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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 Base Station will stop working and the User Equipments (UEs) 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].

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on January 16, 2014.

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1. Introduction

Bit Error Rate (BER) is a significant parameter for the mobile service, which can cause the Base Station to stop working when its value exceeds the threshold of the service. In IP/MPLS based mobile backhaul network, PW and L3VPN are adopted to bear the mobile service end-to-end, 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 or MPLS OAM, to trigger MPLS TE HSB or FRR to switch traffic fast when failure happens. But as to BER, even if the BER value exceeds the threshold, the detection mechanisms cannot detect the failure to trigger traffic switch to the backup path. In this document, we propose new extensions of RSVP-TE to advertise the BER measurement requirement of the LSP to its transit LSRs and the egress LSR, and to report the BER measurement result from any transit LSR or the egress LSR towards the ingress LSR.

There are two types of BER measurement requirements: one is the single-point BER measurement and the other is the 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. In this document, we just focus on the single-point BER measurement . The multi-point BER measurement will be described in the future version.

For the single-point BER measurement, there are two new extensions of RSVP-TE protocol. 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

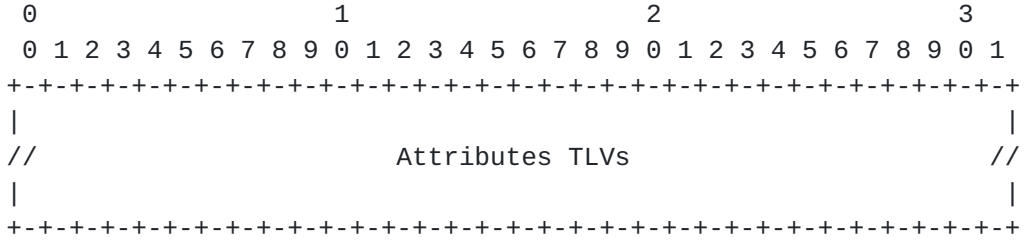

Figure 1: LSP_ATTRIBUTES object

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:

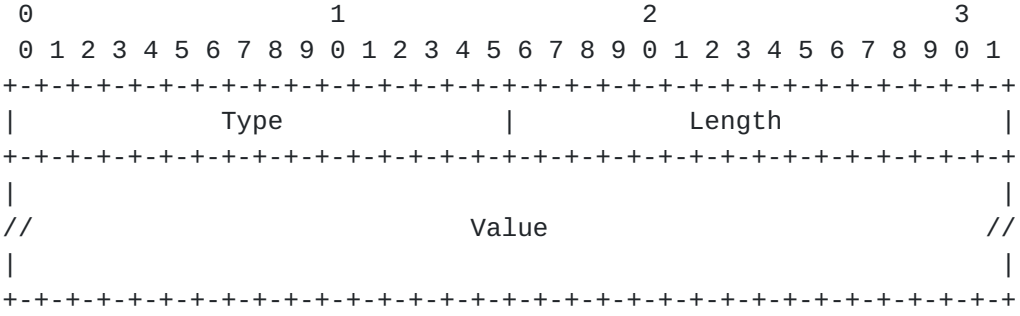

Figure 2: Attributes TLVs format

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:

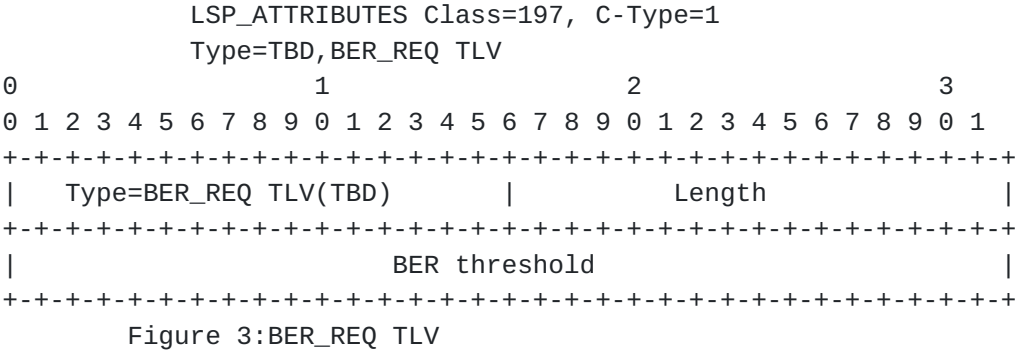

Figure 3:BER_REQ TLV

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 of the service, which is a 32-bit IEEE floating point number. Positive infinity is represented as an IEEE single-precision floating-point number with an exponent of all ones (255) and a sign and mantissa of all zeros. The format of IEEE floating-point numbers is further summarized in [RFC1832]

3.2. Operations for BER_REQUEST TLV

BER_REQUEST TLV is one type of attribute TLVs of the LSP_ATTRIBUTE object, which 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.

When a 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 a 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 a 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 to next LSRs unchanged.

4. Bit Error Indication Report

For the single-point BER measurement, the LSR should report the BER measurement result towards the ingress LSR of the LSP when the BER measurement value exceeds the threshold of the service. This document we propose a new type of Error Code and its Error Value of the ERROR_SPEC object, which is defined in [RFC2205] and [RFC3209], 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]. Here we define a new BER Error Code as below (The Error Code for "BER measurement report" is to be defined) :

Error code	Error value	Description
TBD	0	Bit Error Elimination
	1	Bit Error Indication

4.2. Operations for BER Error Code

The BER measurement result is reported through a new Error Code and 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 trigged to send towards the ingress LSR of this LSP. The PathErr Message MUST include BER Error code with Error Value 1 for Bit Error Indication. When the BER measurement value becomes less than the BER threshold value, the LSR MUST send a PathErr Message with a value of 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. Normative References

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

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC2205] Braden, B., Zhang, L., Berson, S., Herzog, S., and S. Jamin, "Resource ReSerVation Protocol (RSVP) -- Version 1 Functional Specification", RFC 2205, September 1997.

[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.

[RFC5420] Farrel, A., Papadimitriou, D., Vasseur, JP., and A. Ayyangarps, "Encoding of Attributes for MPLS LSP Establishment Using Resource Reservation Protocol Traffic Engineering (RSVP-TE)", RFC 5420, February 2009.

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