Color Operation with BGP-LU
(Slicing by color)

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5G/Metro Network Slicing

- New proposal via color
- Mix of RSVP, SR, LDP
- Controller-less
- Transport service across domain
- Very deterministic path possible
  - e.g. RSVP-RSV-P-RSVP

Source: NGMN
Issues: SR-TE E2E solution with controller

• How to scale the controller, if network size > 10K
  • Up to 300K routers in size

• Remote failure detection

• Label depth at first ingress router
  • Cannot avoid Binding-SID (or alike) in the middle of the network
    • But then, problem is the node failure of the router holding B-SID
Two drafts submitted

- **BGP-LCU**
  - New SAFI to include color in NLRI
  - New length field

- **BGP-LU2**
  - [https://datatracker.ietf.org/doc/draft-chan-idr-bgp-lu2/?include_text=1](https://datatracker.ietf.org/doc/draft-chan-idr-bgp-lu2/?include_text=1)
  - Use of color extended community for slicing
    - Conserve the original NLRI and hence the length field
  - Reuse RFC8277 (BGP-LU) and extend the support for color
  - Need new BGP capability code
Motivation

- Multiple Transport Service by **Slicing BGP** by COLOR
  - Low latency, diversity, BE....
- No need to run SR in all domains – RSVP, LDP, MPLSoUDP compatible
- Predictable label depth
- Remote Failure Signaling
- Scalable to >100k routers in size
- **Controller-less!** But the architecture is still SR controller compatible
- Design for BGP-LU backward compatibility
BGP-LU and BGP-LU2

BGP-LU

Prefix | Label | - OR - | Label
---|---|---|---
Prefix | Label | ≤ | Label

BGP-LU2

Prefix | Label | - OR - | Label
---|---|---|---
Prefix | Label | ≤ | Label
Prefix | Label | ≤ | Label
Prefix | Label | ≤ | Label
E2E – A BGP proposal (aka LU2)

Similar to BGP-LU BUT with COLOR

Anycast SID

2001
13001
8801
1100

VPN label

Access Region | Aggregation Region | Core Region | Aggregation Region | Access Region

SR/SR-TE | RSVP | SR/SR-TE/RSVP

SR-TE end-to-end
Service Mapping Method

Based on “color” attribute embedded

IPv4/IPv6
L3VPN
EVPN
L2VPN

Resolve next-hop
IP+Color

SR-TE end-to-end
Choices of color encoding

• Use of Path Attribute for color – as in the current draft
  • Save byte count for the same advertisement
  • Not normal BGP operation

• Use of new Attribute to prepend to NLRI
  • Just like add path
  • Prepend 4+2 byte (color + 2 reserved byte)
  • Repeat the same info
    • Additional 6KB for 1000 prefixes
Alternatives: Prepend Color info
Similar to Add-path

```
+-------------------------------------------+
| Color Slicing ID (4 octets)               |
+-------------------------------------------+
| Reserved (2 octets)                      |
+-------------------------------------------+
| Path Identifier (4 octets)               |
+-------------------------------------------+
| Length (1 octet)                         |
+-------------------------------------------+
| Label (3 octets)                         ~
+-------------------------------------------+
~ Label (3 octets)                         |
+-------------------------------------------+
| Prefix (variable)                        |
+-------------------------------------------+```