

IGP Color-Aware Shortcut

draft-cheng-lsr-igp-shortcut-enhancement-03

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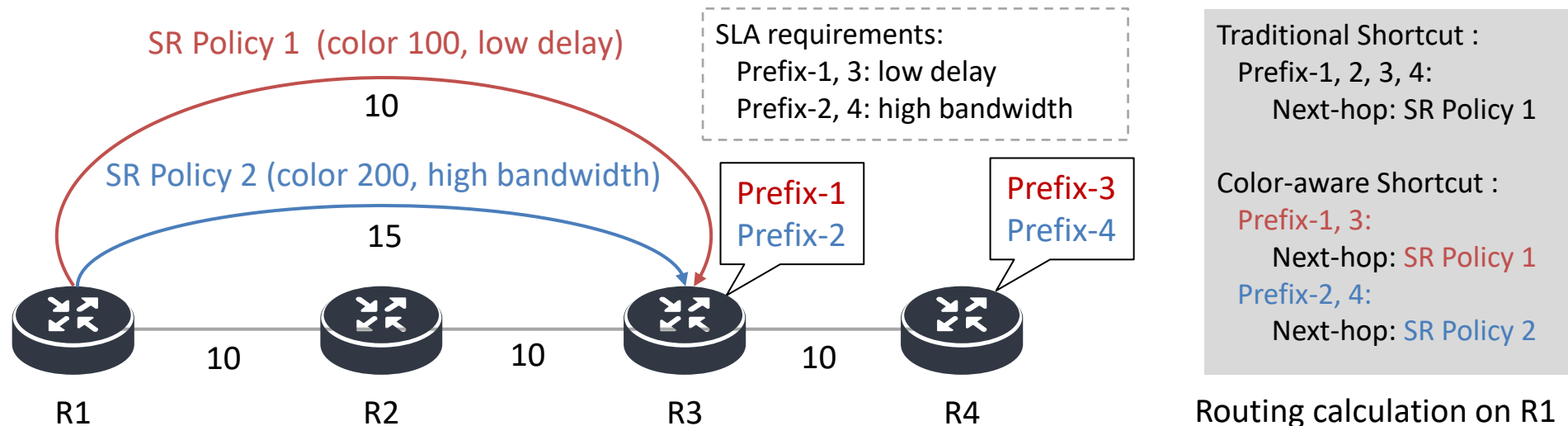
IETF-119, March 2024

Motivation

IGP shortcut [RFC3906] enables IGP to calculate routes over Traffic Engineering tunnels.

The granularity of IGP shortcut is based on nodes. If the first-hop of a node is determined to be a TE-tunnel during the SPF computation, all routes to IP prefixes advertised by that node will be over that TE-tunnel.

In some scenarios, there may be requirements to steer the routes to different prefixes of the same node onto different TE-tunnels. This document describes the enhancement of IGP shortcut which can steer routes onto TE-tunnels based on colors.



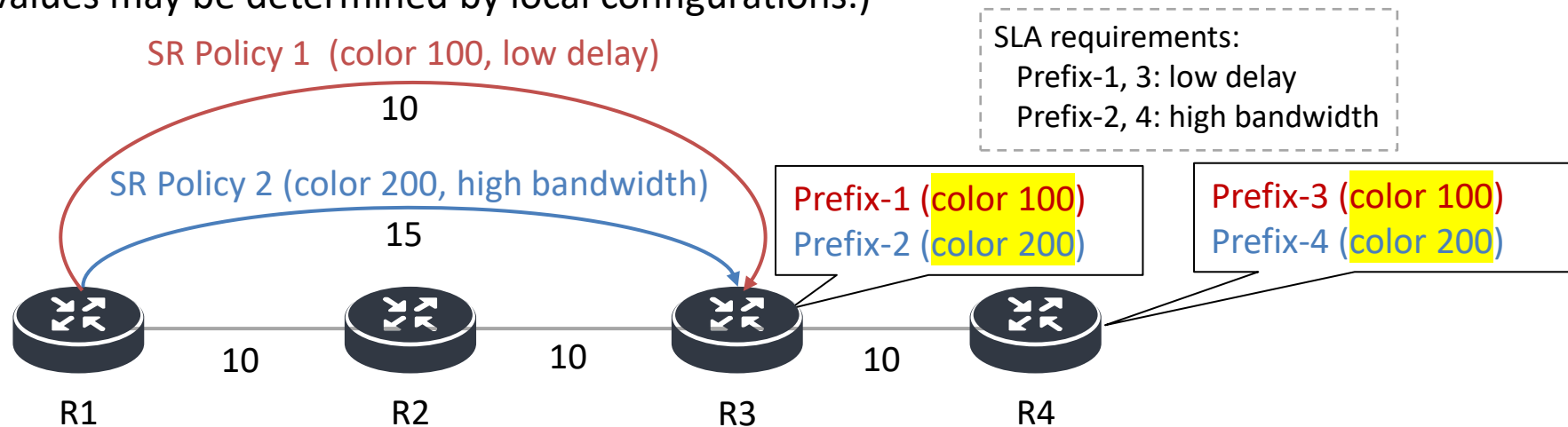
Solution Overview

There is already implementation of policy-based shortcut. On the headend, filtering polices can be configured for tunnels used in IGP shortcut. Only the prefixes which satisfy the polices could be steered over the associated tunnel. However, policy-based shortcut may create difficulty for operation and maintenance: $N_{\text{config}} = N_{\text{headend}} * N_{\text{tunnel}} * N_{\text{prefix}}$

Proposed solution:

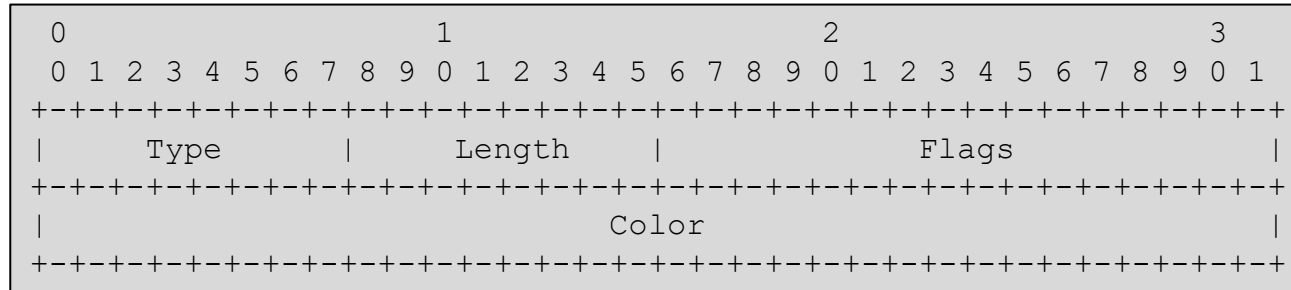
- Colored IGP prefix.
- Colored prefixes are steered over color-matched tunnels.

(Some kinds of TE-tunnels, such as SR Policy, have inherent color values. For the TE-tunnels which have no inherent color, the color values may be determined by local configurations.)

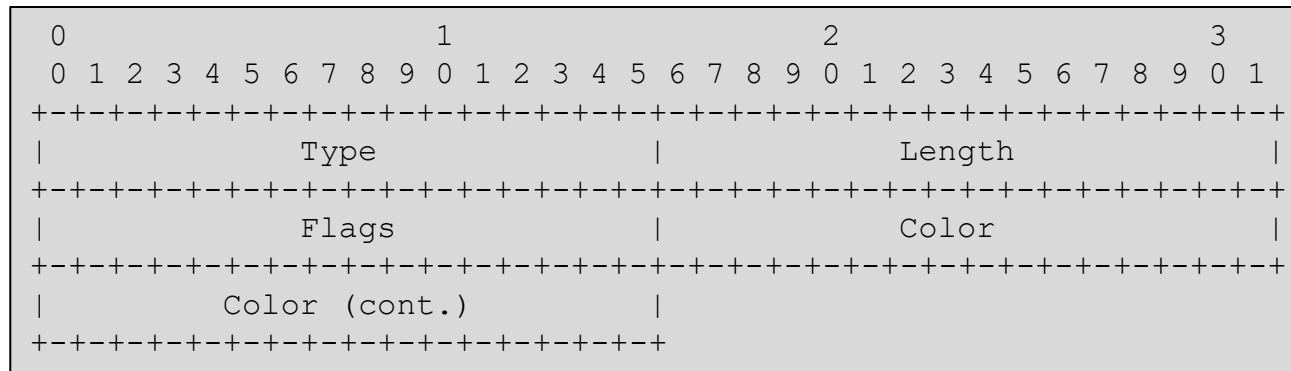


IGP Extension

The IS-IS Color Sub-TLV is applicable to TLVs 27, 135, 235, 236, and 237.



The OSPF Color Sub-TLV is applicable to OSPFv2 Extended Prefix TLV、 OSPFv3 Inter-Area-Prefix TLV、 OSPFv3 Intra-Area-Prefix TLV、 OSPFv3 External-Prefix TLV.



Multiple Colors Sub-TLVs could be attached to one prefix.

SPF Computation

Update the SPF computation of IGP shortcut [RFC3906]:

- Examine the list of tail-end routers directly reachable via a TE-tunnel. If there is a TE-tunnel to this node, we use the TE-tunnel as the first-hop.
- If there is no TE-tunnel, and the node is directly connected, we use the first-hop information from the adjacency database.
- If the node is not directly connected, and is not directly reachable via a TE-tunnel, we copy the first-hop information from the parent node(s) to the new node.



If there is a TE-tunnel to this node, we **add** the TE-tunnel into the first-hop information (**without deleting the previous ones**).

Adds the following steps when calculating next-hops for prefixes advertised by a node:

If a prefix is colored, we look up the first-hop information of the advertiser node for TE-tunnels with the same color.

- If there are eligible TE-tunnels, we compare the costs of paths over those TE-tunnels, and use the next-hop of the TE-tunnel with the lowest path cost.
- If there is no eligible TE-tunnel, we use the native adjacency next-hop.

If a prefix has no color, we use the next-hop with the lowest path cost.

Alternate Solution (without defining new sub-TLV)

Use IGP tags to colored prefixes:

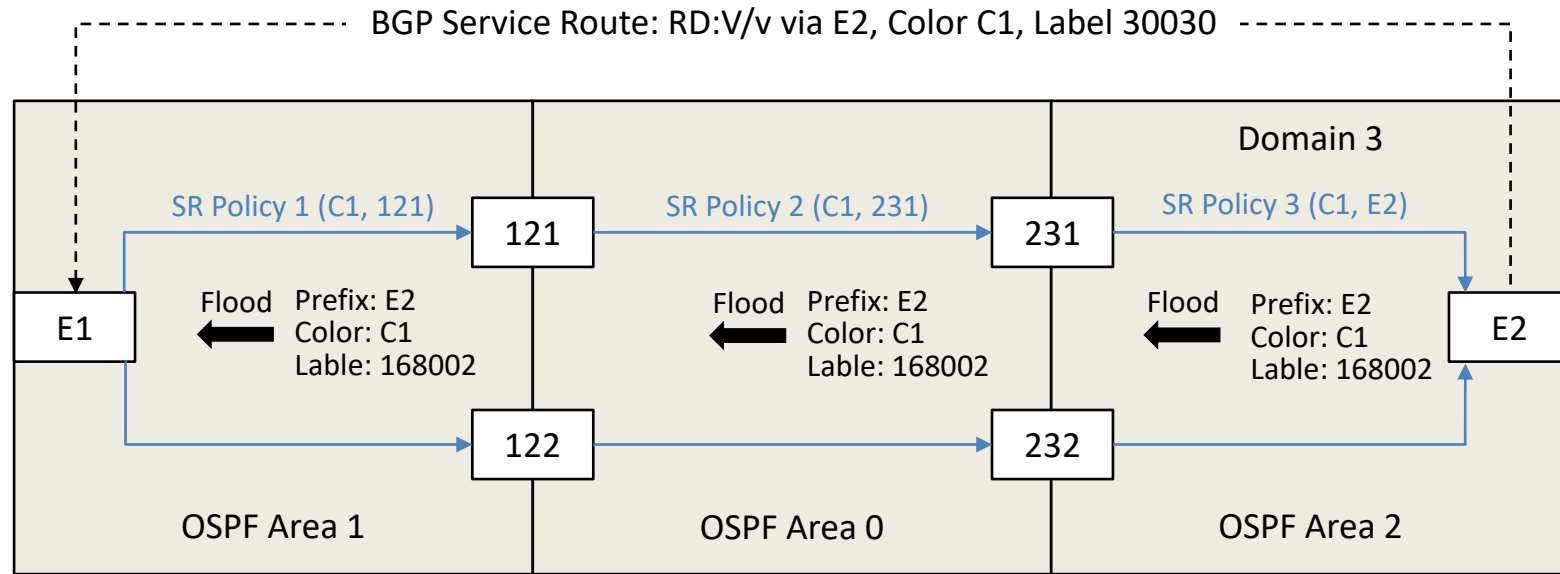
- OSPF: 32-bit Administrative Tag TLV [draft-ietf-lsr-ospf-admin-tags]
- IS-IS: 32-bit Administrative Tag Sub-TLV [RFC5130]

Configure the mapping between tags and colors.

- Advantage: No new sub-TLV needs to be defined.
- Disadvantage: Multiple tags could be attached to one prefix. There must be a mechanism for the receiver to know which tag is used as color.

Use Case: SR Policy based IGP CAR

- SR Policy provides intent in each area.
- IGP CAR route [draft-lin-lsr-igp-car] is resolved over color-matched SR Policy.



Forwarding on E1:
IPv4 VRF V/v =>
PUSH <SR Policy 1
, 168002, 30030>

| Segments in SR Policy 1 |
|-------------------------|
| 168002 |
| 30030 |

Forwarding on 121:
168002 =>
PUSH <SR Policy 2>

| Segments in SR Policy 2 |
|-------------------------|
| 168002 |
| 30030 |

Forwarding on 231:
168002 =>
PUSH <SR Policy 3>

| Segments in SR Policy 3 |
|-------------------------|
| 168002 |
| 30030 |

Next Steps

- Any questions or comments are Welcomed.

Thanks