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Internet-Draft   V. Beeram
Intended status: Standards Track   Juniper Networks
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                                                        July 12, 2021

        Path Computation Element Protocol(PCEP) Extension for RSVP Color
                    draft-rajagopalan-pcep-rsvp-color-01

Abstract

   This document specifies extensions to Path Computation Element
   Protocol (PCEP) to carry a newly defined attribute of RSVP LSP called
   'color' that can be used as a guiding criterion for selecting the LSP
   as a next hop for a service route.

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 [RFC2119].

Status of This Memo

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1. Introduction

   This document defines a new RSVP LSP property, called "color", that
   can be exchanged over PCEP. The 'color' field can be used as one of
   the guiding criteria in selecting the LSP as a next hop for service
   prefixes.

   While the specific details of how the service prefixes are associated
   with the appropriate RSVP LSP's are outside the scope of this
   specification, the envisioned high level usage of the 'color' field
   is as follows.

   The service prefixes are marked with some indication of the type of
   underlay they need. The underlay LSP's carry corresponding markings,
   which we refer to as "color" in this specification, enabling an
   ingress node to associate the service prefixes with the appropriate
   underlay LSP's.

   As an example, for a BGP-based service, the originating PE could
   attach some community, e.g. the Extended Color Community [RFC5512]
   with the service route. A receiving PE could use locally configured
   policies to associate service routes carrying Extended Color
   Community 'X' with underlay RSVP LSP's of color 'Y'.

   While the Extended Color Community provides a convenient method to
   perform the mapping, the policy on the ingress node is free to

classify on any property of the route to select underlay RSVP LSP's of a certain color.

The 'color' specified in this draft is mainly used for facilitating underlay selection, and does not have any effect on the constraints used for path computation.

2. Protocol Operation

The STATEFUL-PCE-CAPABILITY negotiation message is enhanced to carry the color capability, which allows PCC & PCE to determine how incompatibility should be handled, should only one of them support color. An older implementation that does not recognize the new color TLV would ignore it upon receipt. This can sometimes result in undesirable behavior. For example, if PCE passes color to a PCC that does not understand colors, the LSP may not be used as intended. A PCE that clearly knows the PCC's color capability can handle such cases better, and vice versa. Following are the rules for handling mismatch in color capability.

A PCE that has color capability MUST NOT send color TLV to a PCC that does not have color capability. A PCE that does not have color capability can ignore color marking reported by PCC.

When a PCC is interacting with a PCE that does not have color capability, the PCC

o   SHOULD NOT report color to the PCE.

o   MUST NOT override the local color, if it is configured, based on any messages coming from the PCE.

The actual color value itself is carried in a newly defined TLV in the LSP Object defined in [RFC8231].

If a PCC is unable to honor a color value passed in an LSP Update request, the PCC must keep the LSP in DOWN state, and include an LSP Error Code value of "Unsupported Color" [Value to be assigned by IANA] in LSP State Report message.

If an RSVP tunnel has multiple LSP's associated with it, the PCE should designate one of the LSP's as primary, and attach the color with that LSP. If PCC receives color TLV for an LSP that it treats as secondary, it SHOULD respond with an error code of 4 (Unacceptable Parameters).

3. TLV Format

```
 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                    |            Length=4            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                            Color                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
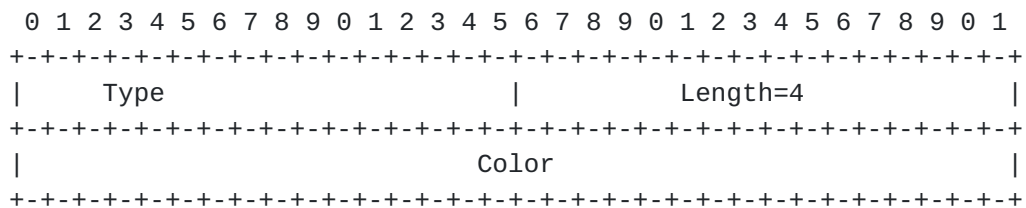
                Figure 1: Color TLV in LSP Object

   Type has the value [TO-BE-ASSIGNED-BY-IANA]. Length carries a value
   of 4. The 'color' field is 4-bytes long, and carries the actual
   color value.

   Section 7.1.1 of RFC8231 [RFC8231] defines STATEFUL-PCE-CAPABILITY
   flags. The following flag is used to indicate if the speaker
   supports color capability:

      C-bit (TO-BE-ASSIGNED-BY-IANA): A PCE/PCC that supports color
      capability must turn on this bit.

4. Usage with BGP-CT

   RSVP LSP's marked with color can also be used for inter-domain
   service mapping as defined in BGP-CT
   [I-D.kaliraj-idr-bgp-classful-transport-planes]. In BGP-CT, the
   mapping community of the service route is used to select a
   "resolution scheme", which in turn selects LSP's of various
   "transport classes" in the defined order of preference. The 'color'
   field defined in this specification could be used to associate the
   RSVP LSP with a particular transport class.

   A colored RSVP LSP can also be exported into BGP-CT for inter-domain
   classful transport.

5. Security Considerations

   This document defines a new TLV for color, and a new flag in
   capability negotiation, which do not add any new security concerns
   beyond those discussed in [RFC5440], [RFC8231] and [RFC8281].

   An unauthorized PCE may maliciously associate the LSP with an
   incorrect color. The procedures described in [RFC8253] and [RFC7525]
   can be used to protect against this attack.

6. IANA Considerations

   IANA is requested to assign code points for the following:

   o Code point for "Color" TLV from the sub-registry "PCEP TLV Type
      Indicators".

   o C-bit value from the sub-registry "STATEFUL-PCE-CAPABILITY TLV
      Flag Field".

   o An error code for "Unsupported color" from the sub-registry "LSP-
      ERROR-CODE TLV Error Code Field".

7. Acknowledgments

   The authors would like to thank Kaliraj Vairavakkalai, Colby Barth &
   Natrajan Venkataraman for their review & suggestions, which helped
   improve this specification.

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