

Workgroup: Network Working Group

Internet-Draft:

draft-ietf-pim-igmp-mld-extension-05

Published: 7 November 2021

Intended Status: Standards Track

Expires: 11 May 2022

Authors: M. Sivakumar            S. Venaas  
          Juniper Networks       Cisco Systems, Inc.  
          Z. Zhang                H. Asaeda  
          ZTE Corporation        NICT

**Internet Group Management Protocol version 3 (IGMPv3) and Multicast  
Listener Discovery version 2 (MLDv2) Message Extension**

**Abstract**

This document specifies a generic mechanism to extend IGMPv3 and MLDv2 by using a list of TLVs (Type, Length and Value).

**Status of This Memo**

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <https://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on 11 May 2022.

**Copyright Notice**

Copyright (c) 2021 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

## Table of Contents

- [1. Introduction](#)
- [2. Conventions used in this document](#)
- [3. Extension Format](#)
  - [3.1. Multicast Listener Query Extension](#)
  - [3.2. Version 2 Multicast Listener Report Extension](#)
  - [3.3. IGMP Membership Query Extension](#)
  - [3.4. IGMP Version 3 Membership Report Extension](#)
- [4. Processing the extension](#)
- [5. Applicability and backwards compatibility](#)
- [6. Security Considerations](#)
- [7. IANA Considerations](#)
- [8. Acknowledgements](#)
- [9. References](#)
  - [9.1. Normative References](#)
  - [9.2. Informative References](#)
- [Authors' Addresses](#)

## 1. Introduction

This document defines a generic method to extend IGMPv3 [[RFC3376](#)] and MLDv2 [[RFC3810](#)] messages to accommodate information other than what is contained in the current message formats. This is done by allowing a list of TLVs (Type, Length and Value) to be used in the Additional Data part of IGMPv3 and MLDv2 messages. This document defines a registry for such TLVs, while other documents will define the specific types and their values, and their semantics. The extension would only be used when at least one TLV is to be added to the message. This extension also applies to the lightweight versions of IGMPv3 and MLDv2 as defined in [[RFC5790](#)].

When this extension mechanism is used, it replaces the Additional Data section defined in IGMPv3/MLDv2 for TLVs.

Additional Data is defined for Query messages in IGMPv3 [[RFC3376](#)] Section 4.1.10 and MLDv2 [[RFC3810](#)] Section 5.1.12, and for Report messages in IGMPv3 [[RFC3376](#)] Section 4.2.11 and MLDv2 [[RFC3810](#)] Section 5.2.11.

## 2. Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

### 3. Extension Format

A previously reserved bit in the IGMPv3 and MLDv2 headers is used to indicate whether this extension is used. When this extension is used, the Additional Data of IGMPv3 and MLDv2 messages is formatted as follows. Note that this format contains a variable number of TLVs. It MUST contain at least one TLV.

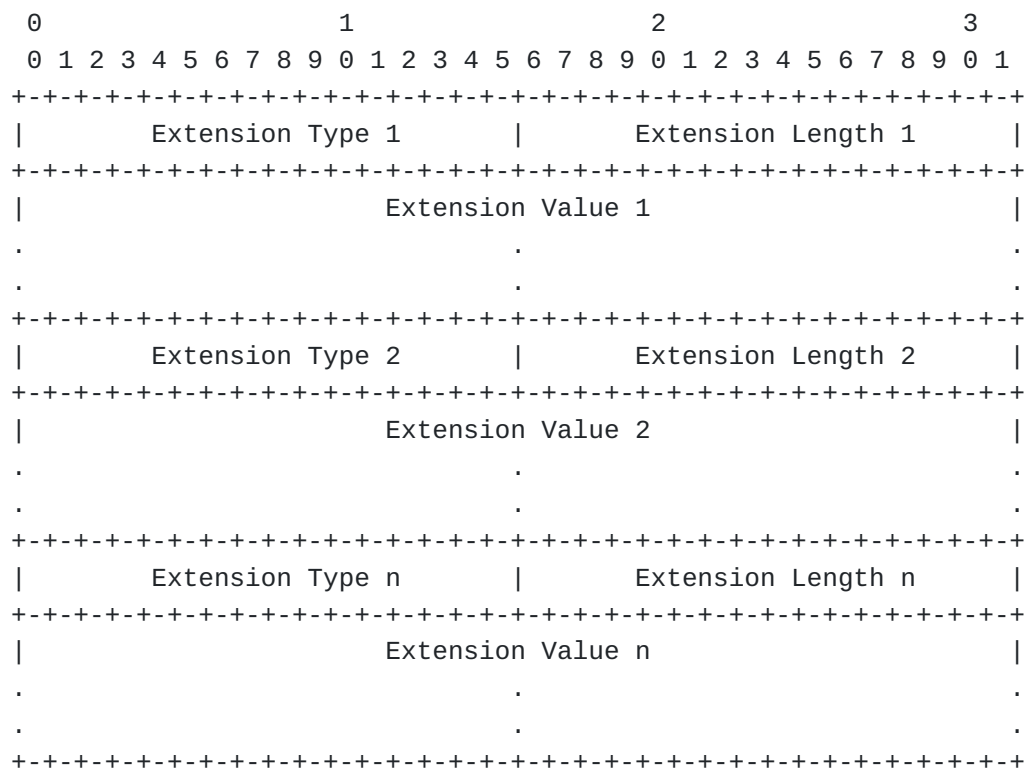


Figure 1: Figure 1: Extension Format

**Extension Type:** 2 octets. This identifies a particular Extension Type as defined in the IGMP/MLD Extension Type Registry. If this is not the first TLV, it will follow immediately after the end of the previous one. There is no alignment or padding.

**Extension Length:** 2 octets. This specifies the length in octets of the following Extension Value field. The length may be zero if no value is needed.

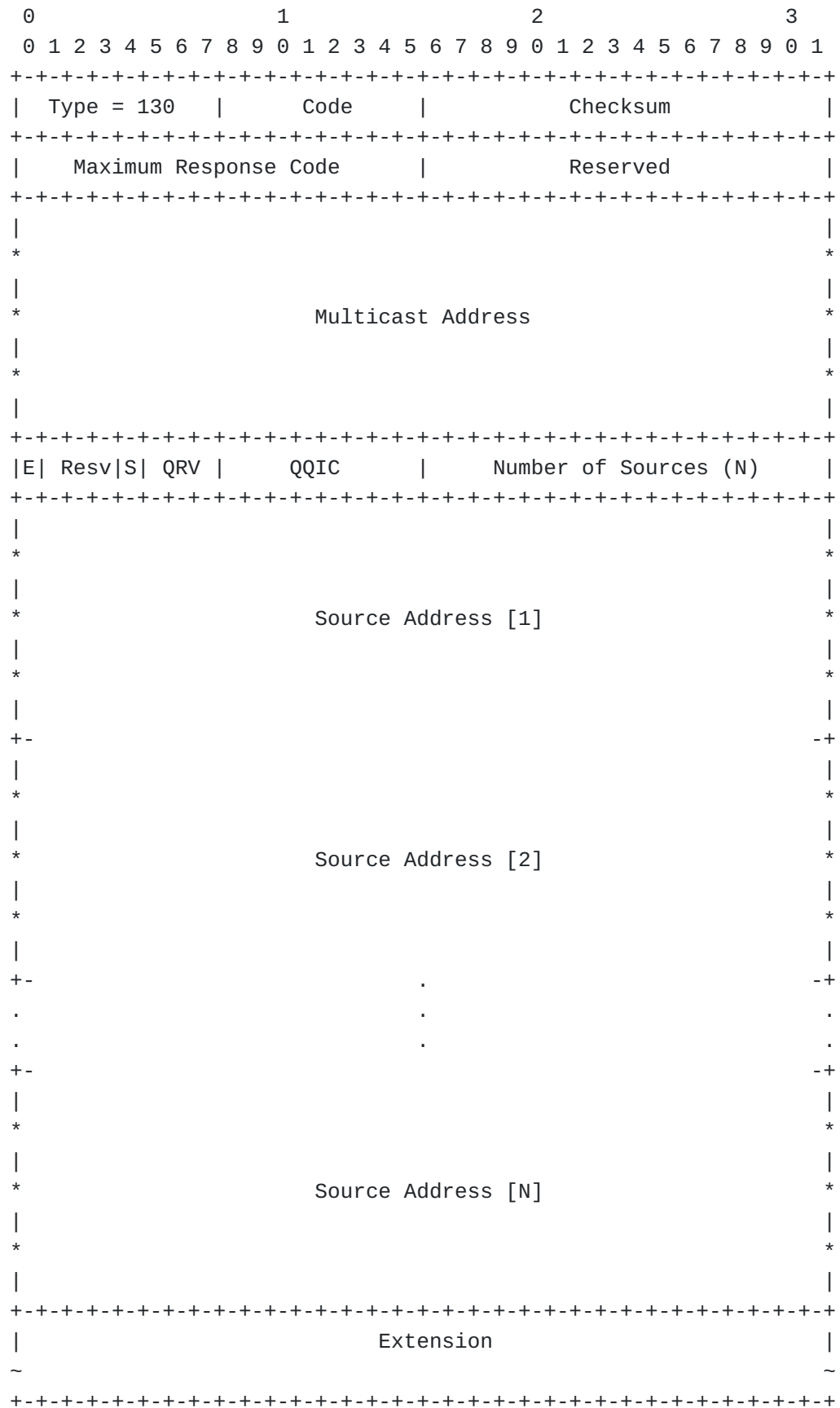
**Extension Value:** This field contains the value. The length and the contents of this field is according to the specification of the Extension Type.

IGMPv3 and MLDv2 messages are defined so that they can fit within the network MTU, in order to avoid fragmentation. When this extension mechanism is used, the number of Group Records in each

Report message should be kept small enough that the entire message, including any extension TLVs can fit within the network MTU.

### **3.1. Multicast Listener Query Extension**

The MLDv2 Query Message format [[RFC3810](#)] with extension is shown below. The E-bit MUST be set to 1 to indicate that the extension is present. Otherwise, it MUST be 0.





### 3.3. IGMP Membership Query Extension

The IGMPv3 Query Message format [[RFC3376](#)] with the extension is shown below. The E-bit MUST be set to 1 to indicate that the extension is present. Otherwise, it MUST be 0.

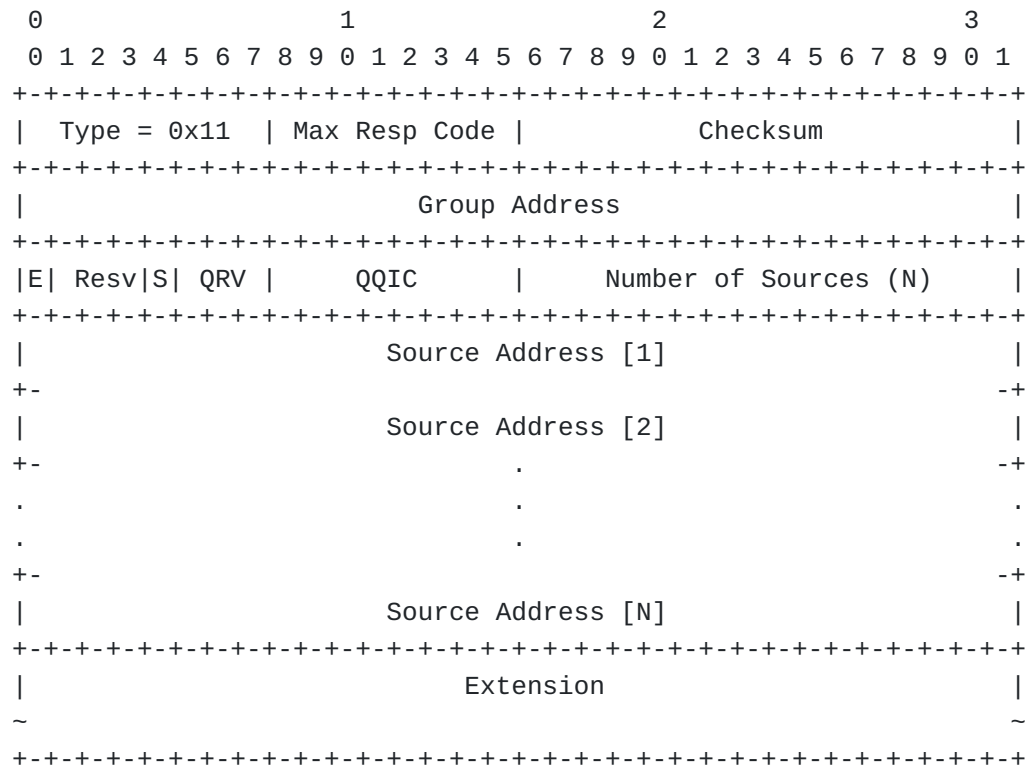


Figure 4: Figure 4: IGMP Query Extension

### 3.4. IGMP Version 3 Membership Report Extension

The IGMPv3 Report Message format [[RFC3376](#)] with the extension is shown below. The E-bit MUST be set to 1 to indicate that the extension is present. Otherwise, it MUST be 0.

At least one TLV MUST be present.



There MUST NOT be any data in the IP payload after the last TLV. To check this, one will need to walk through each of The TLVs until there are less than four octets left in the IP payload. If there are any octets left, validation fails.

The total length of the Extension MUST NOT exceed the remainder of the IP payload length. For this validation, one only examines the content of the Extension Length fields.

Future documents defining a new type MUST specify any additional processing and validation. These rules, if any, will be examined only after the general validation (above) succeeds.

Unsupported types MUST be ignored.

## **5. Applicability and backwards compatibility**

IGMP and MLD implementations, host implementations in particular, rarely change, and it is expected to take a long time for them to support this extension mechanism. Also as new extensions are defined, it may take a long time before they are supported. Due to this, defining extensions should not be taken lightly, and it is crucial to consider backwards compatibility.

Implementations that do not support this extension mechanism will ignore it, as specified in [RFC3376] and [RFC3810].

It is possible that a new extension type only applies to queries, or only to reports, or there may be other specific conditions for when it is to be used. A document defining a new type MUST specify under what conditions the new type should be used, including for which message types. It MUST also be specified what the behavior should be if a message is not used in the defined manner, e.g., if it is present in a query message, when it was only expected to be used in reports.

When defining new types, care should be taken to consider the effect of partial support for the new TLV, by either the hosts or routers, on the same link. Further, it must be considered whether there are any dependencies or restrictions on combinations between the new types and any pre-existing types.

This document defines an extension mechanism only for IGMPv3 and MLDv2. Hence this mechanism does not apply if hosts or routers send older version messages.

## **6. Security Considerations**

The Security Considerations of [RFC3376] and [RFC3810] also apply here.

This document extends the IGMP and MLD message formats, allowing for a variable number of TLVs. Implementations must take care when parsing the TLVs to not exceed the packet boundary, an attacker could intentionally specify a TLV with a length exceeding the boundary.

An implementation could add a large number of minimal TLVs in a message to increase the cost of processing the message to magnify a Denial of Service attack.

## 7. IANA Considerations

IANA is asked to create a new registry called "IGMP/MLD Extension Types" in the "Internet Group Management Protocol (IGMP) Type Numbers" section, with registration procedure "IETF Review" [RFC8126], and with this document as a reference. The registry is common for IGMP and MLD. The initial content of the registry should be as below (empty).

Type	Length	Name	Reference
-----			

## 8. Acknowledgements

The authors thank Ian Duncan, Leonard Giuliano, Jake Holland, Alvaro Retana and Zhaohui Zhang for reviewing the document and providing valuable feedback.

## 9. References

### 9.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
- [RFC3376] Cain, B., Deering, S., Kouvelas, I., Fenner, B., and A. Thyagarajan, "Internet Group Management Protocol, Version 3", RFC 3376, DOI 10.17487/RFC3376, October 2002, <<https://www.rfc-editor.org/info/rfc3376>>.
- [RFC3810] Vida, R., Ed. and L. Costa, Ed., "Multicast Listener Discovery Version 2 (MLDv2) for IPv6", RFC 3810, DOI 10.17487/RFC3810, June 2004, <<https://www.rfc-editor.org/info/rfc3810>>.
- [RFC8126] Cotton, M., Leiba, B., and T. Narten, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26,

RFC 8126, DOI 10.17487/RFC8126, June 2017, <<https://www.rfc-editor.org/info/rfc8126>>.

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.

## 9.2. Informative References

[RFC5790] Liu, H., Cao, W., and H. Asaeda, "Lightweight Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Version 2 (MLDv2) Protocols", RFC 5790, DOI 10.17487/RFC5790, February 2010, <<https://www.rfc-editor.org/info/rfc5790>>.

## Authors' Addresses

Mahesh Sivakumar  
Juniper Networks  
64 Butler St  
Milpitas, CA 95035  
United States of America

Email: [sivakumar.mahesh@gmail.com](mailto:sivakumar.mahesh@gmail.com)

Stig Venaas  
Cisco Systems, Inc.  
Tasman Drive  
San Jose, CA 95134  
United States of America

Email: [stig@cisco.com](mailto:stig@cisco.com)

Zheng(Sandy) Zhang  
ZTE Corporation  
No. 50 Software Ave, Yuhuatai District  
Nanjing  
210000  
China

Email: [zhang.zheng@zte.com.cn](mailto:zhang.zheng@zte.com.cn)

Hitoshi Asaeda  
National Institute of Information and Communications Technology  
4-2-1 Nukui-Kitamachi,  
184-8795  
Japan

Email: [asaeda@nict.go.jp](mailto:asaeda@nict.go.jp)