IP Multicast Use Cases and Analysis over Distributed Mobility Management

draft-sfigueiredo-multimob-use-case-dmm-03.txt

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Draft History

- -00, -01,
  - Presented as the matter of future DMM topic in 83rd Paris meeting

- -02 version
  - Presented in 84th Vancouver meeting

Goals and Requirements

- Identify IP multicast use cases with the applications of existing IP multicast standards over DMM
    - Using MLD Proxy, Multicast Router
    - Including Multicast Listener & Sender Support

- Present detailed analysis on each use case
    - Performance, deployment issues

- Assumptions based on DMM requirements [1]

- [1] H. Chan, "Requirements of distributed mobility management",draft-ietf-dmm-requirements-02 (work in progress), September 2012.

Changes from -02

- According to the Goals,
  - Title clarified and ToC arranged
    - Clearer separation between **Use Cases** and **Analysis**
  - Contents complemented (it now includes **Multicast Router** deployment)

- Analysis summarized in a Table

IP Multicast over DMM

- Interest in DMM within IETF is confirmed
  - Main concept is to distribute unicast IP flows through different anchors deployed at edge-side

- IP multicast over DMM
  - Use case -> Analysis -> Requirement, then …

- The use case doesn't need to be tightly coupled with DMM unicast solution

- But just needed how IP multicasting with various deployment options could be used <u>over DMM</u>

DMM Requirements

- Main paradigm-change in DMM is described in first DMM requirement

  - **REQ1: Distributed deployment**
    "IP mobility, network access and routing solutions provided by DMM MUST enable distributed deployment of mobility management of IP sessions so that traffic does not need to traverse centrally deployed mobility anchors and thus can be routed in an optimal manner."

Use cases and Analysis

- Multicast Listener
  - MLD Proxy on MAR (mobility access router)
  - Multicast Router on MAR

- Multicast Sender
  - MLD Proxy on MAR
  - Multicast Router on MAR

Q & A

- Work flow reasonable?
- Next steps

85th IETF, November 2012, Atlanta, U.S

Backup Slides

Use cases and problem analysis on each use case

Use Case for Multicast Listener

- MLD Proxy on MAR
  - MLD upstream interface can be setup towards upper multicast router or the anchor router with which the MN is associated

```
+----------------+
|   Multicast    |
| Infrastructure |
+----------------+
        *
        *  (S,G)
        *
+-----------+                        +-----------+
|   P-MAR   |------------------|   N-MAR   |
|           |*************|           |
| (MLD-P)   |------------------| (MLD-P)   |
+-----------+                        +-----------+
      *                                    *
      *                                    *
 +------+                             +------+
 |  MN  |            ----->            |  MN  |
 +------+                             +------+
```

10
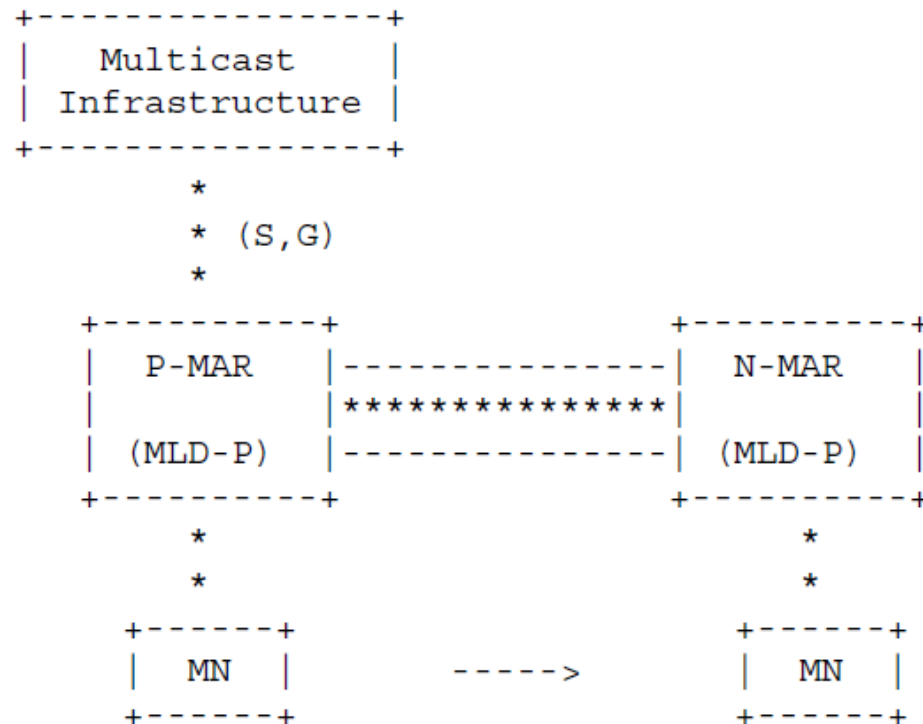
Problem in the use case

- Multicast data replication
  - Similar to tunnel convergence problem introduced in PMIPv6 Base Solution
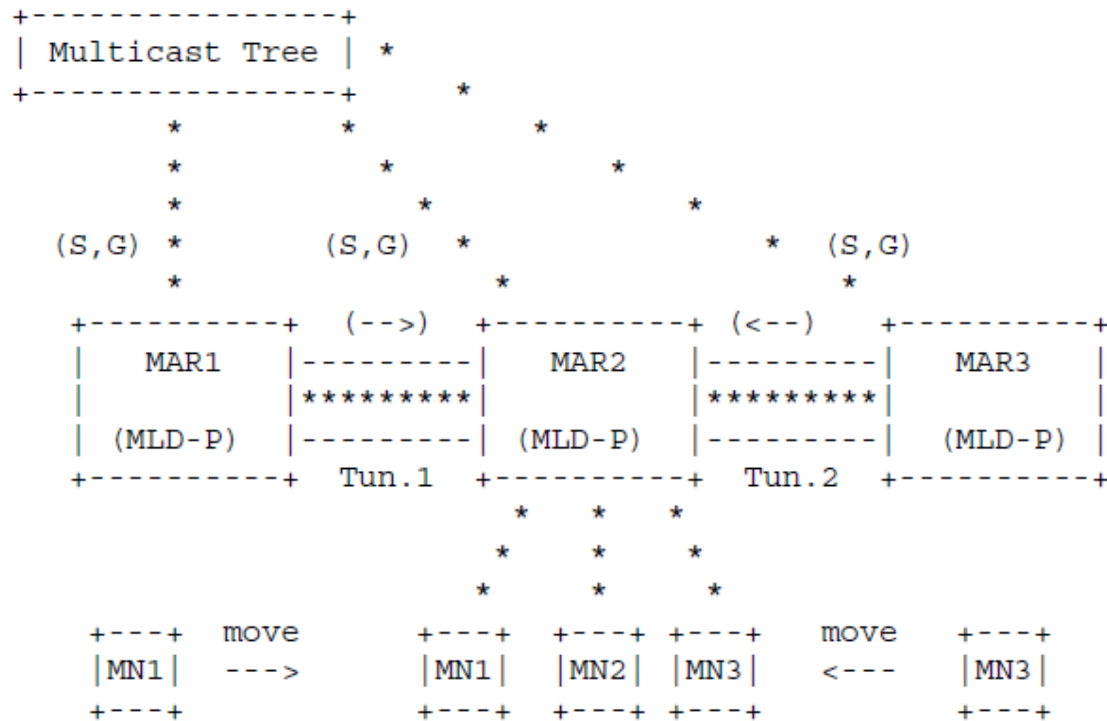
```
+----------------+
| Multicast Tree |  *
+----------------+        *
        *           *           *
        *              *              *
        *                *              *
(S,G)   *          (S,G)    *                  *   (S,G)
        *                     *                   *
+----------+   (-->)  +----------+  (<--)    +----------+
|   MAR1   |---------|   MAR2   |---------|   MAR3   |
|          |*********|          |*********|          |
| (MLD-P)  |---------| (MLD-P)  |---------| (MLD-P)  |
+----------+  Tun.1  +----------+  Tun.2  +----------+
                          *    *    *
                          *    *    *
                          *    *    *
+---+  move      +---+  +---+ +---+    move     +---+
|MN1|  --->      |MN1| |MN2| |MN3|    <---      |MN3|
+---+            +---+ +---+ +---+               +---+

    (<--/-->) : direction of the multicast packet flow
```

Problem in the use case

- Non-optimal routing
  - Multicast packets may traverse a long distance as a MN moves

```
+----------------+
|   Multicast    |
| Infrastructure |
+----------------+
        *
        *  (S,G)
        *
+-----------+                              +-----------+
|   P-MAR   |------              ------|   N-MAR   |
|           |******  ...  ******|           |
| (MLD-P)   |------              ------| (MLD-P)   |
+-----------+                              +-----------+
      *                                          *
      *                                          *
+-------+                              +-------+
|  MN   |              ----->          |  MN   |
+-------+                              +-------+
```
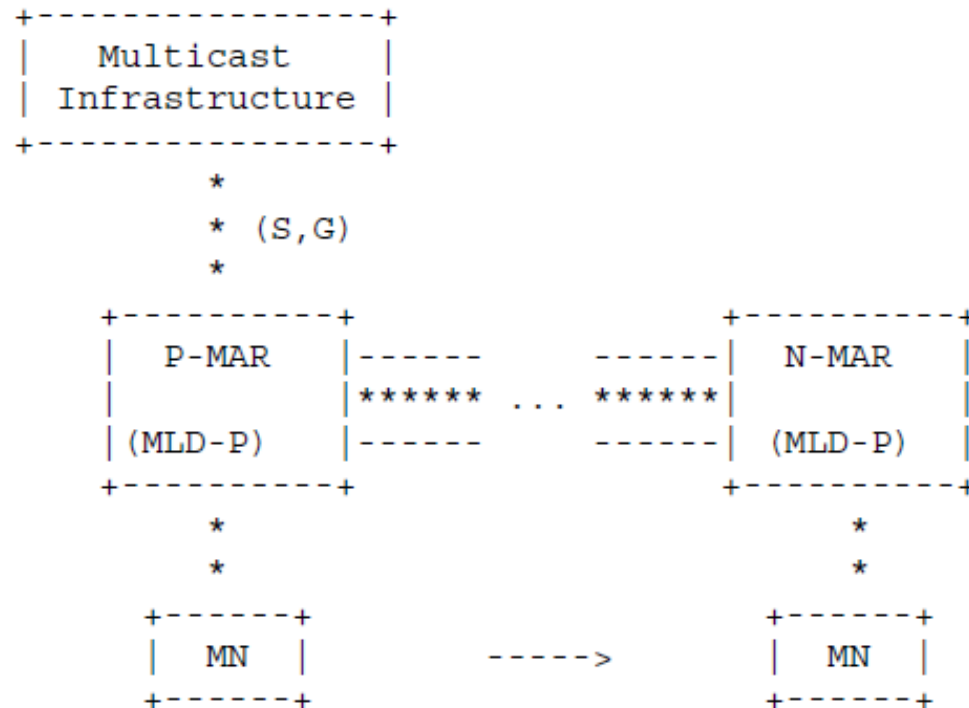
Use Case for Multicast Sender

- MLD Proxy on MAR
  - Upstream interface of MLD Proxy for multicast sender is set up towards an upper multicast router

```
+------+                +----------------+
|  RP  |--------|  Multicast       |
+------+        | Infrastructure |
   *            +----------------+
   *  (S,G)              |
   *                     |
+----------+        +----------+
|  P-MAR   |----------|  N-MAR   |
|          |**********|          |
| (MLD-P)  |----------| (MLD-P)  |
+----------+        +----------+
   *                       *
   *                       *
+------+                +------+
|  S   |    ---->       |  S   |
+------+                +------+
```
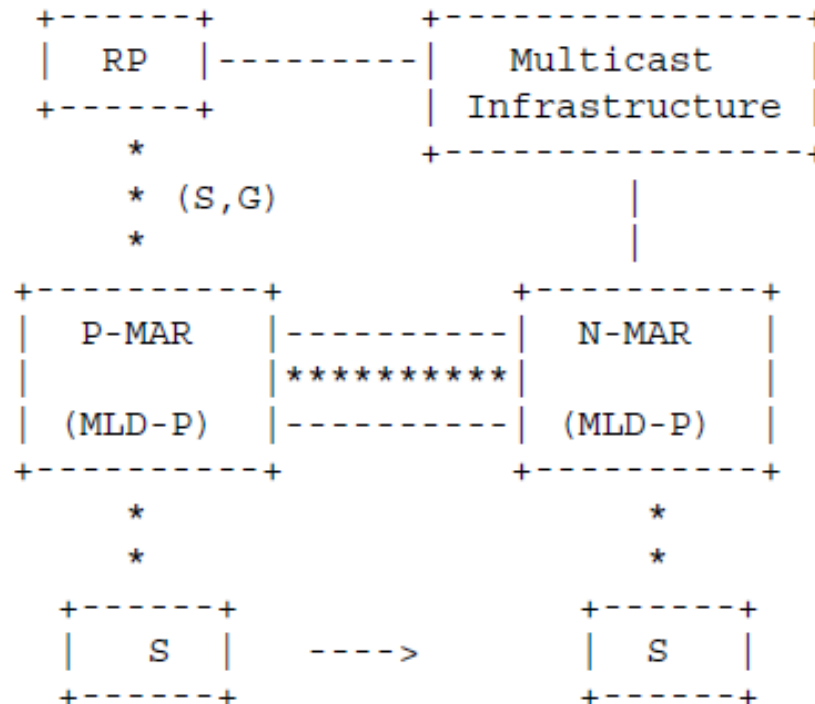
Problem in the use case

- Triangular routing after sender mobility
- Flow of multicast data (source movement)
  - Source -> N-MAR-> P-MAR -> Multicast Tree -> N-MAR -> L1

```
+------+              +----------------+
|  RP  |*********|     Multicast       |
+------+         |   Infrastructure    |
   *             +----------------+
   *  (S,G)              *
   *                     *
+-----------+       +-----------+
|   P-MAR   |-------|   N-MAR   |
|           |*******|           |
| (MLD-P)   |-------| (MLD-P)   |
+-----------+       +-----------+
      *                *      *
      *                *      *
+------+  move +------+ +------+
|  S   |  ---> |  S   | |  L1  |
+------+       +------+ +------+
```
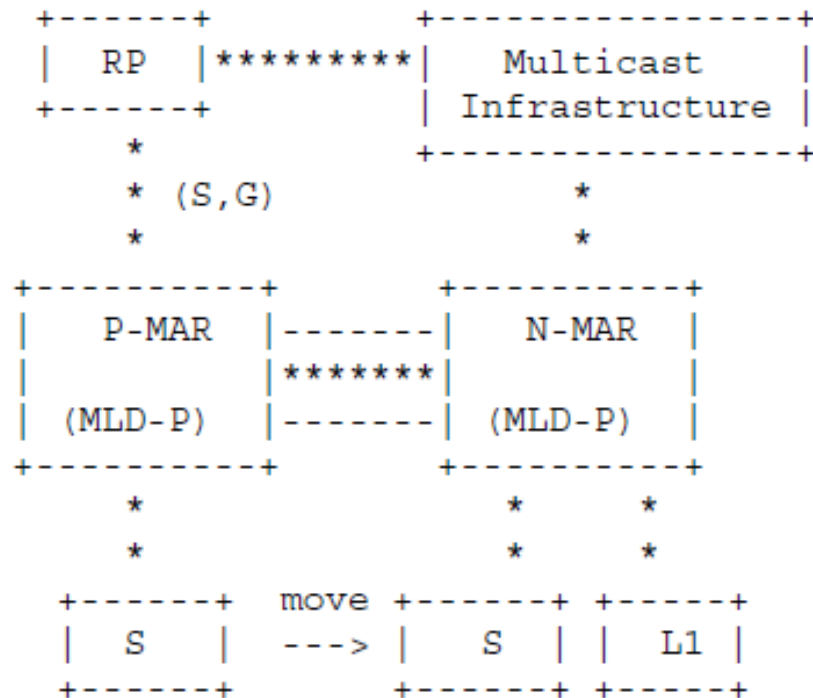
Problem in the use case

- Triangular routing after listener mobility
- Flow of multicast data (listener movement)
  - Source -> N-MAR -> Multicast Tree -> P-MAR -> N-MAR

```
+------+                  +----------------+
|  RP  |*********|        |   Multicast    |
+------+         |        | Infrastructure |
    *                     +----------------+
    *  (S,G)                      *
    *                            *
+----------+           +----------+
|   N-MAR  |-------|    P-MAR  |
|          |*******|           |
|  (MLD-P) |-------|   (MLD-P) |
+----------+           +----------+
    *         *                  *
    *         *                  *
+------+  +----+   move   +----+
|  S   |  | L1 |   <---   | L1 |
+------+  +----+          +----+
```