Segment Routing for Redundancy Protection

draft-geng-spring-sr-redundancy-protection-04

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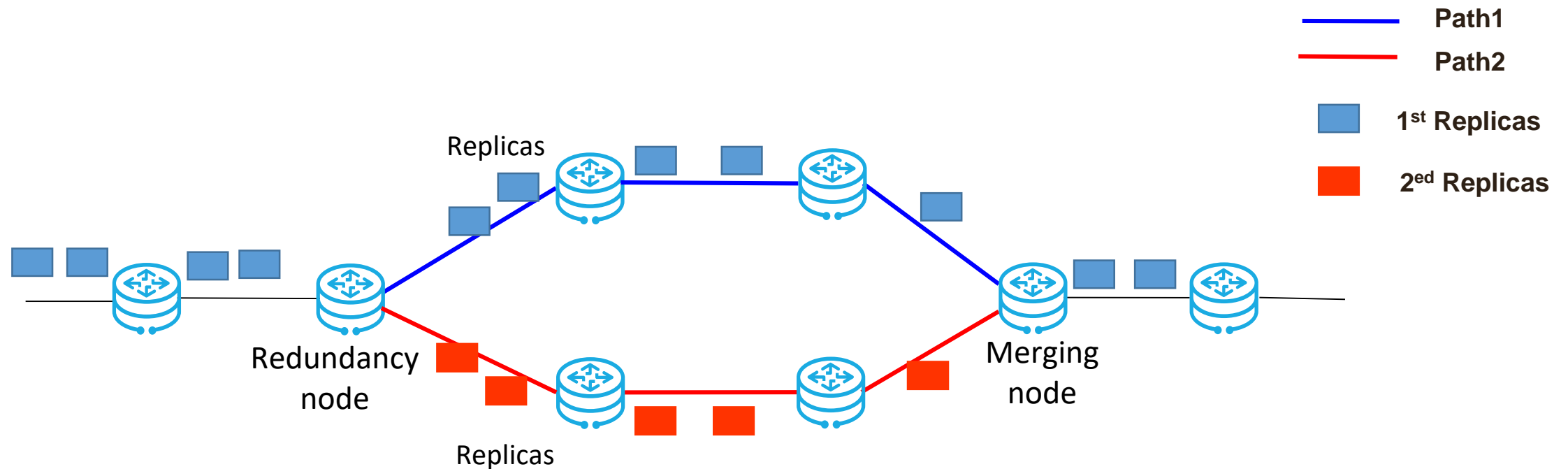Pablo Camarillo, **Cisco**
Gyan Mishra, **Verizon**

Presenter: Gyan Mishra

SRv6 Redundancy Protection (a.k.a. Live-Live)

1. Packets are replicated at Redundancy node into two or more copies
2. Each replicas are transmitted via different disjoint forwarding paths concurrently
3. Duplicate packets are removed or merged by Merging node

History

- IETF 104/105, presented in DetNet WG as DetNet SRv6 Data Plane Encapsulation

- IETF 106, presented in DetNet WG, DetNet WG suggested us take to SPRING

- IETF 109 - now: presented in SPRING WG, re-defined the proposal as a generalized protection mechanism for live-live

Draft Structure

- Scenario of Redundancy Protection in SR

- Two Segment to Support Redundancy Protection

  - Redundancy segment
  - Merging segment

- Meta Data to Support Redundancy Protection

- Segment Routing Policy to Support Redundancy Protection

Techniques to support Redundancy Protection

- **Redundancy Segment:** *(draft-geng-spring-sr-redundancy-protection-04)*
    - to perform the packet replication function on Redundancy Node
    - A BSID associated with a Redundancy policy (a variant of SR Policy) to steer the flow
    - in case of SRv6, new behavior End.R is defined
- **Merging Segment:** *(draft-geng-spring-sr-redundancy-protection-04)*
    - to perform the packet elimination function on Merging Node
    - in case of SRv6, new behavior End.M is defined
- **Encapsulation of flow ID and sequence number:** *(draft-geng-6man-redundancy-protection-srh-00)*
    - Flow Identification: to identify a unique flow
    - Sequence Number: to identify the packet sequence within one flow
- **Redundancy Policy:** *(draft-geng-spring-redundancy-policy-01)*
    - includes more than one ordered lists of segments between Redundancy Node and Merging Node
    - all the ordered lists of segments are used at the same time

Redundancy Segment

S01. When an SRH is processed {
S02.   If (Segments Left>0)   {
S03.   Decrement IPv6 Hop Limit by 1
S04.   Decrement Segments Left by 1
S05.   Update IPv6 DA with Segment List[Segments Left]
S06.   Add flow identification and sequence number if indicated*
S07.   Duplicate the packets (as number of active SID lists in B)
S08.   Push the new IPv6 headers to each replica. The IPv6 header contains an SRH with the SID list in B
S09.   Set the outer IPv6 SA to A
S10.   Set the outer IPv6 DA to the first SID of new SRH SL
S11.   Set the outer Payload Length, Traffic Class, Flow Label, Hop Limit and Next-Header fields
S12.   Submit the packet to the egress IPv6 FIB lookup for transmission to the new destination
S13.   }
S14. }

* Adding flow identification and sequence number is an optional behavior for Redundancy Segment. The instruction execution is determined and explicitly indicated by SR policy or Segment itself.

Merging Segment

S01. When an SRH is processed {
S02. If (Segments Left> or ==0)   {
S03.   Acquire the sequence number of received packet and look it up in table
S04.   If (this sequence number does not exist in the table) {
S05.   Store this sequence number in table
S06.   Remove the outer IPv6+SRH header
S07.   Decrement IPv6 Hop Limit by 1 in inner SRH
S08.   Decrement Segments Left by 1 in inner SRH
S09.   Update IPv6 DA with Segment List[Segments Left] in inner SRH
S10.   Submit the packet to the egress IPv6 FIB lookup and transmit
S11.   }
S12.   ELSE {
S13.   Drop the packet
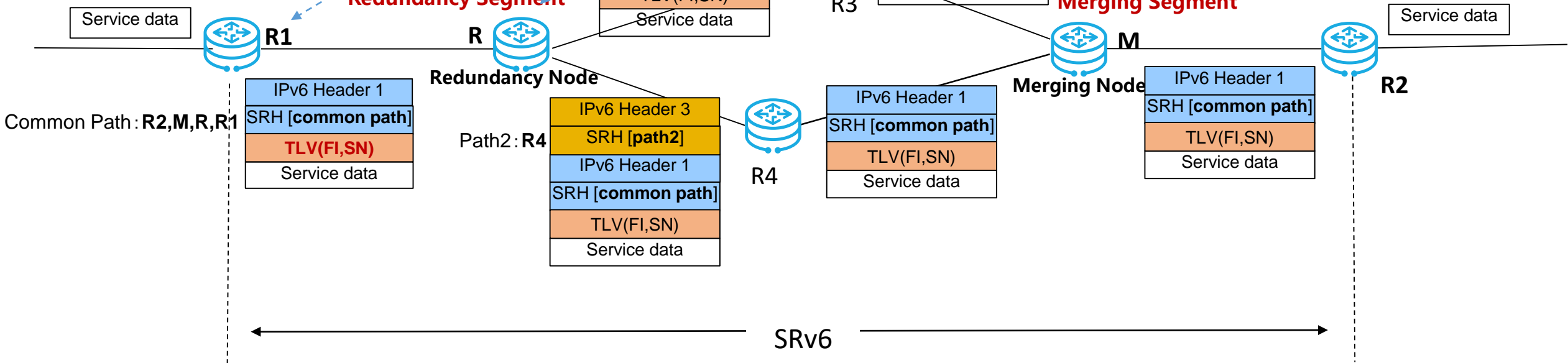S14.   }
S15.   }
S16. }

SRv6 Redundancy Protection

Addressing Received Comments

1. **What is the location to add Flow ID and Sequence Number?**
Agreement: there is advantage to add FI/SN at ingress node, and is updated in 04-revision.

2. **Whether it is doable to use replication segment in redundancy protection?**
Agreement: clarifications and modifications are required to make on Replication SID to support redundancy protection.

3. **How redundancy policy designates multiple paths?**
Agreement: it is clarified on ML and defined in different draft, we will update the revision soon.

4. **Whether Redundancy segment is a topological/routable segment?**
Agreement : it is flexible to either include topological semantics or not. And redundancy protection provides a underlay solution.

5. **Discussion on merging segment**
Agreement: it is necessary to define it.

Addressing Received Comments

6. Relationship with DetNet

- Redundancy protection is a generalized protection mechanism, a.k.a live-live
- It is similar to "1+n protection" but different behavior at merging node
- It provides the ultra reliable capability to Segment Routing networks
- It provides the ultra reliable protection to many use cases, e.g. cloud VR/Game, IPTV and other type of video services, high value private lines
- It could be applicable to DetNet use cases

Draft Revision since IETF 110

1) Use case clarification (section 1) :

   ➢ targets to provide ultra reliable transmission

   ➢ Adds more use cases

   ➢ Focus on p2p service

2) Reorganize the example description in SRv6 scenario in (section 3)

3) Flexible place to add flow identification and sequence number (section 3 and 4)

   1) ingress node

   2) redundancy node

4) Change Segment pseudo code accordingly (section 4)

5) Regarding the segment usage in SR over MPLS, take reference from RFC8964 (section 4)

6) Separate redundancy policy specification into different draft (section 6)

Next Steps

- Thanks for all the discussions on ML!
- Ready to adopt as a WG draft?

Thank you !