New Proposals and Protocols for Distributed Mobility Management

draft-liebsch-mext-dmm-phl

draft-mccann-dmm-flatarch

draft-seite-dmm-dma

IETF83, Paris

DMM WG

29th March 2012

Problem Statement

- Centralized anchors lead to
  - Inefficient routing
  - Scalability bottlenecks
  - Points of failure
- Distribution of mobility anchors may help, but
  - Need to deal with change of anchor during an active packet data session
  - Enable IP address continuity after change of anchor

Proposed approaches for DMM

- 3 proposals for a network-based, localized mobility management distributed scheme
  - Maintenance of the forwarding plane is based on NAT, tunneling, or routing updates

- Common objectives
  - Derive fundamentals which are not dependent on the IP mobility protocol
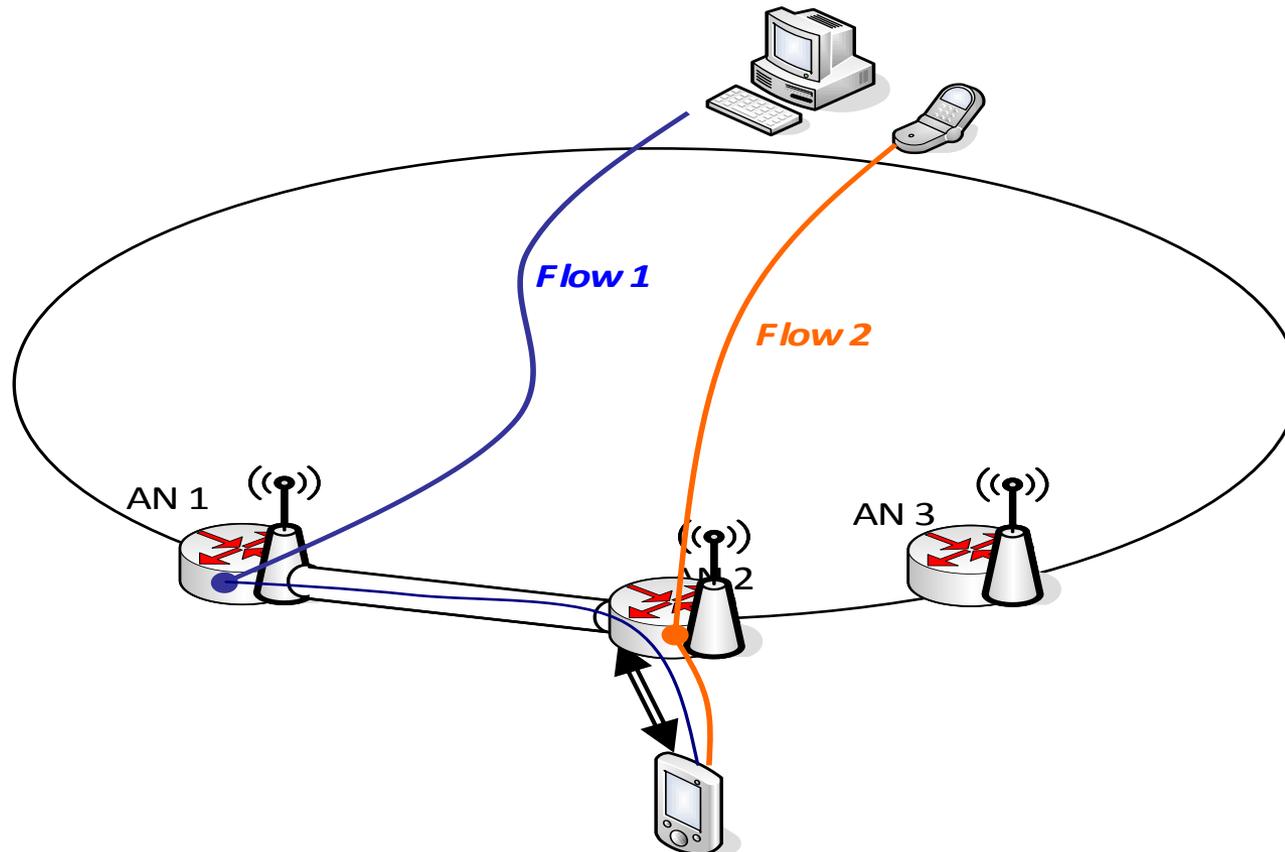 - Enable optimal routes between data source and MN

draft-liebsch: Locator-based DMM

- Re-use existing routing plane
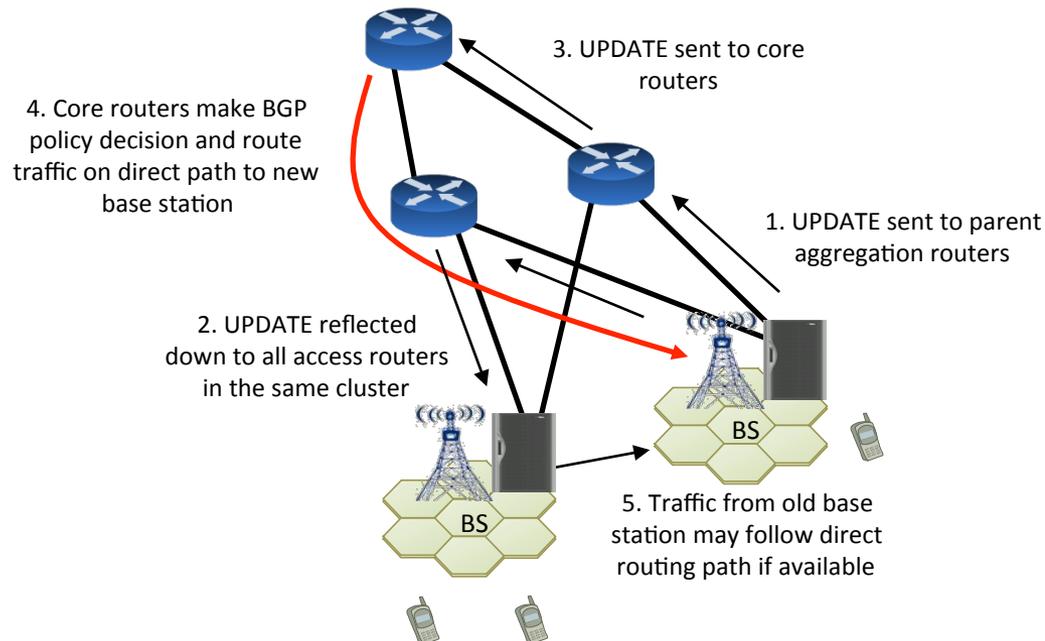- Some routers (IR) can use NAT between identifier IP and locator IP
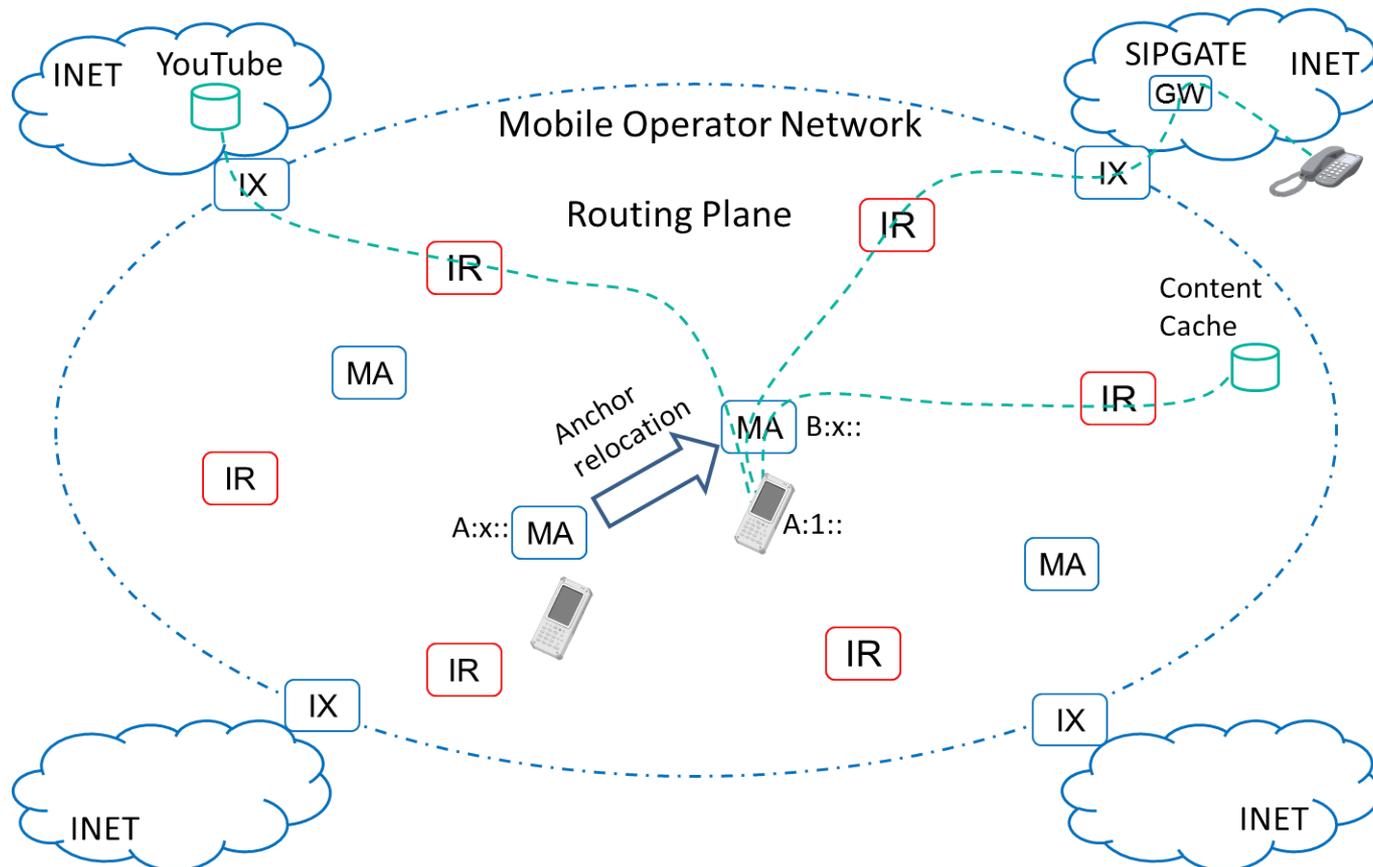
draft-seite: Tunnelling based DMM

- The basic is to reuse PMIP
  - MAG and LMA functions co-located in each AR

Flow 1

Flow 2

AN 1

AN 3

draft-mccann: based on BGP updates

- UPDATE propagates where needed
  - Packets get routed on optimal path from anywhere
  - Natural redundancy & fault tolerance from BGP

3. UPDATE sent to core routers

4. Core routers make BGP policy decision and route traffic on direct path to new base station

1. UPDATE sent to parent aggregation routers

2. UPDATE reflected down to all access routers in the same cluster

BS

BS

5. Traffic from old base station may follow direct routing path if available

Common Solution Components

- IP Point-of-Attachment (**PoA**) moved closer to MN

- Dynamic IP Address Allocation at PoA
  - Assigned addresses are topologically related to PoA
  - No dependency on address assignment/delegation, re-use mechanisms of IP mobility protocols

- New sessions can use most recently assigned address

- Dynamic Mobility Management
  - Update mobility/routing states only when the MN performs handover between PoA

- Maintain a Database of MN's Currently Assigned Addresses

- Upon change of PoA
  - Consult Database, find current addresses
  - Push state to enable IP address continuity → forward current address in use to new PoA

Dynamic IP Address Allocation

- draft-liebsch-mext-dmm-phl
  - HNP/HoA can serve as identifier (@previous PoA) and locator (@current PoA)
    - No specific requirement on allocation, e.g. stateful, prefix pool at anchor, delegation , …
- draft-mccann-dmm-flatarch
  - DHCP
    - On-demand, not needed on every mobility event
- draft-seite-dmm-dma
  - No specific requirement; RS/RA, DHCP,… can be used
    - Allocation during MN's attachment to the PoA
    - Anchored prefixes (prefixes anchored in previous PoAs) are deprecated

MN Address Database

- To retrieve the addresses which need to the preserved after the handover

- Acceptable to keep the control plane centralized
  - draft-liebsch: Any suitable system for Mapping Control
    - Active Mapping System to enable query and 'push' of MN's per-host locator into IRs
    - Optional use of routing protocol to propagate states into selected IRs
  - draft-mccann: DNS based
    - Dynamic DNS update of forward & reverse entries
    - Query interface is well known
  - draft-seite
    - The MN could provide the sessions during attachment to the PoA (e.g. piggyback RS), but we can consider it is against the "no host support" dogma
    - So, draft-seite goes for a "Centralized Session Database" (e.g. policy store from RFC 5213)
  - draft-liebsch and draft-seite do not specify the detailed interface with the address/policy database

Mobility Handling

- draft-liebsch-mext-dmm-phl
  - Push Locator to Mapping Controller, from there provide to Ingress Tunnel/NAT Routers (push or query)
- draft-mccann-dmm-flatarch
  - Push Locator as NEXT_HOP in a BGP_UPDATE
- draft-seite-dmm-dma
  - Send a PBU to all previous PoAs

Compare/Contrast (1)

- Traffic path
  - draft-liebsch and draft-mccann redirect traffic in the core of the network
  - draft-seite redirects traffic at the previous PoA
- State maintenance
  - draft-liebsch[1] and draft-mccann[2] require per-host state in some[1] or all[2] core routers
    - draft-mccann at all routers within a BGP route reflector cluster
    - draft-liebsch at IRs which must be merely somewhere on the path
  - draft-seite distributes this state to the previously visited PoAs

Compare/Contrast (2)

- Introduction of new entities
  - draft-liebsch and draft-seite require unspecified mapping database/policy store
  - draft-liebsch introduces interface between some routers, which serve as IR, and the mapping system
  - draft-mccann has no unspecified interfaces but mandates COTS BGP routers in the core
  - All 3 proposals use specially modified PoA routers
- Address allocation
  - draft-mccann uses DHCP so address lifecycle is under the control of the MN
  - draft-seite requires allocation of an HNP at each PoA
  - draft-liebsch requires at least a topological correct locator prefix to be allocated at each PoA

Compare/Contrast (3)

- Session Database
  - draft-mccann attempts to specify the session database using DNS
    - Facilitates operation without RADIUS or Diameter
      - Necessary for fast authentication at each AR
  - draft-liebsch proposes the use of an active mapping system to provide locator states to routers (query or push)
  - draft-seite relies on the session policy store in the style of PMIP

Additional features

- Authentication
  - draft-mccann contains a proposal for a new fast authentication mechanism that can be run at every new PoA or between the MN and HA
    - Integrates the attachment process with the identifier used to index the session database (DNS)
  - Should we reconsider the AAA authentication model for DMM?
    - Complex mechanisms such as HOKEY would be needed for fast re-authentication under a AAA framework
- Integration with Global Mobility Management
  - draft-mccann points out how its scheme could be integrated with global client-based mobility
    - Use BGP_UPDATE to grab traffic at an HA
      - » replacement for proxy ND
      - » HA no longer needs to be directly on the home link
    - Any of the 3 schemes could be used this way
    - If DMM is used again for a CoA in a new network, global client-initiated Binding Updates to the HA are minimized

Summary/Conclusions

- All 3 proposals have common elements, but the elements are instantiated in different ways
- It is possible to derive basics for DMM
  - IP Point-of-Attachment (PoA) close to MN
  - Assigned addresses are topologically related to PoA
  - New sessions use most recently assigned address
  - Mobility states created only when IP address conservation is required after the handover
  - Some part of the control plane may remain centralized
- It should not prevent further enhancements
  - e.g. full distribution of the control plane using DHT