BIER Multicast Overlay for HTTP Response

https://tools.ietf.org/html/draft-purkayastha-bier-multicast-http-response-00

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Recap : Multicast HTTP using BIER
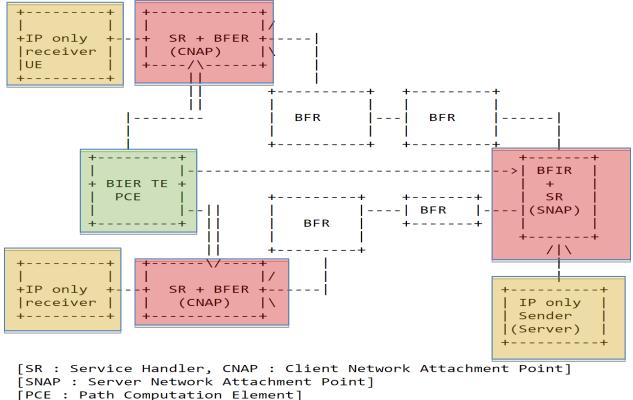
- Draft "Multicast HTTP using BIER" (
https://tools.ietf.org/html/draft-purkayastha-bier-multicast-http-00.html) describes:
  - Example realization of the use case (
  https://tools.ietf.org/html/draft-ietf-bier-use-cases-06#section-3.10)
  - A Few requirements
- Operational details were described
  - Required Functional elements
    - PCE
    - Service Router
  - Suggested Protocols
    - Between Service Routers and PCE, Registration with PCE

Reference Architecture over BIER

```
+---------+    +-----------+
|         |    |         |/
+IP only  +----+  SR + BFER +-----|
|receiver |    |   (CNAP)   |\    |
|UE       |    +----/\------+     |
+---------+       ||              |
                  ||        +---------+    +---------+
                  ||        |         |    |         |
          |--------        |  BFR    |---|   BFR   |------|
          |               +---------+    +---------+      |
          |                                                |
+---------+                                    +-------+
|         |--------------------------------->| BFIR  |
+ BIER TE +                                   |   +   |
|   PCE   |                                   |  SR   |
|         |--||        +---------+  +-------+ | (SNAP)|
+---------+  ||        |         |--|  BFR  |-|       |
             ||        |  BFR    |  +-------+ |       |
             ||        |         |           +-------+
             ||        +---------+              /|\
+---------+  ||   +------\/----+     |
|         |  ||   |        |/           +----------+
+IP only  +--+   |  SR + BFER +------|     | IP only  |
|receiver |    |   (CNAP)   |\            | Sender   |
+---------+    +------------+             |(Server)  |
                                         +----------+

[SR : Service Handler, CNAP : Client Network Attachment Point]
[SNAP : Server Network Attachment Point]
[PCE : Path Computation Element]
```

- The multicast overlay is formed by the BFIR and BFER of the BIER layer and the additional SR (Service Handler) and PCE (Path Computation Element) elements

Realization over IPMC

- "HTTP Response Multicast" maybe realized over IP Multicast (IPMC)
  - Require support for group formation, maintain group state and IGMP signaling to join a group

- For fewer receivers
  - Many of the bitrates may not be required and dropped by the CNAP
  - Extremely high and undesirable amount of IP multicast signaling protocol activity (PIM/IGMP)

Realization over BIER

- Components
  - **SR** : terminates application level protocols, extracts the URI to determine the PATH ID via PCE request
  - **PCE** : keeps track of all service execution end points and how to reach them. (can be part of BIER-TE)
  - Interface functions to BFIR where the PATH ID is mapped to BIER header

- Achieving Multicast
  - SNAP simply coalesces the forwarded HTTP requests from the CNAP, and determines for every requested block the set of CNAPs requesting it
  - A set of CNAPs corresponds to a set of bits in the BIER-bitstring, one bit per CNAP
  - The SNAP then sends the block into BIER with the appropriate bitstring set

Advantages of Realization over BIER

- Eliminates any dynamic multicast signaling between CNAP and SNAP

- Avoid sending of any unnecessary data block, which in the IP multicast solution is pretty much unavoidable

- SNAP can also easily control how long to delay sending of blocks
  - For example, it may wait for some percentage of the time of a block (e.g, 50% = 1 second), ensuring that it is coalescing as many requests into one BIER multicast answer as possible

Next steps

- We suggest to include an additional Applicability Statement documenting "How BIER can be applied to aggregate HTTP responses over a BIER infrastructure"
  - The draft will elaborate on the solution to support the applicability statement