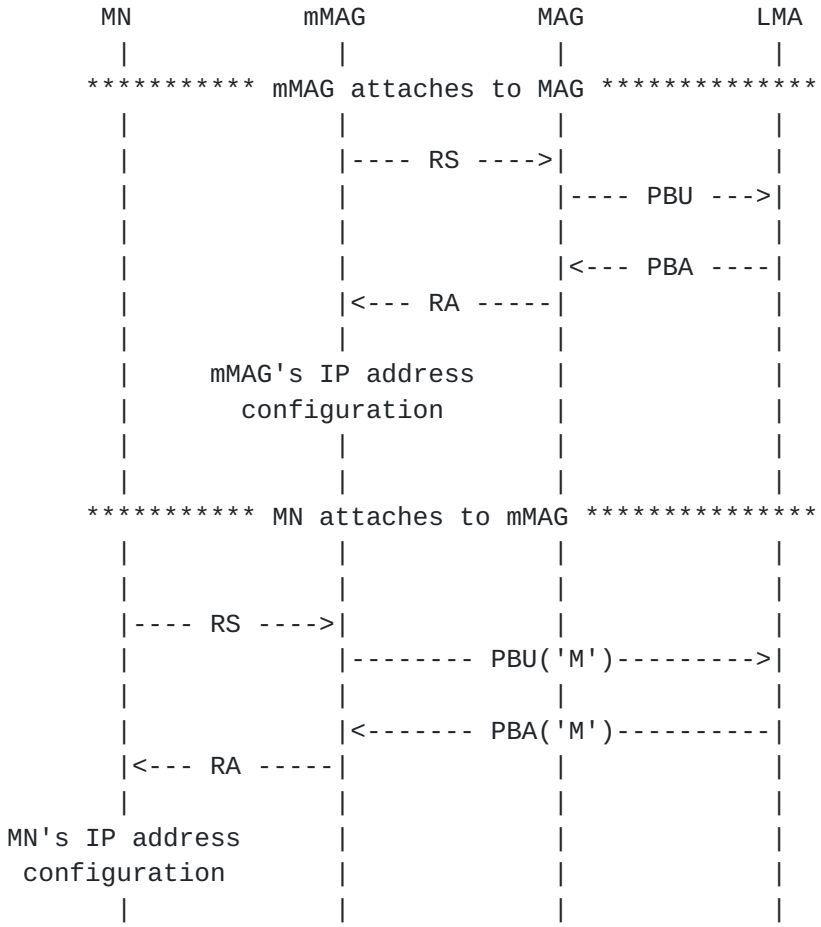


Figure 1 mMAG and MN Attachment - Signaling Call Flow

Figure 1 shows the signaling call flow when the mMAG enters the Proxy Mobile IPv6 domain. In order to enable network mobility service support, the mMAG should be attached first to PMIPv6 domain. The MAG on detecting the mMAG performs authentication and authorization process as it does normal MN in [RFC5213] and then sends Proxy Binding Update message to the LMA.

The LMA on receiving Proxy Binding Update message creates new Binding Cache entry and assigns new prefix and associates mMAG's ID and assigned prefix. The LMA sends Proxy Binding Acknowledgement message including assigned prefix to the MAG. The mMAG configures its IPv6 address based on the prefix received from Router Advertisement.

Subsequently, when a MN enters into wireless range of mobile network, the mMAG detects MN's attachment and performs NEMO service availability of attached MN through authentication and authorization processes. If is verified, the mMAG will be aware of the address of the LMA to which it belongs for attached MN. The mMAG then sends Proxy Binding Update message with setting 'M' flag to the associated LMA. The MAG as intermediate entity between mMG and LMA will treat this message as normal packets originated from the mMAG and send it after encapsulating the message with destination IP address of LMA. On receiving encapsulated Proxy Binding Update message, the LMA will decapsulate and processes the message by adding the MN's ID to Binding Cache with setting 'M' flag indicating that this node belongs to a mobile network and store mMAG's source IP address as Proxy Care-of Address in Proxy Binding Update message.

The LMA then assigns and delivers new prefix to the mMAG by sending Proxy Biding Acknowledgement message with setting 'M' flag. The mMAG sends Router Advertisement message to the MN. The MN configures its stateless IPv6 address based on received prefix in Router Advertisement message.

The MAG is transparent for exchanging signaling messages and data packets between mMAG and LMA. 'M' flag is used to let the LMA know that additional Binding Cache entry lookup should be allowed when it receives packets destined MN's prefix. On receiving Proxy Binding Update message, the LMA sets 'M' flag in Binding Cache entry of the MN. As a result, when a LMA receives a packet destined MN's prefix within mobile network, it performs recursive look up processing. In a first look up, the LMA obtains the mMAG to which the MN is attached. And in a second look up, the LMA obtains a MAG to which the mMAG of the MN is attached. The packets will be tunneled with mMAG's IP address and MAG's address to which mMAG belongs, for destination IP address in inner/outer tunnel header, respectively.

### 3.2. mMAG Handoff

The mMAG's handoff is assumed that the mMAG moves to the newly attached mobile access gateway (n-MAG) from the previously attached mobile access gateway (p-MAG).

The mMAG's handoff process follows normal PMIPv6 handoff specified in [RFC5213]. The n-MAG detects mMAG attach and sends Proxy Binding Update message to mMAG's associated LMA by following standard PMIPv6 operation.

On receiving Proxy Binding Update message from n-MAG, the LMA will change the transport endpoint of the tunnel from p-MAG to n-MAG in LMA Binding Cache. The LMA is not required to perform additional operations for MNs within mMAG in Binding Cache due to mMAG's handoff because each binding of MN and mMAG, mMAG and MAG is managed separately. After updating Binding Cache entry of mMAG, the LMA sends Proxy Binding Acknowledgment message to the n-MAG. The n-MAG will send Router Advertisements containing the mMAG's home network prefix, and this will ensure the mMAG will not detect any change with respect to layer-3 attachment of its interface.

### 3.3. Mobile Node Handoff

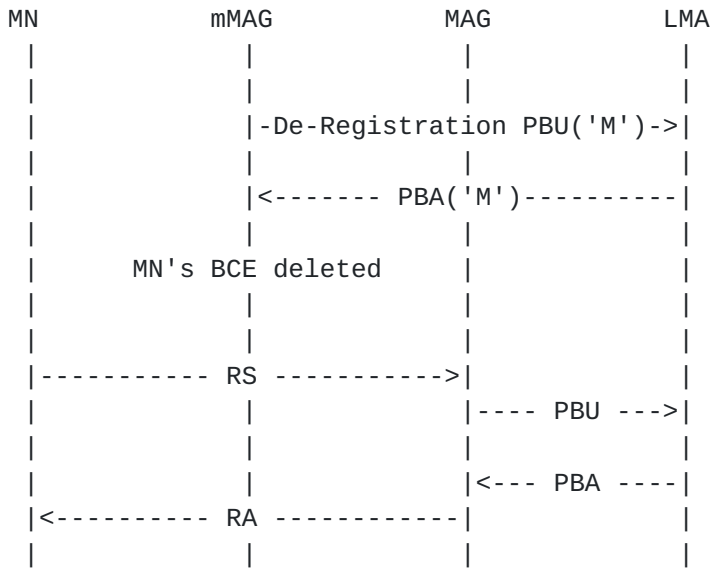


Figure 2 Mobile Node Handoff - Signaling Call Flow

Figure 2 shows the signaling call flow for the MN's handoff from mMAG to fixed MAG in same PMIPv6 domain. When the mMAG detects the MN detach, it will send de-registration Proxy Binding Update with the lifetime value of zero and setting 'M' flag to the LMA. Upon receiving the Proxy Binding Update message, the LMA waits for amount of time specified in [RFC5213], before it deletes the Binding Cache entry. On accepting Proxy Binding Acknowledgment message from the LMA the mMAG deletes the MN in the Binding Update List. On detecting new MN, the MAG performs initial attach operation following the specification in [RFC5213]. The LMA updates MN's Binding Cache entry by changing Proxy CoA with the MAG's address and setting 'M' flag to '0'.

## 4. mMAG Operation

A mMAG, a new functional entity, is responsible for taking charge of MNs within mobile network to detect the MN's movements to and from the access link and to send the Proxy Binding Update message on behalf of the MN to the LMA as a MAG does in this document. The mMAG has same data structure of Binding Update List a MAG has and it emulates attached MNs by sending Router Advertisements based on each MN's home network prefix in the Proxy Binding Update List. But when the mMAG sends the Proxy Binding Update message to the LMA, it is required to add 'M' flag in Proxy Biding Update message.

## 5. LMA Operation

When the LMA receives Proxy Binding Update message, it is not required to recognize where the message comes from fixed MAG or mMAG and to have knowledge of mMAG list not to extend PMIPv6 specification possibly. However, the LMA needs to have additional element called 'M' flag in Binding Cache to distinguish which kinds of MAG the node is attached. This is used to provide efficient mMAG handoff management, not requiring the changes of Binding Cache of MNs within mobile network due to mMAG's handoff and to forward the packets destined the MN that belongs to mMAG.

## 6. MAG Operation

A MAG is transparent for providing network mobility support. The mMAG attached to the MAG is treated as normal MN. No extension or modification is required to the MAG.

## 7. MN Operation

No extension is required.

## 8. IANA Considerations

This document makes no request of IANA.

## 9. Security Considerations

TBD

## 10. References

### 10.1. Normative References

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

[RFC6275] C. Perkins, D. Johnson, and J. Arkko, "Mobility Support in IPv6", IETF RFC 6275, July 2011.

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

[RFC3963] V. Devarapalli, R. Wakikawa, A. Petrescu, and P. Thubert, "Network Mobility (NEMO) Basic Support Protocol", RFC3963, January 2005.

### 10.2. Informative References

[N-PMIPv6]I. Sogo, C. J. Bernardos, M. Calderon, A. Banchs, and A. Azcorra, "NEMO-Enabled Localized Mobility Support for Internet Access in Automotive Scenarios", IEEE Coms. Mag., vol.47, no.5, pp.152-159, May 2009.

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