

# How NRPs should be expressed in packets using SR

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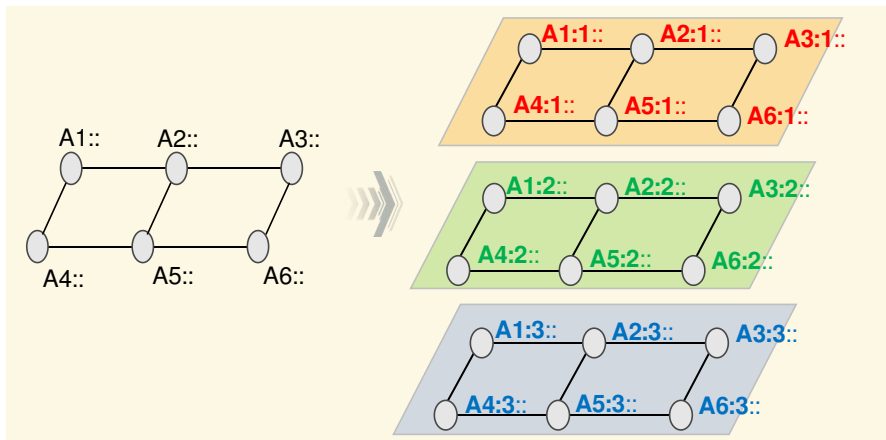
- Background
- NRP selector comparison in data plane
- SR policy for NRP
- Procedures

# NRP and SR

- Network Resource Partition (NRP) is a subset of the resources and associated policies in the underlay network
  - Can be used to support one or a group of network slice services
- Segment Routing (SR) achieves source routing by encapsulating packets with an ordered list of instructions called “segments”
  - A segment may be associated with a topological instruction, a service instruction, or a specific packet treatment
- There are two approaches to realize NRP with SR
  - Introduces resource-awareness to Segment Identifiers (SIDs)
    - Segment IDs indicate both the instruction and the set of resources to be used
  - Introduces a dedicated data plane identifier (NRP Selector ID) to SR packets
    - Both the SID list and the NRP Selector ID needs to be carried in packets

# Comparison of the Two Approaches

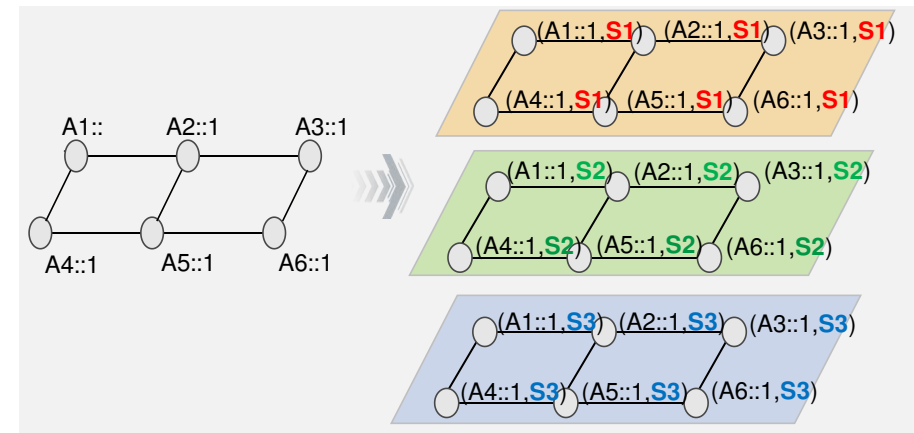
- Reuse existing SR data plane
  - SR-MPLS and SRv6
- Give resource semantics to SR SIDs
  - Minimum change to SR forwarding
- Allocate different groups of SIDs for different NRPs
  - Additional overhead in control plane and network management



- Suitable for small number of NRPs

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- Introduce dedicated NRP ID in packets
  - Needs data plane extension
  - The encapsulation is protocol-specific
- Packet forwarding based on both SIDs and NRP ID
- No additional SIDs allocated for NRP
  - Better scalability



- Applicable to large amount NRP deployment

- With the resource-awareness approach, existing SR policy can support it.
- With the NRP Selector ID approach, how to support NRP under SR policy?

# SR Policy Extension for NRP

- draft-jiang-spring-sr-policy-nrp describes the SR Policy extension to enable NRP association
  - Candidate Path to NRP Association: Each Candidate Path of an SR Policy MUST be associated with an NRP.
  - NRP Selector ID Assignment: The NRP Selector ID assigned to each Candidate Path MAY be the same or different.
  - Resource Sharing within a Candidate Path: All Segment Lists belonging to a Candidate Path are associated with its assigned NRP and share its allocated resource set.

# Updated SR Policy Information Model

- Extended SR Policy Information Model Example is as blow:

SR Policy POL1

Candidate Path CP1

Preference 200

NRP Selector ID 100

Segment List 1 <SID11...SID1i>, Weight 1

Segment List 2 <SID21...SID2j>, Weight 1

Segment List 3 <SID31...SID3k>, Weight 1

Candidate Path CP2

Preference 100

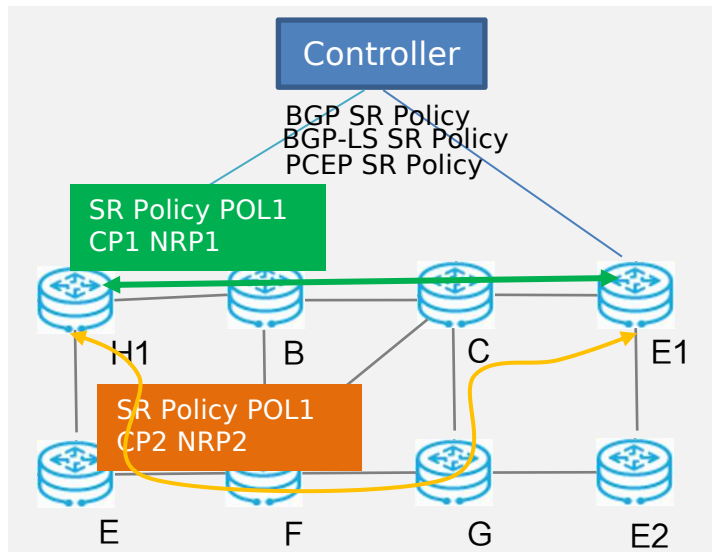
NRP Selector ID 200

Segment List 4 <SID41...SID4i>, Weight 1

Segment List 5 <SID51...SID5j>, Weight 1

Segment List 6 <SID61...SID6k>, Weight 1

# Procedures



SR Policy POL1 : CP1 associated with NRP1  
CP2 associated with NRP2

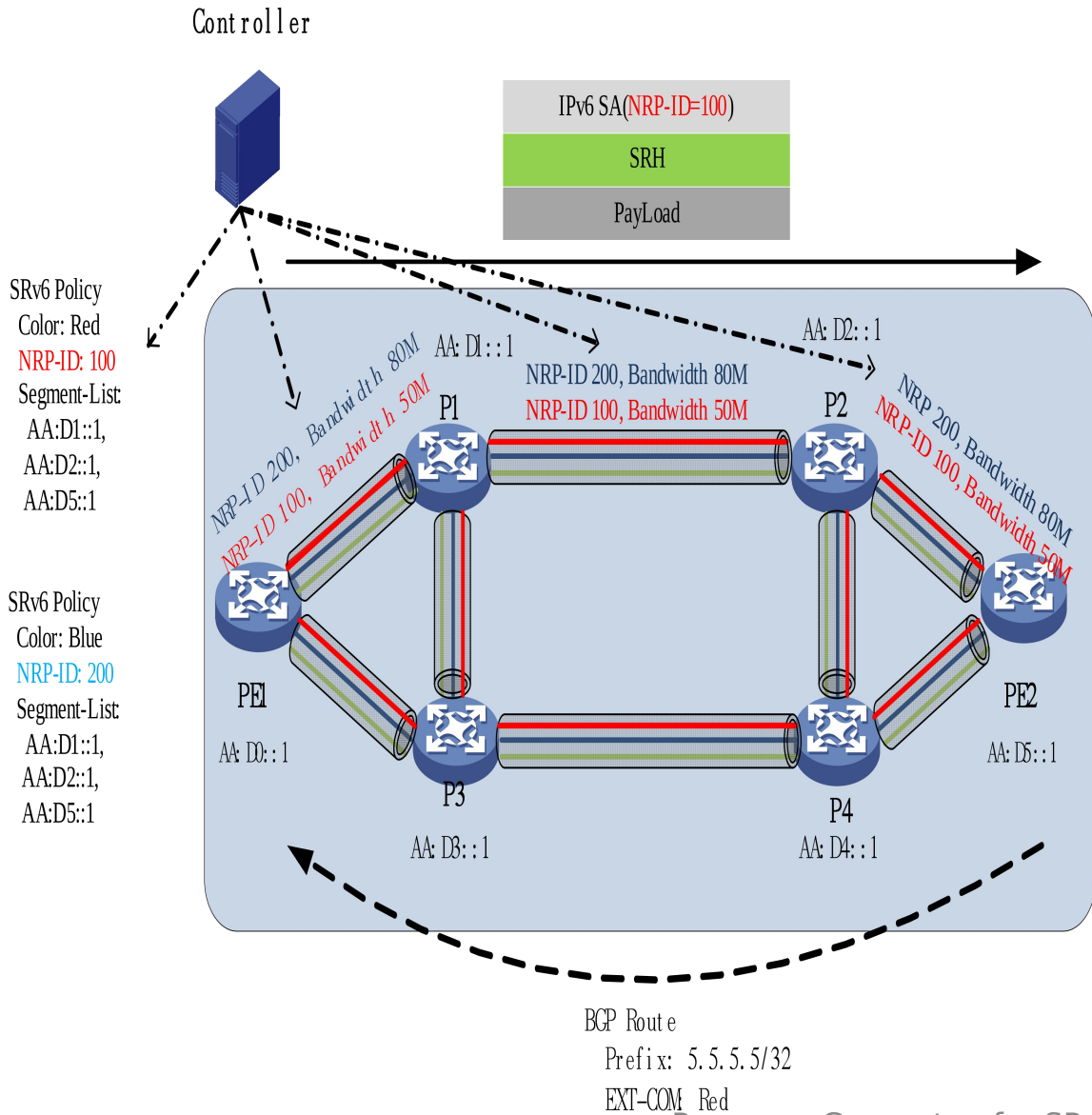
- An SR Policy CP may be instantiated with a specific NRP on the headend node via a local configuration, PCEP, or BGP SR Policy signaling.
- SR Policy headend node H1 steers service traffic into the SR Policy, selects the active path (e.g., CP1), and encapsulates the packet (adding the Segment List and NRP ID1).
- Each transit node (e.g., B, C) reads the NRP ID in the packet and schedules it to the dedicated resources reserved for the NRP (e.g., HQoS queues) for forwarding.

# Next Step

- Comments welcome.

**Thank you!**

# Use case



- ① Analyze user requirements and plan NRP resources and paths. Create NRP instances and slice channels under each interface:
  - Create a red NRP with ID 100 and associated bandwidth of 50M
  - Create a blue NRP with ID 200 and associated bandwidth of 80M
- ② BGP service routes carry color via the extended community (Ext-com) attribute.
- ③ The controller provisions SRv6 Policies with slicing information via PCE/BGP:
  - SRv6 Policy (Color Red) associated with NRP-ID 100
  - SRv6 Policy (Color Blue) associated with NRP-ID 200
- ④ Slice traffic is steered to the corresponding SRv6 Policy based on color.
- ⑤ The forwarding plane carries the NRP ID via the source address or HBH, and the transit device forwards traffic by further looking up the resource queue based on the NRP ID.
- ⑥ Head-end And Transit device reports NRP statistics  
Head-end device reports SRv6 Policy status