

Network Working Group  
Internet-Draft  
Updates: [3973](#), [5015](#), [6754](#), [7761](#), [8364](#)  
(if approved)  
Intended status: Standards Track  
Expires: December 27, 2019

S. Venaas  
Cisco Systems, Inc.  
A. Retana  
Futurewei Technologies, Inc.  
June 25, 2019

**PIM reserved bits and type space extension**  
**draft-ietf-pim-reserved-bits-02**

Abstract

The currently defined PIM version 2 messages share a common message header format. The common header definition contains eight reserved bits. This document specifies how these bits may be used by individual message types, and creates a registry containing the per message type usage. This document also extends the PIM type space by defining three new message types. For each of the new types, four of the previously reserved bits are used to form an extended type range.

This document Updates [RFC7761](#) and [RFC3973](#) by defining the use of the currently Reserved field in the PIM common header. This document further updates [RFC7761](#) and [RFC3973](#), along with [RFC5015](#), [RFC6754](#) and [RFC8364](#), by specifying the use of the currently Reserved bits for each PIM message.

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 December 27, 2019.

## Copyright Notice

Copyright (c) 2019 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

<a href="#">1.</a>	Introduction . . . . .	<a href="#">2</a>
<a href="#">2.</a>	Conventions used in this document . . . . .	<a href="#">3</a>
<a href="#">3.</a>	PIM header common format . . . . .	<a href="#">3</a>
<a href="#">4.</a>	Flag Bit definitions . . . . .	<a href="#">3</a>
<a href="#">4.1.</a>	Flag Bits for Type 4 (Bootstrap) . . . . .	<a href="#">4</a>
<a href="#">4.2.</a>	Flag Bits for Type 10 (DF Election) . . . . .	<a href="#">4</a>
<a href="#">4.3.</a>	Flag Bits for Type 12 (PFM) . . . . .	<a href="#">4</a>
<a href="#">4.4.</a>	Flag Bits for Type 13 (Type Space Extension) . . . . .	<a href="#">4</a>
<a href="#">4.5.</a>	Flag Bits for Type 14 (Type Space Extension) . . . . .	<a href="#">4</a>
<a href="#">4.6.</a>	Flag Bits for Type 15 (Type Space Extension) . . . . .	<a href="#">4</a>
<a href="#">5.</a>	PIM Type Space Extension . . . . .	<a href="#">5</a>
<a href="#">6.</a>	Security Considerations . . . . .	<a href="#">5</a>
<a href="#">7.</a>	IANA considerations . . . . .	<a href="#">5</a>
<a href="#">8.</a>	References . . . . .	<a href="#">6</a>
<a href="#">8.1.</a>	Normative References . . . . .	<a href="#">6</a>
<a href="#">8.2.</a>	Informative References . . . . .	<a href="#">7</a>
	Authors' Addresses . . . . .	<a href="#">7</a>

## [1.](#) Introduction

The currently defined PIM version 2 messages share a common message header format defined in the PIM Sparse Mode [\[RFC7761\]](#) and Dense Mode [\[RFC3973\]](#) specifications. The common header definition contains eight reserved bits. The message types defined in these documents all use this common header. However, several messages already make use of one or more bits, including the Bootstrap [\[RFC5059\]](#), DF-Election [\[RFC5015\]](#), and PIM Flooding Mechanism (PFM) [\[RFC8364\]](#) messages. There is no document formally specifying that these bits are to be used per message type.



The PIM message types as defined in the PIM Sparse Mode [RFC7761] and Dense Mode [RFC3973] specifications are in the range from 0 to 15. That type space is almost exhausted. Message type 15 was reserved by [RFC6166] for type space extension. In Section 5, this document specifies the use of the flag bits for message types 13, 14 and 15 in order to extend the PIM type space. The registration procedure for the extended type space is the same as for the existing type space, and the existing PIM message type registry is updated to include the extended type space.

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.

The common PIM header is defined in [section 4.9 of \[RFC7761\]](#) and [section 4.7.1 of \[RFC3973\]](#). This document updates the definition of the Reserved field and refers to that field as PIM message type flag bits, or simply flag bits. The new common header format is as below.

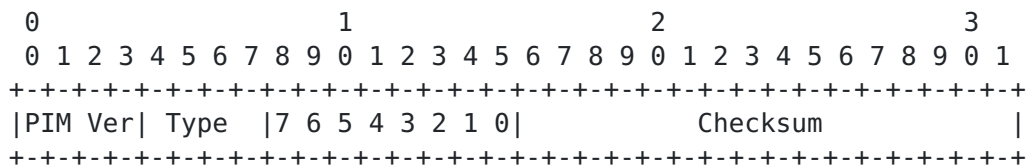
The Flags Bits field is defined in [Section 4](#). All other fields remain unchanged.

Unless otherwise specified, all the flag bits for each PIM type are Reserved [RFC8126]. They MUST be set to zero on transmission, and they MUST be ignored upon receipt. The specification of a new PIM type, MUST indicate whether the bits should be treated differently.



Currently for the message types 0 (Hello), 1 (Register), 2 (Register Stop), 3 (Join/Prune), 5 (Assert), 6 (Graft), 7 (Graft-Ack), 8 (Candidate RP Advertisement), 9 (State Refresh) and 11 (ECMP Redirect), all flag bits are Reserved.

When defining flag bits it is helpful to have a well defined way of referring to a particular bit. The most significant of the flag bits, the bit immediately following the type field is referred to as bit 7. The least significant, the bit right in front of the checksum field is referred to as bit 0. This is shown in the diagram below.



#### **4.1. Flag Bits for Type 4 (Bootstrap)**

PIM message type 4 (Bootstrap) [[RFC5059](#)] defines flag bit 7 as No-Forward. The usage of the bit is defined in that document. The remaining flag bits are Reserved.

#### **4.2. Flag Bits for Type 10 (DF Election)**

PIM message type 10 (DF Election) [[RFC5015](#)] specifies that the four most significant flag bits (bits 4-7) are to be used as a sub-type. The remaining flag bits are currently Reserved.

#### **4.3. Flag Bits for Type 12 (PFM)**

PIM message type 12 (PFM) [[RFC8364](#)] defines flag bit 7 as No-Forward. The usage of the bit is defined in that document. The remaining flag bits are Reserved.

#### **4.4. Flag Bits for Type 13 (Type Space Extension)**

This type and the flag bit usage is defined in [Section 5](#).

#### **4.5. Flag Bits for Type 14 (Type Space Extension)**

This type and the flag bit usage is defined in [Section 5](#).

#### **4.6. Flag Bits for Type 15 (Type Space Extension)**

This type and the flag bit usage is defined in [Section 5](#).

## 7. IANA considerations





Review" as defined in [RFC8126] with this document as a reference.  
The initial content of the registry should be as below.

Type	bit(s)	Name	Reference
0	0-7	Reserved	[RFC3973] [RFC7761]
1	0-7	Reserved	[RFC3973] [RFC7761]
2	0-7	Reserved	[RFC3973] [RFC7761]
3	0-7	Reserved	[RFC3973] [RFC7761]
4	0-6	Reserved	[RFC3973] [RFC7761]
4	7	No-Forward	[RFC5059]
5	0-7	Reserved	[RFC3973] [RFC7761]
6	0-7	Reserved	[RFC3973] [RFC7761]
7	0-7	Reserved	[RFC3973] [RFC7761]
8	0-7	Reserved	[RFC3973] [RFC7761]
9	0-7	Reserved	[RFC3973] [RFC7761]
10	0-3	Reserved	[RFC3973] [RFC7761]
10	4-7	Sub-type	[RFC5015]
11	0-7	Reserved	[RFC6754]
12	0-6	Reserved	[RFC3973] [RFC7761]
12	7	No-Forward	[RFC8364]
13	0-3	N/A (used by 13.0-13.15)	[this document]
13	4-7	Extended type	[this document]
13.0-13.15	0-3	Reserved	[this document]
14	0-3	N/A (used by 14.0-14.15)	[this document]
14	4-7	Extended type	[this document]
14.0-14.15	0-3	Reserved	[this document]
15	0-3	N/A (used by 15.0-15.15)	[this document]
15	4-7	Extended type	[this document]
15.0-15.15	0-3	Reserved	[this document]

## 8. References

### 8.1. 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>>.
- [RFC3973] Adams, A., Nicholas, J., and W. Siadak, "Protocol Independent Multicast - Dense Mode (PIM-DM): Protocol Specification (Revised)", [RFC 3973](#), DOI 10.17487/RFC3973, January 2005, <<https://www.rfc-editor.org/info/rfc3973>>.



- [RFC5015] Handley, M., Kouvelas, I., Speakman, T., and L. Vicisano, "Bidirectional Protocol Independent Multicast (BIDIR-PIM)", [RFC 5015](#), DOI 10.17487/RFC5015, October 2007, <<https://www.rfc-editor.org/info/rfc5015>>.
- [RFC5059] Bhaskar, N., Gall, A., Lingard, J., and S. Venaas, "Bootstrap Router (BSR) Mechanism for Protocol Independent Multicast (PIM)", [RFC 5059](#), DOI 10.17487/RFC5059, January 2008, <<https://www.rfc-editor.org/info/rfc5059>>.
- [RFC6754] Cai, Y., Wei, L., Ou, H., Arya, V., and S. Jethwani, "Protocol Independent Multicast Equal-Cost Multipath (ECMP) Redirect", [RFC 6754](#), DOI 10.17487/RFC6754, October 2012, <<https://www.rfc-editor.org/info/rfc6754>>.
- [RFC7761] Fenner, B., Handley, M., Holbrook, H., Kouvelas, I., Parekh, R., Zhang, Z., and L. Zheng, "Protocol Independent Multicast - Sparse Mode (PIM-SM): Protocol Specification (Revised)", STD 83, [RFC 7761](#), DOI 10.17487/RFC7761, March 2016, <<https://www.rfc-editor.org/info/rfc7761>>.
- [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>>.
- [RFC8364] Wijnands, IJ., Venaas, S., Brig, M., and A. Jonasson, "PIM Flooding Mechanism (PFM) and Source Discovery (SD)", [RFC 8364](#), DOI 10.17487/RFC8364, March 2018, <<https://www.rfc-editor.org/info/rfc8364>>.

## **[8.2.](#) Informative References**

- [RFC6166] Venaas, S., "A Registry for PIM Message Types", [RFC 6166](#), DOI 10.17487/RFC6166, April 2011, <<https://www.rfc-editor.org/info/rfc6166>>.

Authors' Addresses



Stig Venaas  
Cisco Systems, Inc.  
Tasman Drive  
San Jose CA 95134  
USA

Email: stig@cisco.com

Alvaro Retana  
Futurewei Technologies, Inc.  
2330 Central Expressway  
Santa Clara CA 95050  
USA

Email: aretana@futurewei.com