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Support of Point-to-Multipoint Bidirectional Forwarding Detection (BFD) in Transparent Interconnection of Lots of Links (TRILL)

Abstract

Point-to-multipoint (P2MP) Bidirectional Forwarding Detection (BFD) is designed to verify multipoint connectivity. This document specifies the support of P2MP BFD in Transparent Interconnection of Lots of Links (TRILL). Similar to TRILL point-to-point BFD, BFD Control packets in TRILL P2MP BFD are transmitted using RBridge Channel messages. This document updates RFCs 7175 and 7177.

Status of This Memo

This is an Internet Standards Track document.

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Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at https://www.rfc-editor.org/info/rfc8564.

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1. Introduction

TRILL supports multicast forwarding. Applications based on TRILL multicast may need quick detection of multicast failures using P2MP BFD [RFC8562]. This document specifies TRILL support of P2MP BFD.

To use P2MP BFD, the head end needs to periodically transmit BFD Control packets to all tails using TRILL multicast. A new RBridge Channel message is allocated for this purpose.

In order to execute the global protection of distribution used for multicast forwarding [TRILL-TREES], the head needs to track the active status of tails [RFC8563]. If the tail loses connectivity as detected by not receiving the new RBridge Channel message from the head, the tail should notify the head of the lack of multipoint

connectivity with unicast BFD Control packets. These unicast BFD Control packets are transmitted using the existing RBridge Channel message assigned to BFD Control [RFC7175].

This document updates [RFC7177] as specified in Section 3 and updates [RFC7175] as specified in Sections 4 and 5.

2. Acronyms and Terminology

2.1. Acronyms

Data Label: VLAN or Fine-Grained Label [RFC7172].

BFD: Bidirectional Forwarding Detection

P2MP: Point to Multipoint

TRILL: Transparent Interconnection of Lots of Links or Tunneled Routing in the Link Layer

2.2. 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.

Familiarity with [RFC6325], [RFC7175], and [RFC7178] is assumed in this document.

3. Bootstrapping

The TRILL adjacency mechanism bootstraps the establishment of one-hop TRILL BFD sessions [RFC7177]. Multi-hop sessions are expected to be configured by the network manager. A slight wording update to the second sentence in Section 6 of [RFC7177] is required.

It currently reads:

> If an RBridge supports BFD [RFC7175], it will have learned whether the other RBridge has BFD enabled by whether or not a BFD-Enabled TLV [RFC6213] was included in its Hellos.

Now it should read:

> If an RBridge supports BFD (see [RFC7175] and [RFC8564]), it will have learned whether the other RBridge has BFD enabled by whether or not a BFD-Enabled TLV [RFC6213] was included in its Hellos.

In addition, a normative reference to this document is added to RFC 7177 as a result of this update.

4. A New RBridge Channel Message for P2MP BFD

RBridge Channel protocol number 0x002 is defined for TRILL point-to-point BFD Control packets in [RFC7175]. That RFC states that if the M bit of the TRILL Header of the RBridge Channel packet containing a BFD Control packet is nonzero, the packet is generally dropped. In P2MP BFD, the head is required to probe tails using multicast. This means the M bit will be set to 1. For this reason, a new RBridge Channel message (P2MP BFD Control), whose protocol code point is 0x007, is specified in this document. An RBridge that supports P2MP BFD MUST support the new RBridge Channel message for P2MP BFD. The capability to support the RBridge Channel message for P2MP BFD, and therefore support performing P2MP BFD, is announced within the RBridge Channel Protocols sub-TLV in Link State PDUs (LSPs) [RFC7176].

As specified in [RFC7178], when the tail receives TRILL Data packets sent as BFD RBridge Channel messages, it will absorb the packets itself rather than deliver these packets to its attached end stations.

5. Discriminators and Packet Demultiplexing

The processing in Section 3.2 of [RFC7175] generally applies except that the test on the M bit in the TRILL Header is reversed. If the M bit is zero, the packet MUST be discarded. If the M bit is one, it is processed.

After the processing per Section 3.2 of [RFC7175], the tail demultiplexes incoming BFD packets based on a combination of the source address and My Discriminator as specified in [RFC8562]. In addition to this combination, TRILL P2MP BFD requires that the tail use the Data Label, which is either the inner VLAN or the Fine-Grained Label [RFC7172], for demultiplexing. If the tail needs to notify the head about the failure of a multipath, the tail is required to send unicast BFD Control packets using the same Data Label as used by the head.

6. Tracking Active Tails

According to [RFC8562], the head has a session of type MultipointHead that is bound to a multipoint path. Multipoint BFD Control packets are sent by this session over the multipoint path, and no BFD Control packets are received by it. Each tail dynamically creates a MultipointTail per a multipoint path. MultipointTail sessions receive BFD Control packets from the head over multipoint paths.

An example use is when a multicast tree root needs to keep track of all the receivers as in [TRILL-TREES]; this can be done by maintaining a session of type MultipointClient per receiver that is of interest, as described in [RFC8563]. See [RFC8563] for detailed operations of tracking active tails.

7. Security Considerations

Multipoint BFD provides its own authentication but does not provide encryption (see the Security Considerations in [RFC8562]). As specified in this document, the point-to-multipoint BFD payloads are encapsulated in RBridge Channel messages that have been extended by [RFC7978] to provide security. [RFC7978] provides encryption only for point-to-point extended RBridge Channel messages, so its encryption facilities are not applicable to this document. However, [RFC7978] provides stronger authentication than that currently provided in BFD. Thus, there is little reason to use the BFD security mechanisms if authentication per [RFC7978] is in use. It is expected that a future TRILL document will provide for group keying; when that occurs, the use of RBridge Channel security [RFC7978] will be able to provide both encryption and authentication.

For general multipoint BFD security considerations, see [RFC8562].

For general RBridge Channel security considerations, see [RFC7178].

8. IANA Considerations

IANA has allocated the following from the Standards Action [RFC8126] range of the "RBridge Channel Protocols" registry, which is part of the "Transparent Interconnection of Lots of Links (TRILL) Parameters" registry.

Protocol	Number
P2MP BFD Control	0x007

9. References

9.1. Normative References

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