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RSVP-TE Extensions For Signaling GMPLS Restoration LSP
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Abstract

In transport networks, there are requirements where Generalized Multi-Protocol Label Switching (GMPLS) recovery scheme need to employ restoration LSP while keeping resources for the working and/ or protecting LSPs reserved in the network. Existing GMPLS recovery procedures do not address these requirements. This document describes best common practice for using RSVP-TE for GMPLS recovery with restoration LSP.

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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1. Introduction

Generalized Multi-Protocol Label Switching (GMPLS) extends MPLS to include support for different switching technologies [RFC3471] [RFC3473]. These switching technologies provide several protection schemes [RFC4426][RFC4427] (e.g. 1+1, 1:N and M:N). GMPLS RSVP-TE signaling has been extended to support various recovery schemes to establish Label Switched Paths (LSPs) [RFC4872][RFC4873], typically working LSP and protecting LSP. [RFC4427] Section 7 specifies various schemes for GMPLS restoration.

In GMPLS recovery schemes currently considered, restoration LSP is signaled after the failure has been detected and notified on the working LSP. These schemes assume that working LSP is removed from the network before restoration LSP is signaled. In transport networks, as working LSPs are typically signaled over a nominal path, there are many scenarios where service providers would like to keep resources associated with the working LSPs reserved. This is to make sure that the service (working LSP) can use the nominal path when the failure is repaired. Consequently, in transport networks one can employ a recovery scheme where a new restoration LSP is signaled while working LSP and/ or protecting LSP are not torn down in control plane due to a failure. Restoration LSP differs from a secondary LSP in the way that secondary LSP does not reserve resources in the data plane and is not able to carry any traffic until it is refreshed whereas restoration LSP does reserve resources and is able to carry traffic.

One example of the recovery scheme considered in this draft is 1+R recovery. The 1+R recovery is exemplified in Figure 1. In this example, working LSP on path A-B-C-Z is pre-established. Typically after a failure detection and notification on the working LSP, a second LSP on path A-H-I-J-Z is established as a restoration LSP. Unlike protection LSP, restoration LSP is signaled on as needed basis.

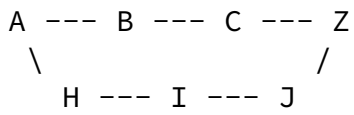

Figure 1: An example of 1+R recovery scheme

During failure with 1+R recovery scheme, in general, working LSP resources are not released and working and restoration LSPs coexist in the network. Nonetheless, working and restoration LSPs can share

network resources. Typically when failure is recovered on the working LSP, restoration LSP is no longer required and torn down (e.g. revertive mode).

Another example of the recovery scheme considered in this draft is 1+1+R. In 1+1+R, a restoration LSP is signaled for the working LSP and/ or the protecting LSP after the failure has been detected and notified on the working LSP or the protecting LSP. The 1+1+R recovery is exemplified in Figure 2. In this example, working LSP on path A-B-C-Z and protecting LSP on path A-D-E-F-Z are pre-established. After a failure detection and notification on a working LSP or protecting LSP, a third LSP on path A-H-I-J-Z is established as a restoration LSP. The restoration LSP in this case provides protection against a second order failure. Restoration LSP is torn down when the failure on the working or protecting LSP is repaired.

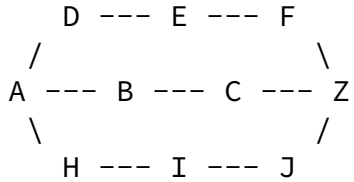

Figure 2: An example of 1+1+R recovery scheme

[RFC4872] Section 14 defines PROTECTION object for GMPLS recovery

signaling. The PROTECTION object is used to identify primary and secondary LSPs using S bit and protecting and working LSPs using P bit. However, the PROTECTION object does not have a way to identify restoration LSP. [RFC4872] and [RFC6689] define the usage of ASSOCIATION object for further associating GMPLS working and protecting LSPs for the case where restoration LSP is signaled for GMPLS recovery after the working or protecting LSPs are removed.

This draft outlines the best common practice for identifying the restoration LSP for GMPLS recovery where working and protecting LSP resources are kept reserved.

2. Conventions used in this document

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 [RFC2119].

3. Restoration LSP Signaling Extensions

3.1. Signaling Procedure

Where GMPLS recovery scheme need to employ restoration LSP while keeping resources for the working and/ or protecting LSPs reserved in the network, restoration LSP is signaled with ASSOCIATION object with the association ID set to the LSP ID of the LSP it is restoring. For example, when a restoration LSP is signaled for a working LSP, the ASSOCIATION object in the restoration LSP contains the association ID set to the LSP ID of the working LSP. Similarly, when a restoration LSP is signaled for a protecting LSP, the ASSOCIATION object in the restoration LSP contains the association ID set to the LSP ID of the protecting LSP.

The procedure for signaling the PROTECTION object is specified in [RFC4872][RFC4873] and does not change. Restoration LSP for the working LSP is signaled with P bit cleared and restoration LSP for the protecting LSP is signaled with P bit set.

When using a GMPLS recovery mode, where working LSP is destroyed, and the restoration LSP is promoted to be the new working LSP, restoration

LSP RSVP Path message MUST be refreshed by using the ASSOCIATION_OBJECT.LSP_ID from the destroyed working LSP ASSOCIATION_OBJECT.LSP_ID.

When using a GMPLS recovery mode, where a protecting LSP is destroyed, and the restoration LSP is promoted to be the new protecting LSP, restoration LSP RSVP Path message MUST be refreshed by using the ASSOCIATIN_OBJECT.LSP_ID from the destroyed protecting LSP ASSOCIATION_OBJECT.LSP_ID.

4. IANA Considerations

This document makes no request for IANA action.

5. Security Considerations

This document introduces no additional security considerations. For a general discussion on MPLS and GMPLS related security issues, see the MPLS/GMPLS security framework [RFC5920]. In addition, the considerations specified in [RFC4872] and [RFC4873] will apply.

6. Acknowledgement

The authors would like to thank George Swallow for the discussion on the GMPLS restoration.

7. References

7.1. Normative references

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7.2. Informative References

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Multi-Protocol Label Switching, RFC 4427, March 2006.

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