Intra-domain SAVNET method

draft-lin-savnet-lsr-intra-domain-method

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Background

[draft-li-savnet-intra-domain-architecture] describes the intra-domain SAVNET architecture.

- Achieves accurate source address validation (SAV) in an intra-domain network based on SAV-specific information exchanged among routers, instead of depending on local routing information.
- Efficiently and accurately generate the correct mapping relationship between a source prefix and the valid incoming interface(s), called SAV rules.

Based on the SAV architecture, we propose a method of generating SAV rules in Intra-domain by extending IGP.

Proposal

1. Advertise the source prefix (called protected prefix) participating in SAV rule calculation through IGP.
2. Calculate the SAV rule through the received protected prefix.
   - Take other router who advertised the protected prefix as root to calculate the shortest path.
   - Determine the legal incoming interface of the protected prefix for SAV rule based on the shortest path.
3. Automatically generate SAV rule based on the source prefix and calculated incoming interface.

Calculation Process of Intra-area

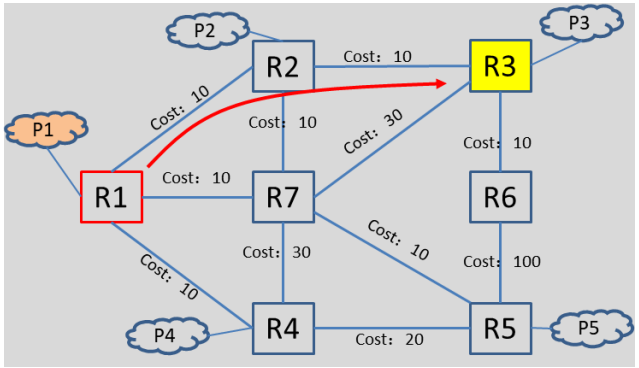
Take R3 as an example, for the source prefix P1 which is located in R1, the calculation is as follows:

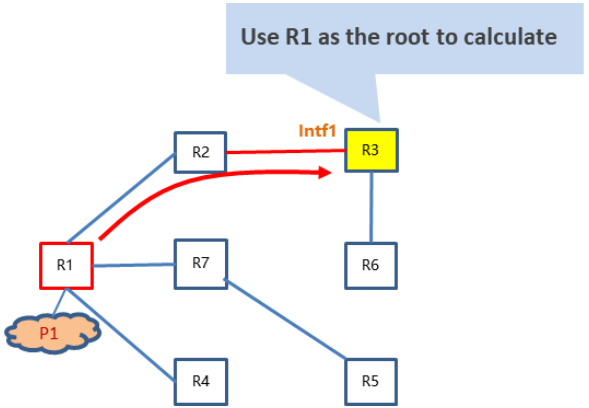
1. When R1 advertises the source prefix P1, it identifies the protected prefix in IGP routing message.

   Need to extend IGP①.

2. After receiving the routing message from R1, R3 uses R1 as the root to calculate which interface the message will reach in R3.

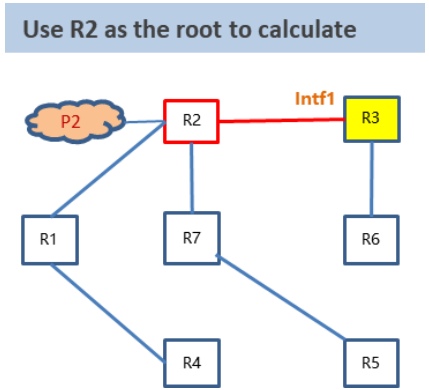
3. The calculated result is that the packet from P1 will arrive from Intf1. Therefore, Intf1 is the legal incoming interface of prefix P1 of SAV rule.

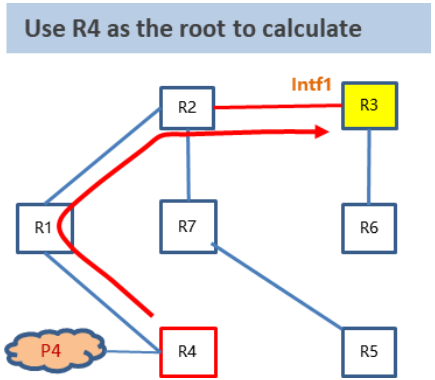


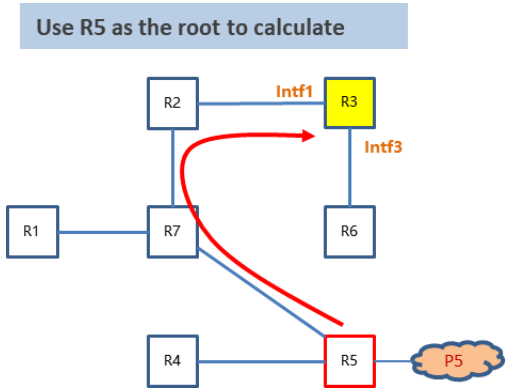


Calculation Process of Intra-area

Using the same method, after receiving the routing message from R2, R4 and R5, R3 will calculate the legal incoming interfaces for prefix P2, P4 and P5.







Calculation Process of Inter-area

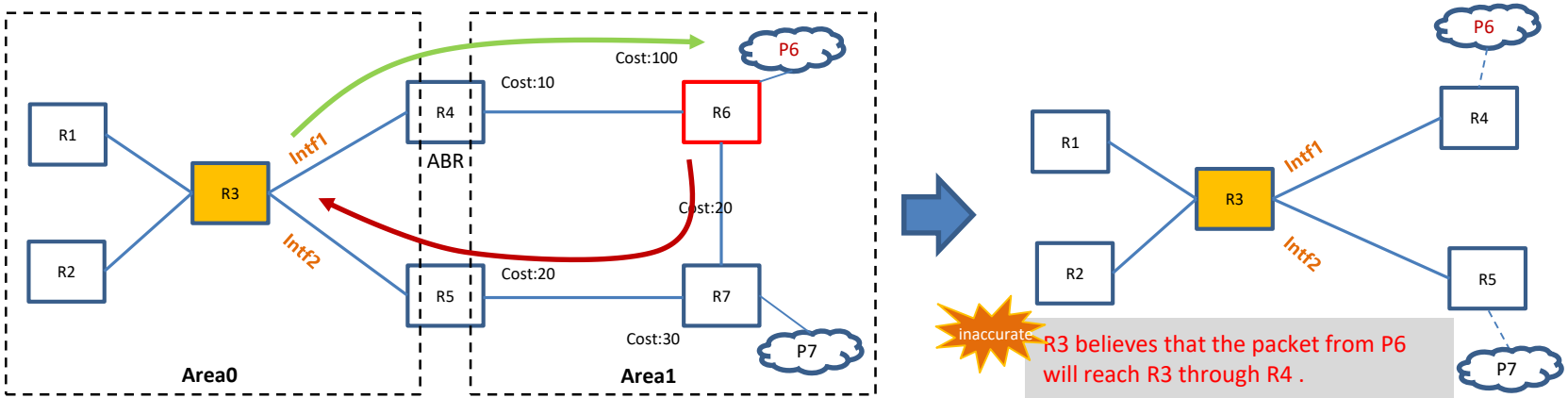
- **Problem: Inaccurate calculation**

When advertising inter-area routes, R3 cannot be aware the specific cost of the link in Area1.

According to the route information, R3 will calculate that the incoming interface of the packet from prefix P6 is **intf1.**

Based on the actual cost of the link, the packet from P6 will reach R3 through R7 and R5.

The real incoming interface is intf2.



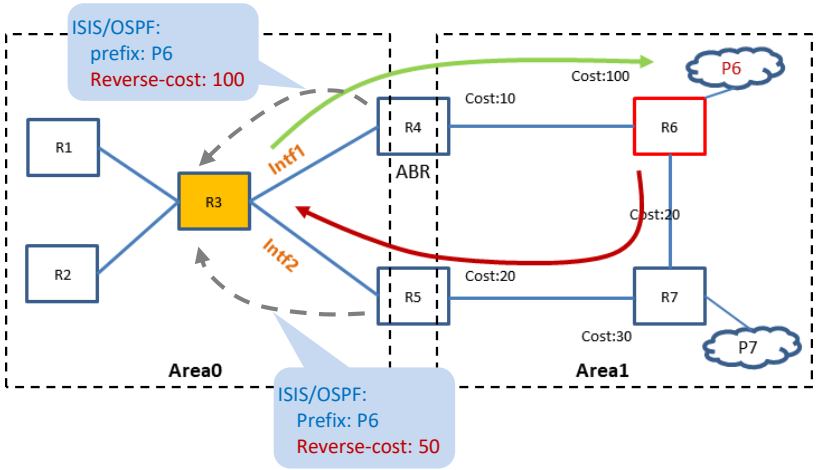
Calculation Process of Inter-area

- **How to solve it ?**

ABR calculates the total cost from R6 to this ABR and advertises the total cost to R3 through IGP.

1. Extend IGP to carry the total reverse cost of prefix to ABR when ABR advertises the inter-area routes.
   - When R4 advertises the prefix of R6, it carries cost 10 and reverse cost 100.
   - When R5 advertises the prefix of R6, it carries cost 40 and reverse cost 50 .
2. According to the two reverse costs R3 determines the real incoming interface Intf2.

To carry the reverse cost in the inter-area network, we need another extension of IGP.



SAV Rules on R3	
Prefix	Interface
P6	Intf2
P7	Intf2

Protocol Extension ①

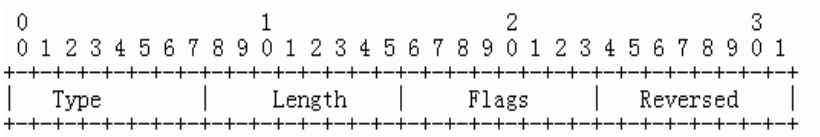
■ Prefix-SAV SUB-TLV

Used to Identify the prefix is a SAV protected prefix.

✓ IS-IS

The Prefix-SAV sub-TLV is a sub-TLV of the following IS-IS TLVs:

- TLV-135 (Extended IPv4 reachability).
- TLV-235 (Multi-topology IPv4 Reachability).
- TLV-236 (IPv6 IP Reachability).
- TLV-237 (Multi-topology IPv6 IP Reachability).



Type: TBD for IS-IS

Length: 2 octets

Flags: Reserved flag field

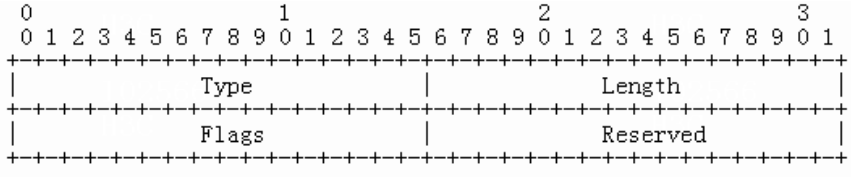
✓ OSPFv2

When the Route Type of OSPFv2 Extended Prefix TLV is Inter-Area (3), Prefix-Reverse-cost sub-TLV can be used.

✓ OSPFv3

The Prefix-SAV sub-TLV is a sub-TLV of the following OSPFv3 TLVs as defined in [RFC8362] :

- Intra-Area Prefix TLV
- Inter-Area Prefix TLV



Type: TBD respectively for OSPFv2 and OSPFv3

Length: 4 octets

Flags: Reserved flag field

Protocol Extension ②

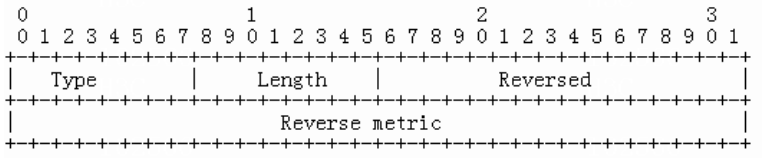
■ Prefix-Reverse-cost SUB-TLV

Used to carry the total costs from the router where the prefix is located to ABR.

✓ IS-IS

When the level 2 router leaks routes, Prefix-Reverse-cost sub-TLV can be used to carry reverse total cost, as the sub-TLV of the following IS-IS TLVs:

- TLV-135 (Extended IPv4 reachability).
- TLV-235 (Multi-topology IPv4 Reachability).
- TLV-236 (IPv6 IP Reachability).
- TLV-237 (Multi-topology IPv6 IP Reachability).



Type: TBD for IS-IS
Length: 2 octets
Reverse metric: Indicates the total cost value from the router where the prefix is located to ABR.

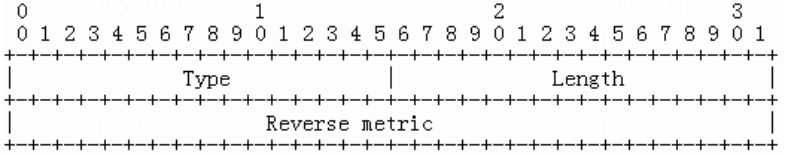
✓ OSPFv2

Prefix-Reverse-cost sub-TLV can be used when the Route Type of OSPFv2 Extended Prefix TLV is Inter-Area (3).

✓ OSPFv3

The Prefix-Reverse-cost sub-TLV is a sub-TLV of the following OSPFv3 TLVs:

- Inter-Area Prefix TLV



Type: TBD respectively for OSPFv2 and OSPFv3

Length: 4 octets

Flags: Reserved flag field

Next Steps

- This proposal has been presented at the IETF-114 meeting of SAVNET WG. We are seeking for more feedback from LSR WG.
- Any questions or comments are Welcomed.