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**BIER BFD**  
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Abstract

Point to multipoint (P2MP) BFD is designed to verify multipoint connectivity. This document specifies the application of P2MP BFD in BIER network.

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## [1. Introduction](#)

Bit Index Explicit Replication (BIER) [[RFC8279](#)] provides optimal forwarding of multicast data packets through a multicast domain. It does so without requiring any explicit tree-building protocol and without requiring intermediate nodes to maintain any per-flow state. BIER resilience use cases are described in [[I-D.xiong-bier-resilience](#)] including End-to-End 1+1 and 1:1 Protection and the failure detection mechanisms MAY use P2MP BFD and P2MP active tail detection method respectively.

[[I-D.ietf-bfd-multipoint](#)] defines a method of using Bidirectional Forwarding Detection(BFD) to monitor and detect unicast failures between the sender (head) and one or more receivers (tails) in multipoint or multicast networks. [[I-D.ietf-bfd-multipoint-active-tail](#)] describes active tail extensions to the BFD protocol for multipoint networks.

This document describes the procedures for using such mode of BFD protocol to verify multipoint or multicast connectivity between a multipoint sender (the "head", Bit-Forwarding Ingress Routers(BFIRs)) and a set of one or more multipoint receivers (the"tails", Bit-Forwarding Egress Routers(BFERs)). The BIER BFD only supports the



unidirectional multicast. This document defines the use of P2MP BFD as per [[I-D.ietf-bfd-multipoint](#)], and active tail as per [[I-D.ietf-bfd-multipoint-active-tail](#)] for BIER-specific domain.

## **2. Conventions used in this document**

### **2.1. Terminology**

This document uses the acronyms defined in [[RFC8279](#)] along with the following:

BFD: Bidirectional Forwarding Detection.

OAM: Operations, Administration, and Maintenance.

P2MP: Point to Multi-Point.

### **2.2. Requirements Language**

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. BIER BFD Encapsulation**

BIER BFD encapsulation uses the BIER OAM packet format defined in [[I-D.ietf-bier-ping](#)]. The value of the Msg Type field MUST be set to BIER BFD (TBD1 by IANA ). BFD Control packet, defined in [Section 4](#) [[RFC5880](#)] immediately follows the BIER OAM header.

## **4. Bootstrapping BIER BFD**

### **4.1. BIER OAM Ping Bootstrap**

The BIER OAM ping could be used for BIER BFD bootstrap. The BFIR sends the BIER OAM ping Echo request messages carrying a BFD discriminator TLV which immediately follows the Target SI-Bitstring TLV ([section 3.3.2](#) [[I-D.ietf-bier-ping](#)]) which MUST be included to carry the set of BFER information (Sub-domain-id, Set ID, BS Len, Bitstring) for the purpose of session establishment.

The BFD discriminator TLV is a new TLV for BIER OAM TLV with the type (TBD2 by IANA) and the length of 4. The value contains the 4-byte local discriminator generated by BFIR for this session.



## 4.2. IGP protocol Bootstrap

An alternative option to bootstrap the BIER BFD is to advertise the BFD information IGP protocol in control plane. This document defines a new BIER BFD Sub-TLV carried in IS-IS and OSPF capability to advertise My Discriminator for BFIR.

### 4.2.1. IS-IS extension for BIER BFD

The new BIER BFD Sub-TLV is carried in the ISIS router capability TLV. The format is as follows.

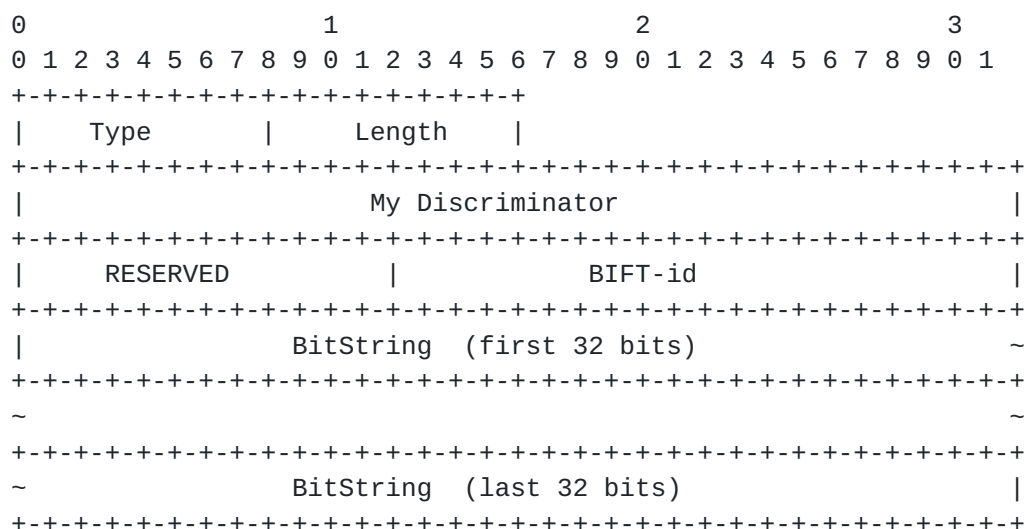


Figure 1: BIER BFD Sub-TLV for IS-IS extension

Type : TBD3 by IANA.

Length : Length of the BIER BFD Sub-TLV for IS-IS extension, in bytes.

My Discriminator : A unique, nonzero discriminator value generated by BFIR for each multipoint path.

The BitString field carries the set of BFR-IDs of BFER(s) that the BFIR expects to establish BIER BFD session.

The BIFT-id represents a particular Bit Index Forwarding Table (BIFT) as per [\[RFC8279\]](#).



#### 4.2.2. OSPF extension for BIER BFD

The new BIER BFD Sub-TLV is carried in the Router Information Link State Advertisement (LSA). The format is as follows.

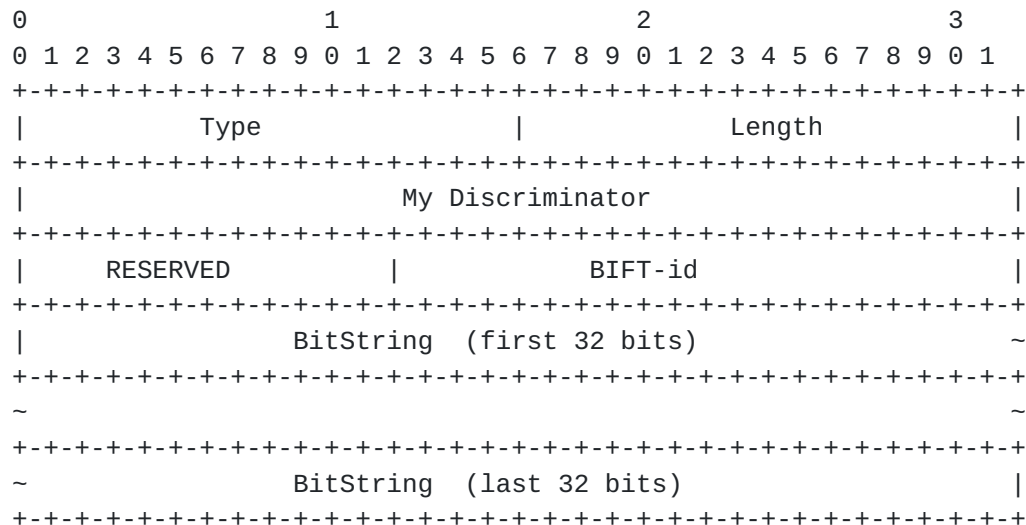


Figure 2: BIER BFD Sub-TLV for OSPF extension

Type : TBD4 by IANA.

Length : Length of the BIER BFD Sub-TLV for OSPF extension, in bytes.

Other fields in BIER BFD Sub-TLV is the same with [section 4.2.1](#).

### 5. Discriminators and Packet Demultiplexing

The tail(BFER) demultiplexes incoming BFD packets based on a combination of the source address and My discriminator as specified in [\[I-D.ietf-bfd-multipoint\]](#). The source address is BFIR-id and BIER MPLS Label (MPLS network) or BFIR-id and BIFT-id (Non-MPLS network) for BIER BFD.

### 6. Active Tail in BIER BFD

[\[I-D.ietf-bfd-multipoint-active-tail\]](#) defined an extension for Multipoint BFD, which allows tails to notify the head of the lack of multipoint connectivity. For BIER BFD in active tail mode, the BFIR may learn the state and connectivity of the BFERs. As per [\[I-D.ietf-bfd-multipoint-active-tail\]](#), the BFIR can send the Poll sequence messages in combination with the unicast BFD over the monitored BFERs.





## 7. Security Considerations

For BIER OAM packet processing security considerations, see [\[I-D.ietf-bier-ping\]](#).

For general multipoint BFD security considerations, see [\[I-D.ietf-bfd-multipoint\]](#).

No additional security issues are raised in this document beyond those that exist in the referenced BFD documents.

## 8. Acknowledgements

Authors would like to thank the comments and suggestions from Jeffrey (Zhaohui) Zhang, Donald Eastlake 3rd.

## 9. IANA Considerations

IANA is requested to assign new type from the BIER OAM Message Type registry as follows:

Value	Description	Reference
TBD1	BIER BFD	[this document]
TBD2	BFD discriminator TLV	[this document]
TBD3	BIER BFD Sub-TLV for IS-IS	[this document]
TBD4	BIER BFD Sub-TLV for OSPF	[this document]

Table 1

## 10. References

### 10.1. Normative References

[I-D.ietf-bfd-multipoint]

Katz, D., Ward, D., Networks, J., and G. Mirsky, "BFD for Multipoint Networks", [draft-ietf-bfd-multipoint-19](#) (work in progress), December 2018.

[I-D.ietf-bier-ping]

Kumar, N., Pignataro, C., Akiya, N., Zheng, L., Chen, M., and G. Mirsky, "BIER Ping and Trace", [draft-ietf-bier-ping-04](#) (work in progress), October 2018.



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[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>>.

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## **10.2. Informative References**

[I-D.ietf-bfd-multipoint-active-tail]

Katz, D., Ward, D., Networks, J., and G. Mirsky, "BFD Multipoint Active Tails.", [draft-ietf-bfd-multipoint-active-tail-10](#) (work in progress), November 2018.

[ISO9577] ISO/IEC TR 9577:1999,, "International Organization for Standardization "Information technology - Telecommunications and Information exchange between systems - Protocol identification in the network layer"", 1999.



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