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Stateless and Scalable Network Slice Identification for SRv6
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Abstract

This document defines a stateless and scalable solution to achieve network slicing with SRv6.

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1. Introduction

SRv6 Network Programming[I-D.ietf-spring-srv6-network-programming] enables the creation of overlays with underlay optimization to be deployed in an SR domain[RFC8402].

As defined in [RFC8754], all inter-domain packets are encapsulated for the part of the packet journey that is within the SR domain. The outer IPv6 header is originated by a node of the SR domain and is destined to a node of the SR domain.

This document describes a stateless encoding of slice identification in the outer IPv6 header of an SR domain. The slice identification is independent of topology and the QoS/DiffServ policy of the network, thus enabling scalable network slicing for SRv6 overlays.

2. Slice Identifier

Each network slice in an SR domain is uniquely identified by an 8-bit Slice Identifier (SLID).

3. Ingress PE SLID Assignment

When an ingress PE receives a packet that traverses the SR domain, it encapsulates the packet in an outer IPv6 header and optional SRH as defined in [RFC8754]. The ingress PE MAY also classify the packet into a slice and set the slice identifier as follows:

- Set the SPI bit (SLID Presence Indicator) in the Traffic Class field of the outer IPv6 header.

- Write this SLID in the 8 most significant bits of the Flow Label field of the outer IPv6 header. The remaining 12 bits of the Flow

Label field were set as described in section 5.5 of [RFC8754] for inter-domain packets.

The slice classification method is outside the scope of this document.

The choice of the SPI bit from within the IPv6 Traffic Class field is a domain-wide configuration and is outside the scope of this document.

4. Per-Slice Forwarding

Any router within the SR domain that forwards a packet with SPI bit set uses the SLID to select a slice and apply per-slice policies.

There are many different policies that could define a slice for a particular application or service. The most basic of these is bandwidth-allocation, an implementation complying with this specification SHOULD support the bandwidth-allocation slice as defined in the next section.

5. Bandwidth-Allocation Slice

A per-slice policy is configured at each interface of each router in the SR domain, with one traffic shaper per SLID. The bitrate of each shaper is configured to reflect the bandwidth allocation of the per-slice policy.

If shapers are not available, or desirable, an implementation MAY configure one scheduling queue per SLID with a guaranteed bandwidth equal to the bandwidth-allocation for the slice. This option allows a slice to consume more bandwidth than its allocation when available.

Per-slice shapers or queues effectively provides a virtual port per slice. This solution MAY be complemented with a per-virtual-port hierarchical DiffServ policy. Within the context of one specific slice, packets are further classified into children DiffServ queues which hang from the virtual port. The DSCP value in the IPv6 header SHOULD be used for queue selection.

6. Backward Compatibility

The Flow Label usage described in this document is consistent with [RFC6437] and [RFC6438].

PE routers that do not set the SPI bit do not enable the SLID semantic of the Flow Label bits. Hence, SLID-aware routers would not attempt to classify these packets into a slice.

Any router that does not process the SPI nor the SLID forwards packets as usual.

7. Acknowledgements

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8. References

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