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NET-PGM extension: SRv6 uSID illustration
draft-filsfils-spring-net-pgm-srv6-usid-illus-00

Abstract

This document illustrates the SRv6 "micro segment" (SRv6 uSID or uSID for short) instruction.

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1. Introduction

SRv6 Network Programming [I-D.ietf-spring-srv6-network-programming] defines a mechanism to build a network program with topological and service segments. It leverages the SRH [I-D.ietf-6man-segment-routing-header] to encode a network program together with optional metadata shared among the different SIDs.

[I-D.filsfils-spring-net-pgm-extension-srv6-usid] draft extends SRv6 Network Programming with a new type of SRv6 SID behavior: SRv6 uN. This document illustrates it.

2. Illustration

This section extends the illustrations for SRv6 Network Programming [I-D.filsfils-spring-srv6-net-pgm-illustration] to cover uSID. The reference topology is the same with the addition of link 6-8.

2.1. Reference diagram

Nodes 1 to 8 are considered within the network domain.

Nodes X and Y are outside the domain.

Nodes 1 and 8 act as PE respectively to nodes X and Y.

All the links within the domain have the same IGP metric. The IGP-metric shortest-path from 1 to 8 is 1-2-7-8 while the latency-metric shortest-path from 1 to 8 is 1-2-3-4-5-6-7-8.

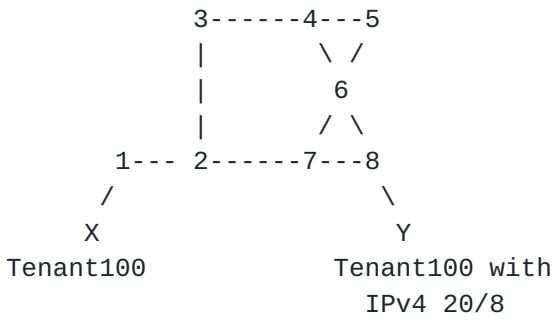

Figure 1: Reference topology

2.2. SRv6 overlay with underlay optimization

Let us illustrate a low-latency SR-L3VPN service delivered to a packet (X,Y).

PE 1 encapsulates (X, Y) in an outer IPv6 header with DA = 2001:db8:0300:0500:0700:: and SRH (B:8:D0::; SL=1; NH=4). Leveraging the illustration conventions from SRv6 network programming, the following resulting packet leaves node 1 in the direction of node 3:

(A1::, 2001:db8:0300:0500:0700::)(B:8:D0::; SL=1; NH=4)(X, Y)

2001:db8:0300:0500:0700:: is a uSID carrier encoding a source routed stateless path via node 3 then 5 then 7.

B:8:D0:: is an End.DT4 SID instantiated at node 8.

1 sends this packet to 2, as 2 is on the shortest-path to 2001:db8:0300::/48 advertised by 3.

When 2 receives the packet, 2 performs a regular IPv6 FIB lookup. It finds a FIB entry for 2001:db8:0300::/48 and forwards along the shortest path to 3.

When 3 receives the packet, 3 matches 2001:db8:0300::/48 in its "My SID Table" and executes the uN behavior. The updated DA becomes 2001:db8:0500:0700::. Node 3 then performs a lookup on the updated DA and forwards the packet to 5 along the shortest path to 2001:db8:0500::/48.

The following packet leaves node 3:

(A1::, 2001:db8:0500:0700::)(B:8:D0::; SL=1; NH=4)(X, Y)

4 forwards along the shortest path to 2001:db8:0500::/48.

When 5 receives the packet, 5 matches 2001:db8:0500::/48 in its "My SID Table" and executes the uN behavior. The updated DA becomes 2001:db8:0700::. 5 performs a lookup on the updated DA and forwards the packet to 7 along the shortest path to 2001:db8:0700::/48.

The following packet leaves node 5:

(A1::, 2001:db8:0700::)(B:8:D0::; SL=1; NH=4)(X, Y)

6 forwards along the shortest path to 2001:db8:0700::/48.

When 7 receives the packet, 7 matches 2001:db8:0700::/48 in its "My SID Table" and finds the bound function uN. As a result, Node 7 executes the "End with PSP and USD support" pseudocode, decrementing the SL value in the SRH, and updating the DA with the next SID B:8:D0::. Since the SL value is zero the SRH is removed. Node 7 performs a lookup on the updated DA and forwards along the shortest path.

The following packet leaves node 7:

(A1::, B:8:D0::)(X, Y)

8 receives it, performs the End.DT4 function and sends the IP packet (X, Y) towards its VPN destination.

This example illustrates the benefits highlighted in the next section.

3. Acknowledgements

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5. References

[I-D.filsfils-spring-net-pgm-extension-srv6-usid]
Filsfils, C., Camarillo, P., Cai, D., Voyer, D., Meilik, I., Patel, K., Henderickx, W., Jonnalagadda, P., and D. Melman, "Network Programming extension: SRv6 uSID instruction", draft-filsfils-spring-net-pgm-extension-srv6-usid-03 (work in progress), February 2020.

[I-D.filsfils-spring-srv6-net-pgm-illustration]
Filsfils, C., Camarillo, P., Li, Z., Matsushima, S., Decraene, B., Steinberg, D., Lebrun, D., Raszuk, R., and J. Leddy, "Illustrations for SRv6 Network Programming", draft-filsfils-spring-srv6-net-pgm-illustration-01 (work in progress), August 2019.

[I-D.ietf-6man-segment-routing-header]
Filsfils, C., Dukes, D., Previdi, S., Leddy, J., Matsushima, S., and D. Voyer, "IPv6 Segment Routing Header (SRH)", draft-ietf-6man-segment-routing-header-26 (work in progress), October 2019.

[I-D.ietf-spring-srv6-network-programming]
Filsfils, C., Camarillo, P., Leddy, J., Voyer, D., Matsushima, S., and Z. Li, "SRv6 Network Programming", draft-ietf-spring-srv6-network-programming-10 (work in progress), February 2020.

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