# Stateless Traffic Engineering Multicast

draft-geng-msr6-traffic-engineering-01
draft-geng-msr6-rlb-segment-00
draft-chen-pim-srv6-p2mp-path-06
draft-chen-pim-mrh6-03
draft-eckert-msr6-rbs-00

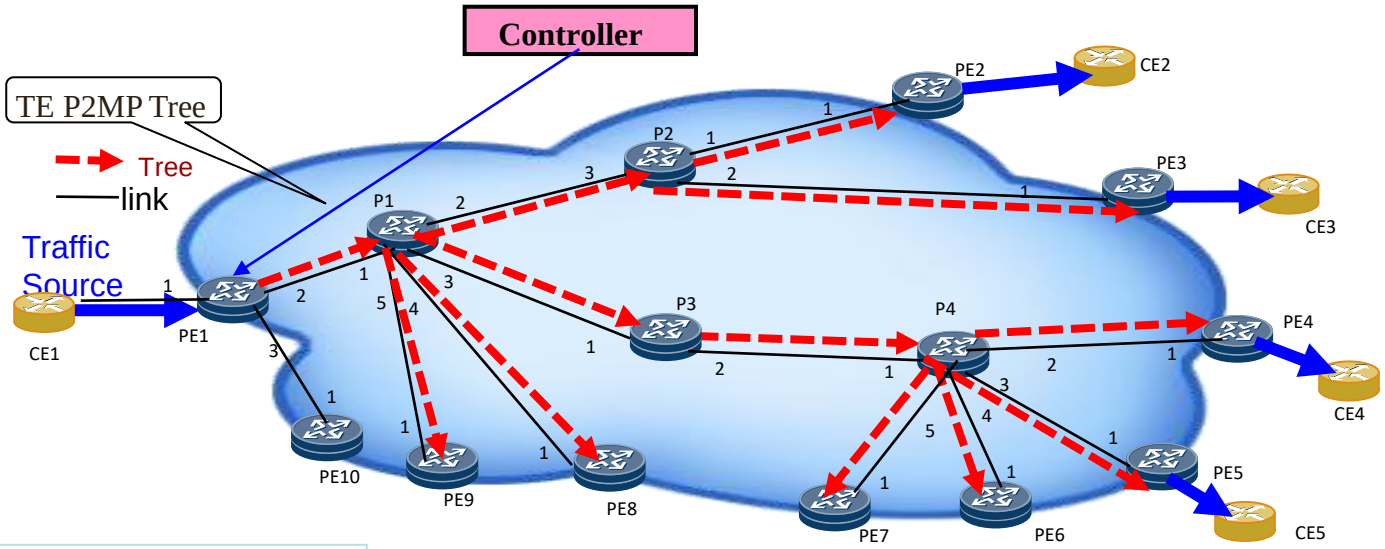
MSR6 BoF IETF 114

# Architecture Overview

- 5 solution drafts use IPv6 routing header, called MRH (Multicast/MSR6 Routing Header), for TE Multicast

```
|<--IPv6 header -->|<--Routing header--->|
+------------------+---------------------+--------------------------+
|  Next Header =   | Next Header         | (an extension header)    |
|43(Routing header)|                     | IP multicast packet/data |
| SA=IPv6 Address  |Routing Type=TBD(MRH)|                          |
| DA=IPv6 Address  |Tree/Subtree encoded |                          |
+------------------+---------------------+--------------------------+
                   |<------- MRH ------->|
```

MRH contains TE P2MP Tree




For multicast packet to be transported by TE P2MP tree,

- Ingress (e.g., PE1) encapsulates the packet in IPv6 MRH with tree
- The packet is transmitted along tree to egresses. No state in core, Tree in MRH not changed.
- Egress (e.g., PE2) decapsulates the packet in a MRH and sends it to next header process

# Brief on Solution Drafts (1/2)

Draft list:

1. Stateless Traffic Engineering (TE) Multicast using MRH (draft-chen-pim-mrh6-03)
2. Recursive Bitstring Structure (RBS) for Multicast Source Routing over IPv6 (MSR6) (draft-eckert-msr6-rbs-00)
3. Stateless SRv6 Point-to-Multipoint Path (draft-chen-pim-srv6-p2mp-path-06)
4. IPv6 Multicast Source Routing Traffic Engineering (draft-geng-msr6-traffic-engineering-01)
5. RLB (Replication through Local Bitstring) Segment for Multicast Source Routing over IPv6 (draft-geng-msr6-rlb-segment-00)

Draft 1

a) IPv6 extension header for TE Multicast is defined
b) TE Tree is represented by the links on the tree
c) The links are encoded by Link numbers and bitstrings
d) A link number is local to a node
e) For a portion of tree, a more efficient encoding (bitstring or link #) is used.

Draft 2

a) MSR6/RBS IPv6 extension header is defined
b) TE Tree is represented by the adjacencies on the tree
c) The adjacencies are encoded by bit positions in bitstrings
d) A bit position is local to a node

# Brief on Solution Drafts (2/2)

Draft 3

a) Multicast SIDs for the nodes on tree
b) Tree structure in SIDs' arguments by N-Branches and N-SIDs as "pointer" to start of sub-tree/branch
c) Procedure of SID duplicates packet for each branch, and sends copy to next hop

Draft 4

a) End.RL (MSR6 Endpoint Replication List) SID for each node on tree
b) Arguments in SID: "Replication number" indicating the number of replications and a "Pointer" pointing to the first child
c) Procedure of SID replicates packet for each child and sends copy to root of child

Draft 5

a) End.RLB (Replication through Local Bitstring) SID with LB
b) Local Bitstring indicating the links on tree and Pointer.
c) LB Segment is a special segment of 128-bits containing the Local Bitstring.
d) Procedure of SID replicates packet for link with bit set to 1 and sends copy to next hop

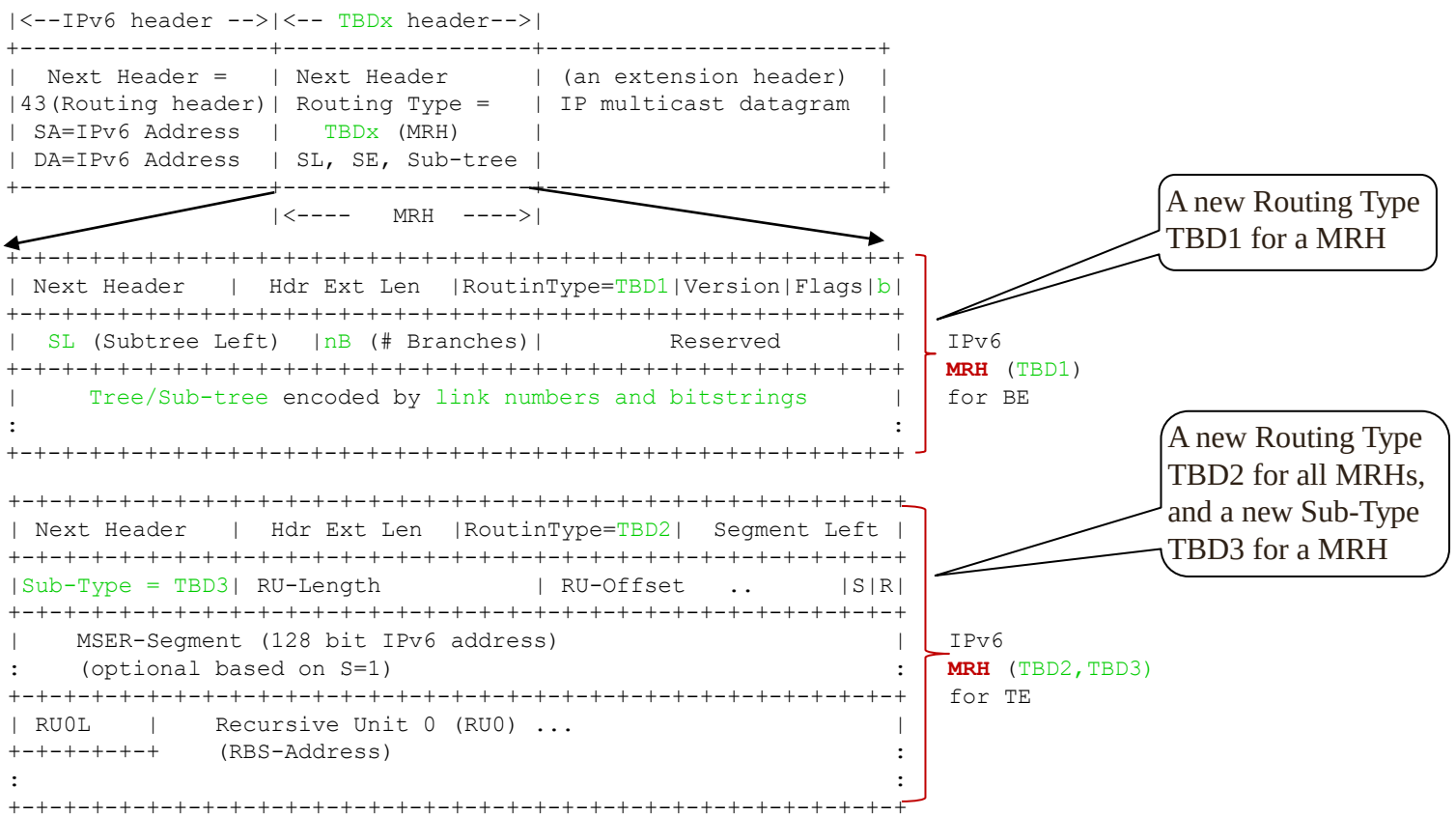
# Summary on Solution Drafts

- IPv6 extension header as MRH used in Draft 1 and 2
- Bitstrings used in Draft 1, 2, and 5 for scalability
- SIDs for multicast in SRH used in Draft 3, 4 and 5.

## MRH in two ways:

i. A new Routing Type for a MRH

ii. A new routing type for all MRH and a new Sub-Type for a MRH



# Experiments on a Solution

Experiments on solution in draft 2 shows

- ✓ Scalable
- ✓ Simple

Prototype implemented

- ➢ easily and
- ➢ quick

Simulations

- ➢ done for large scale SP, e.g., 2048 edge/egress routers
- ➢ Illustrated it is very scalable,

  Its efficiency is about one magnitude higher

# Next Steps

Converge these TE multicast solutions

- MRH
- Encoding of Tree

# Next

Comments