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**MPL Parameter Configuration Option for DHCPv6**  
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Abstract

This draft is to define a way to configure MPL parameter via DHCPv6 option.

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## 1. Introduction

Multicast Protocol for Low power and Lossy Networks (MPL) [[I-D.ietf-roll-trickle-mcast](#)] defines a protocol to make a multicast network among low power and lossy network i.e. wireless mesh networks. MPL has various parameters to control its behavior and tradeoff between end-to-end delay and network utilization. In some environments, the parameters shall be configured carefully to meet each environment and requirement. According to the MPL draft [section 5.4](#), the parameter should be same for all nodes within an MPL domain. And the MPL draft does not define a method to configure it.

Some managed wireless mesh networks may have a DHCP server to configure network parameters with DHCP relay in each node. MPL parameters shall be considered as a part of network parameters (parameter shall match within an MPL domain). This document is to define the way to distribute parameters for MPL forwarders as a simple DHCPv6 [[RFC3315](#)] option.

## 2. MPL Parameter Configuration Option

Per MPL domain, there are following 10 parameters. An MPL domain is defined by an MPL domain address.

- o PROACTIVE\_FORWARDING
- o SEED\_SET\_ENTRY\_LIFETIME
- o DATA\_MESSAGE\_IMIN
- o DATA\_MESSAGE\_IMAX
- o DATA\_MESSAGE\_K
- o DATA\_MESSAGE\_TIMER\_EXPIRATIONS
- o CONTROL\_MESSAGE\_IMIN
- o CONTROL\_MESSAGE\_IMAX
- o CONTROL\_MESSAGE\_K
- o CONTROL\_MESSAGE\_TIMER\_EXPIRATIONS

One network may have multiple MPL domains with different configuration. To configure plural of MPL domains via DHCP, there may be more than one MPL Parameter Configuration Option given to DHCP



clients from a DHCP server.

## 2.1. Unsigned Short Floating Point

MPL has many timer parameters. Expected range of the timers depends on the network topology or MAC/PHY nature. To accommodate wide range of timer values efficiently, the MPL Parameter Configuration Option uses base-10 unsigned short floating point number with 3-bit exponent and 13-bit significand defined as follows (exp. stands for exponent).

```

      0                               1
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
+---+---+---+---+---+---+---+---+
| exp. |      significand      |
+---+---+---+---+---+---+---+---+

```

The represented value is (significand) \* 10<sup>(exp.)</sup>. Minimum exponent is 0 (binary 000) and maximum is 6 (binary 110). exp=7 (binary 111) is reserved for future use. Minimum significand is 0 (all 0) and maximum is 8191 (all 1).

Unlike IEEE754 half precision floating point (binary16), there is no sign bit (no negative value for a timer), exponent is not biased (no fractional value for a timer), no implicit leading 1 in significand, and base is 10. Therefore, there could be more than one representation for a value.

Followings are examples of common timer values represented by unit of milliseconds.

One second (1,000 ms.): exp = 3, significand = 1. 0x6001.

One minute (60,000 ms.): exp = 4, significand = 6, 0x8006.

One hour (3,600,000 ms.): exp = 5, significand = 36, 0xa024.

One day (86,400,000 ms.): exp = 5, significand = 864, 0xa360

Maximum timer length represented by unsigned short floating point with millisecond precision is 8191\*10<sup>6</sup> milliseconds (13 weeks 3 days 19 hours 16 minutes 40 seconds).

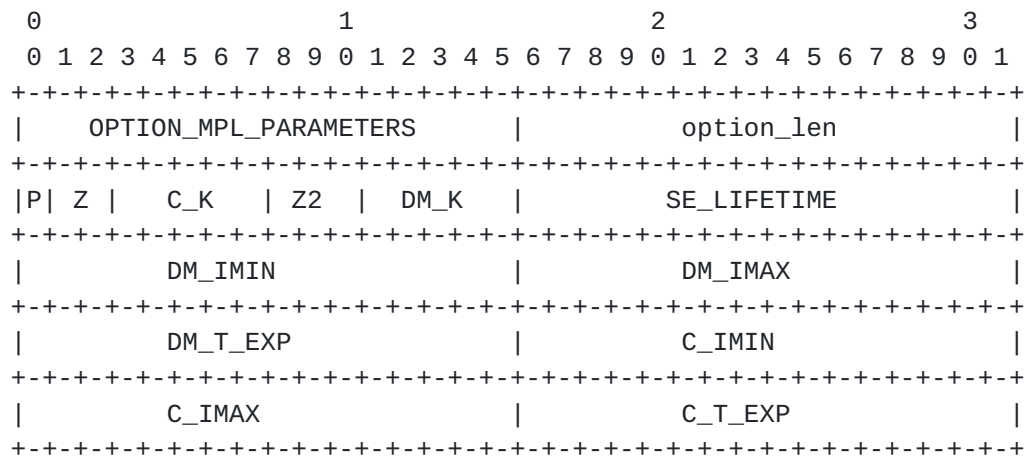
With exponent and significand, an unsigned short floating point (usfp) can be encoded as follows.

```
usfp = (exponent << 13)|(0x1fff & significand);
```



## 2.2. MPL Parameter Configuration Option Format

To distribute a configuration of an MPL domain or a default value for all MPL domains (wildcard) under the network managed by the DHCP server, this document defines a DHCPv6 option format as follows. Short floating point format is used to describe wide range of timer values.



(if option\_len = 32 )



OPTION\_MPL\_PARAMETERS: not yet assigned.

option\_len: Length of the option. It SHOULD be 16 (without MPL domain address) or 32 (with MPL domain address)

P (1 bit): A flag to indicate PROACTIVE\_FORWARDING

Z (1 bit) Reserved. Should be 0.

C\_K (5 bits): Value of CONTROL\_MESSAGE\_K.

Z2 (3 bit) Reserved. Should be all 0.





DM\_K (5 bits): Value of DATA\_MESSAGE\_K.

SE\_LIFETIME: SEED\_SET\_ENTRY\_LIFETIME. The value is milliseconds in unsigned short floating point.

DM\_IMIN: Value of DATA\_MESSAGE\_IMIN. The value is milliseconds in unsigned short floating point.

DM\_IMAX: Value of DATA\_MESSAGE\_IMAX. The value is milliseconds in unsigned short floating point.

DM\_T\_EXP: Value of DATA\_MESSAGE\_TIMER\_EXPIRATIONS. The value is milliseconds in unsigned short floating point.

C\_IMIN: Value of CONTROL\_MESSAGE\_IMIN. The value is milliseconds in unsigned short floating point.

C\_IMAX: Value of CONTROL\_MESSAGE\_IMAX. The value is milliseconds in unsigned short floating point.

C\_T\_EXP: Value of CONTROL\_MESSAGE\_TIMER\_EXPIRATIONS. The value is milliseconds in unsigned short floating point.

### **2.3. DHCPv6 Client Behavior**

Clients MAY request MPL Parameter Configuration Option, as described in [RFC3315](#) [[RFC3315](#)], sections [17.1.1](#), [18.1.1](#), [18.1.3](#), [18.1.4](#), [18.1.5](#) and 22.7. As a convenience to the reader, we mention here that the client includes requested option codes in Option Request Option.

Clients MUST discard MPL Parameter Configuration Option if it is invalid (i.e. it sets reserved bits or it has timers with reserved exp=7 in Unsigned Short Floating Point).

### **2.4. MPL Forwarder Behavior**

If a DHCPv6 client requests and receives MPL parameter configuration option, the node SHOULD join the MPL domain given by the option and act as an MPL forwarder. Nodes SHOULD configure MPL forwarders with the given parameters when it joins to the MPL domain.

The priority of MPL Parameter configuration applied for an MPL Domain is as follows (high to low).

- o Specific MPL Parameter Configuration to the MPL Domain (optlen=32)
- o Wildcard MPL Parameter Configuration (optlen=16)



- o Default configuration given in the MPL specification.

There SHALL be no more than one MPL parameter configuration option for a MPL domain or the wildcard. Thus, the order of DHCPv6 option in the packet has no effect on precedence.

A node MAY leave from an MPL domain if the node is attached to the MPL domain according to previously received MPL parameter configuration option, and, the node received updated MPL parameter configuration option without specific configuration option for the MPL domain.

MPL parameter may be updated occasionally. With stateful DHCPv6, updates can be done when the renewal timer expires. However, on stateless DHCPv6 there are no way to update the parameters properly. There is a DHCPv6 option to push updates [[I-D.jiang-dhc-stateless-reconfiguration](#)].

## **2.5. DHCPv6 Server Behavior**

Sections [17.2.2](#) and [18.2](#) of [RFC3315](#) [[RFC3315](#)] govern server operation in regards to option assignment. As a convenience to the reader, we mention here that the server will send MPL Parameter Configuration Option only if configured with specific value for MPL Parameter Configuration Option and the client requested it.

Servers MUST ignore incoming MPL Parameter Configuration Option.

## **2.6. DHCPv6 Relay Behavior**

It's never appropriate for a relay agent to add options to a message heading toward the client, and relay agents don't actually construct Relay-Reply messages anyway. There are no additional requirements for relays.

## **3. IANA Considerations**

A DHCPv6 option code for MPL Parameter Configuration Option needs to be assigned from IANA.

## **4. Security Considerations**

Forged option may cause too many MAC broadcasting. Reasonable bound of parameters (not too high K, not too low IMIN) may be defined by implementations or derived from MAC/PHY specifications. DHCP server or the network itself shall be trusted by some means including



network access control or DHCP authentications.

## 5. References

### 5.1. Normative References

- [I-D.ietf-roll-trickle-mcast]  
Hui, J. and R. Kelsey, "Multicast Forwarding Using Trickle", [draft-ietf-roll-trickle-mcast-04](#) (work in progress), February 2013.
- [RFC3315] Droms, R., Bound, J., Volz, B., Lemon, T., Perkins, C., and M. Carney, "Dynamic Host Configuration Protocol for IPv6 (DHCPv6)", [RFC 3315](#), July 2003.

### 5.2. Non-Normative References

- [I-D.jiang-dhc-stateless-reconfiguration]  
Jiang, S. and B. Liu, "Stateless Reconfiguration in Dynamic Host Configuration Protocol for IPv6 (DHCPv6)", [draft-jiang-dhc-stateless-reconfiguration-00](#) (work in progress), October 2013.

## Appendix A. Update History

Updates on 03 to 04:

- o Added more sections according to dhc-options-guidelines
- o Removed 'no update' requirement on MPL forwarder behavior
- o Added reference to I-D.jiang-dhc-stateless-reconfiguration

Updates on 02 to 03:

- o C flag is removed and wildcard shall be identified by optlen
- o Added some description on update of MPL parameters
- o Clearly stated there shall not be two or more configuration for an MPL domain and option order is not significant.

Updates on 01 to 02:



- o Added co-author

Updates on 00 to 01:

- o Corrected target area, track, etc.

## [Appendix B](#). Acknowledgements

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