PMIPv6 – MIPv6 Interactions
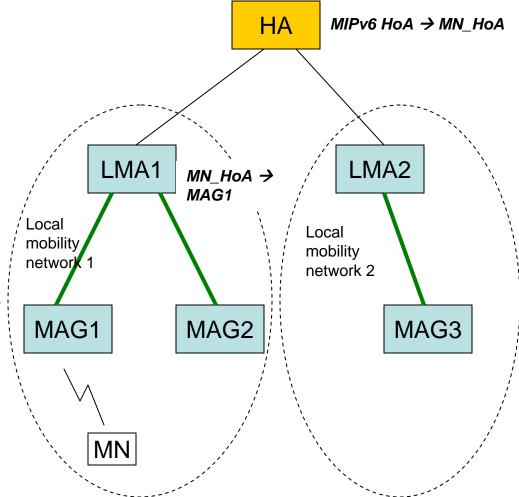
NETLMM WG, IETF 69

Status

- draft-giaretta-netlmm-mip-interactions-01 submitted recently
- A Merge of three drafts
  - draft-giaretta-netlmm-mip-interactions-00
  - draft-devarapalli-netlmm-pmipv6-mipv6-01
  - draft-weniger-netlmm-pmipv6-mipv6-issues-00
- Describes three interworking scenarios between MIPv6 and PMIPv6
  - Captures issues
  - Describes possible solutions to address the issues
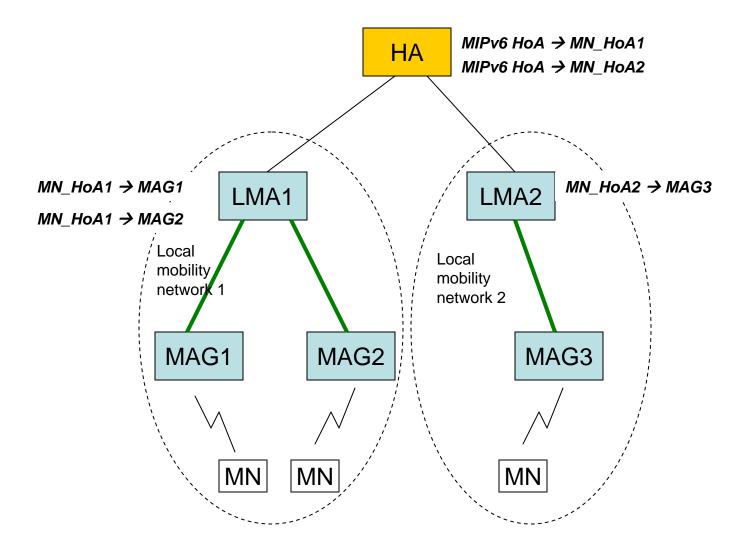
Scenario A

- **PMIPv6 and MIPv6 used in an hierarchical manner**
  - PMIPv6 used for local mobility management
  - MIPv6 used for global mobility management
  - Mobility between LMAs results in an update of MIPv6 binding
- **PMIPv6 assigned address (MN_HoA) is used as the CoA for MIPv6 binding**
- **The result is a Mobile IP tunnel over the PMIPv6 tunnel**

HA — *MIPv6 HoA → MN_HoA*

LMA1 — *MN_HoA → MAG1*

LMA2

Local mobility network 1

Local mobility network 2

MAG1   MAG2   MAG3

MN

Scenario A (contd.)

- No issues have been identified for this scenario
- The draft describes message flows for handovers

Scenario A – Handover flow

Scenario B

- A Mix of mobile nodes that use MIPv6 and those that depend on PMIPv6 on mobility management in a particular access network
- A common mobility anchor
  - Acts a MIPv6 HA for those MNs that use MIPv6
  - Acts a PMIPv6 LMA for those MNs that depend on PMIPv6 for mobility management
- Access router performs a dual role
  - IPv6 access router for those MNs that use MIPv6
    - CoA configured from prefixes advertised by the access router
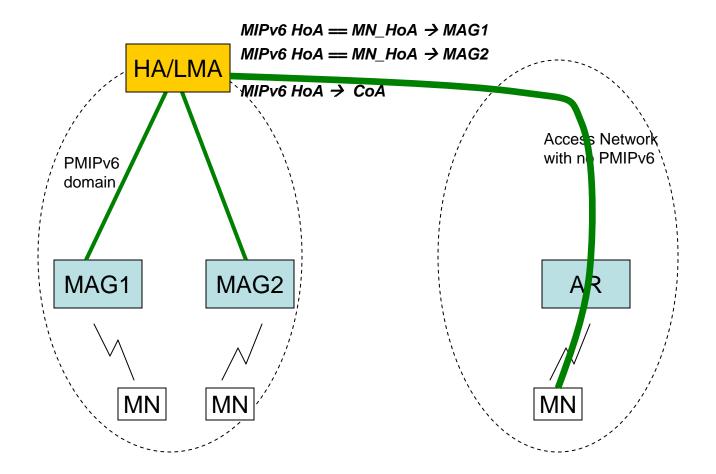 - MAG for those MNs that use PMIPv6

Scenario B (contd.)

- The access router needs to know if the mobile node wants to use MIPv6 or rely on PMIPv6
  - Advertise a local prefix for CoA configuration for MIPv6 MNs
  - Advertise home network prefix from the LMA for MNs that rely on PMIPv6
- Not addressed in the draft currently
  - This is a system deployment issue
  - Not a protocol issue

Scenario C

- MN transitions between using MIPv6 and PMIPv6
- MIPv6 HA and PMIPv6 LMA functionalities co-located on the same node
- Some access networks support PMIPv6 and some don't
  - Some of those access networks that support PMIPv6 appear as home link with respect to MIPv6
    - MN does not send a MIPv6 binding update since it is at home
    - No tunneling overhead when MN attached to home link
- Mobile IPv6 stack on the mobile node always active

Scenario C – Handover flow

MIPv6 HoA == MN_HoA → MAG1
MIPv6 HoA == MN_HoA → MAG2

MIPv6 HoA → CoA

HA/LMA

PMIPv6
domain

MAG1

MAG2

Access Network
with no PMIPv6

AR

MN

MN

MN

Scenario C – Binding Cache Lookup

- Binding cache lookup is different for MIPv6 and PMIPv6
  - MIPv6 HA uses home address
  - PMIPv6 LMA uses MN identity
- The HA/LMA entity needs to use both the MN identity and the home address for lookup
  - If IKEv2/IPsec is used, the MN identity is obtained from the IDi payload during the IKEv2 exchange
  - If RFC 4283 is used (along with RFC 4285), the identity is carried along with the binding update
  - For PMIPv6, MN identity is carried along with the proxy binding update
- At any time, there is only one binding cache entry per mobile node

Scenario C – Binding Cache Update

- The binding cache entry for the MN is modified both by the MAG and the MN

- HA/LMA must allow both authorized MAGs and the MN to modify the binding cache entry for the MN

  - The PMIPv6 base specification already requires the LMA to verify if the MAG is authorized to send a proxy BU on behalf of the MN

Scenario C – Processing a MIPv6 de-registration BU

- When the MN transitions from MIPv6 to PMIPv6, the de-registration BU from the MN is received after the proxy BU from the MAG
  - This could delete the binding cache entry created/updated by the MAG
- The draft recommends ignoring the de-registration BU from the MN
  - If the proxy flag is set in the binding cache entry
  - Send a binding ack with status 0 (success)

Scenario C – Out of order BUs and Proxy BUs

- MN transitions from PMIPv6 to MIPv6
  - MAG sends a Proxy BU to create/update the binding cache entry when the MN is attached to the PMIPv6 domain
  - Proxy BU is delayed
  - MN sends a BU from a non-PMIPv6 domain and creates a binding cache entry at the HA
  - The delayed Proxy BU when received by the LMA overrides the binding cache entry for the MN
  - MN cannot send/receive packets until it sends a BU again
- MN transitions from MIPv6 to PMIPv6
  - MN sends a BU from a non-PMIPv6 domain
  - The BU is delayed
  - MN moves to a PMIPv6 domain and the MAG sends a proxy BU
  - The delayed BU from the MN is received after the Proxy BU from the MAG – this overrides the binding cache entry created by the MAG
  - No packets can be sent/received until the MAG sends a proxy BU again
- There are some proposals, but no solution in the draft yet
  - Tentative BCE with a hystersis timer

Scenario C – LMA/HA bootstrapping

- Bootstrapping should ensure that the same HA and LMA is used
  - LMA assigned for the MN should be usable as a MIPv6 HA
  - Same home address assigned using PMIPv6 and MIPv6
- In case Home Agent is assigned through the bootstrapping procedure, then this can be addressed easily
  - The assigned home agent can ensure the same home address is given to the MN again
- In case Home Agent is discovered, for example using DNS, it is an issue
  - No solution yet

Scenario C – Threat of Compromised MAG

- A compromised MAG can create havoc with binding cache entries for the mobile nodes

- Threat exists even with base PMIPv6

- But the threat here is worse since it affects also MNs that use MIPv6-only and not just those MNs that transition between using MIPv6 and PMIPv6

- Documented in the security considerations section