**RSVP-TE Recovery Extension for data plane initiated reversion,
and protection timer signaling
draft-takacs-ccamp-revertive-ps-10**

Abstract

   RSVP-TE recovery extensions are specified in [RFC4872] and
   [RFC4873].  Currently recovery signaling does not support the
   request for revertive protection and recovery timers values. This
   document extends the PROTECTION Object format allowing sub-TLVs, and
   defines two sub-TLVs to carry wait-to-restore and hold-off
   intervals.

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

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## 1.  Introduction

   Generalized MPLS (GMPLS) extends MPLS to include support for
   different switching technologies [RFC3471].  These switching
   technologies provide several protection schemes [RFC4426][RFC4427]
   (e.g. 1+1, 1:N, M:N).  Many characteristics of those protection
   schemes are common regardless of the switching technology (e.g.  TDM,
   LSC, etc).  GMPLS RSVP-TE signaling has been extended to support the
   various protection schemes and establish Label Switched
   Paths (LSPs) configuring its specific protection characteristics
   [RFC4426][RFC4872].

   Currently RSVP-TE extensions do not address the configuration of
   protection switching timers.  It also does not provide information on
   the protection switching operation mode (i.e., revertive or non-
   revertive).

   The Hold-off time (HOFF) is defined as the time between the reporting
   of signal fail or degrade, and the initialization of the recovery
   switching operation [RFC4427].  This timer is useful to limit the
   number of switch actions when multiple layers of recovery are being
   used, or in case of 1+1 unidirectional protection scheme [G.808.1] to
   prevent too early switching due to the differential delay
   between the short and long path.

   The Wait-to-Restore time (WTR) is defined as a period of time that
   must elapse after a recovered fault before an LSP can be used again
   to transport the normal traffic and/or to select the normal traffic
   from the LSP [RFC4427].  The WTR time is fundamental in revertive
   mode of operation, to prevent frequent operation of the protection
   switch due to an intermittent defect [G.808.1].

   Reversion refers to the process of moving normal traffic back to the
   original working LSP after the failure is cleared and the path is
   repaired [RFC4426][RFC4427][RFC4872].  In transport networks
   reversion is desirable since the protection path may not be optimal
   from a routing and resource consumption point of view, additionally,
   moving traffic back to the working LSP allows the protection
   resources to be used to protect other LSPs.

   WTR and HOFF timers must be accurately
   configured at both ends of the LSP.  Operators may need to tune WTR
   and HOFF timers on a per LSP basis to ensure best protection
   switching performance (e.g., account for differential delays between

worker and protection paths).  Currently these values are either pre-
configured to a default value (and so may be suboptimal for some of
the LSPs) or need to be manually set/tuned after the connections have
been established.  Since these parameters are important for recovery
in transport networks, it is desirable that GMPLS RSVP-TE protection
signaling carries the necessary information.

This document extends the PROTECTION Object format allowing sub-TLVs,
and defines three sub-TLVs to carry WTR and HOFF timer values.

## 2.  Updated PROTECTION Object format and sub-TLVs

   In [RFC4872] and [RFC4873] the PROTECTION object is specified to
   support end-to-end and segment recovery.  In order to ease addition
   of protection attributes the PROTECTION Object is extended to carry
   sub-TLVs.  The new format updates the PROTECTION Object format of
   C-Type TBD (suggested value 3).  The updated format is depicted below.
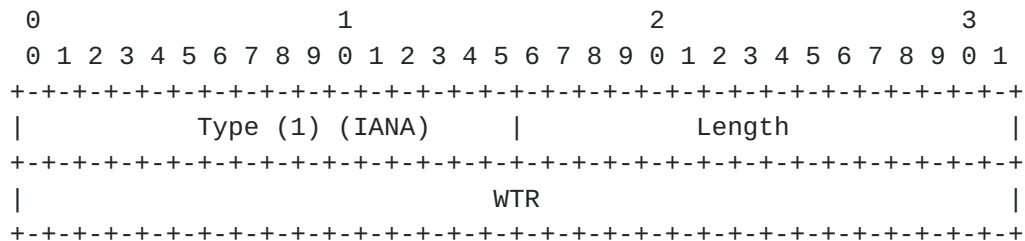   IANA is requested to maintain the TLV space for the PROTECTION Object.

```
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|           Length              | Class-Num(37) |  C-Type(TBD)  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|S|P|N|O| Reserved  | LSP Flags |     Reserved     | Link Flags|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|I|R|   Reserved    | Seg.Flags |          Reserved            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
~                          sub-TLVs                             ~
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
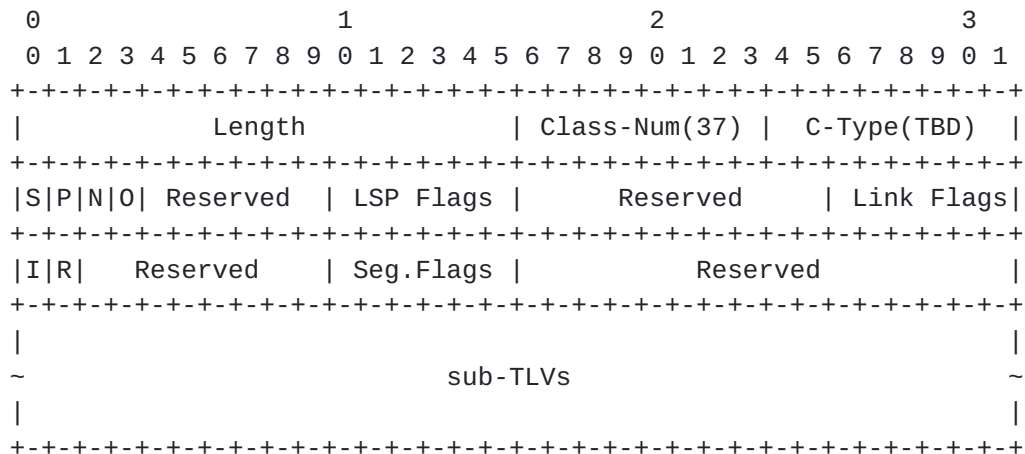
   This document specifies three new sub-TLVs.

   WTR - Wait-to-Restore time sub-TLV specifies the WTR time.  If the
   WTR field is 0 the protection switching operation mode is non-
   revertive, otherwise revertive operation with the signalled timer (in
   milliseconds) is requested.  The value 0xffffffff is reserved, and
   refers to a locally pre-configured WTR value.

```
 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 (1) (IANA)       |            Length             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             WTR                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

HOFF - Hold-off time sub-TLV specifies the HOFF time.  The values are
in milliseconds.  The value 0xffffffff is reserved, and refers to a
locally pre-configured HOFF value.

```
 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 (2) (IANA)      |              Length           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             HOFF                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

In the case of end-to-end protection the PROTECTION Object is
inserted at the top level in the Path message, the WTR and HOFF

options sub-TLVs correspond to the end-to-end protection.  In the
case when a segment of the LSP is to be protected and the WTR and
HOFF timers for the protection segment are
to be set by signaling, explicit segment recovery control has to be
used, i.e., the PROTECTION Object with the desired timers set must be
inserted in the appropriate Secondary Explicit Route Object (SERO).

## 3. Error handling

In the case a specific configuration of the timers is
not supported the corresponding error should be generated and sent
in the PathErr message: "Routing Problem/Unsupported WTR value" or
"Routing Problem/Unsupported HOFF value".

## 4.  IANA Considerations

### 4.1. New TLV space for the PROTECTION object

A new TLV space needs to be opened and maintained for the PROTECTION Object in the "Class Names, Class Numbers, and Class Types " Registry.

### 4.3. New RSVP error sub-code

For Error Code = 24 "Routing Problem" (see [RFC3209]) the following sub-codes are defined.

```
   Sub-code                      Value
   --------                      -----

   Unsupported WTR value         To be assigned by IANA
                                 (suggest value: 80)

   Unsupported HOFF value        To be assigned by IANA
                                 (suggest value: 81)
```

## 5. Security Considerations

   This document introduces no new security issues.  The considerations
   in [RFC4872] and [RFC4873] apply.

## 6.  References

[G.808.1]   "Generic protection switching -- Linear trail and
            subnetwork protection", ITU-T Recommendation G.808.1,
            March 2006.

[IEEE-PBBTE]
            "IEEE 802.1Qay Draft Standard for Provider Backbone
            Bridging Traffic Engineering",  work in progress.

[RFC3471]   "Generalized Multi-Protocol Label Switching (GMPLS)
            Signaling Functional Description", RFC 3471, January 2003.

[RFC4426]   "Generalized Multi-Protocol Label Switching (GMPLS)
            Recovery Functional Specification", RFC 4426, March 2006.

[RFC4427]   "Recovery (Protection and Restoration) Terminology for
            Generalized Multi-Protocol Label Switching (GMPLS)",
            RFC 4427, March 2006.

[RFC4872]   "RSVP-TE Extensions in Support of End-to-End Generalized
            Multi-Protocol Label Switching (GMPLS) Recovery",
            RFC 4872, May 2007.

[RFC4873]   "GMPLS Segment Recovery", RFC 4873, May 2007.

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