BIER in IPv6

draft-zhang-bier-bierin6

6MAN WG

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**BIER (Bit Indexed Explicit Replication)**

- BIER is a new technology which can achieve multicast forwarding without explicitly multicast distribution trees building, and it doesn't require intermediate nodes to maintain any per-flow state.

- Dedicated BIFT (Bit Index Forwarding Table) is used for forwarding.
- The BIER header is modified on each hop.
- Unicast forwarding is used.

- Achieving multicast hop-by-hop forwarding by the BIER header.
- The BIFT-id is modified hop-by-hop according to the next hop node advertising.

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- **RFC8279**
  - Three layers architecture
    - Multicast Flow Overlay
    - BIER Layer
    - Routing Underlay

  - Multicast Flow Overlay
    - Multicast data information \((S, G)\) or \((*, G)\) is exchanged on Edge routers (BFIR and BFER) ONLY.

  - Routing Underlay
    - Depends on OSPF/ISIS or other routing protocols.
    - Advertising the information which is used to build BIER Layer, such as BFR-Prefix, BFR-id, etc.
BIER Header (RFC8296)

- The BitString field contains the BFR-id set of BFERs. It's modified on each branch node.
- The BIFT-id is used to locate the BIFT forwarding items. It's advertised by the next hop node.
- The Proto field indicates the payload type of multicast flow: MPLS, IPv4, IPv6, Ethernet, OAM

- If silicon (chip) supports BIER Ethernet type recognizing, Ethernet encapsulation can be used directly. If not, MPLS or IPv6 can be used.
- For MPLS, the bottom label is also the BIFT-id in BIER header.
- For IPv6, BIER protocol number is used to indicate the following BIER header, a indicator of BIFT-id is also used to locate BIFT items.
- MPLS and IPv6 encap can also be used to travel across BIER incapable nodes.

The encapsulation can be changed hop-by-hop according to the next hop node advertisement.
BIER IPv6 forwarding example

It does not matter if the outer header is IPv6/Ether/anything
BIER IPv6 forwarding example

IPv6 tunnel from A to C to skip BIER-incapable B
To BIER, IPv6 is just an outer encap
To IPv6, BIER is just a next header

- BIERin6: The Next Header field in IPv6 header is set to BIER type.
- Protocol number assignment for BIER
- https://www.iana.org/assignments/protocol-numbers/protocol-numbers.xhtml
Summary

- IPv6 and BIER orthogonal to each other
  - To IPv6, BIER is just a next header
    • Like any other payload
  - To BIER, IPv6 is just an outer header
    • Like any other outer encapsulation header, e.g. Ether
- Only need an IPv6 codepoint for BIER as next header
  - Consistent with general BIER architecture
  - Consistent with general IPv6 architecture

IPv6 header details

- For directly connected neighbor
  - The destination address in IPv6 header SHOULD be the neighbor's link-local address on this router's outgoing interface.
  - The source address SHOULD be this router's link-local address on the outgoing interface.
  - The IPv6 TTL MUST be set to 1.
- For non directly connected neighbor
  - The destination address SHOULD be the BIER prefix of the BFR neighbor.
  - The source address SHOULD be this router's BIER prefix.
  - The TTL MUST be large enough to get the packet to the BFR neighbor.
- The Flow label field in the IPv6 packet SHOULD be copied from the entropy field in the BIER encapsulation.
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• Any Comments
• Thanks!