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        Non PHP Behavior and out-of-band mapping for RSVP-TE LSPs
            draft-ietf-mpls-rsvp-te-no-php-oob-mapping-04.txt

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   Abstract

      There are many deployment scenarios which require Egress Label
      Switching Router (LSR) to receive binding of the Resource ReserVation
      Protocol Traffic Engineered (RSVP-TE) Label Switched Path (LSP)
      to an application, and payload identification, using some "out-
      of-band" (OOB) mechanism. This document proposes protocol
      mechanisms to address this requirement. The procedures described
      in this document are equally applicable for point-to-point (P2P)
      and point-to-multipoint (P2MP) LSPs.

   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 [RFC2119].

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1. Introduction

   When RSVP-TE is used for applications like MVPN [MVPN] and VPLS
   [VPLS], an Egress LSR receives the binding of the RSVP-TE LSP to
   an application, and payload identification, using an "out-of-
   band" (OOB) mechanism (e.g., using BGP). In such cases, the
   Egress LSR cannot make correct forwarding decision until such OOB
   mapping information is received. Furthermore, in order to apply
   the binding information, the Egress LSR needs to identify the
   incoming LSP on which traffic is coming. Therefore, non
   Penultimate Hop Popping (non-PHP) behavior is required to apply
   OOB mapping.

   There are other applications that require non-PHP behavior. When
   RSVP-TE P2MP LSPs are used to carry IP multicast traffic non-PHP
   behavior enables a leaf LSR to identify the P2MP TE LSP, on which
   traffic is received. Hence the egress LSR can determine whether
   traffic is received on the expected P2MP LSP and discard traffic
   that is not received on the expected P2MP LSP. Non-PHP behavior
   is also required to determine the context of upstream assigned
   labels when the context is a MPLS LSP. Non-PHP behavior may also
   be required for MPLS-TP LSPs [MPLS-TP-Framework].

   This document defines two new flags in the Attributes Flags TLV
   of the LSP_ATTRIBUTES object defined in [RFC5420]: one flag for
   communication of non-PHP behavior, and one flag to indicate that
   the binding of the LSP to an application and payload identifier
   (payload-Id) needs to be learned via an out-of-band mapping
   mechanism. The procedures described in this document are equally
   applicable for P2P and P2MP LSPs. Specification of the OOB
   communication mechanism(s) is beyond the scope of this document.

2. RSVP-TE signaling extensions

   This section describes the signaling extensions required to
   address the above-mentioned requirements.

2.1. Signaling non-PHP behavior

   In order to request non-PHP behavior for an RSVP-TE LSP, this
   document defines a new flag in the Attributes Flags TLV of the
   LSP_ATTRIBUTES object defined in [RFC5420]:

Bit Number 6 (TBD): non-PHP behavior flag.

An Ingress LSR sets the "non-PHP behavior flag" to signal the
egress LSRs SHOULD assign non-NULL label for the LSP being
signaled. This flag MUST NOT be modified by any other LSRs in
the network. LSRs other than the Egress LSRs SHOULD ignore this
flag.

When signaling a P2MP LSP, a source node may wish to solicit
individual response to "non-PHP behavior flag" from the leaf
nodes. Given the constraints on how the LSP_ATTRIBUTES may be
carried in Path and Resv Messages according to RFC5420, in this
situation a source node SHOULD use a separate Path message for
each leaf.

If an egress LSR receiving the Path message, supports the
LSP_ATTRIBUTES object and the Attributes Flags TLV, and also
recognizes the "non-PHP behavior flag", it MUST allocate a non-
NULL local label. The egress LSR MUST also include the
LSP_ATTRIBUTES object with "non-PHP behavior flag" set in the
Resv message. For this purpose, as defined in RFC5420, the
LSP_ATTRIBUTES object is placed in the flow descriptor and is
associated with the FILTER_SPEC object that precedes it.

If the egress LSR

- supports the LSP_ATTRIBUTES object but does not recognize the
   Attributes Flags TLV; or

- supports the LSP_ATTRIBUTES object and recognize the Attributes
   Flags TLV, but does not recognize "non-PHP behavior flag";

then it SHOULD silently ignore this request.

An ingress LSR requesting non-PHP behavior SHOULD examine Resv
message for presence of "Non-PHP behavior flag" in the
LSP_ATTRIBUTES object. An ingress LSR requesting non-PHP behavior
MAY send a Path Tear to the Egress which has not included the
LSP_ATTRIBUTES object in the Resv or which has included the
LSP_ATTRIBUTES object in Resv but has not set the "Non-PHP
behavior flag" in it. An ingress LSR requesting non-PHP behavior
MAY also examine the label value corresponding to the Egress
LSR(s) in the RRO, and MAY send a Path Tear to the Egress which
assigns a Null label value.

2.2. Signaling OOB Mapping Indication

   This document defines a single flag to indicate that the normal
   binding mechanism of an RSVP session is overridden. The actual
   out of band mappings are beyond the scope of this document. The
   flag is carried in the Attributes Flags TLV of the LSP_ATTRIBUTES
   object defined in [RFC5420] and is defined as follows:

   Bit Number 7 (TBD): OOB mapping flag.

   An Ingress LSR sets the OOB mapping flag to signal the Egress LSR
   that binding of RSVP-TE LSP to an application and payload
   identification is being signaled out of band. This flag MUST NOT
   be modified by any other LSRs in the network. LSRs other than the
   Egress LSRs SHOULD ignore this flag.

   When signaling a P2MP LSP, a source node may wish to solicit
   individual response to "OOB mapping flag" from the leaf nodes.
   Given the constraints on how the LSP_ATTRIBUTES may be carried in
   Path and Resv Messages according to RFC5420, in this situation a
   source node SHOULD use a separate Path message for each leaf.

   If an egress LSR receiving the Path message, supports the
   LSP_ATTRIBUTES object and the Attributes Flags TLV, and also
   recognizes the "OOB mapping flag", it MUST include the
   LSP_ATTRIBUTES object with "OOB mapping flag" set in the Resv
   message. For this purpose, as defined in RFC5420, the
   LSP_ATTRIBUTES object is placed in the flow descriptor and is
   associated with the FILTER_SPEC object that precedes it.

   The rest of the RSVP signaling proceeds as normal. However, the
   LSR MUST have received the OOB mapping before accepting traffic
   on the LSP. This implies that the egress LSR MUST NOT setup
   forwarding state for the LSP before it receives the OOB mapping.

   Note that the payload information SHOULD be supplied by the OOB
   mapping. If the egress LSR receives the payload information from
   OOB mapping then the LSR MUST ignore L3PID in the Label Request
   Object [RFC3209].

   If the egress LSR

   - supports the LSP_ATTRIBUTES object but does not recognize the
     Attributes Flags TLV; or

   - supports the LSP_ATTRIBUTES object and recognizes the
     Attributes Flags TLV, but does not recognize the "OOB mapping
     flag";

   then it SHOULD silently ignore this request.

   An ingress LSR requesting OOB mapping SHOULD examine Resv message
   for presence of "OOB mapping flag" in in the LSP_ATTRIBUTES
   object. An ingress LSR requesting OOB mapping MAY send a Path
   Tear to the Egress which has not included the LSP_ATTRIBUTES
   object in the Resv or which has included the LSP_ATTRIBUTES
   object in Resv but has not set the " OOB mapping flag" in it.

   In deploying applications where Egress LSR receives the binding
   of the RSVP-TE LSP to an application, and payload identification,
   using OOB mechanism, it is important to recognize that OOB
   mapping is sent asynchronously w.r.t. signaling of RSVP-TE LSP.
   Egress LSR only installs forwarding state for the LSP after it
   receives the OOB mapping. In deploying applications using OOB
   mechanism, ingress LSR may need to know when egress is properly
   setup for forwarding (i.e., has received OOB mapping). How
   ingress LSR determines that LSR is properly setup for forwarding
   at the Egress LSR is beyond the scope of this document.
   Nonetheless, if OOB mapping is not received by the egress LSR
   within a reasonable time, a procedure to tear down the LSP is
   defined in section 2.4.

2.3. Relationship between OOB and non-PHP flags

   "Non-PHP behavior desired" and "OOB mapping indication" flags can
   appear and be processed independently of each other. However, as
   mentioned earlier, in the context of applications discussed in
   this document, OOB mapping require non-PHP behavior. An Ingress
   LSR requesting OOB mapping MAY also set "non-PHP behavior flag"
   in the LSP_ATTRIBUTES object in the Path message.

2.4. Egress Procedure for label binding

   RSVP-TE signaling completion and the OOB mapping information
   reception happen asynchronously at the Egress. As mentioned in
   Section 2, Egress waits for the OOB mapping before accepting
   traffic on the LSP.

   In order to avoid unnecessary use of the resources and possible
   black-holing of traffic, an Egress LSR MAY send a Path Error

   message if the OOB mapping information is not received within a
   reasonable time. This Path Error message will include the error
   code/sub-code "Notify Error/ no OOB mapping received" for all
   affected LSPs. If notify request was included when the LSP was
   initially setup, Notify message (as defined in [RFC3473]) MAY
   also be used for delivery of this information to the Ingress LSR.
   An Egress LSR MAY implement a cleanup timer for this purpose. The
   time-out value is a local decision at the Egress, with a
   RECOMMENDED default value of 60 seconds.

3. Security Considerations

   This document does not introduce any new security issues above
   those identified in [RFC2205], [RFC3209], [RFC3473], [RFC5420]
   and [RFC4875].

4. IANA Considerations

4.1. Attribute Flags for LSP_ATTRIBUTES object

   The following new flags are being defined for the Attributes
   Flags TLV in the LSP_ATTRIBUTES object. The numeric values are
   to be assigned by IANA.

   o   Non-PHP behavior flag - Bit Number 6 (Suggested value).

   o   OOB mapping flag - Bit Number 7 (Suggested value).

   o   These flags are to be used in the Attributes Flags TLV in both
       Path and Resv messages.

   For Error Code = 25 "Notify Error" (see [RFC3209]) the following
   sub-code is defined.

        Sub-code   Value
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        No OOB mapping received   12 (TBD)

5. Acknowledgments

   The authors would like to thank Yakov Rekhter for his suggestions
   on the draft.

6. References

6.1. Normative References

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