RBS (Recursive BitString Structure) for Multicast Source Routing over IPv6 (MSR6)

MSR6 BOF, IETF114 Philadelphia

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Summary (Value proposition)

Enhanced version of draft-xu-msr6-rbs, presented @IETF113, 6MAN, PIM

MSR6 TE with RBS - Compressed representation of a steered tree

Simulations for large scale SP: More efficient/fewer packet copies than “flat bitstrings” (e.g. Like BIER)

Example: 2048 MSER/BFER. 256 bit flat bitstring: packet to 8 BFER may require 8 bitstring = 8 packet copies. With RBS, most often, single packet suffices to reach any set of 8 MSER !

101 Multicast History: PIM-SM: efficient support for “sparse trees” in large networks is key!

Claim: We may be able to use RBS for both BE and TE services (BE = PCE calculates shortest path RBS tree)

Intended to ideally fit existing IPv6 routing header approach

Intended to be minor additional per-packet-copy processing compared to BIER

Every MSR only needs to perform replication on a single bitstring (reuse BIER replication HW)

Additional work: Calculate bitstring offset for every packet copy along the tree

Core property of this proposal “Recursive Bitstring Structure” (RBS) addressing

How it works – the MSR6 RBS specific structure

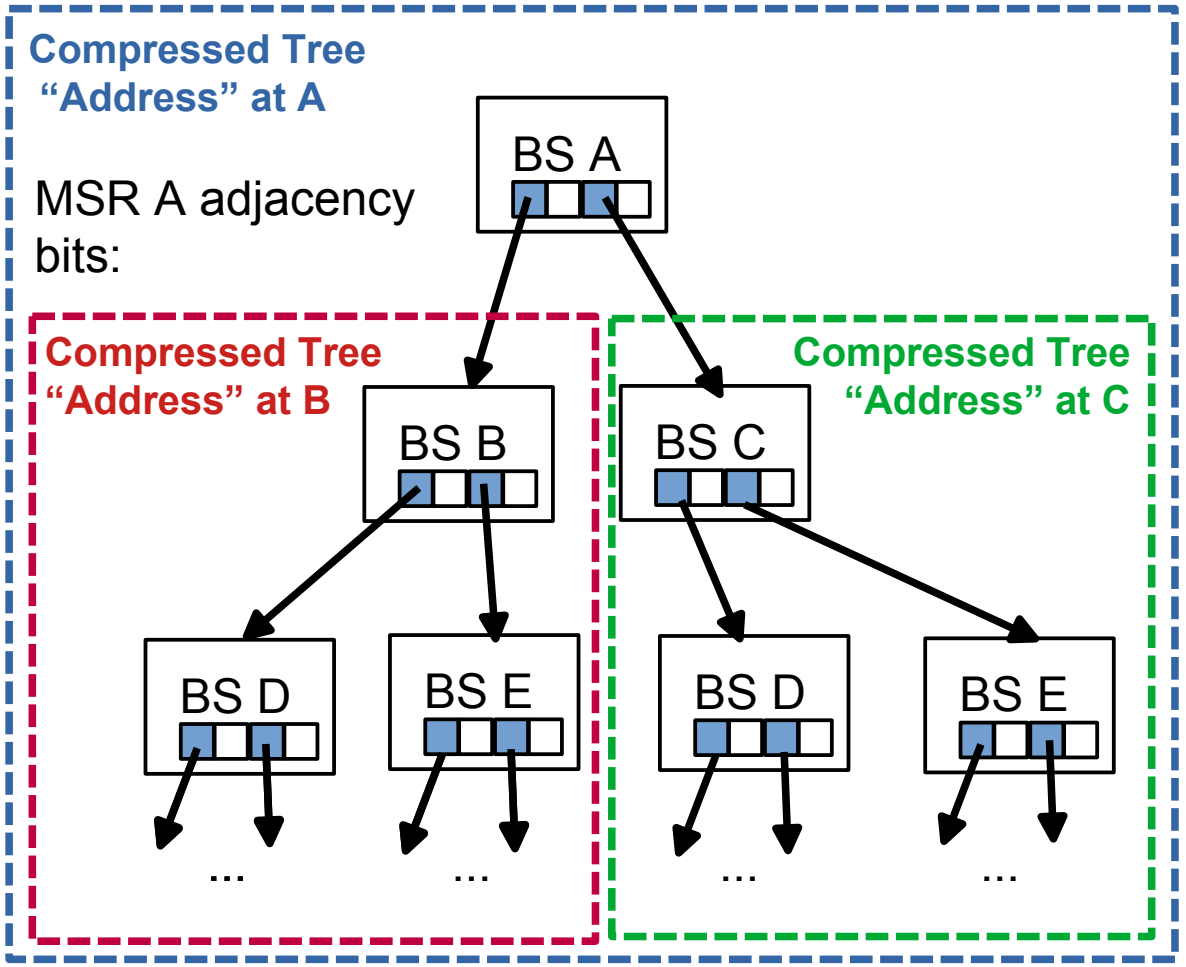
Compressed Tree “Address” at A

1. Describes whole tree!!
2. Rtr A examines its BitString (BS)
   determines the copies to adjacent MSR to make
3. Sees two bits are set. Creates two packet copies
4. For each copy, RBS structure is adjusted

(active) Compressed Tree “Address” at B

(active) Compressed Tree “Address” at C

Each routers structure (A, B, C) is called
a Recursive Unit (RU)



MRH/RBS header explained

Processing the multicast tree across all MSR is ONE routing header segment !

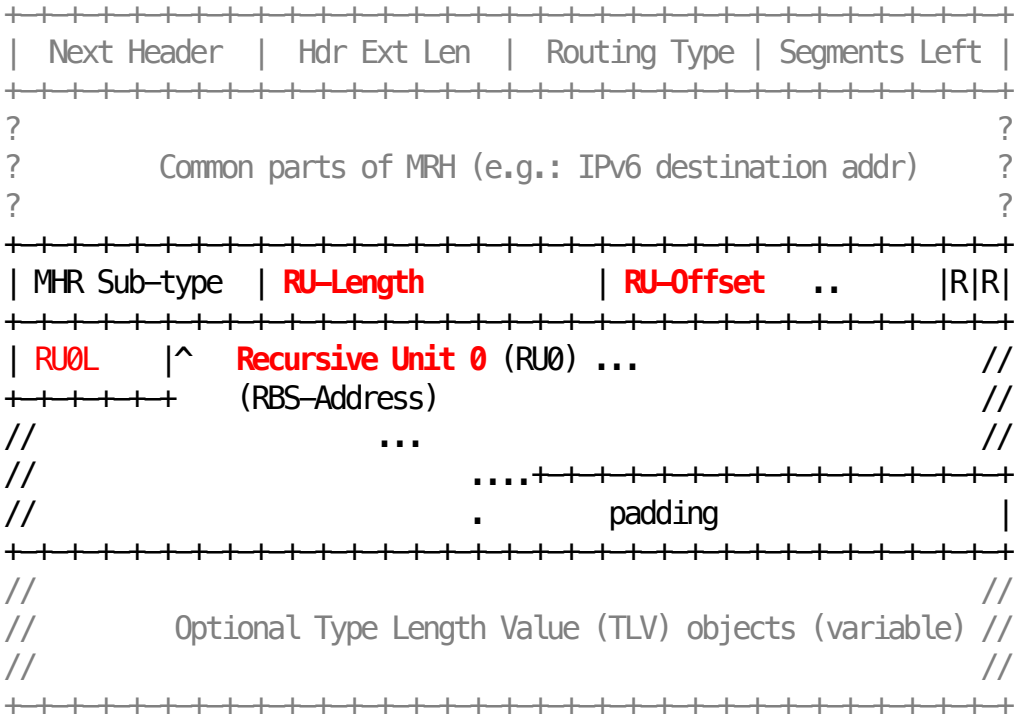
- IPv6 destination address is optional second segment
- Segments Left only counts these segments

RU-Length and RU-Offset indicate active Recursive Unit

- Rewritten on every copy to the next-hop MSR
- Aka: equivalent to Segments-Left, but only for processing the RBS structure hop-by-hop
- 24 bit address rewrite in packet (for high-speed HW)
- Still IPv6 mandatory rewrite of 128 bit destination addr

RU0L

- Length of the Recursive Unit in packet. Never changed
- Packet parsing beyond RU0



RBS – serialization of Recursive Units

Every MSR Bitstring only needs as few bits as that MSR has neighbors

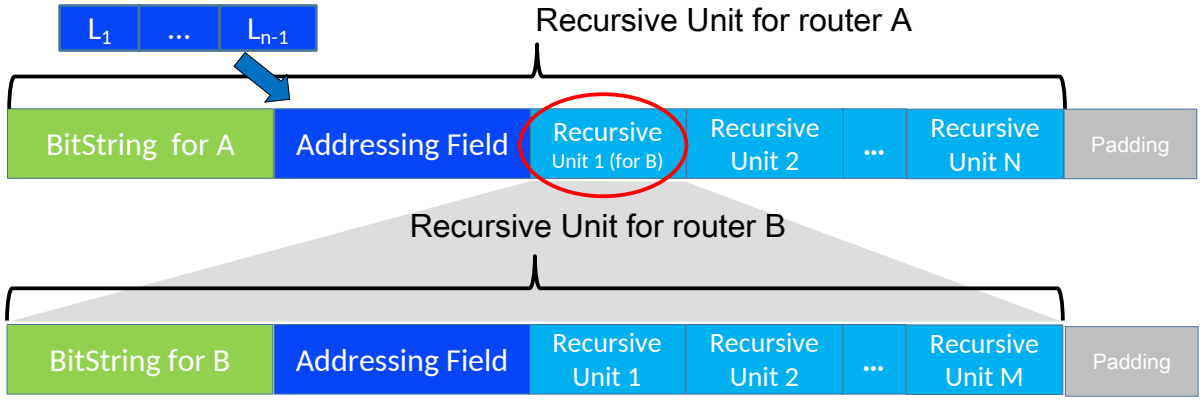
Not 256 as in flat bitstrings but e.g.: 6..10 in core routers!

For every MSR that is NOT leaf of the tree, a Recursive Unit is included

For every leaf we only need a bit in the bitstring and “non-recursive” flag in BIFT (forwarding table)

Recursive Unit for a router hence consists of

(1) BitString, (2) Array of lengths of childrens RU, (3) sequence of children RU



RBS FIB for router A (assuming N = 4)

Index	Recursive	Segment IPv6addr
1	1	B
2	…	…
3	1	C
4	…	…