Architecture Proposals & Comparisons

H Anthony Chan, Basavaraj Patil, Dapeng Liu, Charles Perkins

I-Ds in scope of this discussion

1. draft-chan-dmm-architecture
2. draft-liu-dmm-dynamic-anchor-discussion
3. draft-perkins-dmm-matrix

4. draft-chan-dmm-requirements
5. draft-patil-dmm-issues-and-approaches2dmm

Anthony Chan

Distributed mobility anchors: Architecture draft-chan-dmm-architecture-00

Logical Functions (abstracted MIP/PMIP):
1. LM: Location management (control plane)
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3. HoA allocation
Proxy (HMIP)

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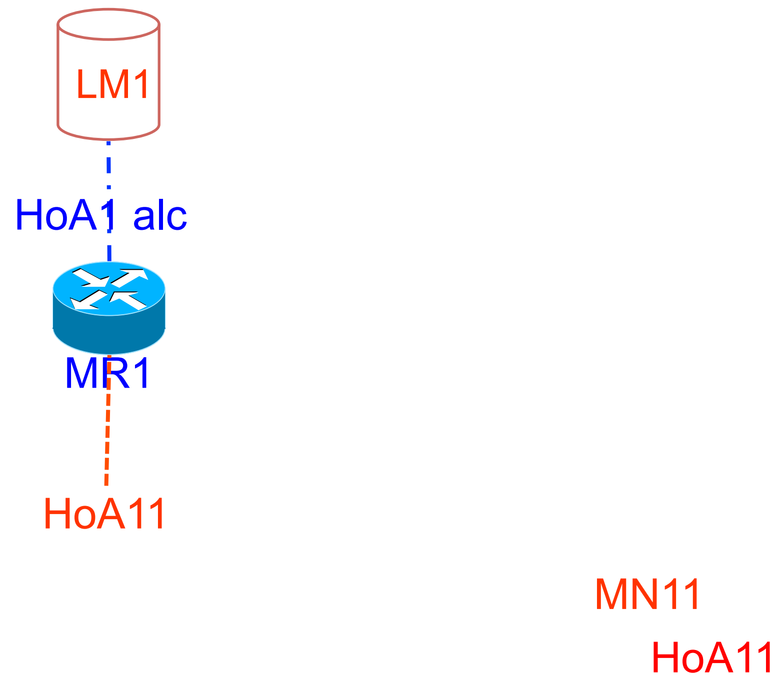

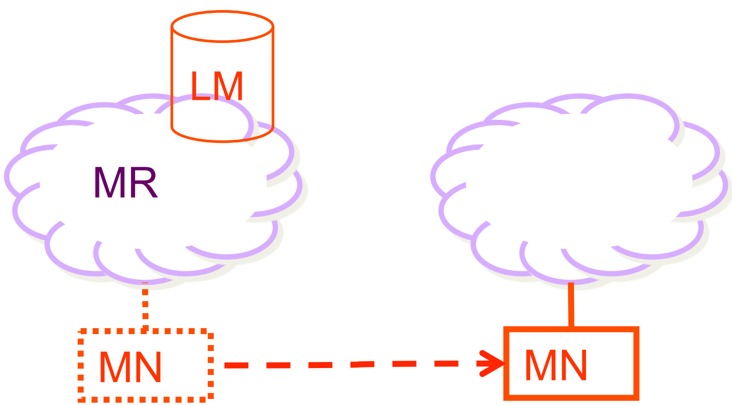

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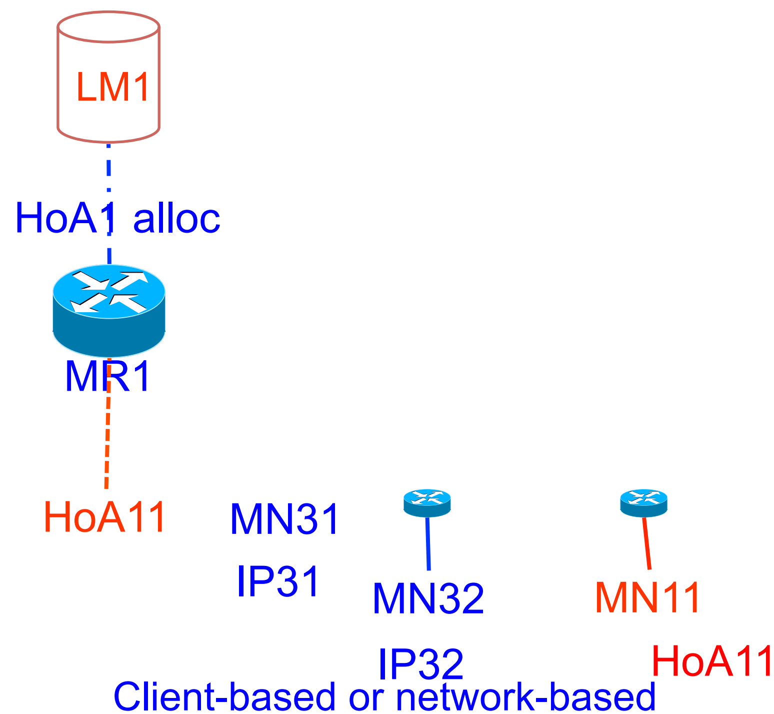

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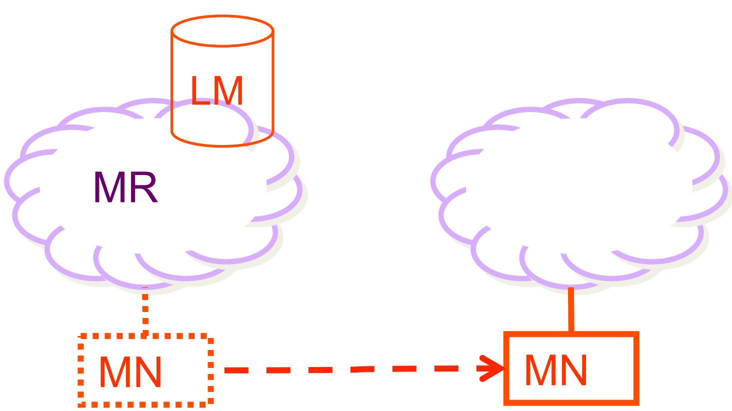

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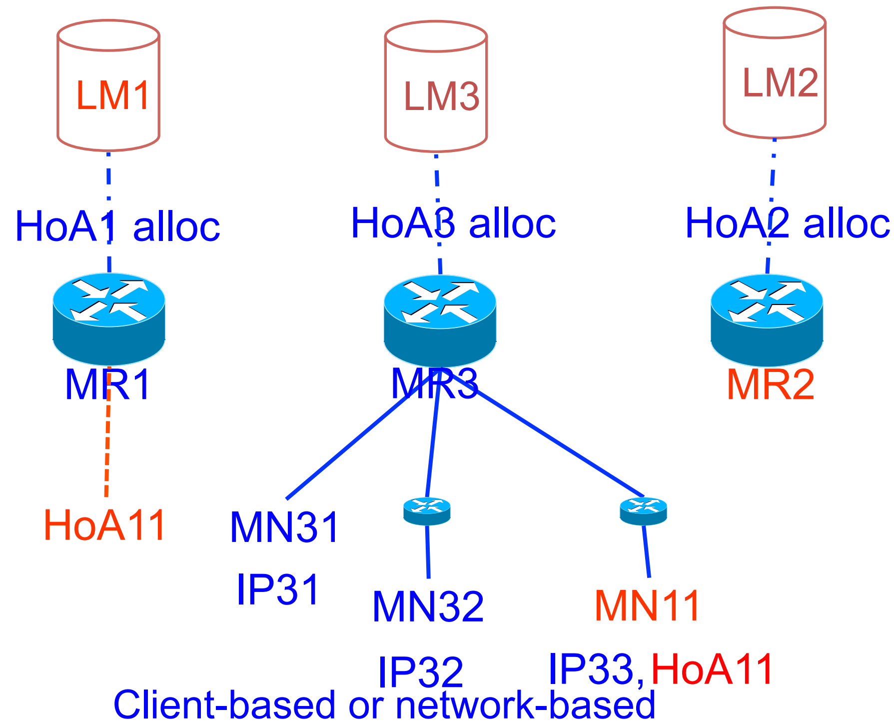

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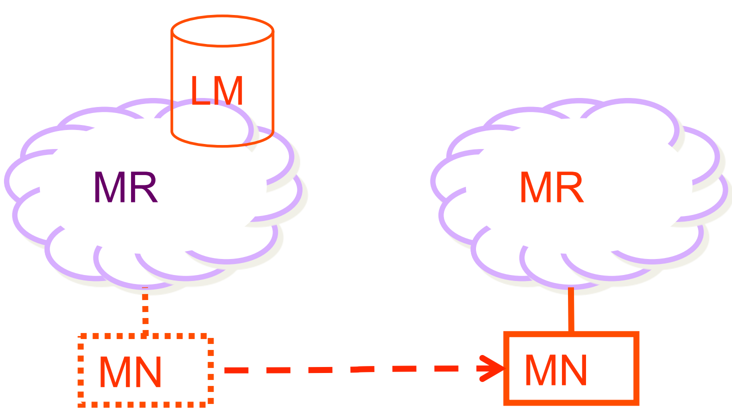

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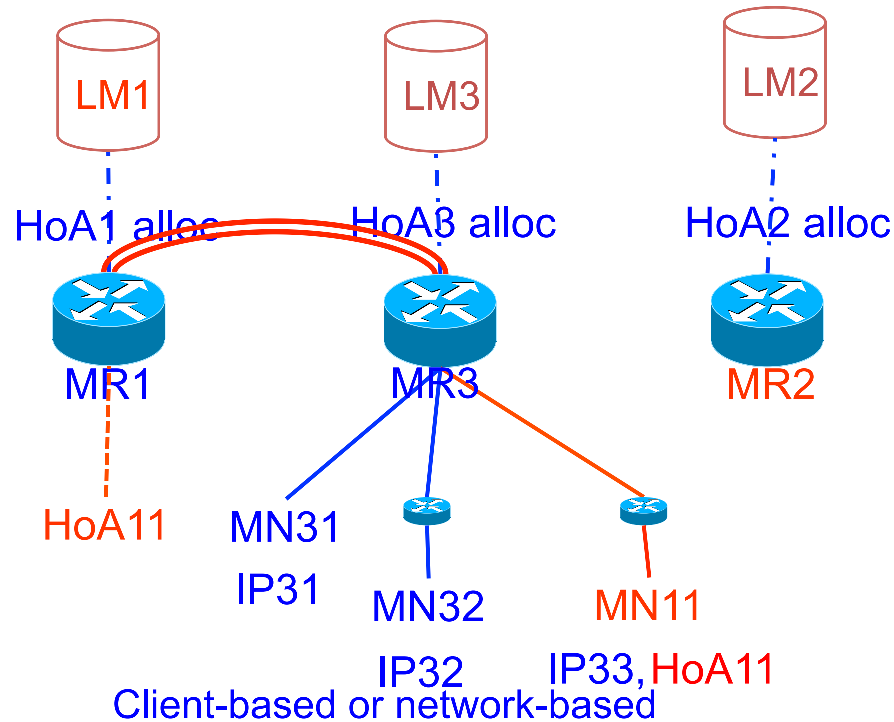

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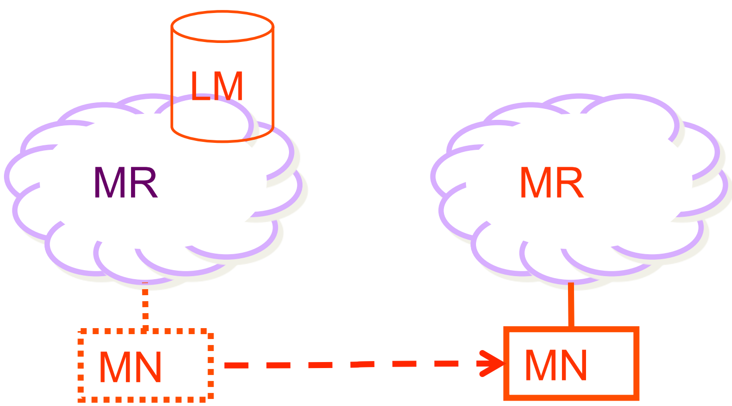

Details in draft-liu-dmm-dynamic-anchor-discussion;
see also draft-bernardos-dmm-pmip; draft-sarikaya-dmm-dmipv6

Distributed mobility anchors: Architecture draft-chan-dmm-architecture-00

Logical Functions (abstracted MIP/PMIP):
1. LM: Location management (control plane)
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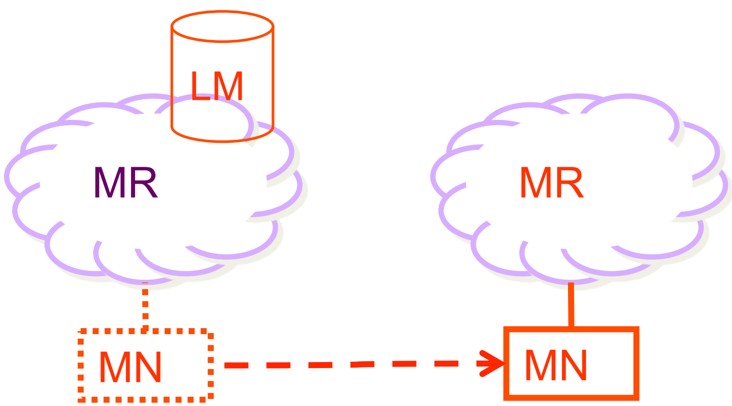
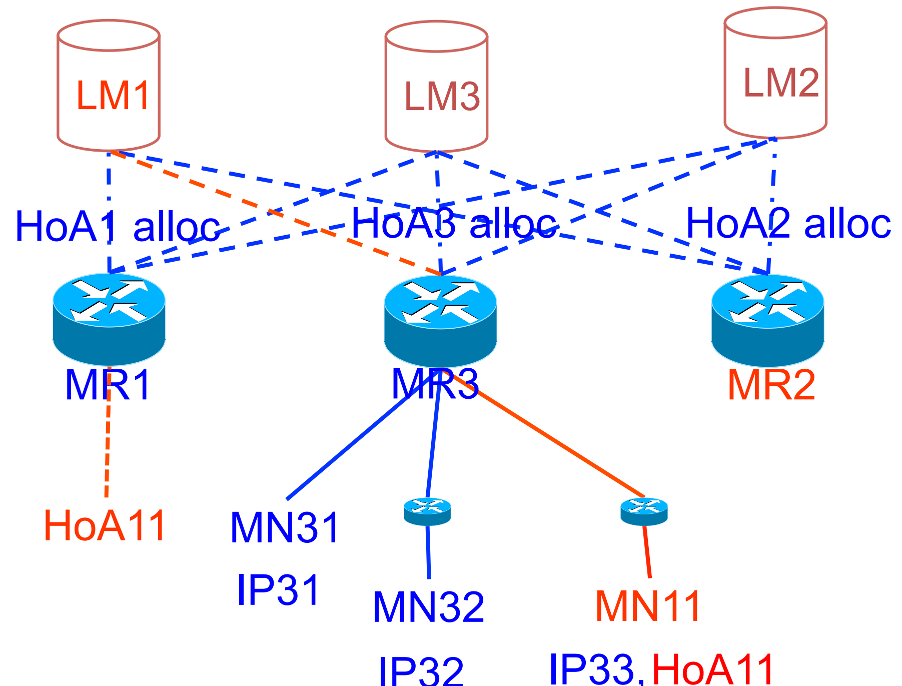
•Location management: control plane is supported by hierarchical and distributed database

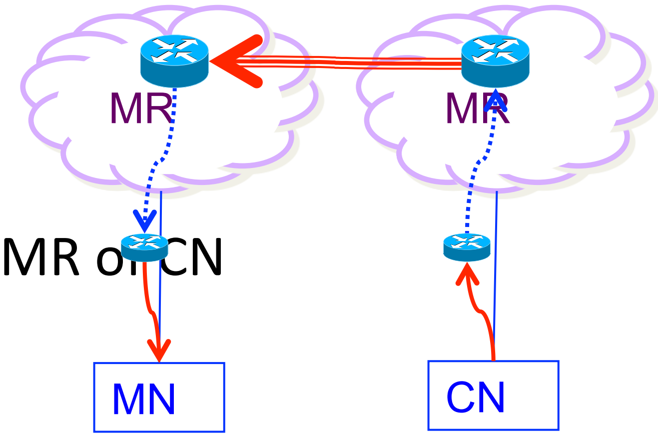
•Mobility routing: use routing table (HoA) or forward/tunnel to elsewhere





Client-based or network-based

Optimize route: many choices



- From CN to MR(CN) choices:
  - Anycast to nearest MR function, i.e., the MR of CN
  - Co-locate the MR function at GW
  - Co-locate the MR function at AR
  - Co-locate the MR function at the co-located AR/GW in flattened network
- From MR(CN) to MR(MN) choices: 1st packet
  - Route 1st packet to HoA; Query location management database
  - Route 1st packet to HoA; Inform MR function of CN about the MR function of the MN.
- From MR(CN) to MR(MN): after 1st packets
  - Use cache of MR to tunnel future packets

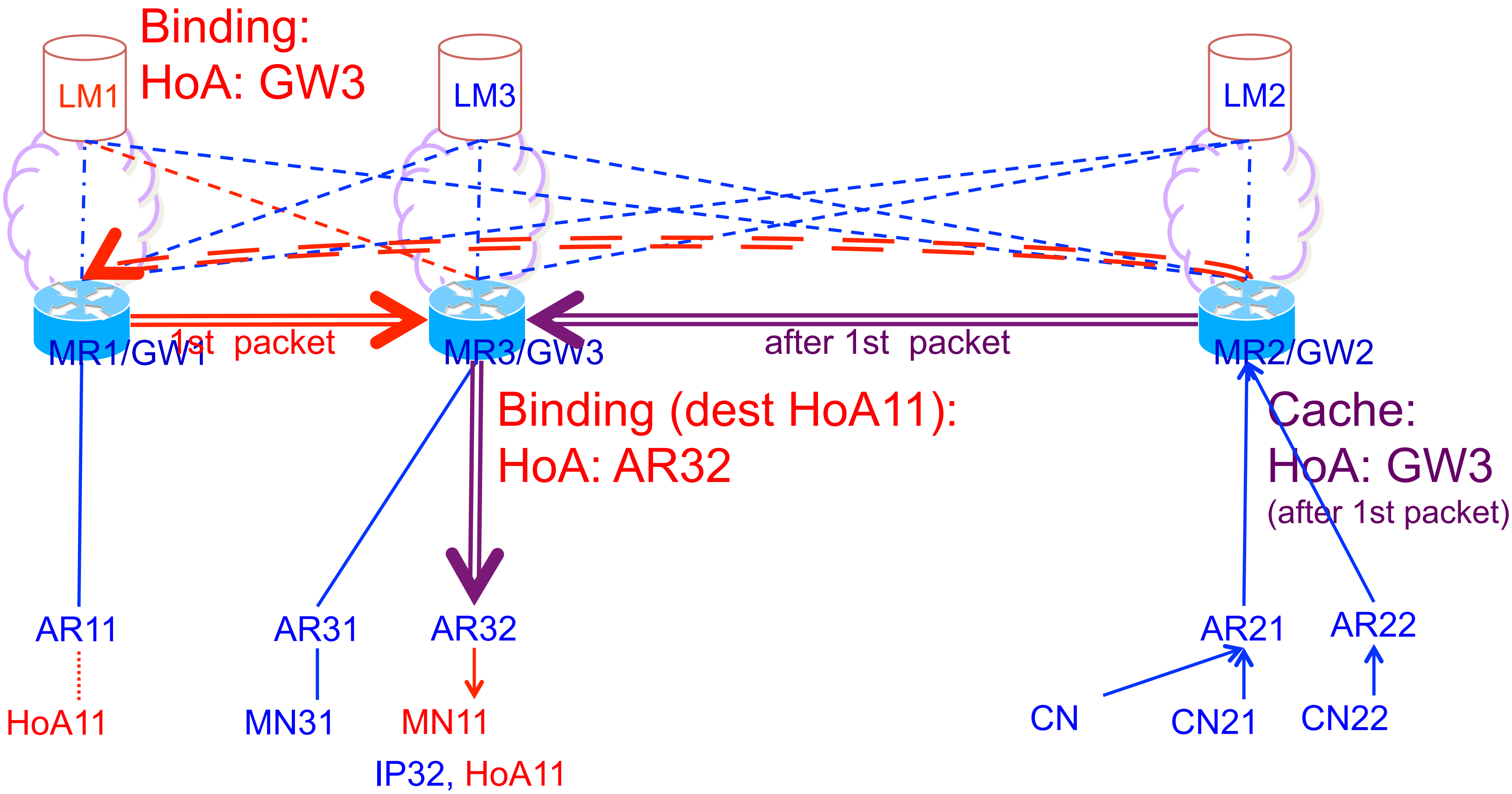
Example: query LM

draft-liebsch-mext-dmm-nat-phl (MR at GW and use NAT instead of tunneling)

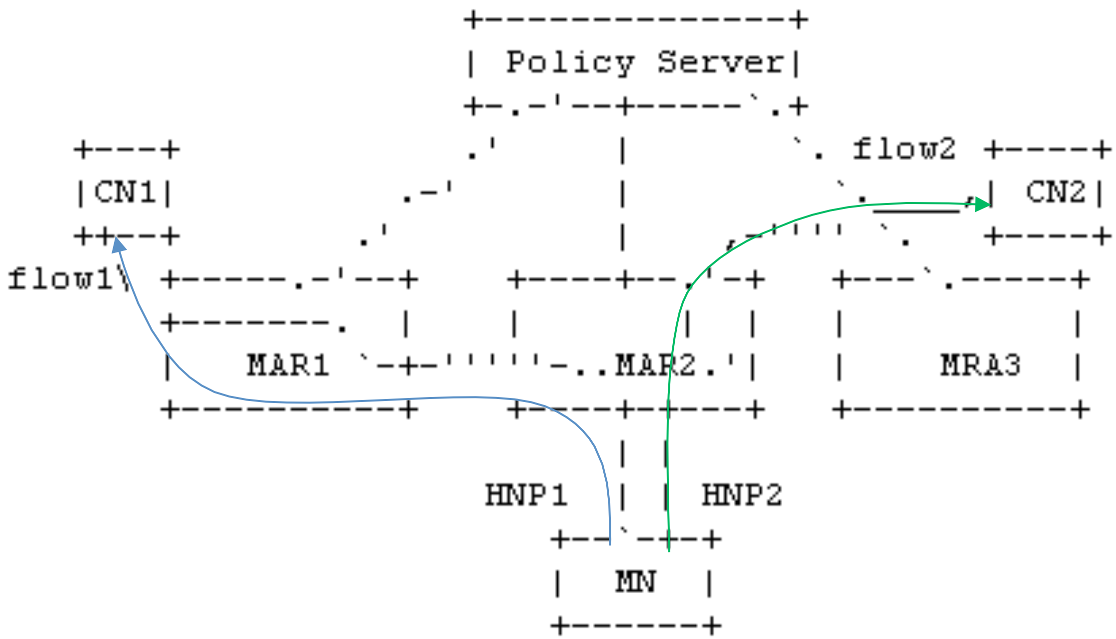
draft-luo-dmm-pmip-based-dmm-approach (MR at AR)

draft-jikim-dmm-pmip (MR at AR)

Example: co-locate MR at GW



Architecture of dynamic anchor for DMM



- Only the newly initiate session will route through the current MAR
- Previous established flow will still be anchored to MAR1

Draft Requirements
draft-chan-dmm-requirements-00 was draft-chan-distributed-mobility-ps-05; with co-authors: Dapeng Liu, Pierrick Seite, Hidetoshi Yokota, Charles E. Perkins, Melia Telemaco, Wassim Michel Haddad, Elena Demaria, Seok Joo Koh, Rute Sofia

- Distributed mobility requirement: The mobility management functions in interconnecting networks be available in multiple locations and therefore are always close to any node so that the node may perform handover with session continuity without routing the data-plane traffic via a centralized anchor.
- — enables mobility management deployment in a distributed architecture to avoid the non-optimal routes. — enables placing the mobility anchor closer to the access network to which the mobile node is attached, thereby supporting the more flattened network and the CDN networks. — a distributed architecture is more scalable than a centralized one and avoids the single point of failure and attack.
- Dynamic mobility requirement: A network supporting a mix of mobile nodes some of which may be stationary for extended time while others may be actively mobile may minimize traffic overhead and avoid unnecessary mobility support.
- — avoids unnecessary mobility support. — avoids mobility signaling overhead with peer-to-peer communication

Defer discussion of requirements

Dapeng

Problems

- Active session management
  - Problem: MAR does not know whether a prefix is still in use. E.g. whether this is a ongoing session using that prefix.
  - Potential solution:
    - Policy server stores the anchor point's address
    - Current AR monitor the traffic, when there is no traffic using the prefix for a certain time, release the binding.

Problems

- Source address selection
  - Problem: MN may have multiple prefixes: HNP1, HNP2…Application need to select the right prefix. RFC3484 can not solve this problem
  - Potential solution:
    - Rules for MN to select source address
      - For any ongoing session, always use the ongoing session's prefix even when there is a new prefix been configured
      - For newly initiate session, select the new prefix
        - » Problem: how does the MN know which prefix is the newest one?

Problems

- CN initiate session
  - The MN have multiple IP addresses, CN need to use the right one to initiate the communication.
- IPv4 support
  - Current solution does not support IPv4

Basavaraj

Issues with hierarchical mobility

- **Backhauling all traffic to a centralized GW**
- **Latency Considerations**
- **Inefficient Routing and signaling overhead**
- **Scalability and cost**

DMM using existing protocols

- Much of the needed protocol requirements for distributed mobility exists
- Missing
  - System level design
  - Lack of mobility aware APIs
- Simply avoid traditional "anchored mobility" and use local (care-of) addresses for communication.
  - RFC 5014 provides means for prefix that has mobility characteristics or a prefix that is local to the current access network.
- Possible solutions in DMM should impose minimal change to MN.

Solutions using current approaches

- Allocate mobility anchors that are topologically close to the MN
  - Consideration of HMIPv6 [RFC5380]
- What might be required:
  - "chain" multiple MAP-domains to extend the micro-mobility area
  - or provide another RFC5014 like prefix type (IPV6_PREFER_SRC_MAP).
  - Mobile IPv6 + Proxy Mobile IPv6 interactions Scenario A.1 in [I-D.ietf-netlmm-mip-interactions] a similar solution.
  - Proxy Mobile IPv6 localized routing solutions [I-D.ietf-netext-pmip6-lr-ps]

Charlie

Compare Matrix for DMM solutions

	RO	SAddr Sel	DynHA	CN wo-HA	Trans Mob	Anchor Mob	DynDNS Mob	HIP/ LISP	Dis- Anc	Host -LoC
scalability	Y	Y	M	Y	Y	M	M	Y	Y	Y
specified?	Y	N	N	N	Y	Y	Y	Y	N	N
IPadd continuity	Y	N	N	Y	Y	Y	N	Y	Y	Y
backhaul friendly	Y	Y	Y	Y	Y	M	Y	M	Y	Y
app friendly	Y	N	Y	Y	N	Y	M	N/Y	Y	Y
server friendly	M	Y	Y	Y	N	Y	Y	N/Y	Y	Y
local routing	Y	Y	M	Y	Y	N	Y	M	M	M
low signaling	N	Y	M	N	N	N	N	N	M	M

Update from pervious version

- Distributed anchor with direct tunnel
  - 1. Scalability: Mobile node's home network contains its first anchor when MN is initialized. When MN moves to a visit network, it can change its mobility anchor to a new anchor point which is located in this visit network. The traffic will not go through mobile node's home network when it is in visit network. No centralized mobility anchor is needed and scalability is improved. Besides, dynamically allocated mobility anchor mechanism can also be applied when mobile node is initialized in its home network.
  - 2. Specified: Internet drafts exist, but no working group document.
  - 3. IP address continuity: All mechanisms introduced in

    [I-D.chan-netext-distributed-lma],

    [I-D.wakikawa-mext-global-haha-spec]

    [I-D.liu-dmm-pmip-based-approach]

    are claimed to support IP address continuity. I.e. additional mechanisms are used to guarantee that mobile node can keeps its HoA unchanged even its mobility anchor is changed.

- 4. Backhaul friendly: Mobile node can change it mobility anchor to a best anchor point (e.g. a nearest anchor point) and packets do not have to traverse the home network, this solution is more backhaul friendly.
- 5. App friendly: Does not require application changing. Socket of application is always binded to mobile node's HoA, so it is application friendly.
- 6. Server-friendly: Does not require server changing, so it is server friendly.
- 7. Local routing: Packets from mobile node to its correspondent node shall go though mobile node's current mobility anchor. If the mobility anchor is mobile node's first router, then local routing is supported.
- 8. Low signaling: Additional signaling is needed for supporting location management approaches and handoff approaches. It can be excepted that number of signaling may increase with growth of mobile node's number. It depends on the specific design.

Per-Host Locators Mechanism

- 1. Scalability: As claimed in [I-D.liebsch-mext-dmm-nat-phl], mobile node are supported to change its current mobility anchor, i.e. when mobile node is not at home, packet will not go through its home network which is similar with Dis-Anc. So it is Yes.
- 2. Specified: Internet drafts exist, but no working group document.
- 3. IP address continuity: Mobile node can keep its HoA unchanged, so IP address continuity is guaranteed. How to guarantee limited packet loss rate when mobile node changes its current anchor point is not very clear now.
- 4. Backhaul friendly: Yes. The reason is same as Dis-Anc.
- 5. App friendly: Yes. The reason is same as Dis-Anc.
- 6. Server-friendly: Yes. The reason is same as Dis-Anc.
- 7. Local routing: Maybe. The reason is same as Dis-Anc.
- 8. Low signaling: The mechanism is based on NAT to guarantee per- host locators. How to guarantee the synchronization of NAT status is un-clear now. But it can be excepted that additional signaling is necessary.

Conclusions

- DMM can be accomplished via extensions and redistribution of mobility elements to the existing protocols

- But an optimal solution to DMM cannot be achieved with minor extensions and/or deployment models

Questions???