Bidirectional Forwarding Detection (BFD) for EVPN Ethernet Segment Failover Use Case
draft-zwm-bess-es-failover-01.txt

Abstract

This document introduces a method for fast switchover of Designated Forwarder for Ethernet Segment failover by using Bidirectional Forwarding Detection protocol.

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1. Introduction

[RFC7432] introduces Ethernet Virtual Private Network (EVPN) technology. Designated Forwarder (DF) election procedures for multihoming Ethernet Segments has been described in it. When PE (provider edge) receives BUM (Broadcast, Unknown Unicast and Multicast) flows, only DF forwards the BUM flows to CE (customer edge). Non-DFs do not forward the BUM flows in order to avoid duplication. If the link between DF and CE fails, another PE will forward the BUM flows after it is elected as DF.

[RFC8584] defines the DF election framework, including that Backup Designated Forwarder (BDF) can be elected as the next best for the role. But before the BDF is elected as DF, the BUM flows are discarded after the link between DF and CE fails.

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+-----+
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|     |
+-----X-----+ PE1 |
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+-----+

For example, CE is multihomed to PE1 and PE2. PE1 is elected as DF. All BUM flows are forwarded by PE1 when the link between PE1 and CE is operational. When the link between PE1 and CE fails, the BUM flows are discarded until PE2 is elected as DF.
This document will use terminology defined in [RFC7432] and [I-D.ietf-bess-evpn-lsp-ping].

2. Conventions used in this document

2.1. Terminology

BFD: Bidirectional Forwarding Detection
BDF: Backup Designated Forwarder
DF: Designated Forwarder
BUM: Broadcast, Unknown unicast, and Multicast
PE: Provider Edge
EVPN: Ethernet Virtual Private Network
CE: Customer Edge
ES: Ethernet Segment
ESI: Ethernet Segment Identifier

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. Proposal

In order to avoid the BUM packet loss on BDF after the link between
DF and CE fails, a data-plane detection function is needed for DF fast switchover. [RFC5884] provides mechanisms for using LSP Ping to
bootstrap a BFD session. [I-D.ietf-bess-evpn-lsp-ping] introduces
four new Target FEC Stack sub-TLVs that are included in the LSP-Ping
Echo Request packet. This document uses the mechanisms defined in
[RFC5884] and the EVPN Ethernet Auto-Discovery (AD) sub-TLV defined
in [I-D.ietf-bess-evpn-lsp-ping] to provide DF fast switchover by
data-plane failure detection.

An LSP-Ping Echo Request message which carries EVPN AD Sub-TLV
associated with the DF-CE Ethernet Segment Identifier (ESI) is used
to bootstrap the BFD session between BDF and DF. After the BFD
session is built, when the Ethernet Segment (ES) fault occurs on DF-CE link, BDF detects the fault by the state change BFD control packet sent by DF, or BDF detects the fault when the detection timer expires. Then BDF becomes DF and will forward the BUM flows to CE.

4. Specification

[I-D.ietf-bess-evpn-lsp-ping] section 4.3 defines an Ethernet AD sub-TLV as a new Target FEC Stack sub-TLV. It is carried in the LSP-Ping Echo Request message. BDF generates an LSP-Ping Echo Request message which carries the associated ES AD sub-TLV. And BDF sends the message with a local discriminator assigned by BDF for this BFD session to DF. DF responds with the BFD control packet with ‘Your discriminator’ set to the discriminator value received in the Echo request message from the BDF. BDF can demultiplex the BFD session based on the received ‘Your Discriminator’ field.

After the BFD session is established, when the link between DF and CE fails, DF MUST send a BFD control packet with the value of State field set to AdminDown through the established BFD session to BDF. If DF is not operational, BDF also detects the failure when the BFD detection time expires. Then BDF becomes DF immediately and forwards the BUM flows to CE.

When the ES between ‘old’ DF and CE recovers, the BFD session MAY be reused or a new BFD session can be established for the ES failover monitor.

For the same example in last section, PE2 generates an LSP-Ping Echo Request message which carries the associated ES AD sub-TLV and sends the message with an assigned local discriminator to DF. PE1 responds with a BFD control packet with ‘Your Discriminator’ set to the received discriminator from PE2. PE2 can demultiplex the BFD session based on the received ‘Your Discriminator’ field.

When the link between PE1 and CE fails, PE1 sends a BFD control packet with the state set to AdminDown to PE2 through the BFD session. If the packet is lost, PE2 also can detect the fault by the session detection time expiration. PE2 becomes DF immediately, then the BUM packets can be forwarded to CE.

The value of bfd.DetectMult (detect multiplier) determines when a BFD system detects a failure. Once BDF detects the loss of the number, equal to the detect multiplier, of consecutive BFD messages for the session between DF and BDF are lost, the BDF will elect itself as DF. Then, BUM flows are duplicated because of the two DFs. To avoid this situation, the bfd.DetectMult MUST be set to more than 1 (common default value is 3).
4.1. BDF changes

If a new router, which can become new BDF, joins the network, the 'old' BDF MUST send a number of consecutive BFD messages with the State set to AdminDown to DF, then DF will remove this BFD session. When DF receives a new session request from the new BDF, DF establishes a new BFD session with the new BDF.

5. Security Considerations

This document does not introduce any new security considerations other than already discussed in [RFC7432] and [RFC5884].

6. IANA Considerations

There is no IANA consideration.

7. Normative References

[I-D.ietf-bess-evpn-lsp-ping]


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