Telemetry collection in multicast network

draft-mirsky-ippm-hybrid-two-step
draft-song-multicast-telemetry

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Problem statement

Background
- Multicast traffic monitoring is important
  - Reconstruct and visualize the multicast tree
  - Performance monitoring and trouble shooting
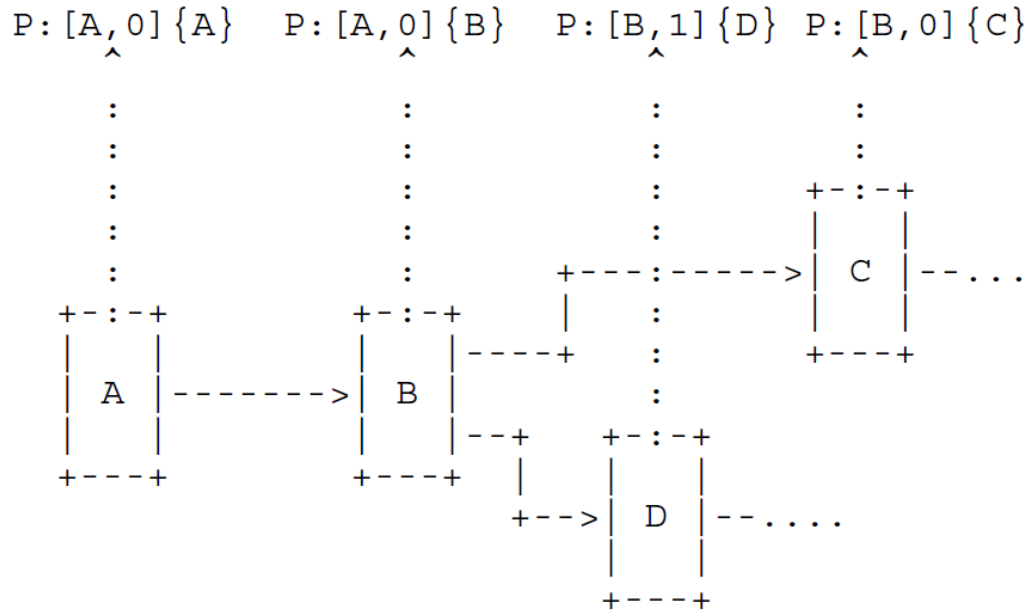- On-path telemetry techniques are promising

Problem
- Currently on-path telemetry techniques have issues:
  - Per-hop collection of telemetry lacks branch identifier
  - Collecting telemetry information in the multicast packet results in unnecessary replication of telemetry information

Objective
- Provide solutions to address the above issues and make the on-path telemetry efficient for multicast traffic
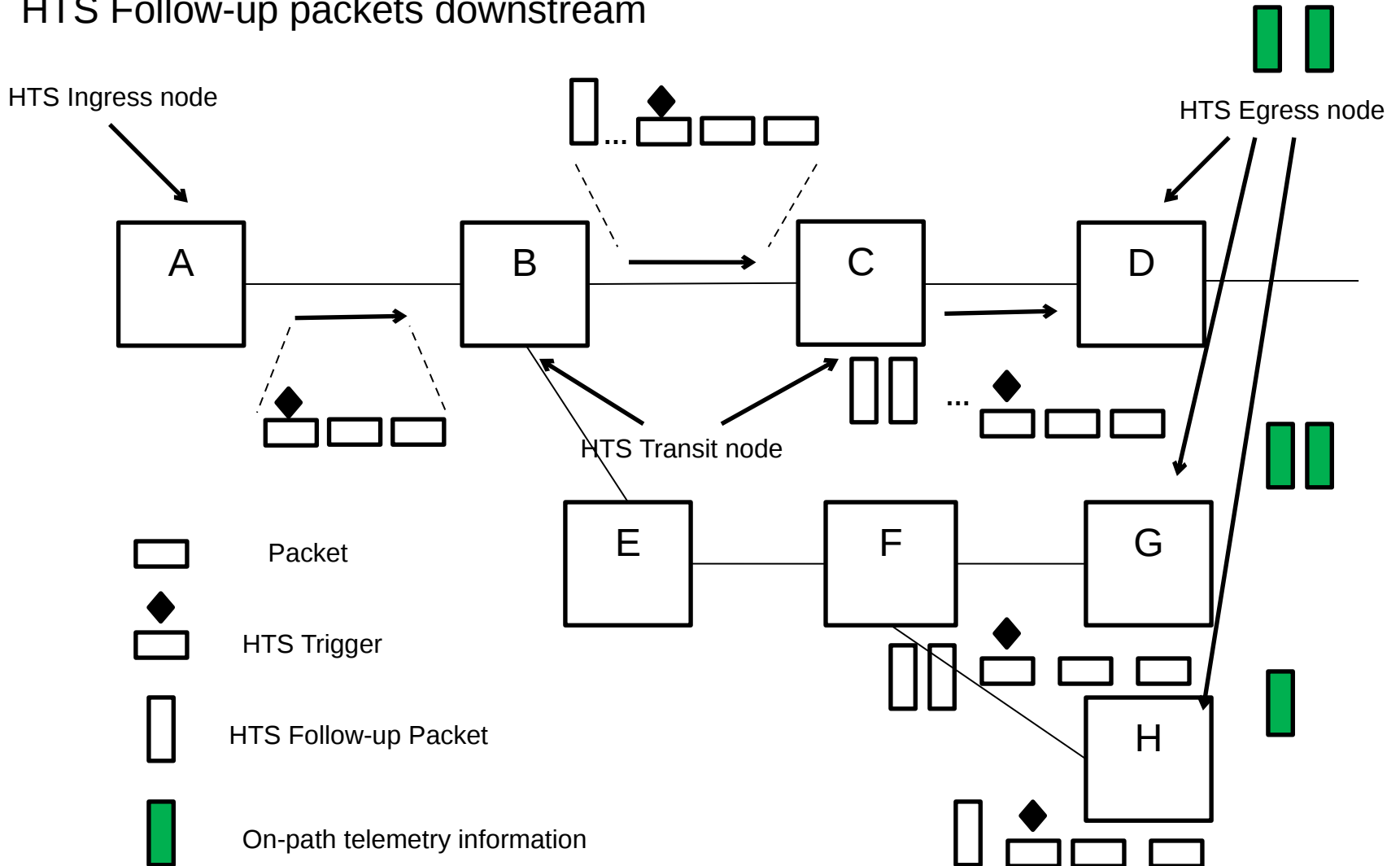
Per-Hop Solution

- Use the original Postcard (PBT) proposal
- Branch Node - either the root or any node that replicates packets
- Branch node adds a branch identifier to the instruction header
  - For global uniqueness, can use the tuple {node ID, index}

```
P:[A,0]{A}    P:[A,0]{B}    P:[B,1]{D}  P:[B,0]{C}
     ^             ^             ^          ^
     :             :             :          :
     :             :             :          :
     :             :             :        +-:-+
     :             :             :        |   |
     :             :      +---:----->|  C  |-- ...
 +-:-+         +-:-+      |    :        |   |
 |   |         |   |----+  :        +---+
 |   |         |   |    :
 | A |------->|  B  |        :
 |   |         |   |--+    +-:-+
 +---+         +---+  |    |   |
                   +-->|  D  |-- ....
                        |   |
                        +---+
```
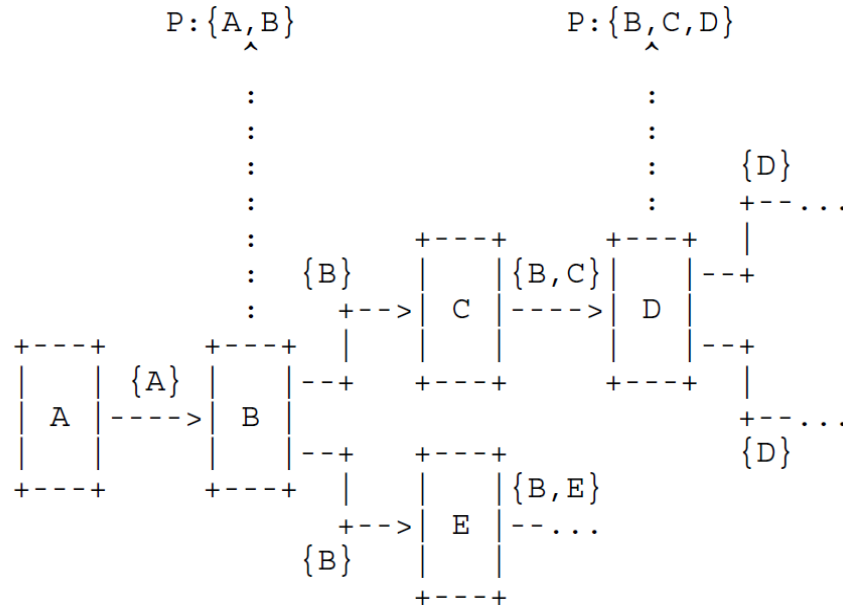
Per-Segment Solution in HTS

Branch Node forwards HTS over the first branch and then originates
HTS Follow-up packets downstream

HTS Ingress node

HTS Egress node

A

B

C

D

HTS Transit node

E

F

G

H

Packet

HTS Trigger

HTS Follow-up Packet

On-path telemetry information

Per-Segment Solution in PBT

- Per-section Postcard
  - A section is the path between two adjacent branch nodes or between a branch node and its adjacent leaf node.
  - A postcard is send at each section's end node
    - The postcard contains the data for the entire section
    - Postcards for the same packet can be stitched together.

```
        P:{A,B}                          P:{B,C,D}
           ^                                 ^

           :                                 :
           :                                 :
           :                           :        {D}
           :                           :        +--...
           :            +---+          +---+    |
           :    {B}     |   |  |{B,C}| |   |--+
           :         +-->|  C  |---->|  D  |
  +---+         +---+    |   |  |   |    |   |--+
  |   |   {A}   |   |--+ +---+         +---+    |
  |  A  |---->|  B  |                         +--...
  |   |         |   |--+ +---+                 {D}
  +---+         +---+    |   |  |{B,E}
                      +-->|  E  |--...
                 {B}     |   |
                         +---+
```

Next steps

- Your comments, suggestions, questions always welcome and greatly appreciated
- WG adoption