Inter-domain Network Slicing via BGP-LU

draft-zhou-idr-inter-domain-lcu-04

Authors: Ran Chen, Shaofu Peng, Chuning Dai

Presenter :Ran Chen

IDR WG IETF-113 Meeting, March 2022

Introduction

- This document aims to solve inter-domain network slicing problems using existing technologies. It attempts to establish multiple BGPLU LSPs of different colors for a/multiple prefix to stitch multiple.

- This document describes the colored BGP-LU LSP, which contains two options:

  - Defines the multiple paths for the same destination prefix and advertise in BGP UPDATE message, and each UPDATE message can contain the color Extended Community [RFC9012] with different color value, which helps to select the underlying resources. Requires additional path function.

  - Configures multiple prefixes and multiple colors on PE. One prefixes corresponds to one color. This mode does not require to additional path function. Does not require to additional path function.

Colored BGP-LU Capability Advertisement

- Uses the Capability Advertisement procedures [RFC3392] to determine whether the speaker could use Colored BGP-LU Extensions with a particular peer.

- The fields in the Capabilities Optional Parameter are set as follows
  - The Capability Code field TBD1 (which indicates Colored BGP-LU Extensions capabilities).
  - The Capability Length field is set to 4.
  - The Capability Value field is defined as:

```
+--------------------------------------------------+
| Address Family Identifier (2 octets)             |
+--------------------------------------------------+
| Subsequent Address Family Identifier (1 octet)   |
+--------------------------------------------------+
| reseve (1 octet)                                 |
+--------------------------------------------------+
```

- AFI-Address Family Identifier (16 bit), The values is 1 "IPV4"or 2 "IPV6".
- SAFI-Subsequent Address Family Identifier (8 bit), The values is 1 "Unicast" or 4(BGP LU).
- Res.-Reserved (8 bit) field. SHOULD be set to 0 by the sender and ignored by the receiver.
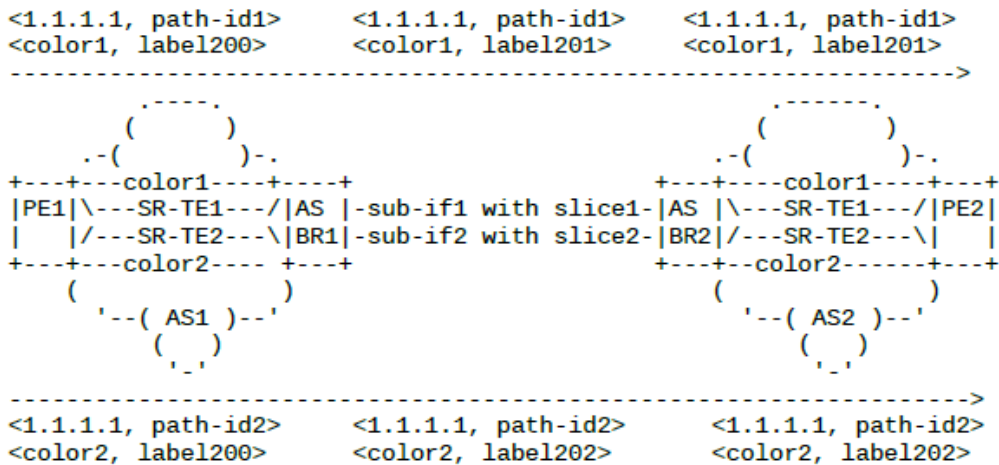
Deploy Considerations

- All routers require the Colored BGP-LU Capability Advertisement. If transit network domains that do not support Colored BGP-LU , Processed as follows:

- When the Colored BGP-LU neighbor receives the BGP-LU routes, if it continues to advertise the BGP-LU routes to the upstream neighbor that supports the Colored BGP-LU, the BGP-LU routes shouldn't be changed to the Colored BGP-LU routes.

- When receiving the Colored BGP-LU advertisement from the neighbor that supports Colored BGP-LU, if the advertisement continues to be advertised to the upstream neighbor that does not support Colored BGP-LU, the advertisement should be changed to BGP-LU advertisement, that is, advertise one out of multiple path.

Question 1: How does route resolution work with your feature?

- Recursive and Color-aware
  - Uses Color and Next hop in the lookup key
  - Chooses underlay SLA path
    - SR Policy
    - IGP FA
    - RSVP-TE
    - LPM based on policy

Question 2: Route origination and propagation

- Consider the following example of establishing multiple BGP-LU LSPs per different colors in a cross-domain scenario.

```
<1.1.1.1, path-id1>      <1.1.1.1, path-id1>      <1.1.1.1, path-id1>
<color1, label200>       <color1, label201>       <color1, label201>
------------------------------------------------------------------>
         .-----.                                      .-------.
        (       )                                     (        )
      .-(         )-.                            .-(          )-.
+---+---color1----+---+                  +---+----color1----+---+
|PE1|\---SR-TE1---/|AS |-sub-if1 with slice1-|AS |\---SR-TE1---/|PE2|
|   |/---SR-TE2---\|BR1|-sub-if2 with slice2-|BR2|/---SR-TE2---\|   |
+---+---color2---- +---+                  +---+--color2------+---+
      (           )                            (            )
       '--( AS1 )--'                            '--( AS2 )--'
          (   )                                    (   )
           '_'                                      '_'
------------------------------------------------------------------>
<1.1.1.1, path-id2>      <1.1.1.1, path-id2>      <1.1.1.1, path-id2>
<color2, label200>       <color2, label202>       <color2, label202>

Label Exchange Tables:
ASBR1:                          ASBR2:
inLabel outLabel nextHop        inLabel outLabel nextHop
201      200      SR-TE1         201      201      sub-if1
202      200      SR-TE2         202      202      sub-if2

PE2:
prefix   color   outLabel   nextHop
1.1.1.1    1       201       SR-TE1
1.1.1.1    2       202       SR-TE2
```

- PE1 : <1.1.1.1, path-id1> <color1, label200>
  <1.1.1.1, path-id2> < color2,label200 >
- ASBR1 : Modifies the next hop to itself.
  Allocate two new labels based
  on <prefix, path-id, color>.
- ASBR2 : Generates two different labels
  based on the <prefix, path-id, color>.

- Establishes Multiple end to end BGP-LU LSPs.
  Different BGP-LU LSPs select the underlay SLA
  path according to their colors(intent).

Next Steps

- Comments welcome.
- WG adoption?

Thanks!