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Tunnel Negotiation for Proxy Mobile IPv6  
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Tunnel Negotiation for PMIPv6

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## Abstract

Proxy Mobile IPv6 allows a mobile node's IPv4 and IPv6 traffic between a Local Mobility Anchor(LMA) and a Mobile Access Gateway (MAG) to be tunneled using IPv6, IPv4 ,IPv4-UDP, or GRE encapsulation headers. In this document, a new mobility option is specified for tunnel negotiation between the LMA and MAG.

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## 1. Introduction

Proxy Mobile IPv6 is a network-based mobility management protocol that enables mobility without the involvement of the host. [[RFC5213](#)] specifies IPv6 address/prefix mobility with the transport network being IPv6. IPsec ESP in tunnel mode MAY be used to protect the mobile node's tunneled data traffic. The support for IPv4 addressing or an IPv4 transport network is described in the companion document [[I-D.ietf-netlmm-pmip6-ipv4-support](#)]. This document supports several tunnel encapsulation modes like IPv6 in IPv4, IPv4 in IPv4, IPv6/IPv4 in IPv4-UDP, or IPv6/IPv4 in IPv4-UDP-ESP. Furthermore, [[I-D.ietf-netlmm-grekey-option](#)] defines a new Mobility Option for allowing a LMA and MAG to negotiate GRE (Generic Routing Encapsulation) encapsulation and exchange downlink and uplink GRE keys.

It is possible that the LMA and MAG have different tunneling capability and preference, such as

- o The LMA and MAG belong to different administrative domains. The LMA may prefer IPsec to IP-in-IP encapsulation based on some policy between the MAG's domain and the LMA's.
- o Network transition from IPv4 to IPv6. GRE is required for supporting mobile nodes with overlapping private IPv4 addresses; IPv6-in-IPv4 encapsulation is used when core networks are IPv4 dominant, while IPv4-in-IPv6 when transport networks are IPv6 enabled.
- o QoS control. GRE key can be exploited when service providers need to differentiate flows and provide QoS capabilities for mobile nodes.
- o ...

In this document, a new mobility option is defined to allow the LMA

and MAG to negotiate tunnel types. This option is carried in Proxy Binding Update (PBU) and Proxy Binding Acknowledgement(PBA) messages.

## [2.](#) 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 [[RFC2119](#)].

The terminology in this document is based on the definitions in [[RFC5213](#)].

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## [3.](#) Tunnel Negotiation

Using the Tunnel Type option defined in [Section 4.1](#) , the MAG and the LMA can negotiate encapsulation modes.

When the mobile access gateway determines, based on, e.g., the MAG local policy, the MAG-LMA peer agreement, or loading status, that some type of tunnel encapsulation is needed, the mobile access gateway MUST include the Tunnel Type option in the Proxy Binding Update message sent to the local mobility anchor. After successfully processing the Proxy Binding Update and accepting the tunnel type requested from the mobile access gateway, the LMA MUST send a successful Proxy Binding Acknowledgement to the MAG including a Tunnel Type option.

If the requested tunnel type is not acceptable, the local mobility anchor MUST reject the request and send a Proxy Binding Acknowledgement message with Status field set to TUNNEL\_NEGOTIATION\_FAILURE (TBD by IANA), and a Tunnel Type option MUST be included in this message to show the LMA's preference of encapsulation. Then the MAG SHOULD initiate a new cycle PBU/PBA message exchange.

### [3.1.](#) Local Mobility Anchor Considerations

When the local mobility anchor and the mobile access gateway successfully negotiates tunnel type, the local mobility anchor SHOULD maintain this as a part of the mobile node Binding Cache Entry(BCE ) . This requires that the BCE described in the Proxy Mobile IPv6 base

specification [[RFC5213](#)] be extended. To support the mechanism specified in this document, the BCE must be extended with the following additional field.

- o A tunnel type indicating what kind of encapsulation is used for the mobile node's traffic.

[3.2.](#) Mobile Access Gateway Considerations

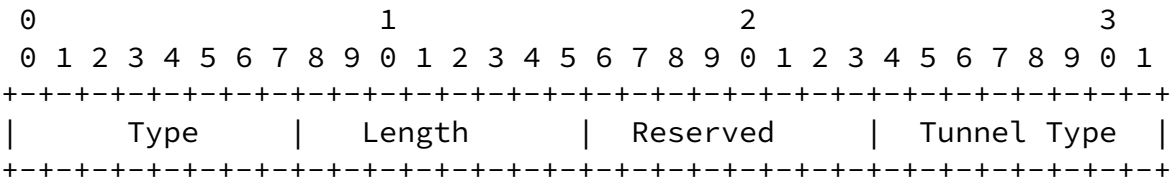
Every mobile access gateway maintains a Binding Update List entry for each currently attached mobile node, as described in [[RFC5213](#)]. To support the mechanism specified in this document, the conceptual Binding Update List entry data structure must be extended with the following new additional field.

- o A tunnel type indicating what kind of encapsulation is used for the mobile node's traffic.

[4.](#) Message Formats

[4.1.](#) Tunnel Type Option

A new mobility option, the Tunnel Type option, is defined for use in Proxy Binding Update and Proxy Binding Acknowledgment messages exchanged between the mobile access gateway and the local mobility anchor. This option is used for negotiating tunnel encapsulation mode.



Type

<IANA>

Length

8-bit unsigned integer indicating the length in octets of the option, excluding the type and length fields.

#### Reserved

These fields are unused. They MUST be initialized to zero by the sender and MUST be ignored by the receiver.

#### Tunnel Type

- 0x01: IPv6/IPv4 in IPv6
- 0x02: IPv6/IPv4 in IPv4
- 0x03: GRE
- 0x04: IPsec ESP
- 0x05: IPv6/IPv4 in IPv4-UDP
- 0x06: IPv6/IPv4 in IPv4-UDP-TLV
- 0x07: IPv6/IPv4 in IPv4-UDP-ESP

Figure 1: Tunnel Type Option

#### [4.2.](#) Status Codes

The following status code values are defined for use in the Binding Acknowledgment message when using Proxy Mobile IPv6.

##### TUNNEL\_NEGOTIATION\_FAILURE (TBD less than 128)

When the local mobility anchor receives a Proxy Binding Update with a Tunnel Type option while the tunnel encapsulation is not supported, the LMA uses this code to indicate to the mobile access gateway the failure of tunnel negotiation. The mobile access gateway then either initiates another PBU/BPA message exchange or terminates the registration.

## [5.](#) IANA consideration

This document defines a new Option, the Tunnel Type Option, described in [Section 4.1](#). This option is carried in the Mobility Header. The type value for this option needs to be assigned from the same numbering space as allocated for the other mobility options defined in the Mobile IPv6 specification [[RFC3775](#)]. Status code is also needed to be allocated

## [6.](#) Security Considerations

In this document, the PBU and the PBA are piggybacked with tunnel type negotiation . IPsec is mandatory to be used between the LMA and the MAG for confidentiality protection on the PBU and PBA messages.

## [7.](#) Acknowledgements

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