BIER for dummies

- New multicast transport paradigm
- **No multicast protocol** (uses unicast forwarding)
- Forwarding **state is in the packets** (not in the routers & groups)

**BIER BitString:**

```
0 1 0 1 ... 1 0 0 0
```

Stored in packet
Modified during replication

*Each bit set indicates a destination the packet should go to.*
BIER for dummies 6man

Multicast Packet
From: 2001::1
To: ff05::f000::1000

Encap in BIER With BitString 1110

Decap

BIER Domain

Bit 1

Bit 2

Bit 3

Bit 4
BIER MPLS encap

- Defined in `<draft-ietf-bier-mpls-encapsulation-05>`
- BitString length from 64 to 4096 bits
- Sub-Domain and BitSet ID (provide more bits) are in MPLS label

```
  0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---------------------------------------------+
| 0 1 0 1 | Ver | Len | Entropy |
+---------------------------------------------+
| BitString (first 32 bits)                   ~
+---------------------------------------------+
| BitString (last 32 bits)                    ~
+---------------------------------------------+
| OAM | Reserved | Proto | BFIR-id |
+---------------------------------------------+
```
What about IPv6?

• BIER is an experimental WG chartered to specify the MPLS encap and "another encapsulation".
• My opinion: This other encap should enable BIER in IPv6-only networks.

• There are two options:
  • Use an hop-by-hop extension header option (or something similar).
  • Use the IPv6 header (This draft).
# BIER over IPv6

<table>
<thead>
<tr>
<th>Source Address</th>
<th>p bits</th>
<th>128-p bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destination Address</td>
<td>BIER IPv6 Prefix</td>
<td>BitString bits</td>
</tr>
<tr>
<td>Payload</td>
<td>BIER Sub-Domain And Bit Set ID</td>
<td>BIER Bit String</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Version</th>
<th>Traffic Class</th>
<th>Flow Label</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Payload Length</th>
<th>Next Header</th>
<th>Hop Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>(IPv4 – IPv6 – UDP – …)</th>
<th></th>
</tr>
</thead>
</table>
Multicast Packet
From: 2001::1
To: ff05:f00::1000

Encap in BIER With Destination
2001::e

Decap
2001::1
2001::2
2001::2
2001::4
2001::8

2001::2
2001::4
2001::8

BIER Domain

2001::e

2001::8
Pros and Cons of this approach

• Pros:
  • Works in IPv6 only networks
  • No extension header.
  • Compatible with existing extension headers (e.g. IPv6 SR)
  • Backward compatibility with hosts (for receiving and sending BIER IPv6 packets).

• Cons:
  • No more than ~80 BIER bits.
Questions for 6man

• The BIER working group supports this work.

• Does 6man object?
  • Does anyone think a hop-by-hop header approach would be better?
  • Are there any other option?
  • Should we just stick to L2/L2.5?

Thanks for the feedback