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LMA Controlled MAG Session Parameters
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Abstract

This specification defines a new extension, LMA-Controlled-MAG-Session-Params to Proxy Mobile IPv6. This option can be used by the local mobility anchor in Proxy Mobile IPv6 signaling for notifying the mobile access gateway to conform to various configuration parameters such as heartbeat parameters and binding refresh parameters.

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1. Introduction

A large Proxy Mobile IPv6 (PMIPv6) [[RFC5213](#)] deployment, such as residential deployment, can have tens of thousands of mobile access gateways (MAG) spread across geographical locations. While it can be operationally challenging to manage such a large number of MAGs, it can also be very difficult to ensure configuration consistency across all the MAGs if they are not centrally managed. Configuring aggressive values of parameters such as re-registration timeout and heartbeat interval can potentially create considerable signaling load on the local mobility anchor (LMA). This document provides a new option to enable the LMA to control various parameters on the MAG such as the re-registration frequency [[RFC5213](#)] and heartbeat frequency [[RFC5847](#)]. With this option, the configuration of these tunable parameters done centrally on the LMA enables Service Providers to have better control on the behavior of the MAGs with deterministic signaling load on the LMA.

2. Conventions and Terminology

2.1. Conventions

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](#)].

2.2. Terminology

All the terms used in this document are to be interpreted as defined in [[RFC5213](#)], [[RFC5847](#)] and [[RFC7563](#)].

3. Protocol Extension

The LMA Controlled MAG Parameters (LCMP) option is a mobility header option used to exchange information related to the parameters that a LMA enforces on a MAG. The option can be included in Proxy Binding Acknowledge (PBA) message only, and there MUST NOT be more than a single instance of this mobility option in the PBA message. This mobility option MUST contain one or more LCMP sub-options. The sub-options are defined in [Section 3.1](#). The LCMP option has an alignment requirement of $4n+2$ [[RFC2460](#)].

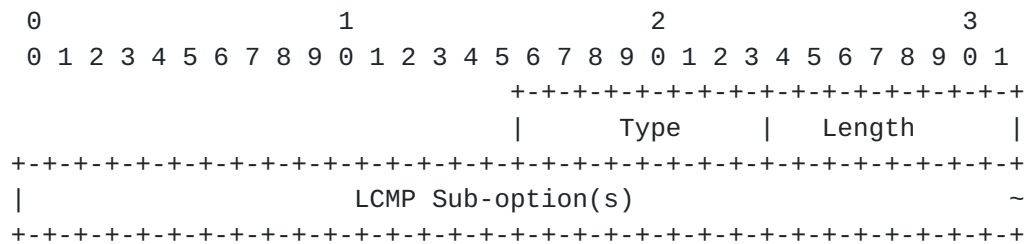


Figure 1: LMA Controlled MAG Parameters Option

Type

MUST be set to the value of IANA-1, indicating that it is a LMA-Controlled-MAG-Parameters option.

Length

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

LCMP Sub-option(s)

LCMP Sub-options are described in the below sections. The sub-options can be present in any order. Inclusion of any specific sub-option is optional, but at least one sub-option MUST be present.

3.1. Format of the LCMP Sub-Options

The LCMP sub-options are used for carrying information elements related to various parameters that need to be configured on the MAG. These sub-options can be included in the LCMP option defined in [Section 3](#). The LCMP sub-options have an alignment requirement of 4n. The format of this sub-option is as follows.

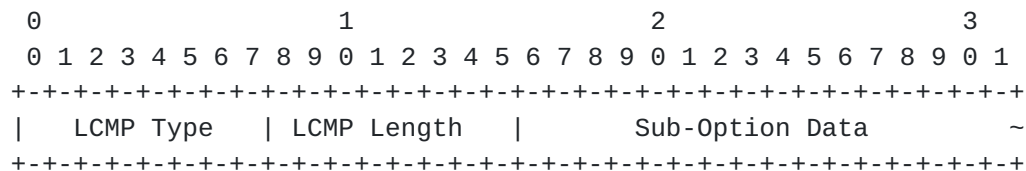


Figure 2: LMA Controlled MAG Parameters Sub-Option

Type

8-bit unsigned integer indicating the type of the LCMP sub-option. This specification defines the following types:

- 0 - Reserved
- 1 - Binding Re-registration Control Sub-Option
- 2 - Heartbeat Control Sub-Option

Length

8-bit unsigned integer indicating the number of octets needed to encode the Option Data, excluding the LCMP Type and LCMP Length fields of the sub-option.

3.1.1. Binding Re-registration Control Sub-Option

The Binding Re-registration Control Sub-Option is a mobility sub-option carried in the LCMP mobility option defined in [Section 3.1](#). This sub-option carries re-registration related timer values. There MUST be no more than a single instance of this sub-option in LCMP option. The format of this sub-option is defined below.

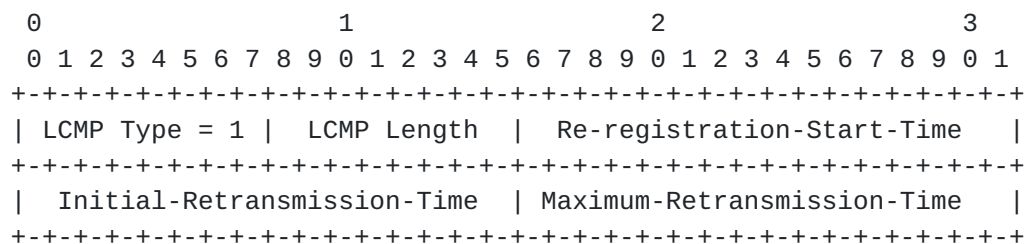


Figure 3: Binding Re-registration Control Sub-Option

LCMP Type

- 1 for Binding Re-registration Control Sub-Option

LCMP Length

Re-registration-Start-Time

16-bit unsigned integer indicating the number of time units before the expiry of the PMIPv6 binding lifetime when the registration refresh process needs to be activated. One time unit is 4 seconds.

Initial-Retransmission-Time

16-bit unsigned integer indicating minimum delay in seconds before the first Proxy Binding Update (PBU) retransmission of the exponential back-off process.

Maximum-Retransmission-Time

16-bit unsigned integer indicating maximum delay in seconds before the last PBU retransmission message of the exponential back-off process.

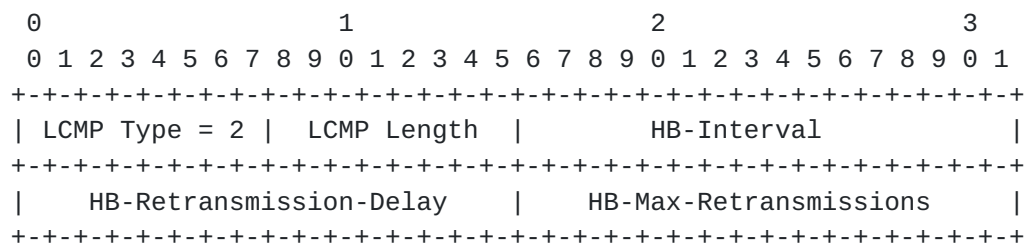
3.1.2. Heartbeat Control Sub-Option

Figure 4: Heartbeat Control Sub-Option

LCMP Type

2 for Heartbeat Control Sub-Option

LCMP Length

6

HB-Interval

16-bit unsigned integer indicating heartbeat interval, i.e. time delay in seconds after a successful heartbeat exchange (heartbeat request followed by response) when the next heartbeat exchange can be triggered.

HB-Retransmission-Delay

16-bit unsigned integer indicating minimum time delay in seconds before a heartbeat message is retransmitted.

HB-Max-Retransmissions

16-bit unsigned integer indicating maximum number of heartbeat retransmissions.

4. Protocol Configuration Variables**4.1. Local Mobility Anchor - Configuration Variables**

This specification defines the following variables to be configured by the system management. The configured values for these protocol variables MUST survive server reboots and service restarts.

EnableLCMPSubOptReregControl

This flag indicates the operational state of the Binding Re-registration Control sub-option support. The default value of this flag is (0), indicating that support for the Binding Re-registration Control sub-option is disabled.

EnableLCMPSubOptHeartbeatControl

This flag indicates the operational state of the Heartbeat Control sub-option support. The default value of this flag is (0), indicating that support for the Heartbeat Control sub-option is disabled.

The following variables MAY be defined at various granularities such as per binding, per cluster of bindings, per peering MAG, per cluster of peering MAGs or any other custom grouping. Regardless of the granularity of this configuration, the LMA MUST be able to determine the value of these variables for every individual binding.

LCMPReregistrationStartTime

This variable is used to set the minimum time interval in number of seconds before the expiry of the PMIPv6 binding lifetime when the registration refresh process SHOULD be activated. The default value of this variable is 10 units, where each unit is 4 seconds.

LCMPInitialRetransmissionTime

This variable is used to set the minimum delay in seconds before the first PBU retransmission of the exponential back-off process. This variable is same as INITIAL_BINDACK_TIMEOUT mentioned in [Section 6.9.4 of \[RFC5213\]](#). The default value of this variable is 1 second.

LCMPMaximumRetransmissionTime

This variable is used to set the maximum delay in seconds before the last PBU retransmission message of the exponential back-off process. This variable is same as MAX_BINDACK_TIMEOUT mentioned in [Section 6.9.4 of \[RFC5213\]](#). The default value of this variable is 32 seconds.

LCMPHeartbeatInterval

This variable is used to set the time delay in seconds after a successful heartbeat exchange (heartbeat request followed by response) when the next heartbeat exchange can be triggered. The default value of this variable is 60 seconds. The time delay SHOULD NOT be less than 30 seconds or more than 3600 seconds. The value of this variable MAY be derived from the variable HEARTBEAT_INTERVAL defined in [Section 5 of \[RFC5847\]](#) if configured on the LMA.

LCMPHeartbeatRetransmissionDelay

This variable is used to set the minimum time delay in seconds before a heartbeat message is retransmitted. The value of this variable SHOULD be less than LCMPHeartbeatInterval. The default value of this variable is 5 seconds.

LCMPHeartbeatMaxRetransmissions

This variable is used to set the maximum number of heartbeat retransmissions. The default value of this variable is 3. The value of this variable MAY be derived from the variable MISSING_HEARTBEATS_ALLOWED defined in [Section 5 of \[RFC5847\]](#) if configured on the LMA.

5. Protocol Considerations

The following considerations apply to the LMA and the MAG.

For supporting this extension, the conceptual Binding Cache Entry

data structure maintained by the LMA, described in [Section 5.1 of \[RFC5213\]](#) and the conceptual Binding Update List entry data structure maintained by the MAG, described in [Section 6.1 of \[RFC5213\]](#), need to be extended to store the LCMP option related information elements defined below.

- o LCMPReregistrationStartTime
- o LCMPInitialRetransmissionTime
- o LCMPMaximumRetransmissionTime
- o LCMPHeartbeatInterval
- o LCMPHeartbeatRetransmissionDelay
- o LCMPHeartbeatMaxRetransmissions

5.1. Local Mobility Anchor Considerations

On receiving a PBU message [\[RFC5213\]](#) from a MAG, the LMA MUST check if the variable EnableLCMPSubOptReregControl is configured and set to (1). If yes, and if all of LCMPReregistrationStartTime, LCMPInitialRetransmissionTime and LCMPMaximumRetransmissionTime are set to NON_ZERO values, then it MUST include Binding Re-registration Control Sub-Option in the LCMP mobility option which is in turn included in the PBA message. If the variable EnableLCMPSubOptReregControl is configured and set to (1) and if any of LCMPReregistrationStartTime, LCMPInitialRetransmissionTime and LCMPMaximumRetransmissionTime is set to ZERO value, then the LMA MUST report a configuration error and reject the binding request by sending a PBA message with status code '128-Reason Unspecified' [\[RFC5213\]](#).

The LMA MUST also check if variable EnableLCMPSubOptHeartbeatControl is configured and set to (1). If yes, and if all of LCMPHeartbeatInterval, LCMPHeartbeatRetransmissionDelay and LCMPHeartbeatMaxRetransmissions are set to NON_ZERO values, then it MUST include Heartbeat Control Sub-Option in the LCMP mobility option which is in turn included in the PBA message. If the variable EnableLCMPSubOptHeartbeatControl is set to (1) and if any of LCMPHeartbeatInterval, LCMPHeartbeatRetransmissionDelay and LCMPHeartbeatMaxRetransmissions is set to ZERO value, then the LMA MUST report a configuration error and reject the binding request by sending a PBA message with status code '128-Reason Unspecified' [\[RFC5213\]](#).

5.2. Mobile Access Gateway Considerations

If the PBA message [RFC5213] received from the LMA contains the LCMP mobility option and the Binding Re-registration Control Sub-Option, then the MAG MUST overwrite the binding re-registration related timer parameters configured locally on the MAG with the parameters received in Binding Re-registration Control Sub-Option. If any of the parameters in the Binding Re-registration Control Sub-Option is ZERO, then the PBA message MUST be ignored and an error message SHOULD be logged.

Similarly, if the LCMP mobility option contains the Heartbeat Control Sub-Option, then the MAG MUST overwrite the heartbeat related timer parameters configured locally on the MAG with the parameters received in the Heartbeat Control Sub-Option. If any of the parameters in the Heartbeat Control Sub-Option except HB-Retransmission-Delay is ZERO, then the PBA message MUST be ignored and error message SHOULD be logged.

6. IANA Considerations

This document requires the following IANA actions in the "Mobile IPv6 Parameters" registry.

- o Action 1: This specification defines a new mobility header option, "LMA Controlled MAG Parameters". This mobility option is described in [Section 3](#). The type value (IANA-1) for this option needs to be assigned from the same numbering space as allocated for the other mobility options, as defined in [RFC6275].
- o Action 2: This specification defines a new mobility sub-option format, the LCMP Parameters sub-option. The format of this mobility sub-option is described in [Section 3.1](#). This sub-option can be carried in the LCMP Parameters option. The type value for this sub-option needs to be managed by IANA, under the registry "LMA Controlled MAG Parameters Sub-Option Type Values". This specification reserves the following type values. Approval of new LCMP Parameters sub-option type values are to be made through IANA Expert Review.

+---+	-----	+
0	Reserved	
+---+	-----	+
1	Binding Re-registration Control Sub-Option	
+---+	-----	+
2	Heartbeat Control Sub-Option	
+---+	-----	+

7. Security Considerations

The LCMP Parameters option defined in this specification allows the configuration of re-registration and heartbeat frequencies. This option is defined for carrying it in Proxy Binding Update and Proxy Binding Acknowledgement messages. This option is carried like any other mobility header option as specified in [RFC5213] and does not require any special security considerations.

8. Acknowledgements

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