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RSVP-TE Signaling For GMPLS Restoration LSP
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Abstract

In transport networks, there are requirements where Generalized Multi-Protocol Label Switching (GMPLS) end-to-end recovery scheme needs to employ restoration Label Switched Path (LSP) while keeping resources for the working and/or protecting LSPs reserved in the network after the failure.

This document reviews how the LSP association is to be provided using Resource Reservation Protocol - Traffic Engineering (RSVP-TE) signaling in the context of GMPLS end-to-end recovery when using restoration LSP where failed LSP is not torn down. No new procedures or mechanisms are defined by this document, and it is strictly informative in nature.

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1. Introduction

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

In GMPLS recovery schemes generally considered, restoration LSP is signaled after the failure has been detected and notified on the working LSP. In non-revertive recovery mode, working LSP is assumed to be removed from the network before restoration LSP is signaled. For revertive recovery mode, a restoration LSP is signaled while working LSP and/or protecting LSP are not torn down in control plane due to a failure. In transport networks, as working LSPs are typically signaled over a nominal path, 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 to provide deterministic behaviour and guaranteed Service Level Agreement (SLA). Consequently, revertive recovery mode is usually preferred by recovery schemes used in transport networks.

As defined in [RFC4872] and being considered in this document, "fully dynamic rerouting switches normal traffic to an alternate LSP that is not even partially established only after the working LSP failure occurs. The new alternate route is selected at the LSP head-end node, it may reuse resources of the failed LSP at intermediate nodes and may include additional intermediate nodes and/or links."

One example of the recovery scheme considered in this document 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 per need basis.

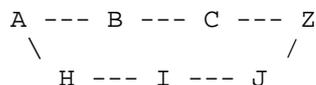


Figure 1: An example of 1+R recovery scheme

During failure switchover 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 document 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.

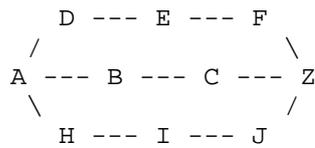


Figure 2: An example of 1+1+R recovery scheme

[RFC4872] Section 14 defines PROTECTION object for GMPLS recovery signaling. As defined, the PROTECTION object is used to identify primary and secondary LSPs using S bit and protecting and working LSPs using P bit. Furthermore, [RFC4872] defines the usage of ASSOCIATION object for associating GMPLS working and protecting LSPs.

[RFC6689] Section 2.2 reviews the procedure for providing LSP associations for GMPLS end-to-end recovery and covers the schemes where the failed working LSP and/or protecting LSP are torn down.

This document reviews how the LSP association is to be provided for GMPLS end-to-end recovery when using restoration LSP where working and protecting LSP resources are kept reserved in the network after the failure.

2. Signaling Restoration LSP Association

Where GMPLS end-to-end recovery scheme needs to employ restoration LSP while keeping resources for the working and/or protecting LSPs reserved in the network after the failure, 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]. Specifically, restoration LSP being used as a working LSP is signaled with P bit cleared and being used as a protecting LSP is signaled with P bit set.

As discussed in Section 1 of this document, [RFC6689] Section 2.2 reviews the procedure for providing LSP associations for the GMPLS end-to-end recovery scheme using restoration LSP where the failed working LSP and/or protecting LSP are torn down.

3. IANA Considerations

This document makes no request for IANA action.

4. Security Considerations

This document reviews procedures defined in [RFC4872] and [RFC6689] and does not define any new procedure. As such, no new security considerations are introduced in this document.

5. Acknowledgement

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

6. References

6.1. Normative References

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