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RSVP-TE Extensions for Bit Error Rate (BER) Measurement
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Abstract

In the mobile backhaul network, the mobile service is sensitive to Bit Error Rate (BER). When the BER value of the service exceeds the threshold, the cell site equipments will stop working and the mobile terminal users cannot obtain voice and data services anymore. Now the mobile backhaul tends to be IP/MPLS network and MPLS TE LSP is used to bear the mobile service which may be encapsulated in PW or L3VPN end to end. Then the ingress Label Switched Router (LSR) of the MPLS TE LSP needs to get information on BER along the path of the LSP. This document proposes new extensions of RSVP-TE to advertise the BER measurement requirement of the specific LSP to all of the transit LSRs and the egress LSR, and to report the BER measurement result from any transit or egress LSR towards the ingress LSR.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

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1. Introduction

Bit Error Rate (BER) is a significant parameter for the mobile service, which can cause the cell site equipment to stop working when its value exceeds the threshold that the mobile service can tolerate. In IP/MPLS based mobile backhaul network, PW and L3VPN are adopted to bear the mobile service, and MPLS TE LSP is adopted as the transport tunnel for which Hot-standby (MPLS TE HSB) or fast reroute (MPLS TE FRR) technologies is used to meet the SLA(Service Level Agreement). There are different kinds of failure detection methods, such as BFD[RFC5884] or MPLS OAM[RFC4378], to trigger fast traffic switch when failure happens. But as to BER, even if the BER value exceeds the threshold, the detection mechanisms may be not able to detect the failure to trigger traffic switch to the backup path. In order to solve the issue, RSVP-TE extensions can be introduced to notify the ingress LSR of the BER measurement result when a specific LSR along

the LSP detects that the BER value exceeds the threshold or restores to the normal value below the threshold. When the ingress LSP receives the BER measurement result, it can switch the traffic between the primary path and the backup path which is policy specific and out of scope of the document.

This document defines new extensions of RSVP-TE for BER measurement: One extension is to advertise the BER measurement requirement to all of the transit LSRs and the egress LSR, then these LSRs along the path will start BER measurement for the LSP. The other extension is to report the BER measurement result from any transit LSR or the egress LSR towards the ingress LSR.

2. Terminology

BER: Bit Error Rate

RAN: Radio Access Network

LSR: Label Switch Router

LSP: Label Switch Path

3. BER_REQUEST TLV

3.1. Format of BER_REQUEST

Path Message of RSVP-TE is used to signal the BER measurement requirement of the LSP, and the LSP_ATTRIBUTES object will be included in the Path Message. The LSP_ATTRIBUTES object which is defined in [RFC5420] is used to signal attributes required in support of an LSP, or to indicate the nature or use of an LSP. The LSP_ATTRIBUTES object format is as below (refer to[RFC5420]):

LSP_ATTRIBUTES class = 197, C-Type = 1

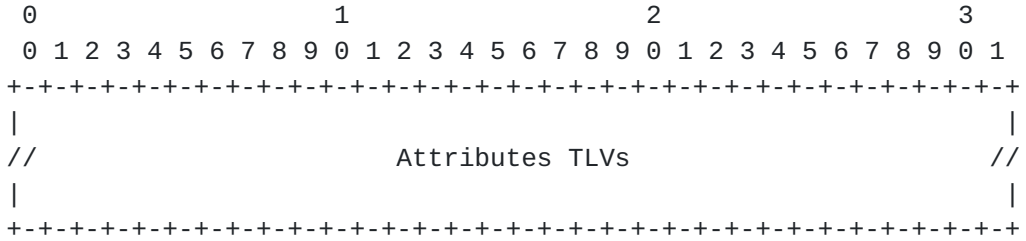

Figure 1: LSP_ATTRIBUTES object

The LSP_ATTRIBUTES object class is 197 of the form 11bbbbbb. This C-Num value (see [RFC2205], Section 3.10) ensures that LSRs that do

not recognize the object pass it on transparently. One C-Type is defined, C-Type = 1 for LSP Attributes.

The Attributes TLVs are encoded as below:

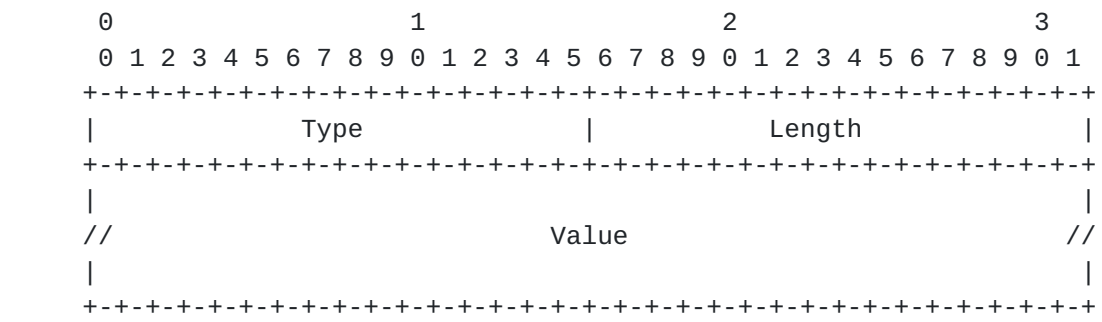

Figure 2: Attributes TLVs format

Here we define the BER_REQUEST TLV which is a new type of Attribute TLV to indicate the BER measurement requirement of the LSP. The format of BER_REQUEST TLV is as below:

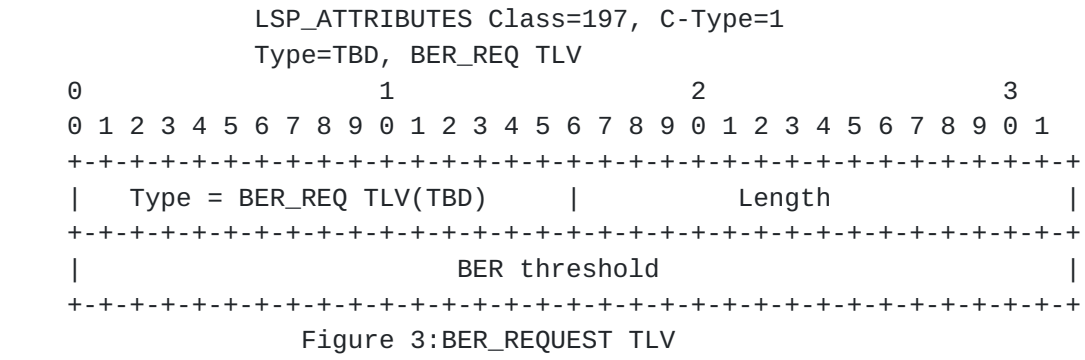

Figure 3:BER_REQUEST TLV

Type

The identifier of the BER_REQUEST TLV which should be allocated by IANA.

Length

Indicates the total length of the TLV in two octets.

Value

The BER threshold for the service. It is a 32-bit IEEE floating point number. The format of IEEE floating-point numbers is further summarized in [RFC1832].

3.2. Procedures for BER_REQUEST TLV

BER_REQUEST TLV is one type of attribute TLVs of the LSP_ATTRIBUTE object. It is optional and MAY be placed in Path messages to advertise the BER measurement requirement of the LSP. The process of the LSP_ATTRIBUTE object can refer to section 4.2 in [RFC5420].

When a RSVP-TE LSP requires the BER measurement of the path, the ingress LSR MUST send a Path Message with BER_REQUEST TLV in which the BER threshold value is set according to the service requirement.

When an LSR receives a Path Message with the BER_REQUEST TLV, the LSR SHOULD start the BER measurement for the LSP. The LSR MUST pass the Path Message with BER_REQUEST TLV unchanged to the next LSR. If the measured BER value exceeds the BER threshold value set in the BER_REQUEST TLV, the LSR MUST report the bit error result towards the ingress LSR of the LSP.

If an LSR cannot support the BER_REQUEST TLV, the LSR SHOULD ignore this TLV and pass the Path Message with BER_REQUEST TLV unchanged to the next LSR.

For an LSR which has started the BER measurement on receiving the Path Message with the BER_REQUEST UEST TLV, if the LSR receives the updated Path Message without BER_REQUEST TLV, it MUST stop the BER measurement for this LSP and pass the Path Message unchanged to the next LSR.

4. BER Measurement Result Report

For an LSR that starts the BER measurement, When the BER measurement value exceeds the threshold for the service, the LSR MUST report the indication of bit error towards the ingress LSR of the LSP. If the LSR has already reported the indication of bit error, it MUST report the elimination of bit error towards the ingress LSR when it measures that the BER is blow the specified threshold. A new type of Error Code and its Error Value of the ERROR_SPEC object are defined to report the BER measurement result within PathErr Message.

4.1. Error Code for BER measurement report

The ERROR_SPEC object is defined in [RFC2205] and [RFC3209]. The BER Error Code and its Error Values are defined as below:

Error Code	Error Value	Description
TBD	0	Bit Error Elimination
	1	Bit Error Indication

4.2. Procedures for BER Error Code

The BER measurement result is reported through a new Error Code and the corresponding Error Value of the ERROR_SPEC object which is placed in PathErr Message.

For a LSR which has started the BER measurement for the specific LSP, if the BER measurement value exceeds the threshold of the service, a PathErr Message MUST be sent towards the ingress LSR of this LSP. The PathErr Message MUST include an ERROR_SPEC object with the BER Error code and Error Value 1 for Bit Error Indication. When the BER measurement value becomes less than the BER threshold value after report the Bit Error Indication, the LSR MUST send a PathErr Message including an ERROR_SPEC object with the BER Error Code and Error Value 0 for Bit Error Elimination.

5. IANA Considerations

IANA should allocate the type value of the BER_REQUEST TLV and the BER Error Code which are defined in this document.

6. Security Considerations

The extensions of RSVP TE for BER in this document do not introduce any new security issues, and the reader is referred to the security considerations expressed in [RFC2205], [RFC3209], and [RFC5420].

7. References

7.1. Normative References

[RFC1832] Srinivasan, R., "XDR: External Data Representation Standard", RFC 1832, August 1995.

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[RFC3209] Awduche, D., Berger, L., Gan, D., Li, T., Srinivasan, V., and G. Swallow, "RSVP-TE: Extensions to RSVP for LSP Tunnels", RFC 3209, December 2001.

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7.2. Informative References

[RFC4378] Allan, D. and T. Nadeau, "A Framework for Multi-Protocol Label Switching (MPLS) Operations and Management (OAM)", RFC 4378, February 2006.

[RFC5884] Aggarwal, R., Kompella, K., Nadeau, T., and G. Swallow, "Bidirectional Forwarding Detection (BFD) for MPLS Label Switched Paths (LSPs)", RFC 5884, June 2010.

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