RSVP-TE Extensions for Bit Error Rate (BER) Measurement
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Zhenbin Li, Li Zhang
IETF 86, Atlanta, GA, USA

Introduction

- Bit Error Rate (BER) is a significant parameter for Mobile Backhaul Service

- In IP/MPLS Mobile Backhaul Network, MPLS TE LSP is used to carry the mobile service, which maybe encapsulated in PW or L3VPN end to end

- BER of MPLS TE LSP path should be advertised to all of the LSRs of this LSP, and the BER measurement value need to be collected by ingress LSR of this LSP for more protection work   measurement

- Here, we propose two extensions of RSVP-TE

    - to advertise the BER measure requirement of the specific LSP to its transit LSRs and egress LSR

    - and to report the BER measurement result from any transit or egress LSR towards the ingress LSR

Procedures

- Send BER measurement requirement: RSVP-TE Path Message will be sent with BER_REQUEST TLV, which is a new attribute TLV of LSP_ATTRIBUTE object. BER_REQUEST TLV will indicate the BER threshold of the specific LSP

- Receive BER measurement requirement: when a LSR receives the Path Message with BER_REQUEST TLV, it will start BER measurement for this LSP.

- Report BER measurement result: for a LSR, if the BER measurement value exceeds the threshold of a specific LSP, a PathErr Message MUST be sent towards the ingress LSR with BER Error Code with value 1 for bit error indication ; if the BER measurement value becomes less than the threshold, a PathErr Message with BER Error code with value 0 for bit error elimination MUST be sent towards the ingress LSR
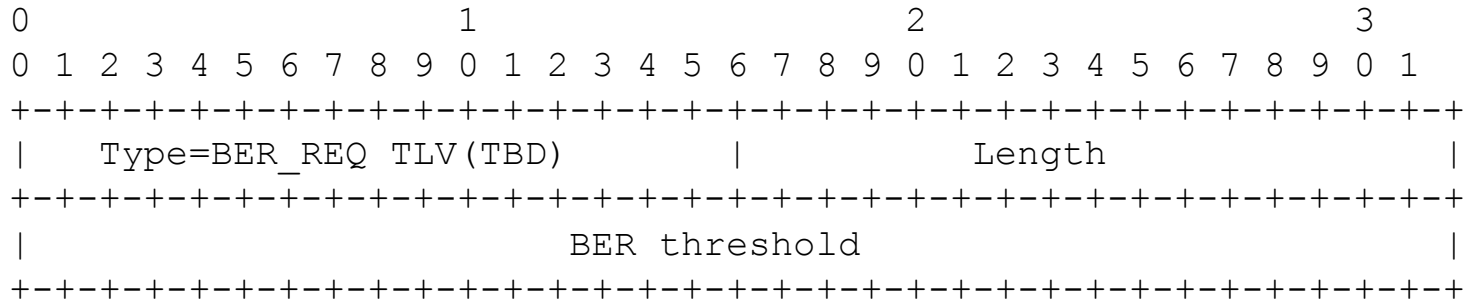
Considerations

- BER Measurement type: single-point BER measurement and multi-point BER measurement. The first one is to measure if the BER value of one point of the LSP path has exceeded the threshold of the service. The second one is to measure if the sum of BER value of multiple points of the LSP exceeds the threshold of the service. We only consider single-point BER measurement here, and multi-point BER measurement will be discussed in the future version.

- BER measurement requirement state: a LSP can require BER measurement or not, which will be advertised to the transit LSRs and egress LSR by Path Message with BER_REQUEST TLV or not.

- BER measurement result state: both the value exceeds the threshold or not should be reported towards the ingress LSR of the LSP by PathErr Message with BRE Error Code with value 1 or 0

RSVP-TE extension (1)

- BER_REQUEST TLV

```
                LSP_ATTRIBUTES Class=197, C-Type=1
                      Type=TBD,BER_REQ TLV

0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    Type=BER_REQ TLV(TBD)       |            Length            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        BER threshold                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

- Procedure
  - RSVP-TE Path Message SHOULD be sent with BER_REQUEST TLV to advertise the BER measurement requirement to the transit LSRs and egress LSR
  - If a LSP dose not require BER measurement anymore, a Path Message without BRE_REQUEST TLV SHOULD be sent
  - The LSR receiving the Path Message with BER_REQUEST TLV will start BER measurement for this LSP with the threshold value set in the TLV

RSVP-TE extension (2)

- Error code of BER measurement report

```
Error code                 Error value              Description
-----------------------------------------------------------------------------
   TBD "BER                    0                     bit error elimination
   measurement report"         1                     bit error indication
```

- Procedure
  - when the BER measurement value exceeds the threshold, a PathErr Message MUST be sent towards the ingress LSR of the LSP with the BER Error Code with Error Value 1 for bit error indication
  - When the BER measurement value is less than the threshold, the LSR MUST send a PathErr Message with BER Error Value 0 for bit error elimination

Summary

- RSVP-TE extensions for BER distribution can be used for all kinds of point-to-point TE LSP

- BER measurement requirement for the specific LSP should be advertised automatically, which will reduce the configuration work

- BER measurement result should be reported towards the LSP ingress LSR directly and promptly

- BER measurement for TE LSP can enhance the mobile backhaul network reliability

Next Steps

- Multi-point BRE measurement will be discussed later

- BER measurement for TE-FRR will be discussed later

- BER measurement for point-to-multipoint LSP will be discussed later, too