PMIPv6-MIPv6 Interactions

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Motivation and objective

• Motivations
  – long discussion in the mailing list
  – interest in others SDOs

• Objective
  – identify the main scenarios
  – identify the open issues for each scenario
  – identify the requirements on the PMIPv6 side and MIPv6 side to support the scenarios
  – understand if the scenarios can be supported in the base spec or further work is needed
Scenarios

• PMIPv6 as the local mobility management protocol and MIPv6 as the global mobility management protocol

• MIPv6 terminals and “PMIPv6 terminals” in the same network

• Movements between PMIPv6-enabled areas and PMIPv6 non-enabled area
PMIPv6 as local and MIPv6 as global

- Similar to a MIPv6-HMIPv6 scenario
- The address assigned from the PMIP LMA is used as the CoA for MIPv6 BU
Local Mobility Management

- HoA
  - CoA configuration
  - PBU (CoA1, MAG1)
  - PBA
  - BU (HoA, CoA1)
  - BA
  - HoA → CoA1

- CoA1
  - MAG1
  - MAG2
  - CoA configuration/confirmation
  - PBU (CoA1, MAG1)
  - PBA
  - CoA1 → MAG1
  - CoA1 → MAG2
  - PBA

Global Mobility Management

HoA

CoA1

HoA

CoA2

CoA configuration

PBU (CoA2, MAG3)

PBA

BU (HoA, CoA2)

BA

CoA2 → MAG3

HoA → CoA2

MAG2

LMA1

MAG3

LMA2

HoA

CoA3

HoA

CoA4

HoA

CoA5

HoA

CoA6
PMIPv6 as local and MIPv6 as global

- No issues from the above analysis
- Minor issue: possible race condition between PMIP registration and MIP registration
  - if the state at the HA is created before the state at the LMA
    - this is because the PBU and the BU are sent by different entities (MAG and MN)
    - this is different from the HMIPv6/MIPv6 scenario since in the latter case the MN is responsible of sending both registration messages
  - unrealistic
MIPv6 terminals and “PMIPv6 terminals” in the same network

• Two kinds of terminals in the network
  – MNs do not implement MIPv6 and the mobility is handled by PMIPv6
  – MNs implement MIPv6 and want to manage the mobility on their own

• Based on PMIPv6 configuration the network would advertise the home prefix of the MN
  – if so, how the MIPv6 terminals can use MIPv6 if the home network prefix is advertised?

• The issue seems to be solvable at system-level
  – AAA, user’s profiles, out-of-band signaling
  – out of scope of this WG
Movement between PMIPv6 and MIPv6

• The MN uses PMIPv6 and switches to MIPv6 when it moves to an access network that does not have any MAG functionality

• This means the address assigned by the LMA in the PMIPv6 domain becomes the home address while using MIPv6
  – MIP6-HoA == PMIP6-HoA
Movement between PMIPv6 and MIPv6

- MN is in a network where PMIPv6 is used
  - network based mobility
  - MN is at home in a MIPv6 term
  - HoA is the only address used by the MN
Movement between PMIPv6 and MIPv6

- MN moves towards a network that does not support PMIPv6
  - CoA configuration
  - MIPv6 BU
  - MIPv6 HoA is the address used by the MN in the PMIPv6 network

This may be another PMIP domain but with a different LMA or at least serving a different prefix
Issues

• Security
  – assumption in rfc3775: strong binding between HoA and SA used to update the Binding Cache Entry
  – in PMIPv6 different Security Associations are used to update the entry of a HoA (per-MAG Security Association)
  – in this PMIPv6-MIPv6 scenario both host-based and network-based Security Associations are used to update a single HoA/HNP BCE
  – a compromised MAG can send a bogus PBU to the HA/LMA even when the MN is not in the PMIP domain, since the MAG is in the MIP6 "home" domain
    • a possible solution is that the PBU is accepted only if there is no host-based BC entry
    • unfortunately this solution may lengthen the handover latency when the MN returns to the PMIP domain (e.g. due to retransmission of the PBU from the MAG)
Issues (cont’d)

• **HoA management and lookup key in BC**
  – in MIPv6 (rfc3775) the HoA is the lookup key in the BC
    • MN does not include any MN-ID in the BU based on standard rfc3775
  – in PMIPv6 the HoA may not even be present (based on the prefix-per-MN model) and either MN-ID or the network prefix is the lookup key
  – HoA may not even be known by the HA/LMA when PMIP is used
    • the MN may autoconfigure RFC3041 addresses that are not known by the network
  – when the MN sends a standard BU the HA/LMA may create a new entry and treat it as a new registration and not as an update of the network-based registration
    • this may imply having two different entries for the same MN/HoA/HNP and may also imply wrong routing paths
Issues (cont’d)

• Race condition in the registration from MAG and deregistration of the MN
  – when the MN returns to the home network (i.e. PMIP network) the MAG will send a PBU to the HA/LMA and the MN may send a deregistration message
  – depending on which message is received earlier by the LMA/HA the routing path may be correct or not
  – note that the deregistration BU is optional in rfc3775
    • The mobile node SHOULD then send a Binding Update to its home agent, to instruct its home agent to no longer intercept or tunnel packets for it
  – seems solvable
Issues (cont’d)

• **Sequence Numbers**
  – MN will use SN in the BUs
  – PMIP may use timestamps
  – we need to understand how the LMA/HA avoids race conditions and duplicated messages
  – *seems solvable*

• **Multihoming**
  – an interface in the PMIPv6 network and another interface handled with MIPv6
  – what happens if Multiple CoAs extension is used?
  – similar to the case of returning home of one interface
    • but here the home network is the whole PMIP domain
Conclusions

• **PMIPv6 for local mobility and MIPv6 for global mobility management**
  – no issue

• **MIPv6 terminals and “PMIPv6 terminals” in the same network**
  – out of scope since it requires some system-level solutions

• **Movement between PMIPv6 and MIPv6**
  – several issues identified
  – may be solvable
  – should we consider this scenario as an input for PMIPv6 base specification?
  – or should we leave how to handle this scenario for future work after the base spec is ready?