4map6 Segments for IPv4 Service delivery over IPv6-only underlay networks

<draft-dong-spring-sr-4map6-segment-03>

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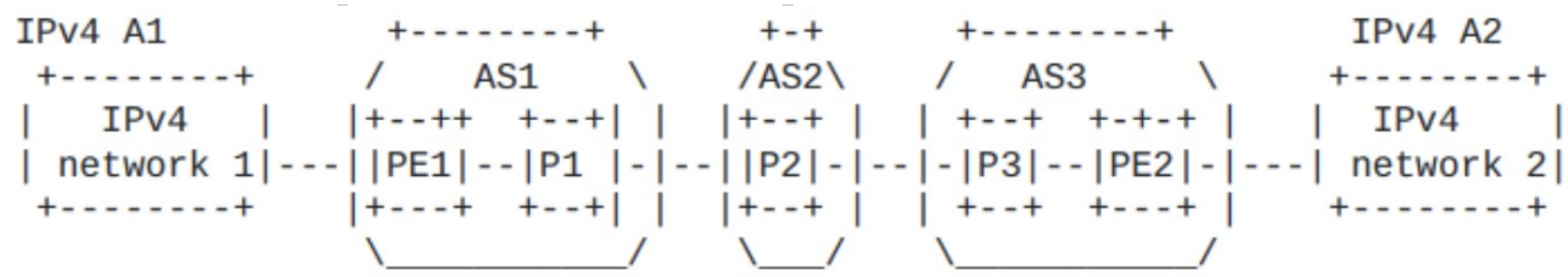
Overview

- 4map6 segments is a new type of segment for Segment Routing. They run in PE nodes and provide support for implementing IPv4/IPv6 conversion function based on address mapping rules in multi-domain IPv6-only underlay network, which is proposed in [*draft-ietf-v6ops-framework-md-ipv6only-underlay*].
- It was firstly submitted on September 12, 2023 , the current version is -03.

Background： Multi-domain IPv6-only Network

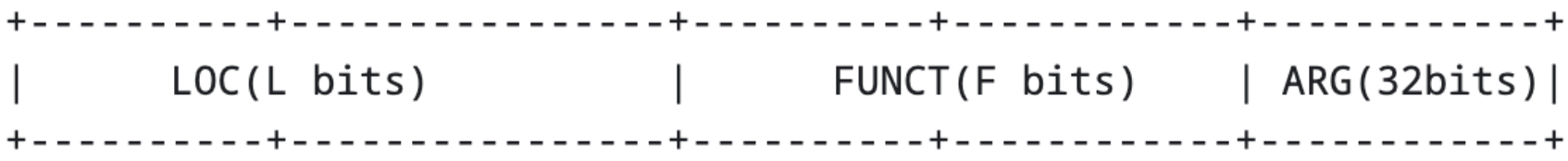
- [*draft-ietf-v6ops-framework-md-ipv6only-underlay*] proposes a framework for deploying IPv6-only as the underlay in multi-domain networks. In this framework, IPv4 packets will be statelessly translated or encapsulated into IPv6 ones for transmission across multi-domain IPv6-only underlay.
- Address mapping rule is used by the ingress PE to generate IPv6 source and destination addresses from the IPv4 source and destination address when j



Multi-domain Underlay Network

Overview of the new SID

The the SID consists of LOC:FUNCT:ARG, where the address (LOC) is encoded in the L most significant bits of the SID, followed by F bits of the function (FUNCT), and A bits of the argument (ARG).

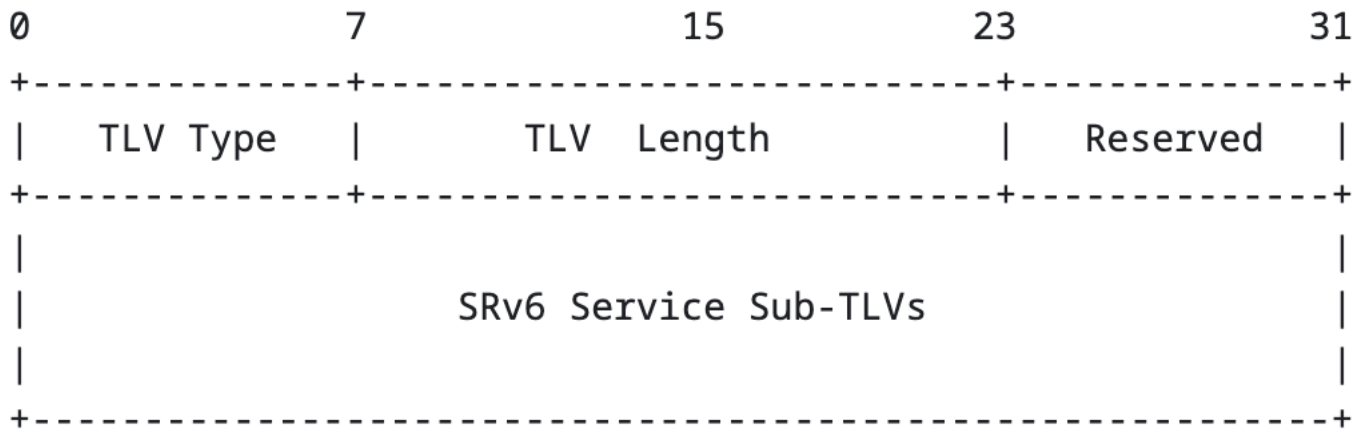


SID architecture

- The LOC field has the positioning function, which is unique in the SR domain. It is used to identify the node that instantiates the 4map6 SID.
- The FUNCT field identifies the behavior bound to the 4map6 SID.
- The ARG field contains the behavioral identity of whether stateless encapsulation or translation is performed at that point and the IPv4 address associated with the PE node. The value of L+F should be less than or equal to 96 since 32 bits are required for IPv4 address.

SRv6 Service TLV Extension

In Section 3， defines a new BGP prefixed SID attribute extension TLV in the SRv6 Service TLVs to implement SID signaling for the 4map6 service of the SRv6 ser



SRv6 Service TLV

- TLV Type (8 bits):
  - Used to identify different TLVS, SRv6 4map6 Service TLV is 8.
- TLV Length (16 bits):
  - Total length of the TLV.
- RESERVED (8 bits)
- SRv6 Service Sub-TLVs (variable):

Behavior

In general ， 4map6 SID nodes operate in pairs. For a particular data stream, one node is the ingress PE, denoted by PE1, and the other is the egress PE, denoted by PE2. Each PE maintains a Mapping rule Database (MD).

IPv4 Address Prefix	IPv6 Mapping Prefix	Encapsulation or Translation E/T

The Structure of Map Rule Database

- The table entries in the MD database consist of IPv4 address prefixes, IPv6 mapping prefixes, and the encapsulation or translation processing E/T way of IPv4 packets.
- Before transmitting an IPv4 packet from PE1 to PE2, the address mapping rule corresponding to its IPv4 destination address needs to be transferred from PE2 to PE1.
- PE2, which supports 4map6 service based on SRv6, publishes the 4map6 SID corresponding to the IPv4 destination address in the BGP Prefix-SID attribute.

Update since IETF 120

- Illustrates IPv4/IPv6 address mapping and packet transformation from the perspective of SRv6, the new SID mainly deal with how to generate new IPv6 headers based on the information of IPv4 packets, it does not involve SRH, so it can be considered as an approach of SRv6 BE.

- The draft refers to draft-ietf-v6ops-framework-md-ipv6only-underlay as the main framework document. The design of this draft supports the scenarios in section 3 of the framework.

Next Steps

- Comments and suggestions are welcome, and further refinement will be made to improve the document.
- Prepare new version for IETF 121.