Network Working Group
Internet-Draft
Intended status: Standards Track
Expires: January 1, 2017

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June 30, 2016

A Transport-Independent Bit Index Explicit Replication (BIER) Encapsulation Header
draft-xu-bier-encapsulation-05

Abstract

Bit Index Explicit Replication (BIER) is a new multicast forwarding paradigm which doesn't require an explicit tree-building protocol nor intermediate routers to maintain any multicast state. This document proposes a transport-independent BIER encapsulation header which is applicable regardless of the underlying transport technology.

Status of This Memo

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

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This Internet-Draft will expire on January 1, 2017.

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1. Introduction

Bit Index Explicit Replication (BIER) [I-D.ietf-bier-architecture] is a new multicast forwarding paradigm which doesn't require an explicit tree-building protocol nor intermediate routers to maintain any multicast state. As described in [I-D.ietf-bier-architecture], BIER adds a header to a multicast data packet (e.g., an IP packet or an MPLS packet). The BIER header carries the information needed for supporting the BIER forwarding procedures. This information at least includes Subdomain-ID, Set-Identifier (SI) and BitString. Subdomain-ID, SI and BitString are used together to identify the set of Bit-Forwarding Egress Routers (BFERs) to which the packet must be delivered. In addition, a Protocol Type field is neccessary to indicate what type of payload is following the BIER header. This document proposes a transport-independent BIER encapsulation header which is applicable regardless of the underlying transport technology.

1.1. Requirements Language

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 RFC 2119 [RFC2119].

2. Terminology

This memo makes use of the terms defined in [I-D.ietf-bier-architecture].

3. BIER Header

The BIER header is shown in Figure 1.

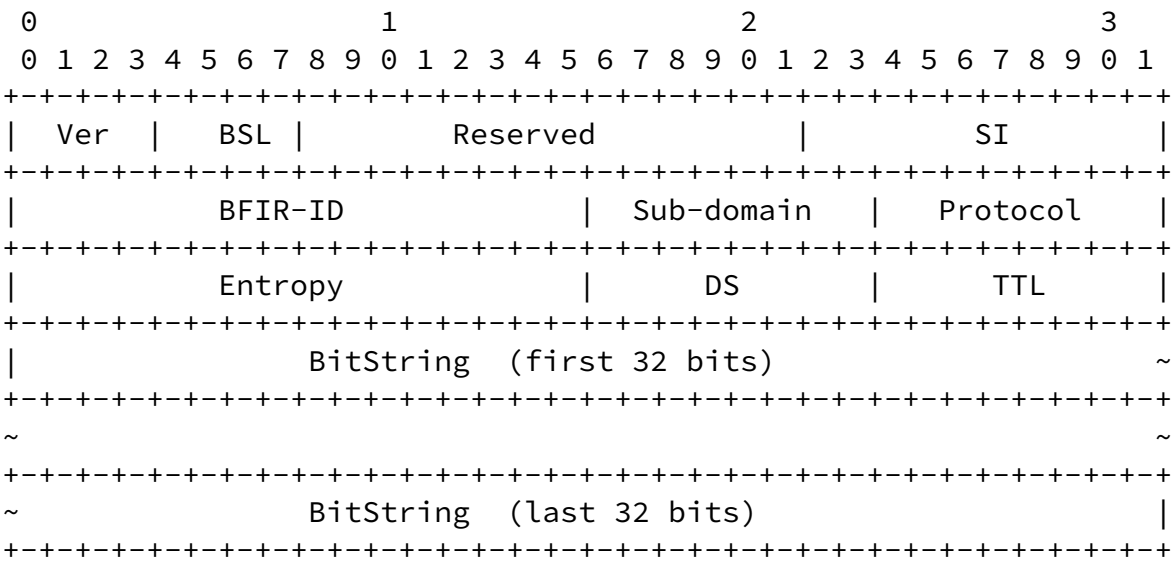

Figure 1: BIER Header Format.

Ver(sion): a 4-bit field identifying the version of the BIER header. This document specifies version 0 of the BIER header.

BSL: Bit String Length. If k is the length of the BitString, the value of this field is log2(k)-5. However, only the following values are supported [I-D.ietf-bier-mpls-encapsulation] :

* 64 bits

* 128 bits

* 256 bits

* 512 bits

* 1024 bits

* 2048 bits

* 4096 bits

The value of the BSL field MUST NOT be set to any value other than those listed above. A received packet containing another value in this field SHOULD be discarded, and an error logged.

SI: a 10-bit field encoding the Set-Identifier (SI) for this packet.

BFIR-ID: a 2-octet field encoding the BFR-ID of the Bit-Forwarding Ingress Router (BFIR), in the BIER sub-domain where the packet is forwarded to.

Sub-domain: a one-octet field encoding the sub-domain where the packet is forwarded to.

Protocol: a one-octet field indicating the protocol type of the BIER payload as per the protocol numbers used in the Protocol field [RFC5237]of the IPv4 header and the Next Header field of an IPv6 header. The valid BIER payload types include (but are not limited to) IPv4, IPv6, MPLS, VXLAN [RFC7348],VXLAN-GPE [I-D.ietf-nvo3-vxlan-gpe]. The corresponding IP Protocol numbers for VXLAN and VXLAN-GPE are to be allocated by IANA.

Entropy: a 2-octet field containing an "entropy" value that can be used for load balancing purposes.

BitString: a variable-length BitString field that, together with the SI field, identifies all the destination BFERs for this packet.

DS: The usage of this field is no different from that of the Differentiated Services (DS) field of IPv4 and IPv6 headers. [RFC2474].

TTL: The usage of this field is no different from that of the Time To Live (TTL) field in the IPv4 header.

4. BIER Header Transport

Since the BIER header format as specified in Section 3 is transport-independent by design, it can be carried with any type of transport encapsulation headers, such as an Ethernet header, a PPP header, an IP header, an MPLS header, a GRE header, an UDP header etc. Any possible transport encapsulation header must be able to indicate the payload is an BIER header. For instance, in the BIER-in-MAC encapsulation case, the EtherType [ETYPES] field of the Ethernet header is used for that purpose. In the BIER-in-IP encapsulation

case, the Protocol field of the IPv4 header or or the Next-Header field of the IPv6 header are used. In the BIER-in-MPLS encapsulation case, either the Protocol Type field [I-D.xu-mpls-payload-protocol-identifier] within the MPLS packet or a yet-to-be-assigned Extended Special Purpose label [RFC7274] can be used.

5. Acknowledgements

Thanks Antoni Przygienda and IJsbrand Wijnands for their valuable comments and suggestions on this document.

6. IANA Considerations

This document includes a request to IANA to allocate an EtherType code,a PPP protocol code, an IPv4 protocol code, an IPv6 Next-Header code, a UDP destination port to indicate that BIER-encapsulated data follows. Furthermore, this document includes a request to IANA to allocate IP Protocol numbers for VXLAN and VXLAN-GPE respectively.

7. Security Considerations

As mentioned in [I-D.ietf-bier-architecture], when BIER is paired with any transport underlay, it inherits the security considerations of the corresponding transport layer. Also, SI and BFIR-ID fields of the BIER header may carry values other than those intended by the BFIR at the risk of misdelivering the packet. Means to protect BFR routers against Man-in-the-Middle and Denial of Service attacks must be provided.

8. References

8.1. Normative References

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8.2. Informative References

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