IGP Reverse Prefix Metric

draft-li-lsr-igp-reverse-prefix-metric-02

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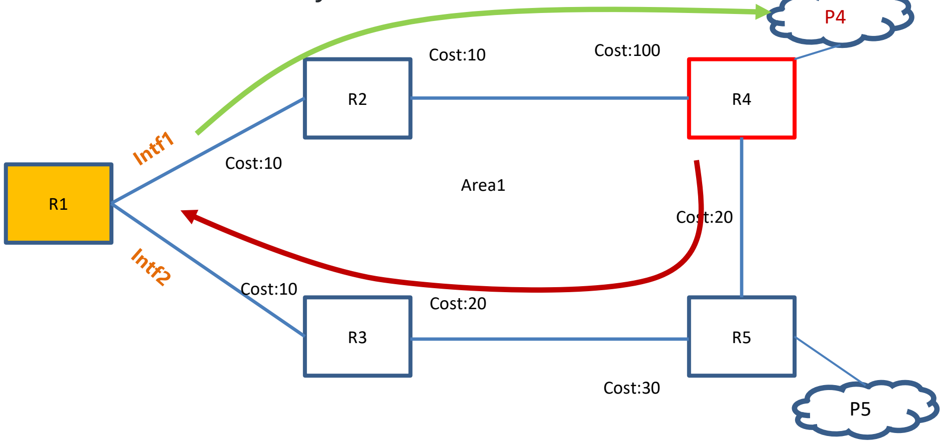
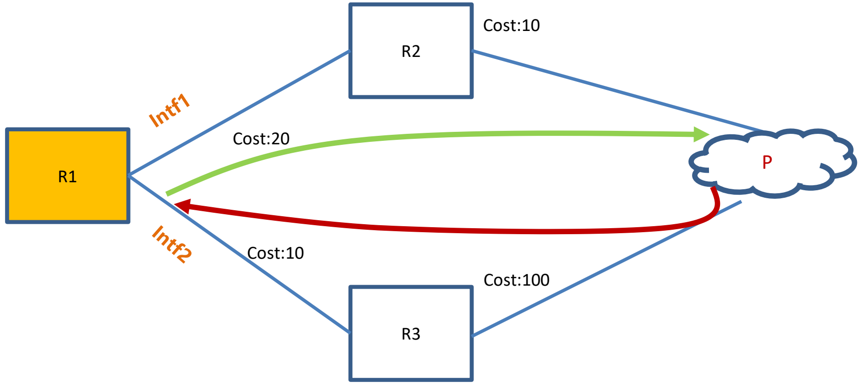
Background

The strict RPF: check process involves verifying that a packet is received on the interface that matches the router's reverse path to the source.

an asymmetric cost network



Anycast network



If the cost between the forward and reverse path to the source is inconsistent, the strict RPF check will fail, resulting in the packet being discarded.

IGP advertise link information through the link-state database, which provides knowledge of both forward and reverse path costs within the domain

The reverse SPF calculation can be performed with the node containing the source address as the root to obtain the reverse ingress interface.

However, in an IGP multi-area network, the reverse cost across areas cannot be obtained from the IGP's LSDB. Only alternative is to add the incoming interfaces for all ABRs advertising the prefix.

Why need reverse prefix metric

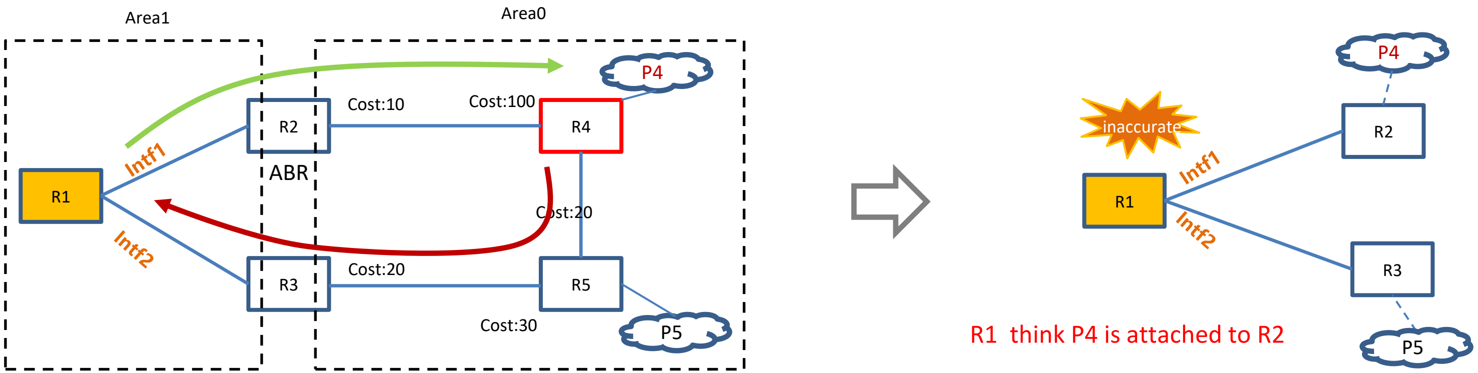
Reverse Path Calculation Issues in Multi-Area Scenarios

- **Area Division**: AS divided into Area0 and Area1, with R2 and R3 as ABRs.
- **LSA Conversion:** ABRs convert Router LSA (Type-1) in Area1 to Network Summary LSA (Type-3) and advertise it to Area0.

Issue

- Inter-area LSA only includes one-way cost (e.g., R2 to R4 cost is 10), failing to reflect reverse cost (e.g., R4 to R2 cost is 100). Leads to inaccurate RPF checks, with packets potentially arriving from incorrect interfaces.

Based on the actual cost, the packet from P4 will reach R3 through R5. The real incoming interface should be intf2.



This document defines the reverse prefix metric TLV, which can be used to add reverse metric information when IGP advertises prefix information.

Protocol Extension: **Prefix-Reverse-cost SUB-TLV**

Prefix-reverse-cost Sub-TLV is used to carry the total costs from the router where the prefix is located to reach ABR.

For IS-IS, When the level 2 router leaks routes through the above TLVs, 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).

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Type      |    Length     |           Reversed            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        Reverse metric                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

The Prefix-Reverse-cost sub-TLV
Type: TBD for IS-IS
Length: 6 octets
Reverse metric: Total cost value from the router where the prefix is located to ABR.

For OSPFv2:

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

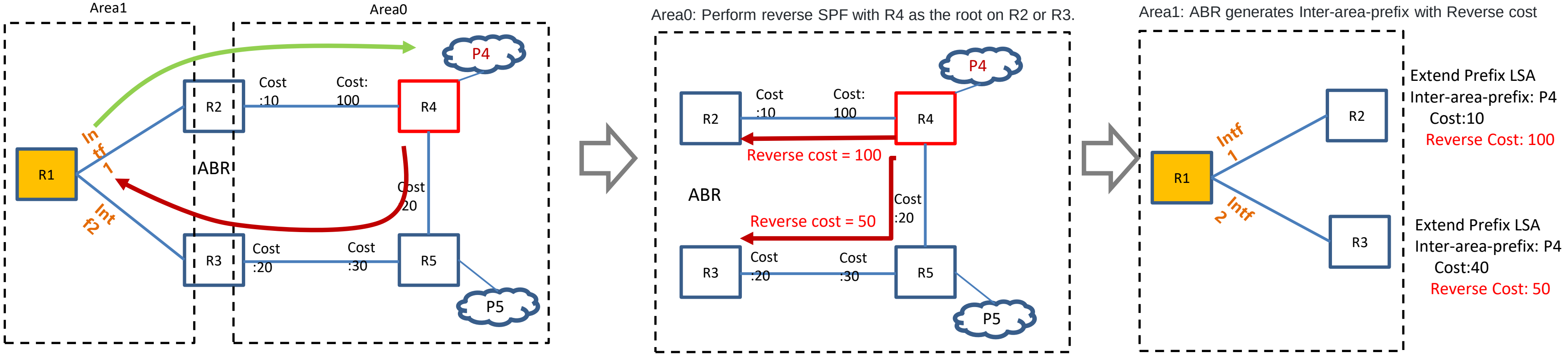
For OSPFv3:

The Prefix-Reverse-cost sub-TLV is a sub-TLV of Inter-Area Prefix TLV

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|             Type              |            Length             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        Reverse metric                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

The Prefix-Reverse-cost sub-TLV
Type: TBD
Length: 4 octets
Reverse metric: Total cost value from the router where the prefix is located to ABR.

Use Case



when R2 advertises the prefix of P4, it carries cost of 10 and reverse cost of 100 at the same time.
Similarly, the cost of P4 advertised by R3 in two directions is 40 and 50 respectively.
R1 then determines the real incoming interface according to the reverse cost.

Next Steps

- Any questions or comments are Welcomed
- Seeking for feedback

THANKS