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Export of BIER Information in IP Flow Information Export (IPFIX)
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Abstract

This document introduces new IP Flow Information Export (IPFIX) Information Elements (IEs) to identify a set of information related to Bit Index Explicit Replication (BIER) such as data contained in BIER header that traffic is being forwarded with.

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 26 July 2026.

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1. Introduction

[RFC8279] introduces a novel multicast data packet forwarding architecture known as "Bit Index Explicit Replication" (BIER). This architecture achieves optimal forwarding within a "multicast domain" without relying on explicit tree-building protocols or requiring intermediate nodes to maintain per-flow state. Currently, BIER technology has been widely adopted in modern data centers and large-scale networks, significantly enhancing the efficiency and scalability of multicast transmission.

[RFC8296] defines the encapsulation of BIER header that provides the information needed to support the BIER forwarding procedures.

This document specifies new IPFIX Information Elements (IEs) within the "IPFIX Information Elements" registry [RFC7012], for BIER purposes. These IEs are used to export the main parameters of BIER flow.

2. Terminology

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.

This document makes use of the terms defined in [RFC7011].

The following terms are used as defined in [RFC7011]:

* IPFIX

* IPFIX Information Elements

The following terms are used as defined in [RFC8296]:

* TC

* TTL

* BFR

* BIFT

* BFIR

* BFER

* BSL

* SD

* SI

3. New IPFIX BIER Information Elements

This section specifies the new IPFIX BIER IEs.

bierBIFTidSection
: The BIFT-id, TC, and S fields defined in the initial three octets of the BIER header (Section 2 of [RFC8296]).

bierTTL
: The value of the TTL field in the BIER header (Section 2 of [RFC8296]). This IE indicates the incoming Time to Live (TTL) when a BIER packet is received.

bierFromMPLSNetwork
This IE indicates whether the BIER packet is from an MPLS network.

bierVersion
The version of the BIER header (Section 2 of [RFC8296]).

bierBSL
The value of the BSL field in the BIER header (Section 2 of [RFC8296]). This IE indicates the length in bits of the BitString defined in the BIER header (Section 2 of [RFC8296]).

bierEntropy
The value of the Entropy field in the BIER header (Section 2 of [RFC8296]). It is can be used for load-balancing purposes.

bierOAMSection
The OAM and Rsv field from the BIER header (Section 2 of [RFC8296]).

bierDSCP
The value of the DSCP field in the BIER header (Section 2 of [RFC8296]). In Non-MPLS networks, it is used to hold a Differentiated Services Codepoint [RFC2474].

bierNextProtocol
The next protocol defined in the Proto field of the BIER header (Section 2 of [RFC8296]). It identifies the type of the payload following the BIER header.

bierBFIRid
The value of the BFIR-id field in the BIER header (Section 2 of [RFC8296]). It indicates the BFR-id of the BFIR in the SD to which the packet has been assigned.

bierBitString
The BitString field defined in the BIER header (Section 2 of [RFC8296]). Together with the packet’s SI and SD, it identifies the destination BFERs for this packet.

4. Sample Use Cases

The IPFIX IEs defined in the Section 3, and some existing IP packet header information [IANA-IPFIX] provide answers to the following questions (amongst others).

* Whether the IP packet is a BIER packet?

* Whether the BIER packet is from an MPLS network?

* What is the incoming TTL of the BIER packet?

* What is BIER version used by the BIER packet?

* What is the type of the payload following the BIER header in the BIER packet?

* What is the destination BFERs for the BIER packet?

5. Security Considerations

There exists no extra security considerations other than those already discussed in Section 11 of [RFC7011] and Section 8 of [RFC7012].

6. IANA Considerations

6.1. IPFIX Information Elements

This document requests IANA to add new IPFIX BIER IEs to the "IPFIX Information Elements" registry [RFC7012] available at [IANA-IPFIX].

Table 1 lists the new IPFIX BIER IEs:

Element ID	Name	Reference
TBD1	bierBIFTidSection	This document
TBD2	bierTTL	This document
TBD3	bierFromMPLSNetwork	This document
TBD4	bierVersion	This document
TBD5	bierBSL	This document
TBD6	bierEntropy	This document
TBD7	bierOAMSection	This document
TBD8	bierDSCP	This document
TBD9	bierNextProtocol	This document
TBD10	bierBFIRid	This document
TBD11	bierBitString	This document

Table 1: New BIER IEs in the "IPFIX Information Elements" Registry

6.1.1. bierBIFTidSection

ElementID: TBD1

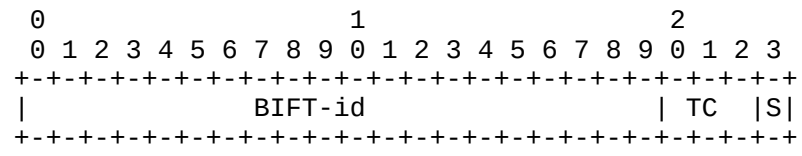
Name: bierBIFTidSection

Abstract Data Type: octetArray

Data Type Semantics: identifier

Status: current

Description: The BIFT-id, TC, and S fields defined in the initial three octets of the BIER header. The size of this information Element is 3 octets.



BIFT-id: BIFT id, 20 bits
TC: Traffic Class, 3 bits
S: Set to 1, 1 bit

Additional Information: See Section 2 of [RFC8296] for more details about the BIFT-id, TC, and S fields.

Reference: [this document]

6.1.2. bierTTL

ElementID: TBD2

Name: bierTTL

Abstract Data Type: unsigned8

Data Type Semantics: default

Status: current

Description: The value of the TTL field in the BIER header. This Information Element indicates the incoming TTL when a BIER packet is received.

Units: hops

Additional Information: See Section 2 of [RFC8296] for more details about the TTL fields.

Reference: [this document]

6.1.3. bierFromMPLSNetwork

ElementID: TBD3

Name: bierFromMPLSNetwork

Abstract Data Type: boolean

Data Type Semantics: default

Status: current

Description: This IE indicates whether the BIER packet is from an MPLS network.

Additional Information: In MPLS networks, the Nibble field of the BIER header MUST be set to the binary value 0101. In Non-MPLS networks, the Nibble field is set to the binary value 0000. Therefore, the Nibble field can be used to identify whether a BIER packet is from an MPLS network. See Section 2 of [RFC8296] for more details.

Reference: [this document]

6.1.4. bierVersion

ElementID: TBD4

Name: bierVersion

Abstract Data Type: unsigned8

Data Type Semantics: identifier

Status: current

Description: The version value of the Ver field in the BIER header.

This Information Element encodes only the 4 bits of the Ver field. Therefore, its value may range from 0 to 0xF.

Additional Information: See Section 2 of [RFC8296] for more details about the Ver field of the BIER header.

Reference: [this document]

6.1.5. bierBSL

ElementID: TBD5

Name: bierBSL

Abstract Data Type: unsigned8

Data Type Semantics: default

Status: current

Description: The value of the BSL field in the BIER header. This Information Element indicates the length in bits of the BitString defined in the BIER header.

This Information Element encodes only the 4 bits of the BSL field. Therefore, its value may range from 0 to 15.

Additional Information: See Section 2 of [RFC8296] for more details about the BSL field of the BIER header.

Reference: [this document]

6.1.6. bierEntropy

ElementID: TBD6

Name: bierEntropy

Abstract Data Type: unsigned32

Data Type Semantics: default

Status: current

Description: The value of the Entropy field in the BIER header. This Information Element indicates the function of load-balancing.

This Information Element encodes only the 20 bits of the Entropy field. Therefore, its value may range from 0 to 0xFFFFF.

Additional Information: See Section 2 of [RFC8296] for more details about the Entropy field of the BIER header.

Reference: [this document]

6.1.7. bierOAMSection

ElementID: TBD7

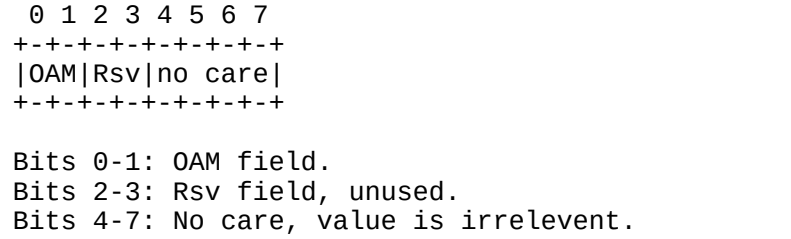
Name: bierOAMSection

Abstract Data Type: unsigned8

Data Type Semantics: flags

Status: current

Description: The OAM and Rsv field from the BIER header.



Additional Information: See Section 2 of [RFC8296] for more details about the OAM and Rsv field of the BIER header.

Reference: [this document]

6.1.8. bierDSCP

ElementID: TBD8

Name: bierDSCP

Abstract Data Type: unsigned8

Data Type Semantics: identifier

Status: current

Description: The value of the DSCP field in the BIER header. In Non-MPLS networks, it is used to hold a Differentiated Services Codepoint.

This Information Element encodes only the 6 bits of the DSCP field. Therefore, its value may range from 0 to 63.

Additional Information: See Section 2 of [RFC8296] for more details about the DSCP field of the BIER header.

Reference: [this document]

6.1.9. bierNextProtocol

ElementID: TBD9

Name: bierNextProtocol

Abstract Data Type: unsigned8

Data Type Semantics: identifier

Status: current

Description: The next protocol defined in the Proto field of the BIER header. This Information Element identifies the type of the payload following the BIER header.

This Information Element encodes only the 6 bits of the Proto field. Therefore, its value may range from 0 to 63.

Additional Information: See Section 2 of [RFC8296] for more details about the Proto field of the BIER header.

Reference: [this document]

6.1.10. bierBFIRid

ElementID: TBD10

Name: bierBFIRid

Abstract Data Type: unsigned16

Data Type Semantics: identifier

Status: current

Description: The value of the BFIR-id field in the BIER header. This Information Element identifies the BFR-id of the BFIR in the SD to which the packet has been assigned.

Additional Information: See Section 2 of [RFC8296] for more details about the BFIR-id field of the BIER header.

Reference: [this document]

6.1.11. bierBitString

ElementID: TBD11

Name: bierBitString

Abstract Data Type: octetArray

Data Type Semantics: identifier

Status: current

Description: The BitString field defined in the BIER header.

Together with the packet's SI and SD, this information Element identifies the destination BFERs for this packet.

Additional Information: See Section 2 of [RFC8296] for more details about the BitString field of the BIER header.

Reference: [this document]

7. References

7.1. 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>.

[RFC2474] Nichols, K., Blake, S., Baker, F., and D. Black, "Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers", RFC 2474, DOI 10.17487/RFC2474, December 1998, <https://www.rfc-editor.org/info/rfc2474>.

[RFC7011] Claise, B., Ed., Trammell, B., Ed., and P. Aitken, "Specification of the IP Flow Information Export (IPFIX) Protocol for the Exchange of Flow Information", STD 77, RFC 7011, DOI 10.17487/RFC7011, September 2013, <https://www.rfc-editor.org/info/rfc7011>.

[RFC7012] Claise, B., Ed. and B. Trammell, Ed., "Information Model for IP Flow Information Export (IPFIX)", RFC 7012, DOI 10.17487/RFC7012, September 2013, <https://www.rfc-editor.org/info/rfc7012>.

[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>.

[RFC8279] Wijnands, IJ., Ed., Rosen, E., Ed., Dolganow, A., Przygienda, T., and S. Aldrin, "Multicast Using Bit Index Explicit Replication (BIER)", RFC 8279, DOI 10.17487/RFC8279, November 2017, <https://www.rfc-editor.org/info/rfc8279>.

[RFC8296] Wijnands, IJ., Ed., Rosen, E., Ed., Dolganow, A., Tantsura, J., Aldrin, S., and I. Meilik, "Encapsulation for Bit Index Explicit Replication (BIER) in MPLS and Non-MPLS Networks", RFC 8296, DOI 10.17487/RFC8296, January 2018, <https://www.rfc-editor.org/info/rfc8296>.

7.2. Informative References

[IANA-IPFIX] "IP Flow Information Export (IPFIX) Entities", n.d., <https://www.iana.org/assignments/ipfix/ipfix.xhtml>.

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