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BGP SR Policy Extensions for Network Resource Partition
draft-dong-idr-sr-policy-nrp-00

Abstract

Segment Routing (SR) Policy is a set of candidate paths, each consisting of one or more segment lists and the associated information. The header of a packet steered in an SR Policy is augmented with an ordered list of segments associated with that SR Policy. A Network Resource Partition (NRP) is a set of network resources allocated in the network which can be used to instantiate a virtual transport network (VTN) for one or a group service traffic. In scenarios where multiple Network Resource Partitions (NRPs) exist in the network, the NRP in which an SR policy is instantiated may also need to be specified, so that the header of the packet can be augmented with the information associated with the NRP. An SR Policy candidate path can be distributed using BGP SR Policy. This document defines extensions to BGP SR policy to specify the NRP in which the SR policy is instantiated.

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BGP SR Policy for NRP

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[1.](#) Introduction

The concept of Segment Routing (SR) policy is defined in [\[I-D.ietf-spring-segment-routing-policy\]](#). An SR Policy is a set of candidate paths, each consisting of one or more segment lists. The head end of an SR Policy may learn multiple candidate paths for an SR Policy. The header of a packet steered in an SR Policy is augmented with an ordered list of segments associated with that SR Policy. The BGP extensions to distribute SR Policy candidate paths is defined in [\[I-D.ietf-idr-segment-routing-te-policy\]](#).

The concept of Virtual Transport Network (VTN) is introduced in [\[I-D.ietf-teas-enhanced-vpn\]](#). A VTN is a virtual underlay network which has customized network topology and a set of dedicated or shared network resources. In a network, multiple VTNs may be created

to meet different service requirements, and services can be mapped to the same or different VTNs. [[I-D.ietf-teas-ietf-network-slices](#)] introduces the concept Network Resource Partition (NRP) as a set of network resources that are available to carry traffic and meet the SLOs and SLEs. In the context of network slicing, an NRP can be used

to instantiate a VTN for one or a group of IETF network slice services. As described in [[I-D.dong-teas-nrp-scalability](#)], one scalable data plane approach is to carry a global NRP ID in the data packet to identify the NRP the packet belongs to, so that the packet can be processed and forwarded using the network resources allocated to the NRP.

In networks where multiple NRPs exist, the identifier of NRP in which the SR policy is instantiated need to be specified, so that at the ingress node of SR policy, the header of data packet can also be augmented with the identifier of the NRP. This document defines the BGP extensions to specify the NRP ID associated with a candidate path of SR policy.

[2.](#) Specification of Requirements

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

[3.](#) NRP Identifier of SR Policy

In order to specify the NRP the candidate path of SR policy is associated with, a new sub-TLV called "NRP sub-TLV" is defined in the BGP Tunnel Encapsulation Attribute [[RFC9012](#)]. The NRP sub-TLV can be carried in the BGP Tunnel Encapsulation Attribute with the tunnel type set to SR Policy.

The NRP sub-TLV is optional and MUST NOT appear more than once for one SR Policy candidate path. If the NRP sub-TLV appears more than once, the associated BGP SR Policy NLRI is considered malformed and the "treat-as-withdraw" strategy of [[RFC7606](#)] is applied.

The NRP sub-TLV has the following format:

0	1	2	3
---	---	---	---

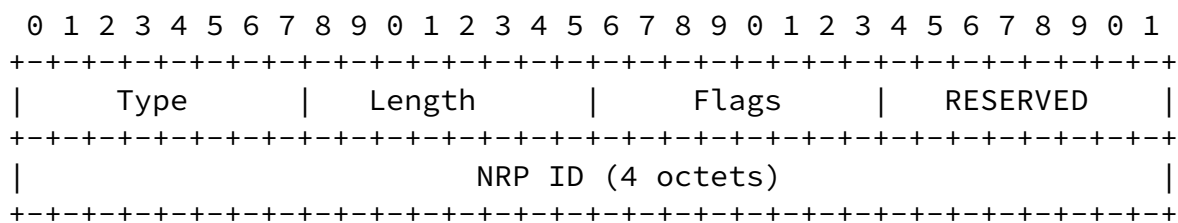


Figure 1. NRP Sub-TLV

where:

- * Type: 123

- * Length: 6
- * Flags: 1-octet flag field. None is defined at this stage. The flags SHOULD be set to zero on transmission and MUST be ignored on receipt.
- * RESERVED: 1 octet of reserved bits. It SHOULD be set to zero on transmission and MUST be ignored on receipt.
- * NRP ID: A 32-bit global significant identifier which is used to identify a NRP. Value 0 and 0xFFFFFFFF are reserved.

The encoding structure of BGP SR Policy with the NRP sub-TLV is expressed as below:

```

SR Policy SAFI NLRI: <Distinguisher, Policy-Color, Endpoint>
Attributes:
  Tunnel Encaps Attribute (23)
    Tunnel Type: SR Policy
      Binding SID
      Preference
      Priority
      Policy Name
      Explicit NULL Label Policy (ENLP)
      NRP
      Segment List
        Weight
        Segment
        Segment

```

...
...

4. Procedures

When a candidate path of SR policy is instantiated with a specific NRP, the originating node of SR policy SHOULD include the NRP ID in the BGP Tunnel Encapsulation Attribute of the BGP SR policy. The setting of other fields and attributes in BGP SR policy SHOULD follow the mechanism as defined in [\[I-D.ietf-idr-segment-routing-te-policy\]](#).

When a BGP speaker receives an SR Policy which is acceptable and usable according to the rules as defined in [\[I-D.ietf-idr-segment-routing-te-policy\]](#), and the SR Policy candidate path selected as the best candidate path is associated with an NRP, the receiver node of the SR policy SHOULD encapsulate the NRP ID in the header of packets steered to the SR Policy. For SR Policy with

IPv6 data plane, the approach is to encapsulate the NRP ID in IPv6 Hop-by-Hop extension header using the mechanism as defined in [\[I-D.dong-6man-enhanced-vpn-vtn-id\]](#). For SR Policy with MPLS data plane, one possible mechanism to encapsulate the NRP ID to the packet is defined in [\[I-D.li-mpls-enhanced-vpn-vtn-id\]](#).

Although the proposed mechanism allows that different candidate paths in one SR policy be associated with different NRPs, in normal network scenarios it is considered that the association between an SR Policy and NRP is consistent, in such case all candidate paths of one SR policy SHOULD be associated with the same NRP.

5. Security Considerations

The security considerations of BGP and BGP SR policy apply to this document.

6. IANA Considerations

IANA has assigned the sub-TLV type as defined in [Section 3](#) from "BGP Tunnel Encapsulation Attribute sub-TLVs" registry.

Value	Description	Reference
123	NRP	This document

7. Acknowledgments

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