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SRv6 Resource Programming with NRP flavor
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Abstract

This document introduces a new flavor type for SRv6 called "Flavor NRP". It associates the SRv6 End.X SID with a set of network resource partitions (referred to as NRP resources). By using the End.X SID with the NRP flavor type, SRv6 policies can provide programmability for network resources.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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Table of Contents

1. Introduction.....2
   1.1. Requirements Language.....3
2. NRP Flavor.....3
3. Use Cases for NRP Flavor.....3
4. Security Considerations.....4
5. IANA Considerations.....5
6. References.....5
   6.1. Normative References.....5
Authors' Addresses.....7

1. Introduction

The concept of network resource partition (NRP) is introduced in [I-D.ietf-teas-ietf-network-slices]. NRP is a set of network resources allocated from the underlying network, which is used to carry specific network traffic and meet the desired Service Level Objectives (SLOs) and Service Level Expectations (SLEs).

Segment Routing (SR) [RFC8402] guides packets using an ordered list of instructions called "segments". Each instruction represents a function performed at a specific location in the network. This function is locally defined on the executing node and can range from simple forwarding to complex user-defined behaviors. Network programming combines the functions of Segment Routing, which are both simple and complex, to achieve network objectives beyond simple packet routing.

When the SRv6 network provides network slicing services, the SRv6 Endpoint behaviors defined in [RFC8986] are not associated with slice-specific network resources (e.g., regular End.X simply forwards packets to endpoints with 'layer-3 adjacency'). Therefore, there is a lack of orchestration for network resources, including link bandwidth, buffer, and queues.

This document defines a new flavor type for SRv6 called "NRP Flavor " which allows the SID to be associated with a set of network resource partitions (e.g., bandwidth, buffer, and queue resources). By programming the SRv6 policy path using SIDs with the NRP flavor type, programmability for SRv6 network resources is achieved.

1.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

2. NRP Flavor

This section defines a new SRv6 Endpoint behavior that can be used to associate with a set of network resource partitions (such as bandwidth, buffer, and queue resources) and identified by the End.X SID with the Flavor type NRP.

The behavior of selecting NRP resources can be identified and chosen using the End.X with Flavor type NRP [RFC8986]. When a packet destined to S is received by N and S is a local End.X with Flavor type NRP, the Step 15 in the End.X processing defined in [RFC8986] is replaced with the following:

Any instance of End.X SID with Flavor NRP behavior is associated not only with one or more L3 adjacencies or L2 Bundles but also with the corresponding NRP resources.

S15. Submit the packet to the IPv6 module for transmission to the new destination via a member of J. If the Flavor type is NRP, use the NRP resources (such as bandwidth, buffer, and queue resources) associated with this SID for packet forwarding.

These End.X SIDs with Flavor type NRP can be assigned by a centralized network controller or network nodes, and can be advertised using IGP or BGP-LS, similar to the regular End.X SID advertisement behavior.

3. Use Cases for NRP Flavor

This section outlines the possible flow of using End.X behavior with Flavor NRP type.

A set of End.X SIDs with Flavor NRP type can be assigned for network resource allocation related to SRv6 policies, to direct service traffic towards different sets of link resources (e.g., bandwidth, buffer, and queue resources) in packet forwarding. The association of this group of End.X SIDs with network resource allocation is identified by using Flavor NRP.

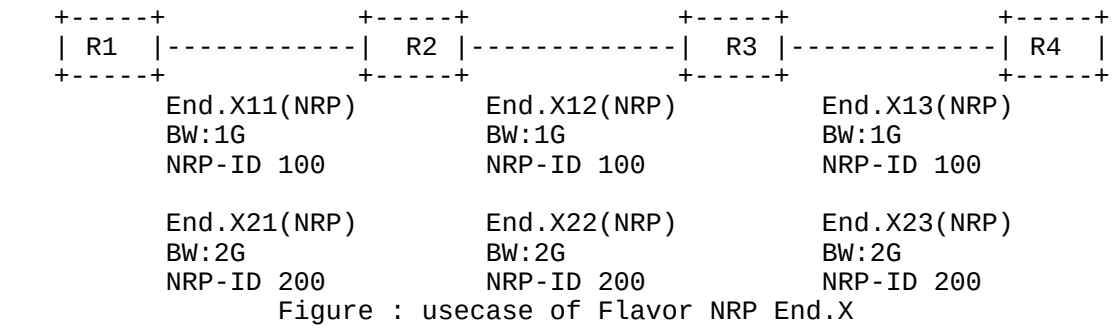

Figure : usecase of Flavor NRP End.X

As shown in Figure 1, there are two network resource partitions: NRP-ID 100 and NRP-ID 200, allocated for two network slices. The End.X SIDs with Flavor type NRP can be associated with a group of network resource partitions assigned to the slice/slice aggregation. Therefore, this group of End.X SIDs with Flavor type NRP can be used to build SR policies, and transit nodes can direct traffic to the set of network resources allocated for that slice.

Here is a possible flow:

The controller obtains the topology information and calculates SRv6 Policy 1 and SRv6 Policy 2 based on SLAs.

The controller collaborates with network nodes to perform resource reservation and allocation of End.X SIDs with Flavor type NRP along SRv6 Policy 1 and SRv6 Policy 2. Taking the interface R1-R2 of SRv6 node R1 along SRv6 Policy 1 as an example, End.X11 is associated with NRP-ID 100, which is the network resource partition identifier for QoS queue for BW 1G, and End.X21 is associated with NRP-ID 200, which is the network resource partition identifier for QoS queue for BW 2G.

The controller uses End.X11, End.X12, and End.X13 to build the SID list for SRv6 Policy 1, and uses End.X21, End.X22, and End.X23 to build the SID list for SRv6 Policy 2.

Then, the controller notifies the ingress nodes about the segment lists of SRv6 Policy 1 and SRv6 Policy 2 through various means, including BGP [I-D.ietf-idr-segment-routing-te-policy].

4. Security Considerations

TBD.

5. IANA Considerations

This document requests the new assignment of End.X with NRP type from "The initial registrations" for the Flavor type NRP of End.X.

Value	Hex	Endpoint Behavior	Reference
TBD	TBD	End.X with NRP	This Document
TBD	TBD	End.X with PSP& NRP	This Document
TBD	TBD	End.X with USP&USD&NRP	This Document
TBD	TBD	End.X with PSP&USP&USD&NRP	This Document

6. References

6.1. Normative References

[I-D.ietf-teas-ietf-network-slices] Farrel, A., "Framework for IETF Network Slices", Work in Progress, Internet-Draft, draft-ietf-teas-ietf-network-slices-12, 30 June 2022, <https://www.ietf.org/archive/id/draft-ietf-teas-ietf-network-slices-12.txt>.

[I-D.ietf-teas-enhanced-vpn] Dong, J., "A Framework for Enhanced Virtual Private Network (VPN+) Services", draft-ietf-teas-enhanced-vpn-10, 6 March 2022, <https://www.ietf.org/archive/id/draft-ietf-teas-enhanced-vpn-10.txt>.

[RFC9352] P. Psenak, Ed.," IS-IS Extensions to Support Segment Routing over the IPv6 Data Plane ", February 2023,<https://datatracker.ietf.org/doc/rfc9352/>.

[RFC7770], A. Lindem, Ed., Ed., "Extensions to OSPF for Advertising Optional Router Capabilities", February 2016, <https://datatracker.ietf.org/doc/rfc7770/>

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