Extension of the MLD proxy functionality to support multiple upstream interfaces

<draft-contreras-multimob-multiple-upstreams-01.txt>

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Problem statement

• General application:
  • Sharing of a common network access infrastructure among different multicast content providers

• Advantages
  • Subscribers can get their preferred contents from different multicast content providers without network constraints and without requiring PIM routing on the access / aggregation device

• Redundancy
Motivation

- The support of multiple upstream interfaces on an MLD proxy functionality has been identified as an opportunity for system optimization
- Complexity
  - Handling of control messages for/from multiple upstreams
  - Efficient handling of data traffic for/from multiple upstreams
- Purpose
  - Identification of requirements for supporting multiple upstreams
  - Specification of the needed MLD proxy functional extensions
- Changes from last version
  - Fixed network communication scenarios introduced
  - PMIPv6 appendix included for explanatory introduction to mobile scenarios (MULTIMOB-centered)
Fixed network communication scenarios

• Fixed broadband based

• Multicast wholesale offer for residential services
  ✓ Complementary multicast service offered by alternative operators in an efficient manner

• Multicast resiliency
  ✓ Path diversity through the connection to distinct leaves in a given multicast tree (skipping routing based mechanisms)

• Load balancing for multicast traffic in the metro network
  ✓ Demand split on different paths

➢ Benefits
  ✓ Resource efficiency on distribution network
  ✓ Avoidance of multicast routing complexity as far as possible from the access / aggregation devices
## Needed functionality per fixed scenario

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Multicast Wholesale</th>
<th>Multicast Resiliency</th>
<th>Load Balancing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upstream Control Delivery</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Downstream Control Delivery</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Active / Standby Upstream interface</td>
<td></td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Upstream i/f selection per mcast group</td>
<td></td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>Upstream i/f selection for all groups</td>
<td></td>
<td></td>
<td>✗</td>
</tr>
</tbody>
</table>
Mobile network communication scenarios

First, a short introduction on Multicast listeners with Proxy Mobile IPv6 (MULTIMOB WG’s scope) ...
Proxy Mobile IPv6 (RFC 5213)

MN 1’s attachment detected by MAG 1

LMA looks for MN 1 ID in its table
LMA adds an entry for MN 1 ID in its table
(IPv6 forwarding is also set-up for the assigned prefix)

MN 1 ID | MN 1’s assigned prefix | MAG 1’s IP address

Proxy BU

Router Solicitation

Proxy BA

MN 1 configures an IPv6 address based on received prefix

Router Advertisement (prefix)
Proxy Mobile IPv6 (RFC 5213)

- MN 1's detachment detected by MAG 1
- MN 1's attachment detected by MAG 2
- LMA looks for MN 1 ID in its table
- MN 1 ID
- MN 1's assigned prefix
- MAG 2's IP address
- MAG 1's IP address
- LMA sets a timer to delete entry for MN 1 ID from its table
- LMA looks for MN 1 ID in its table
- LMA updates the entry for MN 1 ID in its table
- IPv6 forwarding is updated for the assigned prefix
- MN 1 keeps using the same IPv6 address
- MN 1 keeps using the same default router
- Proxy BA
- Proxy BU
- Proxy BA
- Router Solicitation
- Router Advertisement (prefix)
- MAG 1
- MAG 2
- MAG 3

86th IETF, Orlando
A Minimal Deployment Option for Multicast Listeners in PMIPv6 Domains (RFC 6224)

Remote subscription at the LMAs

One MLD proxy instance per LMA

The MN is associated with one LMA
Mobile network communication scenarios

• PMIPv6-based (MULTIMOB)

• Listener mobility
  ✓ Single MLD proxy instance on MAG per LMA
  ✓ Remote and local multicast subscription
  ✓ Dual subscription to multicast groups during handover

• Source mobility
  ✓ Support of remote and direct subscription in basic source mobility
  ✓ Direct communication between source and listener associated with distinct LMAs but on the same MAG
  ✓ Route optimization support in source mobility for remote subscribers

➢ Benefits
  ✓ Traffic routing optimization within the PMIPv6 domain
  ✓ Simultaneous support of remote and local multicast subscription
  ✓ Avoidance of multiple MLD proxy instances on MAG
## Needed functionality per mobile scenario

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Multicast Listener</th>
<th>Multicast Source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single MLD proxy</td>
<td>Direct &amp; Remote Subs.</td>
</tr>
<tr>
<td>Upstream Control Delivery</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Downstream Control Delivery</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Upstream Data Delivery</td>
<td></td>
<td>×</td>
</tr>
<tr>
<td>Downstream Data Delivery</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>1:1 MN to Upstream Association</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>1:N MN to Upstream Association</td>
<td></td>
<td>×</td>
</tr>
<tr>
<td>Upstream i/f selection per mcast group</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Upstream i/f selection for all groups</td>
<td></td>
<td>×</td>
</tr>
<tr>
<td>Upstream traffic replication</td>
<td></td>
<td>×</td>
</tr>
</tbody>
</table>
Proposed next steps

• Collect pending / potential scenarios not yet covered for both fixed and mobile network communications
• Receive comments on documented requirements, and identify new ones, if not yet raised
• Start describing MLD proxy extension to cope with required functionality
• Move the draft proposal to PIM WG
  – Prepare -00 version for PIM WG after Orlando meeting addressing received comments and feedback