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        Assignment of the Generic Associated Channel Header Label (GAL)
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Abstract

   This document describes the assignment of one of the reserved label
   values, defined in RFC 3032 [3], to the 'Generic-ACH Label (GAL)',
   that is used as generic exception mechanism, for example by MPLS
   Transport Profile (MPLS-TP) for Operations and Management (OAM)
   functions.

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 RFC 2119 [1].

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1. Introduction

2. Generic Exception Mechanism

MPLS-TP requires [12] a mechanism to differentiate specific packets
(e.g. OAM) from others, such as normal user-plane ones. This document
proposes that a label be used and calls this special label the
'Generic-ACH Label (GAL)'. One of the reserved label values defined
in RFC 3032 [3] is assigned to the 'Generic-ACH Label (GAL)'. The
value of the label is to be allocated by IANA; this document suggests
the value 13.

The 'Generic-ACH Label (GAL)' is a generic exception mechanism used

   firstly to differentiate specific packets (e.g. OAM) from others,
   such as normal user-plane ones,

   and secondly, to indicate that the Generic Associated Channel
   Header (GE-ACH) [10] appears immediately after the bottom of the
   label stack.

The 'Generic-ACH Label (GAL)' MUST only be used if those two purposes
are fulfilled simultaneously.

Note that, in this document, MPLS-TP OAM (functions, packets) should
be understood in the broad sense, that is, as a set of mechanisms
including Automatic Protection Switching (APS), Signalling Control
Channel (SCC) and Management Control Channel (MCC).

Further, while transport applications are expected to be the first to
use the 'Generic-ACH Label (GAL)', the use of this label is by no
means restricted to MPLS-TP.

3. Relationship with RFC 3429

RFC 3429 [11] describes the assignment of one of the reserved label
values, defined in RFC 3032 [3], to the 'OAM Alert Label' that is
used by user-plane MPLS OAM functions for the identification of MPLS
OAM packets. The value of 14 is used for that purpose.

This document and RFC 3429 [11], thus describe the assignment of
reserved label values for similar purposes. The rationales for the
assignment of a new reserved label can be summarized as follows:

   o Unlike the mechanisms described and referenced in RFC 3429 [11],
      MPLS-TP OAM packets will not reside immediately after the
      'Generic-ACH Label (GAL)' but behind the Generic Associated
      Channel Header (GE-ACH) [10] which, itself, resides immediately
      after the bottom of the label stack when the 'Generic-ACH Label
      (GAL)' appears in this label stack. This will ensure that MPLS-TP
      OAM complies with RFC 4928 [7].

   o The set of OAM functions potentially operated in the context of
      MPLS-TP is wider than the set of OAM functions referenced in RFC
      3429 [11].

   o It has been reported that there are existing implementations and
      running deployments using the 'OAM Alert Label' as described in
      RFC 3429 [11]. It is therefore not possible to modify the 'OAM
      Alert Label' allocation, purpose or usage. Nevertheless, it is
      RECOMMENDED by this document that no further OAM extensions based
      on 'OAM Alert Label' (Label 14) usage be specified or developed.

4. Relationship with Existing MPLS OAM Alert Mechanisms

   RFC 4379 [6] and BFD for MPLS LSPs [8] have defined alert
   mechanisms that enable a MPLS LSR to identify and process MPLS OAM
   packets when the OAM packets are encapsulated in an IP header. These
   alert mechanisms are based on TTL expiration and/or use an IP
   destination address in the range 127/8.

   These alert mechanisms SHOULD preferably be used in non MPLS-TP
   environments. The mechanism defined in this document MAY also be
   used.

5. Applicability and Usages

   The 'Generic-ACH Label (GAL)' MUST only be used with Label Switched
   Paths (LSPs), with their associated Tandem Connection Monitoring
   Entities (see [12] for definitions of TCMEs) and with MPLS Sections.
   A MPLS Section is a network segment between two LSRs that are
   immediately adjacent at the MPLS layer.

   The 'Generic-ACH Label (GAL)' applies to both P2P and P2MP LSPs,
   unless otherwise stated.

   In MPLS-TP, the 'Generic-ACH Label (GAL)' MUST always be at the
   bottom of the label stack (i.e. S bit set to 1). However, in other
   MPLS environments, this document places no restrictions on where the
   'Generic-ACH Label (GAL)' may appear within the label stack.

The 'Generic-ACH Label (GAL)' MUST NOT be used with Pseudowires (PWs) neither with their associated Tandem Connection Monitoring Entities.

The 'Generic-ACH Label (GAL)' MUST NOT appear in the label stack when transporting normal user-plane packets. Furthermore, the 'Generic-ACH Label (GAL)' MUST only appear once in the label stack.

5.1. GAL Processing

The Class of Service (CoS) field (former EXP field) of the 'Generic-ACH Label (GAL)' follows the definition and processing rules specified and referenced in [9].

The Time To Live (TTL) field of the 'Generic-ACH Label (GAL)' follows the definition and processing rules specified in [4].

For detailed information on the Generic-ACH (GE-ACH) mentioned in the following sub-sections, please see [10].

5.1.1. Section

The following figure (Figure 1) depicts two MPLS LSRs immediately adjacent at the MPLS layer.

```
        +---+                +---+
        | A |-------------| Z |
        +---+                +---+
```
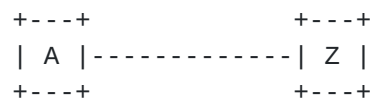
            Figure 1 : MPLS-TP OAM over a MPLS Section

With regards to the MPLS Section, both LERs are Maintenance End Points (see [12] for definitions of MEPs).

The following figure (Figure 2) depicts the format of a labelled MPLS-TP OAM packet when used for MPLS Section OAM.

```
     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
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |                     GAL                 | CoS |S|      TTL     |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |                        Generic-ACH                            |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |                                                               .
    .                     MPLS-TP OAM packet                        .
    .                                                               |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
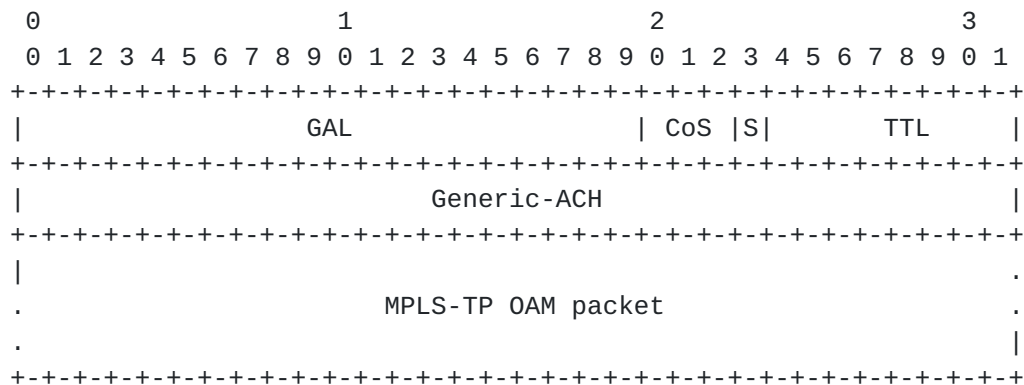
          Figure 2 : Labelled MPLS-TP OAM packet for MPLS Section OAM

   To perform MPLS-TP OAM functions on the MPLS Section, the head-end
   LSR (A) of the MPLS Section generates a MPLS-TP OAM packet with a GE-
   ACH to which it prepends a 'Generic-ACH Label (GAL)'.

   o The TTL field of the 'Generic-ACH Label (GAL)' SHOULD be set to 1.

   o The S bit of the 'Generic-ACH Label (GAL)' MUST be set to 1.

   The MPLS-TP OAM packet, the GE-ACH or the 'Generic-ACH Label (GAL)'
   SHOULD NOT be modified towards the tail-end LSR (Z). Upon reception
   of the labelled packet, the tail-end LSR (Z), after having checked
   the 'Generic-ACH Label (GAL)' fields, SHOULD pass the whole packet to
   the appropriate processing entity.

5.1.2. Label Switched Paths

   The following figure (Figure 3) depicts four LSRs. A LSP is
   established from A to D and switched in B and C.

```
    +---+                +---+                +---+                +---+
    | A |-------------| B |-------------| C |-------------| D |
    +---+                +---+                +---+                +---+
```
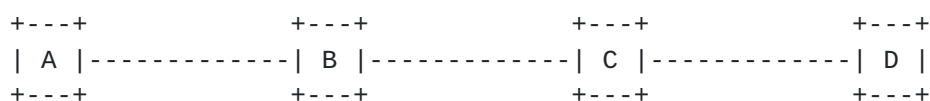
                  Figure 3 : MPLS-TP OAM over a LSP

   With regards to the considered LSP, LERs A and D are MEPs.
   Furthermore, LSRs B and C could be Maintenance Intermediate Points
   (see [12] for definitions of MEPs and MIPs).

   The following figure (Figure 4) depicts the format of a labelled
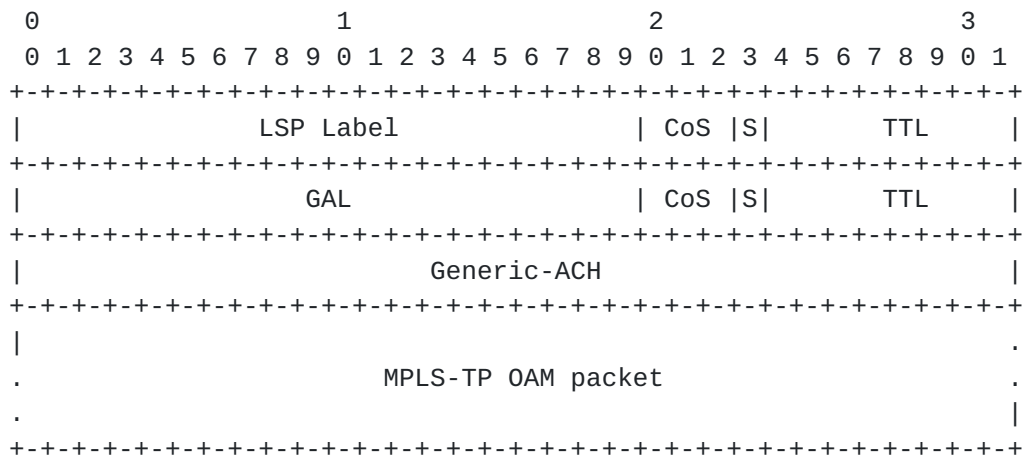   MPLS-TP OAM packet when used for LSP OAM.

```
    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
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                  LSP Label            | CoS |S|      TTL      |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                    GAL                | CoS |S|      TTL      |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                         Generic-ACH                          |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                                                              .
   .                     MPLS-TP OAM packet                       .
   .                                                              |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

           Figure 4 : Labelled MPLS-TP OAM packet for LSP OAM

   Note that, in the general case, the considered LSP MAY be tunnelled
   (e.g. in a MPLS Tunnel existing between B and C), and as such, other
   labels MAY be present above in the label stack.

   To perform MPLS-TP OAM functions on the LSP, the head-end LSR (A) of
   the LSP generates a MPLS-TP OAM packet with a GE-ACH to which it
   prepends a 'Generic-ACH Label (GAL)' to which it prepends the label
   of the LSP.

   o The TTL field of the 'Generic-ACH Label (GAL)' SHOULD be set to 1.

   o The S bit of the 'Generic-ACH Label (GAL)' SHOULD be set to 1, in
      MPLS-TP.

   The MPLS-TP OAM packet, the GE-ACH or the 'Generic-ACH Label (GAL)'
   SHOULD NOT be modified towards the targeted destination. Upon
   reception of the labelled packet, the targeted destination, after
   having checked both the LSP label and 'Generic-ACH Label (GAL)'
   fields, SHOULD pass the whole packet to the appropriate processing
   entity.

5.1.3. LSP Tandem Connection Monitoring Entity

   To be covered in a next version of this document.

5.2. Considerations on Penultimate Hop Popping

   OAM operations require context awareness. The label, immediately
   above the 'Generic-ACH Label (GAL)' in the label stack, provides this
   context. Additionally, a requirement of MPLS-TP OAM is that user-
   plane and OAM packets share the same fate [12]. As such, when

operating MPLS-TP OAM, Penultimate Hop Popping (PHP) SHOULD be
disabled by default for the label immediately above the 'Generic-ACH
Label (GAL)' in the label stack, otherwise neither all MPLS-TP OAM
requirements [12] nor all MPLS-TP OAM functions can be satisfied.

In case PHP is enabled, the context, normally provided by the label
immediately above the 'Generic-ACH Label (GAL)' in the label stack,
SHALL be provided by other means.

Moreover, PHP MUST NOT be applied to the 'Generic-ACH Label (GAL)'
itself.

5.3. Compatibility

LERs and LSRs not capable of processing the 'Generic-ACH Label (GAL)'
SHOULD silently discard the packet.

6. Security Considerations

This document does not raise any security issue that is not already
present in either the MPLS architecture [2], the PWE3 architecture .
[5] or the MPLS-TP framework [ref]. Security considerations, for the
GE-ACH, can be found in [10].

7. IANA Considerations

This document requests that IANA allocates a Label value, to the
'Generic-ACH Label (GAL)', from the pool of reserved labels, and
suggests this value to be 13.

8. Acknowledgments

The authors would like to thank all members of the teams (the Joint
Working Team, the MPLS Interoperability Design Team in IETF and the
T-MPLS Ad Hoc Group in ITU-T) involved in the definition and
specification of MPLS Transport Profile.

9. References

9.1. Normative References

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

[2]   Rosen, E., Viswanathan, A., Callon, R., "Multiprotocol Label
       Switching Architecture", RFC 3031, January 2001

   [3]   Rosen, E., et al., "MPLS Label Stack Encoding", RFC 3032,
         January 2001

   [4]   Agarwal, P., Akyol, B., "Time To Live (TTL) Processing in
         Multi-Protocol Label Switching (MPLS) Networks", RFC 3443,
         January 2003

   [5]   Bryant, S., Pate, P., "Pseudo Wire Emulation Edge-to-Edge
         (PWE3) Architecture", RFC 3985, March 2005

   [6]   Kompella, K., Swallow, G., "Detecting Multi-Protocol Label
         Switched (MPLS) Data Plane Failures", RFC 4379, February 2006

   [7]   Swallow, G., Bryant, S., Andersson, L., "Avoiding Equal Cost
         Multipath Treatment in MPLS Networks", BCP 128, RFC 4928, June
         2007

   [8]   Aggarwal, R., Kompella, K., Swallow, G., Nadeau, T., "BFD For
         MPLS LSPs", draft-ietf-bfd-mpls-07, June 2008

   [9]   Andersson, L., ""EXP field" renamed to "CoS Field"", draft-
         ietf-mpls-cosfield-def-02, June 2008

   [10] Bocci, M., Ward, D., "MPLS Generic Associated Channel", draft-
         bocci-pwe3-ge-ach-00, June 2008

9.2. Informative References

   [11] Ohta, H., "Assignment of the 'OAM Alert Label' for
         Multiprotocol Label Switching Architecture (MPLS) Operation and
         Maintenance (OAM) Functions", RFC 3429, November 2002

   [12] Vigoureux, M., Betts, M., Ward, D., "Requirements for OAM in
         MPLS Transport Networks", draft-vigoureux-mpls-tp-oam-
         requirements-00, July 2008

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