Considerations for traffic steering to SRv6

draft-geng-srv6ops-traffic-steering-to-srv6-03

Gary Geng (Tencent)
Yisong Liu(China Mobile)
Chongfeng Xie(China Telecom)
Changwang Lin (New H3C Technologies)

IETF 125 Shenzhen

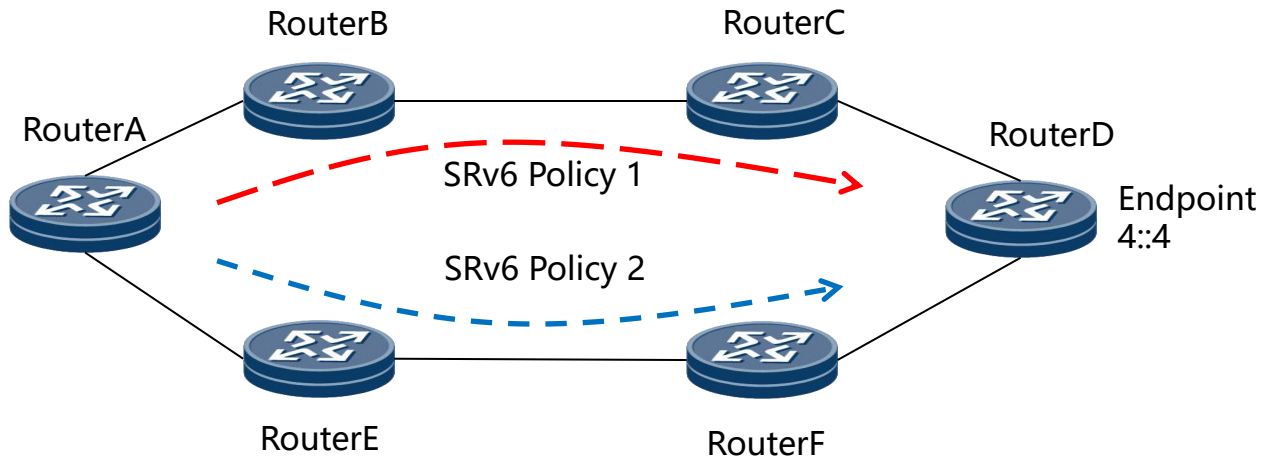
Traffic Steering to SRv6 Summary

- based on destination address
  - Static-Route Traffic Steering
  - IGP-Shortcut Traffic Steering
  - Color-based Traffic Steering
  - BSID-based Traffic Steering
- based on flow characteristics
  - Dscp-based Traffic Steering
  - 802.1p-based Traffic Steering
  - Service-class-based Traffic Steering
  - TE-class-based Traffic Steering
  - Traffic steering via BGP-FlowSpec

Steering Based on Destination Address: Static-Route

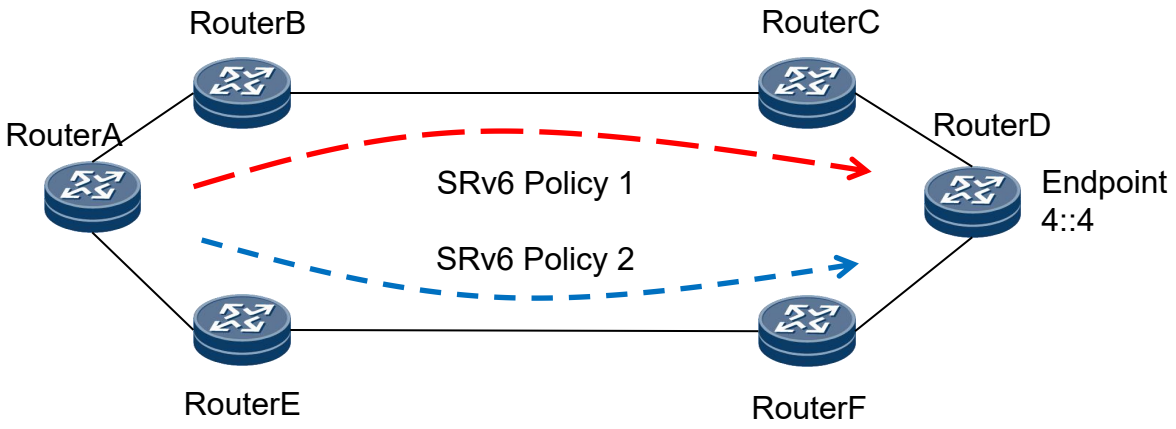
Ip route-static 2.2.2.2/32
srv6-policy 1

Ip route-static 3.3.3.3/32
srv6-policy 2



- Packet destination IPv6 address matching the ipv6 route-static, with next-hop to SRv6 Policy.
- Example:
  - ✓ When the destination address of traffic is specified as 2.2.2.2/32, the traffic will be forwarded along the path defined by SRv6 Policy 1.
  - ✓ When the destination address of traffic is specified as 3.3.3.3/32, the traffic will be forwarded along the path defined by SRv6 Policy 2.

Steering Based on Destination Address: IGP-Shortcut

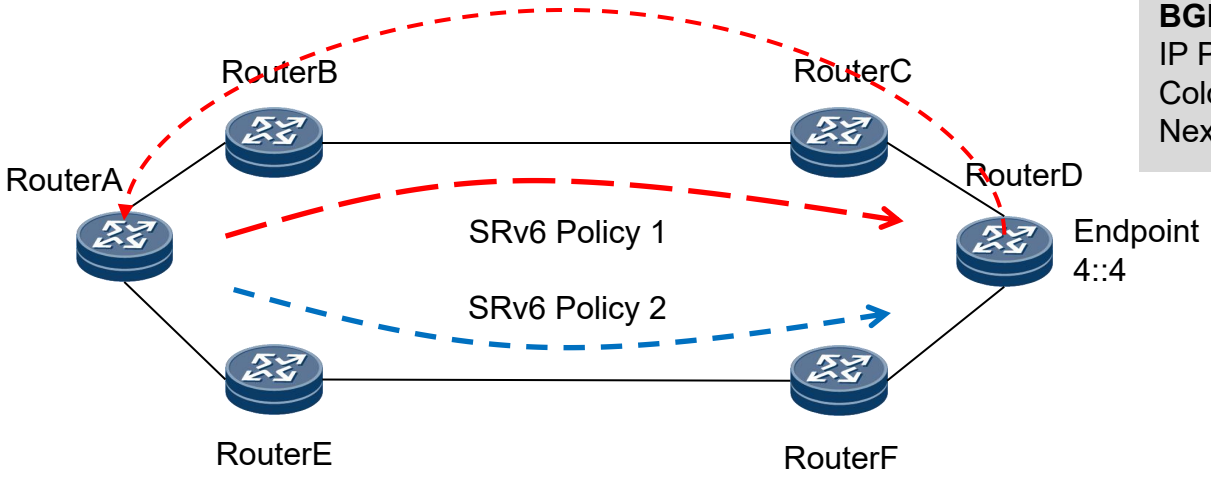


- The head-end node (Router A) treats an SRv6 Policy as a direct (shortcut) link to the endpoint.
- When the IGP-shortcut feature is enabled and the SRv6 Policy status is up, the head-end automatically generates a route to the policy's endpoint address (e.g., 4::4/128) pointing to that policy.
- If the SRv6 Policy goes down, the automatically generated route is withdrawn, and traffic falls back to forwarding via the native IGP path (SRv6 BE).

Steering Based on Destination Address: Color-based

SRv6 Policy 1:
Color 100
Endpoint 4::4

SRv6 Policy 2:
Color 200
Endpoint 4::4



BGP Route:

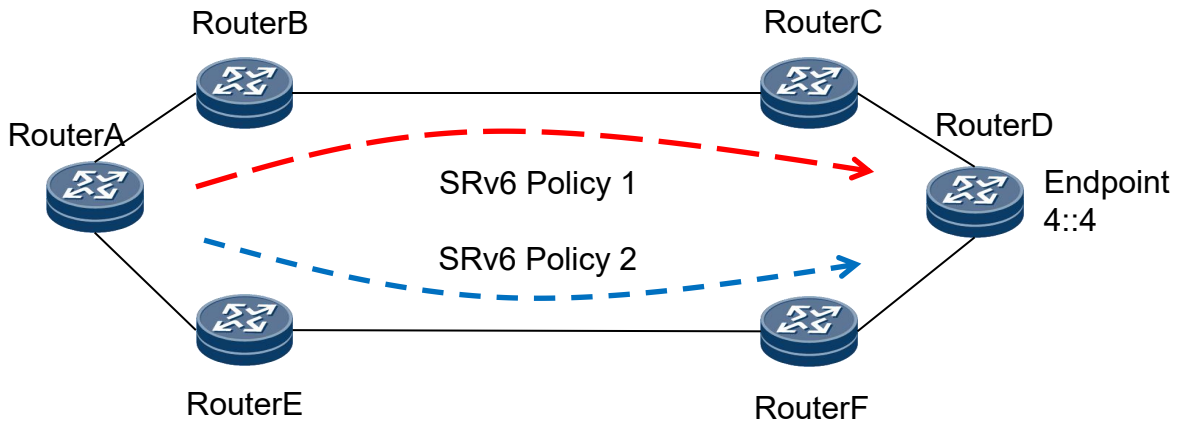
IP Prefix:	2.2.2.2/32	3.3.3.3/32
Color:	100	200
Nexthop:	4::4	4::4

- Leverages BGP routes. A route is advertised with:
  - ✓ A Color extended community (e.g., 100).
  - ✓ A next-hop address (e.g., 4::4, the endpoint).
  - ✓ On the head-end, this route is matched to an SRv6 Policy with the same Color and Endpoint.
  - ✓ Traffic destined for that BGP route is then forwarded via the matching SRv6 Policy.
- Example :
  - ✓ Route for 2.2.2.2/32 is advertised with Color 100, next-hop 4::4, Traffic to 2.2.2.2 → Steered into Policy 1 (Color 100, Endpoint 4::4) .
  - ✓ Route for 3.3.3.3/32 is advertised with Color 200, next-hop 4::4, Traffic to 3.3.3.3 → Steered into Policy 2 (Color 200, Endpoint 4::4) .

Steering Based on Destination Address: BSID-based

SRv6 Policy 1:
BSID<1000::1>

SRv6 Policy 2:
BSID<2000::1>



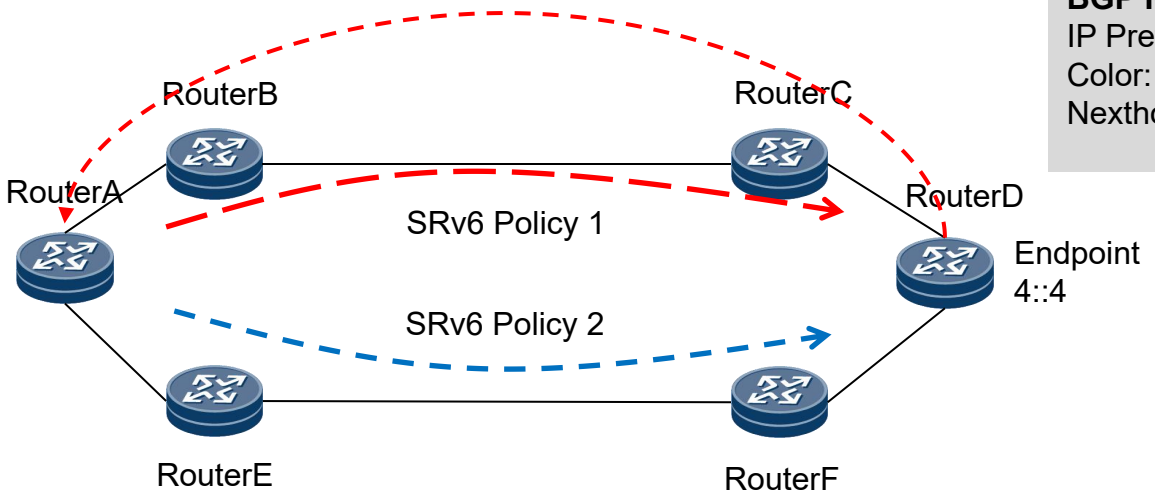
- When a packet's destination IPv6 address matches the Binding SID (BSID) of an SRv6 Policy, the packet is steered into that policy.
- This allows for seamless concatenation of multiple SRv6 policies without inserting the full SID list of the stitched policy into the packet header, reducing encapsulation overhead.
- Example :
  - ✓ If traffic's destination is 1000::1 → Steered into SRv6 Policy 1 (Path: B->C->D).
  - ✓ If traffic's destination is 2000::1 → Steered into SRv6 Policy 2 (Path: E->F->D).

Steering Based on Flow Characteristics: DSCP

SRv6 Policy Group 100
Color 10
EndPoint 4::4
color 100 -> dscp 10
color 200 -> dscp 20

SRv6 Policy 1:
Color 100
Endpoint 4::4

SRv6 Policy 2:
Color 200
Endpoint 4::4



BGP Route:
IP Prefix: 2.2.2.2/32
Color: 10
Nexthop: 4::4

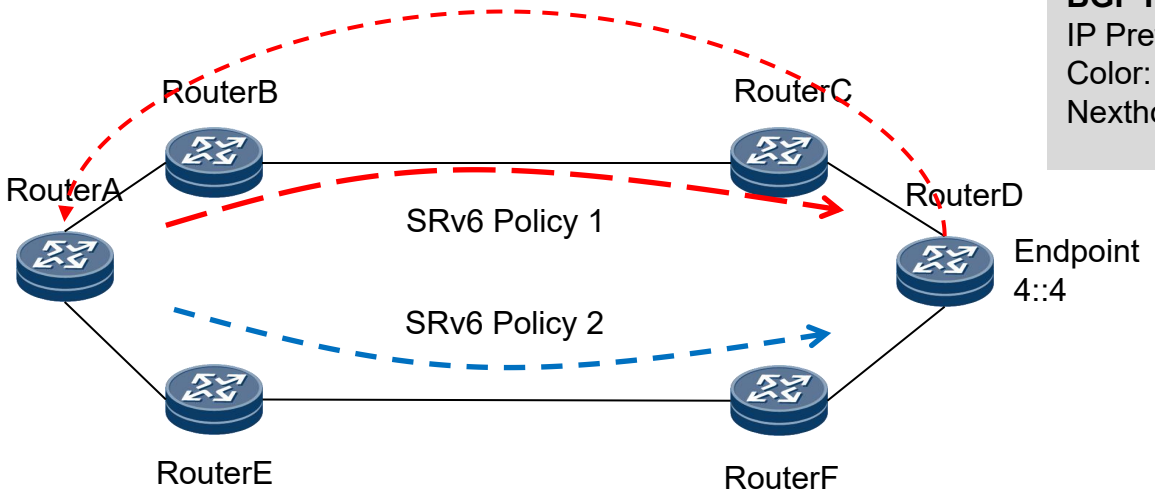
- An SRv6 Policy Group is created for a given endpoint (e.g., endpoint 4::4).
- Within the group, a mapping is defined: DSCP value → Color (e.g., DSCP 10 maps to Color 100; DSCP 20 maps to Color 200).
- A tunnel policy steers traffic matching the destination (e.g., 2.2.2.2/32) to the SRv6 Policy Group.
- The DSCP value in the packet determines which specific SRv6 Policy (e.g., Policy 1 for DSCP 10) inside the group is used.
- Allows different QoS classes for the same destination prefix.

Steering Based on Flow Characteristics: 802.1p

SRv6 Policy Group 100
Color 10
EndPoint 4::4
color 100 -> 802.1p 10
color 200 -> 802.1p 20

SRv6 Policy 1:
Color 100
Endpoint 4::4

SRv6 Policy 2:
Color 200
Endpoint 4::4



BGP Route:
IP Prefix: 2.2.2.2/32
Color: 10
Nexthop: 4::4

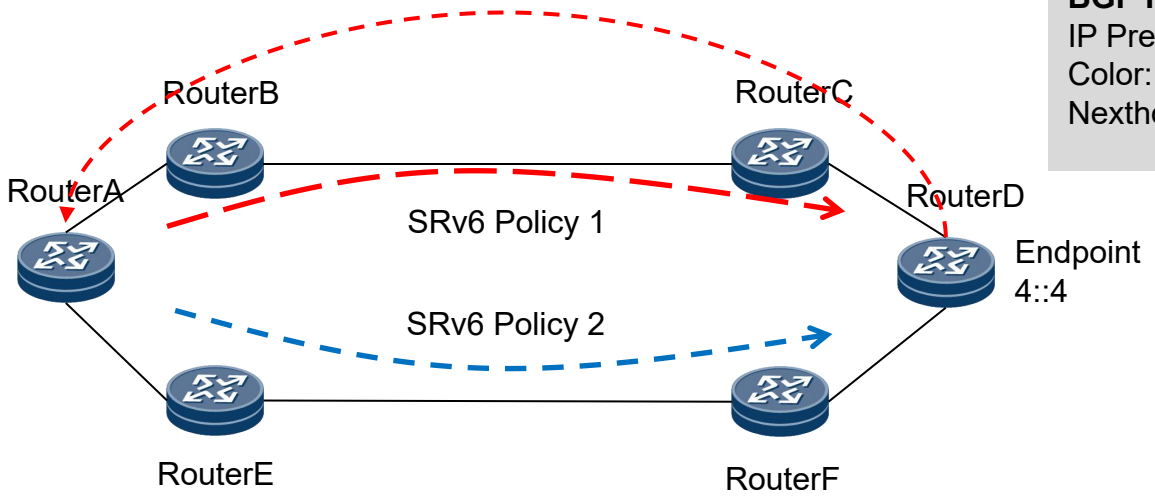
- Steering traffic based on the 802.1p priority value in the VLAN tag (Layer 2)
- It functions almost identically to DSCP-based steering, but uses the 802.1p field as the classifier.
- Requires an SRv6 Policy Group and a tunnel policy to direct traffic to the group.
- A mapping is configured within the group: 802.1p value → Color.
- Example (using Figure 1):
  - ✓ Traffic to 2.2.2.2/32 with 802.1p=10 → Steered into Policy 1.
  - ✓ Traffic to 2.2.2.2/32 with 802.1p=20 → Steered into Policy 2.

Steering Based on Flow Characteristics: Service-class

SRv6 Policy Group 100
Color 10
EndPoint 4::4
color 100 -> service-class 1
color 200 -> service-class 2

SRv6 Policy 1:
Color 100
Endpoint 4::4

SRv6 Policy 2:
Color 200
Endpoint 4::4



BGP Route:
IP Prefix: 2.2.2.2/32
Color: 10
Nexthop: 4::4

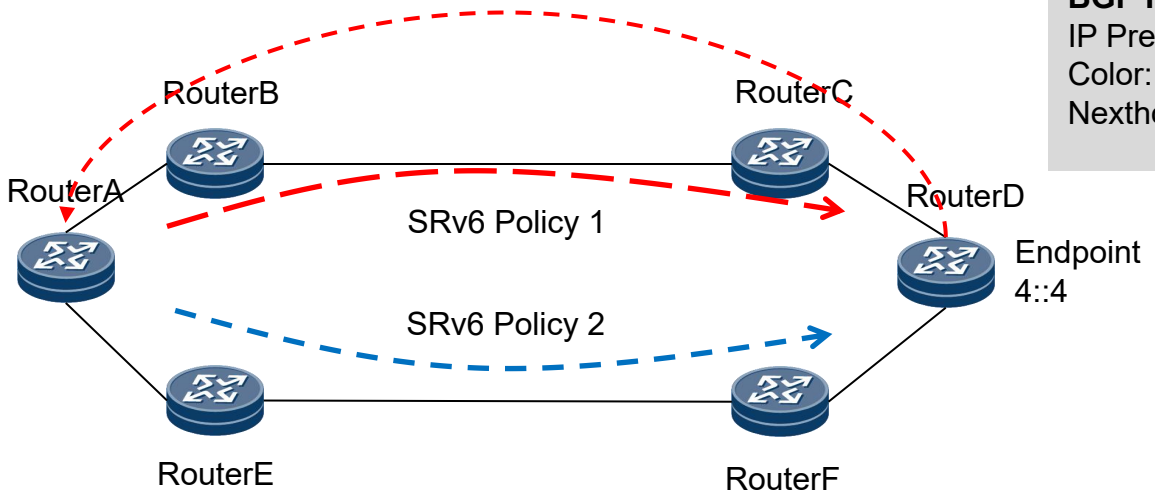
- A local device identifier ("service-class") is used when packets don't carry DSCP or 802.1p information.
- Traffic is first classified locally and marked with a service-class value.
- This traffic is directed to an SRv6 Policy Group.
- A mapping is configured within the group: service-class value → Color.
- Example:
  - ✓ Traffic to 2.2.2.2/32 with local service-class=1 → Steered into Policy 1.
  - ✓ Traffic to 2.2.2.2/32 with local service-class=2 → Steered into Policy 2.

Steering Based on Flow Characteristics: TE-class

SRv6 Policy Group 100
Color 10
EndPoint 4::4
color 100 -> te-class 1
color 200 -> te-class 2

SRv6 Policy 1:
Color 100
Endpoint 4::4

SRv6 Policy 2:
Color 200
Endpoint 4::4



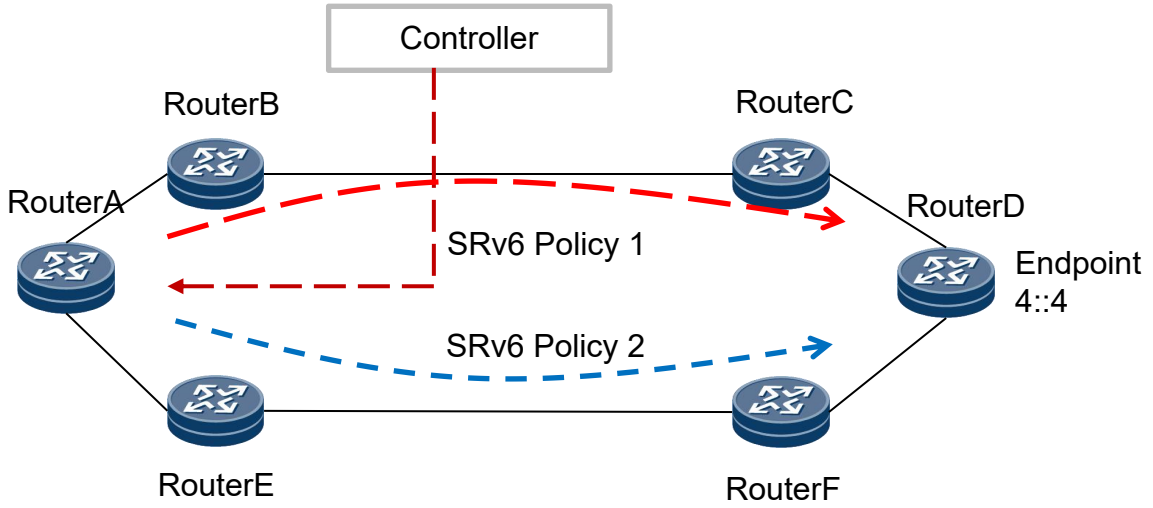
BGP Route:
IP Prefix: 2.2.2.2/32
Color: 10
Nexthop: 4::4

- Uses local identifier "TE class ID", which supports a much larger range (up to 65535) compared to service-class, allowing for more granular service differentiation.
- Traffic is directed to an SRv6 Policy Group.
- A mapping is configured: te-class value → Color.
- Example:
  - ✓ Traffic to 2.2.2.2/32 with local te-class=1 → Steered into Policy 1.
  - ✓ Traffic to 2.2.2.2/32 with local te-class=2 → Steered into Policy 2.

Steering via BGP-FlowSpec

SRv6 Policy 1:
Color 100
Endpoint 4::4

SRv6 Policy 2:
Color 200
Endpoint 4::4



FlowSpec route:
NLRI: Filter Rules
2.2.2.2/32 3.3.3.3/32
Color: 100 200
Nexthop: 4::4

- A controller-based method for flexible, global traffic steering.
- A central controller defines fine-grained traffic matching rules.
- The controller distributes these rules as BGP FlowSpec routes to the head-end node.
- The FlowSpec route includes actions, such as setting the Color and next-hop for the matched traffic.
- Enables dynamic and centralized control over traffic steering policies across the network.
- Example: Controller -> FS Route (Filter Rules, Color: 100/200, Nexthop: 4::4) -> Router A
  - ✓ Controller specify traffic 1(eg. 2.2.2.2/32) with color 100. the traffic will be forwarded along SRv6 Policy 1.
  - ✓ Controller specify traffic 2(eg. 3.3.3.3/32) with color 200. the traffic will be forwarded along SRv6 Policy 2.

Summary

Steering Category	Specific Method	Key Point	Characteristics
Destination Address	**IP Static Route**	Packet DA = Static Route	Simple but not flexible
	BSID-based	Packet DA = BSID	Policy stitching, reducing encapsulation overhead.
	Color-based	BGP Route Color + Next-hop	Standard, scalable way to steer traffic to TE policies.
	IGP-Shortcut	Auto-generated route to endpoint	Simple, automatic steering with built-in failover.
Flow Characteristics	**DSCP-based**	DSCP value in IP header	QoS-based steering (e.g., EF, AF).
	802.1p-based	802.1p in VLAN tag	Layer2 QoS-based steering.
	Service-class	Local device service class	Steering for unmarked traffic.
	TE-class	Local TE class ID	Highly granular service differentiation.
	BGP-FlowSpec	Controller-defined rules	Centralized, flexible, and dynamic policy control.

Next Steps

- Seeking broader review and feedback from WG

Thanks!