

IGP Extensions for Optimized SRv6 SID Advertisement

draft-cheng-lsr-extension-opt-srv6-sid-adv-00

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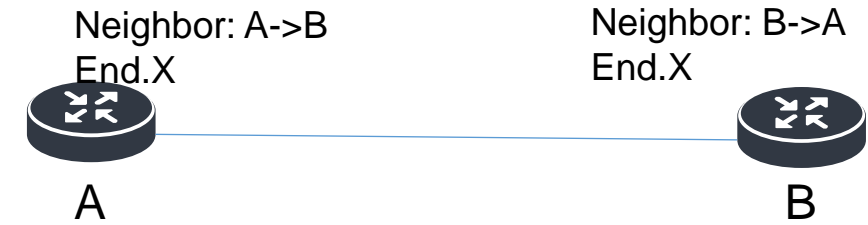
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Motivation

- As the number of Links and Flex-Algo algorithms increases, the amount of required LSDBs increases proportionally.
- When the LSDB data scale expands, it can overwhelm the system and affect the normal flooding of LSDBs, leading to potential malfunction of the IGP protocol.

Link	Flex-Algo	End.X	LSP Size (Bytes)	LSP Number
1	1	$2 * 3 * 1 = 6$	$6 * 24 = 144$	$144 / 1500 = 0.01$
10	10	$10 * 3 * 10 = 300$	$300 * 24 = 7200$	$7200 / 1500 = 4$
100	100	$100 * 3 * 100 = 300,00$	$30000 * 24 = 7200,00$	$720000 / 1500 = 480$

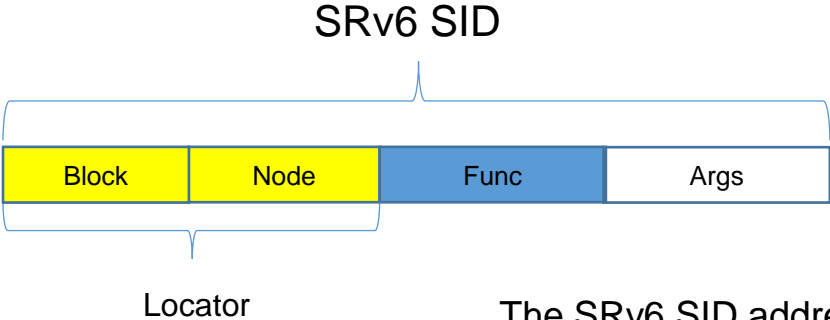
100 devices: $480 * 100 = 480000$ LSPs



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4 Extended IS reachability (t=22, l=250)
  Type: 22
  Length: 250
  4 IS Neighbor: 0000.0000.0002.00
    IS neighbor ID: 0000.0000.0002.00
    Metric: 10
    SubCLV Length: 180
  > subTLV: IPv6 Interface Address (c=12, l=16)
  > subTLV: IPv6 Neighbor Address (c=13, l=16)
  4 subTLV: SRv6 End.X SID (c=43, l=22)
    Code: SRv6 End.X SID (43)
    Length: 22
  > Flags: 0x20, Persistent flag
    Algorithm: Shortest Path First (SPF) (0)
    Weight: 0
    SRv6 Endpoint Function: End.X (PSP) (6)
    SID: 1000::1:0:0
    SubSubCLV Length: 0
  > subTLV: SRv6 End.X SID (c=43, l=22)
  > subTLV: SRv6 End.X SID (c=43, l=22)
  
```

Solution



The SRv6 SID address structure comprises: Locator + Function + Args

Flex-Algo	Locator	End.X SID
0 (Common)	Locator-0	End.X-0
FA-1	Locator-1	End.X-1
FA-2	Locator-2	End.X-2
...
FA-n	Locator-n	End.X-n



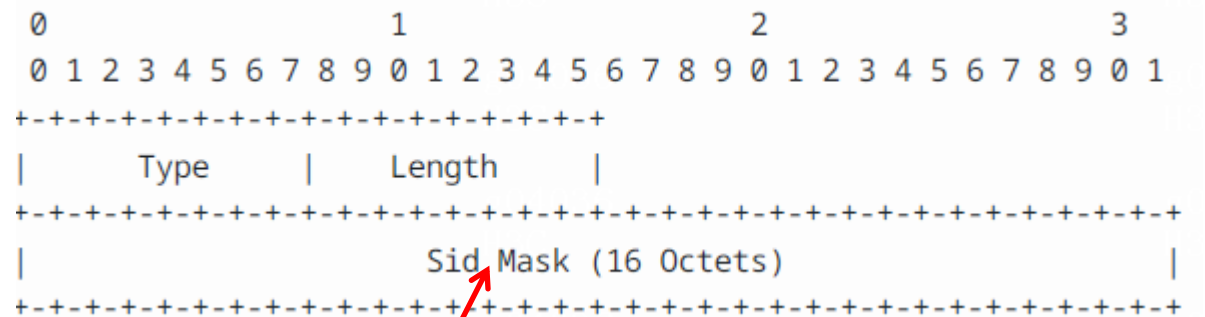
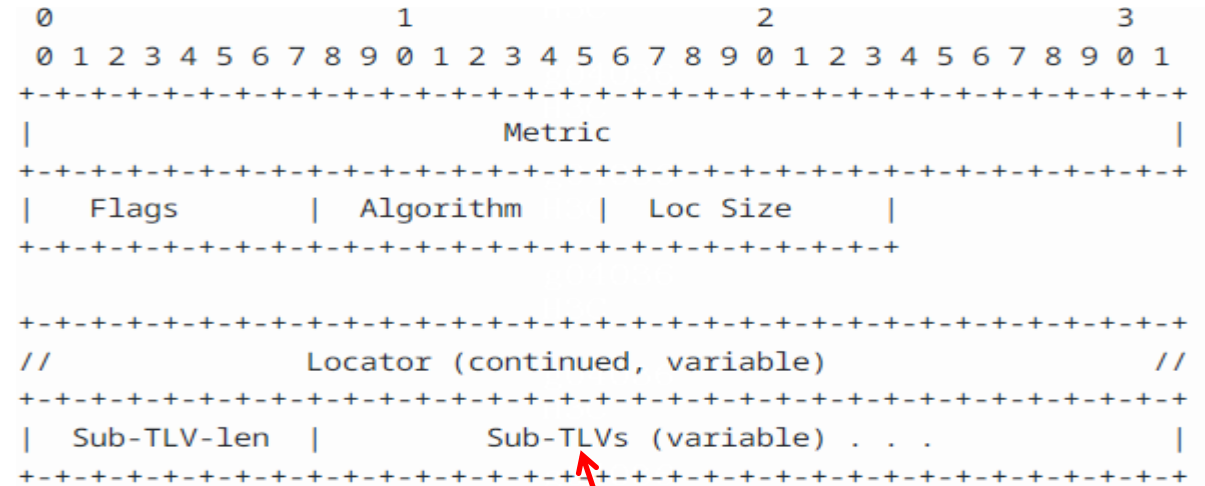
Flex-Algo	Locator	SRv6 End.X SID
0 (Common)	Locator-0	Locator-0.Func.Args
FA-1	Locator-1	Locator-1.Func.Args
FA-2	Locator-2	Locator-2.Func.Args
...
FA-n	Locator-n	Locator-n.Func.Args

- Bulk Alloc: The Func of other Algorithm inherits from End.X of Algorithm 0
- Calculate the End.X for other algorithms by using Algorithm 0's End.X and the Locator of each respective algorithm.
- **Extension: The exact position of the Func field in Locator**

IGP Extension

Locator TLV Format Defined in RFC 9352:

Adding the **Adjacent-Sid-Offset Sub-Sub-TLV** to declare the **position of the Func field** which can be inherited by other algorithms.



Comparison of Two Methods

Without Optimized SRv6 SID Advertisement

Locator TLV: Locator-0(Common)	Nbr TLV: Nbr-1
Locator TLV: Locator-1(Flex-Algo-1)	End.X-1-0 (0)
Locator TLV: Locator-2(Flex-Algo-2)	- End.X-1-1 (Flex-Algo-1)
...	- End.X-1-2 (Flex-Algo-2)
Locator TLV:Locator-n(Flex-Algo-n)	...
	- End.X-1-n (Flex-Algo-n)
	Nbr TLV: Nbr-m
	End.X-m-0 (0)
	- End.X-m-1 (Flex-Algo-1)
	- End.X-m-2 (Flex-Algo-2)
	...
	- End.X-m-n(Flex-Algo-n)

The number of LSPs is a multiple relationship with LINK and FA

Link	Flex-Algo	End.X	LSP Size (Bytes)	LSP Number
1	1	$1 * 3 * 1 = 6$	$6 * 24 = 144$	$144 / 1500 = 0.01$
10	10	$10 * 3 * 10 = 300$	$300 * 24 = 7200$	$7200 / 1500 = 4$
100	100	$100 * 3 * 100 = 30,000$	$30000 * 24 = 720,000$	$720000 / 1500 = 480$

100 devices: $480 * 100 = 48000$ LSPs

Optimized SRv6 SID Advertisement

Locator TLV: Locator-0(Common)	Nbr TLV : Nbr-1
+ Adjacent-Sid-Offset	End.X-1-0 (0)
Sub-Sub-TLV	
Locator TLV: Locator-1(Flex-Algo-1)	
Locator TLV: Locator-2(Flex-Algo-2)	
...	Nbr TLV: Nbr-m
Locator TLV:Locator-n(Flex-Algo-n)	End.X-m-0 (0)

The proportion of LSPs increased due to FA is very small

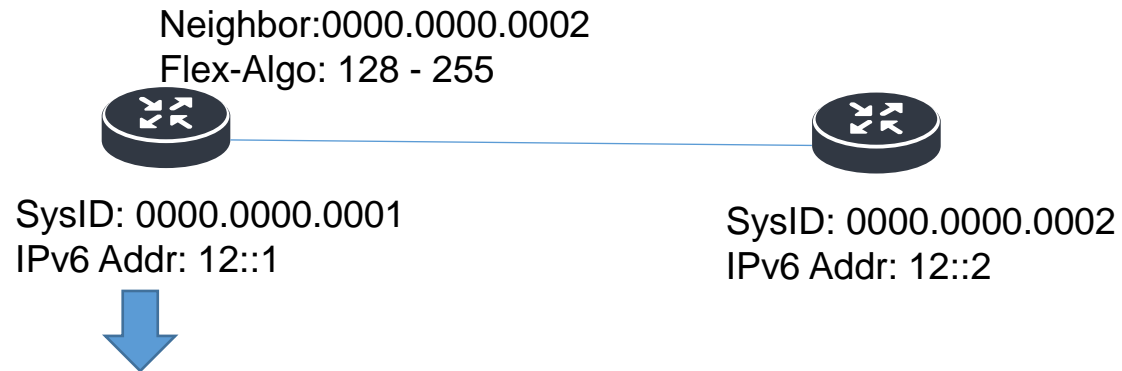
Link	Flex-Algo	End.X	LSP Size (Bytes)	LSP Number
1	1	$1 * 3 * 1 = 6$	$6 * 24 + 1 * 18 = 162$	$162 / 1500 = 0.01$
10	10	$10 * 3 * 10 = 300$	$30 * 24 + 10 * 18 = 900$	$900 / 1500 = 0.6$
100	100	$100 * 3 = 300,00$	$300 * 24 + 100 * 18 = 9000$	$720000 / 1500 = 6$

100 devices: $6 * 100 = 600$ LSPs

Compatibility consideration

- If a device in the network does not support batch generation of End.X, the complete End.X information can still be advertised in the LSP/LSA.
- Use configuration to switch between compatibility mode and full support mode.
- Operate in full support mode if all routers in the domain support this feature; otherwise, use compatibility mode.

Usecase



Flex-Algo	Locator	SRv6 End.X SID
0 (Common)	1000::/64	1000::1:0:0
128	1001::/64	1001::1:0:0
129	1002::/64	1002::1:0:0
...
255	10ff::/64	1080::1:0:0

Locator TLV:

1000::/64 (Flex-Algo 0)
adj-SID-Mask: ::ffff:ffff:0000:0000
 1001::/64 (Flex-Algo 128)
 1002::/64 (Flex-Algo 129)
 ...
 1080::/64 (Flex-Algo 255)

Nbr TLV:

Nbr: 0000.0000.0002
 SRv6 End.X SID: 1000::1:0000:0000 (Flex-Algo 0)
no need to advertise End.X within non-common algorithms

LSP

Next Steps

- Any questions or comments are welcome.

Thanks