Multicast Routing Optimization by PIM-SM with PMIPv6

draft-asaeda-multimob-pmip6-extension-11

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Overview

• Multicast route optimization done by PIM-SM routing protocol running on both LMA and MAG in PMIPv6
  – Source and/or RP addresses selected by the RPF lookup algorithm
    • No tunnel convergence problem
    • Optimized routing
  – Both ASM and SSM supported
• Localized routing and direct routing support
• Mobility support
  – Most of handover scenarios (mentioned until -10) were deleted as they were duplicated with a handover draft
  – Only handover using MN’s policy profile mentioned
Basic Data Flow – Example

- MAG and LMA act as PIM-SM routers
  - Upstream IF for (S1,G1) is MAG’s M-Tunnel IF
  - Upstream IF for (S2,G2) is MAG’s physical IF (i.e., direct routing without any tunnel)
M-Tunnel (GRE Tunnel)

• M-Tunnel is a GRE tunnel manually set up at MAG
  • Dedicated for multicast packet transmission
  • GRE key is manually configured by operation, or dynamically negotiated with RFC5845
  • Tunnel end points can be;
    – LMA
    – Other MAG (for localized routing)
    – PIM-SM routers in a local domain (for direct routing via tunneling)
• Multicast routes with M-Tunnel are referred by MRIB
M-Tunnel Configuration
(Basic operation)

• MAG uses an M-Tunnel (attached to LMA) as an upstream link for external multicast packets
  – E.g., ip mroute 0.0.0.0 0.0.0.0 gre0
Example 1: Basic Operation

PIM-SM router

M-Tunnel

PIM Join

ip mroute 0.0.0.0 0.0.0.0 gre0

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M-Tunnel Configuration (Advanced operation)

• Operators may want to set up multiple upstream interfaces at MAG to support different scenarios;
  – Case 1: Remote contents from a single LMA and local contents via direct routes (static or dynamic)
  – Case 2: Remote contents from different LMAs for different prefixes
  – Case 3: Remote contents from different LMAs managed by ECMP (not for load balancing, but for load split)

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Advanced Operation – 1: M-Tunnel + Direct Routing

Fixed Internet

LMA1

LMA2

PMIPv6-Domain

M-Tunnel

PIM Join

MAG1

MAG2

Src

Src

1.1.1.10

ip mroute 0.0.0.0 0.0.0.0 gre0
ip mroute 1.1.0.0 255.255.0.0 fas1

MN

MN

MN

MN

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Advanced Operation – 2: Multiple M-Tunnels for Different Prefixes

PIM-SM router

M-Tunnel

PIM Join

ip mroute 0.0.0.0 0.0.0.0 gre0
ip mroute 11.1.0.0 255.255.0.0 gre1
ip mroute 20.0.0.0 255.0.0.0 gre1
Advanced Operation – 3: Multiple M-Tunnels by ECMP

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Mobility Support

• Mobility support (i.e. seamless handover)
  – Ex. 1: With Policy Profile
    • When MN’s subscribing channel list is always maintained
  – Ex. 2: With multicast extended PBU/PBA
    • draft-ietf-multimob-fast-handover-03
  – Ex. 3: With multicast extended CXTP
    • draft-vonhugo-multimob-cxtp-extension-02
Handover Scenario
– With PBU (DeReg) and PBA

Detach

MN detachment event

--- DeReg PBU-M ---

(Acquire multicast channel information for MN-ID)
Accept PBU

Attach

MN attachment event (Acquire MN-ID)

--- PBU ---

--- PBA-M ---

(Acquire multicast channel information for MN-ID)

--- M-Tunnel(PIM join) ---

--- M-Tunnel(Multi.data) ---

--- Multicast data ---
Handover Scenario
– Direct Routing

MN -> p-MAG
| ---- MLD Report ----> | ----> PIM join |
| <--- Multicast data ---|

Detach
MN detachment event
| ---- DeReg PBU-M ----> |
| (Acquire multicast channel information for MN-ID) |
| Accept PBU |
| <------------ PBA -----------|

Attach
| -------------- RS ---------------> |
RS
| <------------ PBU -------------->
| <------------ PBA-M -------------->
| (Acquire multicast channel information for MN-ID) |
| <--- PIM join |
| <------------ RA -------------->
| <------------- Multicast data --------------|

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Conclusion

• This draft provides “Multicast Routing Optimization by PIM-SM with PMIPv6”
• WG interests this optimization?