Compressed SRv6 Segment List Encoding in SRH

draft-ietf-spring-srv6-srh-compression

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Changes since WG adoption (1)

- Defined C-SID flavors for the remaining RFC 8986 SIDs
  - End.T, End.B6(.Red), End.BM,… with NEXT-C-SID and REPLACE-C-SID

- Removed NEXT-AND-REPLACE-C-SID flavor due to complexity and lack of implementation
  - As a reminder, NEXT-C-SID and REPLACE-C-SID flavors can be used together in the same SRH (along with any other SRv6 SID)

- For clarity, added the complete pseudocodes in Appendix B for
  - End with NEXT-C-SID
  - End with REPLACE-C-SID

Changes since WG adoption (2)

- SR Source Node (new section)
  - Specifies how an SR Source Node may leverages the C-SID flavors to produce a compressed SRv6 Segment List encoding
  - The original (uncompressed) SID list may comprise any combination of NEXT-C-SID, REPLACE-C-SID, or other (e.g., RFC 8986) SIDs

- Control Plane (extended)
  - Specifies how the SIDs of this document are advertised using existing SRv6 control plane extensions (e.g., RFC 9252, RFC 9352, draft-ietf-lsr-ospfv3-srv6-extensions, draft-ietf-idr-bgp-ls-sr-policy, draft-ietf-pce-segment-routing-ipv6)

Changes since WG adoption (3)

- Operational Considerations (new section)
  - Ping a SID of this document
  - ICMP error processing
- Deployment Model (new section)
  - Same SR domain deployment model as specified in Sec. 5 of RFC 8754
- Implementation Status (renamed and extended)
  - C-SID implementation reports from Cisco, Huawei, Nokia, Arrcus, Juniper, Marvell, Broadcom, ZTE, H3C, Ruijie
  - References to open-source C-SID implementations
  - Added references to past and ongoing interop testing (e.g., EANTC 2023)

Open Issues (1)

Issue #1 — Clarity on one or multiple data plane solutions

> Given that the working group has said that it wants to standardize one data plane solution, and given that the document contains multiple SRv6 EndPoint behaviors that some WG members have stated are multiple data plane solutions, the working group will address whether this is valid and coherent with its one data plane solution objective.

Resolution: All SIDs of the SRv6 dataplane (defined in this document and in other documents) can co-exist in the same SRH. This make SRv6 a single, consistent dataplane solution.

Open Issues (2)

Issue #2 — Conformance to existing RFCs

> As reminded in the conclusion of the adoption call, this document is subject to the policy announced by the SPRING chairs in https://mailarchive.ietf.org/arch/msg/spring/vCc9Ckvwu5HA-RCleV712dsA5OA/.
>
> In particular, this means that this document cannot go to WG last call until 6man completes handling of an Internet Draft that deals with the relationship of C-SIDs to RFC 4291. It is hoped and expected that said resolution will be a WG last call and document approval in 6man of a document providing for the way that C-SIDs use the IPv6 destination address field.
>
> The document currently being looked at for this is draft-krishnan-6man-sids.

Resolution: WG last call for draft-ietf-6man-sids is done

Open Issues (3)

Issue #3 — Updated definition for SegmentsLeft Field needed

The definition for the SegmentsLeft field of the SRH as currently stated in RFC8754 and RFC8200 no longer holds true in the presence of C-SIDs. This definition needs to be updated to still hold true in the presence of C-SIDs.

Resolution: Errata 7102 for RFC 8754 (verified)

"Segments Left: Defined in [RFC8200], Section 4.4. Specifically, for the SRH, the number of unprocessed 128-bit entries in the Segment List."

Open Issues (4)

Issue #4 — Implications on SRH based filtering policies

> In some cases it is possible that the SR policy can be expressed purely with C-SIDs without requiring an SRH. In this case, to allow the SR domain to fail closed, some form of filtering based on the LOC part of the SRv6 SID is required as relying purely on the presence of an SRH will not be sufficient.
>
> I would also like to note upfront that it is already possible based on RFC8754 to send packets without an SRH (e.g. one segment encapsulated into outer header) but having C-SIDs makes it applicable to a wider set of use cases.

Resolution:

- Added text in revision -01 (Sec. 12) indicating that the SRv6 security model (Sec. 5.1 of RFC 8754) also applies here
- The SRv6 security model uses IP address filtering (SRv6 SID block), and does not rely on the presence of an SRH

Open Issues (5)

Issue #5 — ICMPv6 troubleshooting in presence of C-SIDs

> The use of C-SIDs might cause some difficulty in troubleshooting error conditions signaled by ICMPv6. Section 5.4 of RFC8754 describes the ICMPv6 error processing that is required to be performed on the SR Source Nodes to correlate packets since the Destination Address of the packet changes in flight.
>
> Similar logic needs to be specified for SR Source Nodes that use C-SIDs to determine the Destination Address for use by protocol-error handlers.

Resolution: Added text in revision -03 (Sec. 10.3) generalizing the RFC 8754 behavior

- Repeatedly apply the SID behavior until doing so would result in processing the upper-layer header
- The destination address at the last iteration is the ultimate destination of the packet

Conclusion

- Thanks to everyone who provided feedback and suggestions
- Mature technology with multiple production deployments and lab trials
- Authors believe that the work is done

Next steps:

- Work with WG chairs to reflect closure of the issues in the tracker
- Any further feedback from the WG?