



# Network-based and Client-based DMM solutions using Mobile IP mechanisms

draft-bernardos-dmm-cmip-07

draft-bernardos-dmm-pmip-08

draft-bernardos-dmm-distributed-anchoring-09

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# Outline

- Motivation
- Client-based DMM
- Network-based DMM
  - Distributed Logical Interface
- Demos & Open Source
- Next Steps

# Motivation

- 4 main DMM WG documents (fpc-cpdp, anchoring, deployment models and ondemand) close to be completed
  - But **no solution specification** yet
- There exist MIP-based (both client and network) solutions that could be adopted
  - With implementations available

# Extending existing protocols...

- Client Mobile IP (host) based
  - Fabio Giust, Carlos J. Bernardos and Antonio de la Oliva, “*HDMM: deploying client and network-based distributed mobility management*”, Telecommunication Systems, June 2015, Volume 59, Issue 2, pp 247–270
  - [draft-bernardos-dmm-cmip-07](#)
- Proxy Mobile IP (network) based
  - Fabio Giust, Carlos J. Bernardos and Antonio de la Oliva, “*Analytic Evaluation and Experimental Validation of a Network-based IPv6 Distributed Mobility Management Solution*”, Transactions on Mobile Computing, Volume 13, Issue 11, Pages: 2484-2497, Nov. 2014
  - [draft-bernardos-dmm-pmip-08](#)

# Client-based DMM. Overview

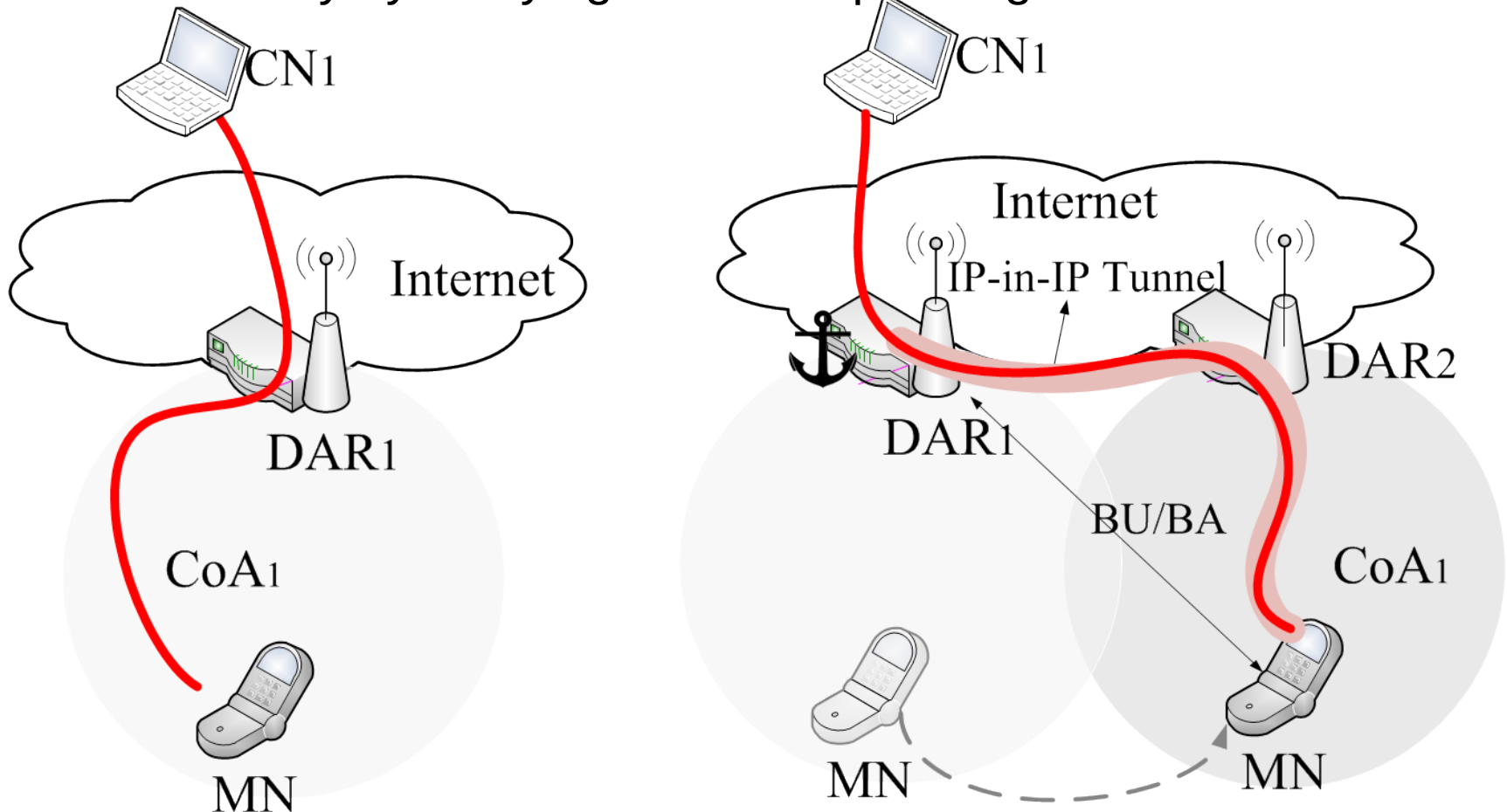
- Re-uses existing approaches
  - Mobile IPv6 : RFC 6275
  - Authorizing MIPv6 BU with CGAs
    - draft-laganier-mext-cga
- Mobility management pushed to the edge of the network
  - The HA is deployed at the access router level

# Client-based DMM. Entities

- Distributed Anchor Router (DAR)
  - Deployed in the MN's default gateway
    - First hop router
  - It assigns a topologically valid address to MNs
  - An on-link MN can send/receive traffic using the address from the DAR
    - DAR forwards such packets as a plain router
  - A DAR anchors the address it assigned when the MN is not on-link (HA role)
    - The MN's address is reachable through a bi-directional IP tunnel

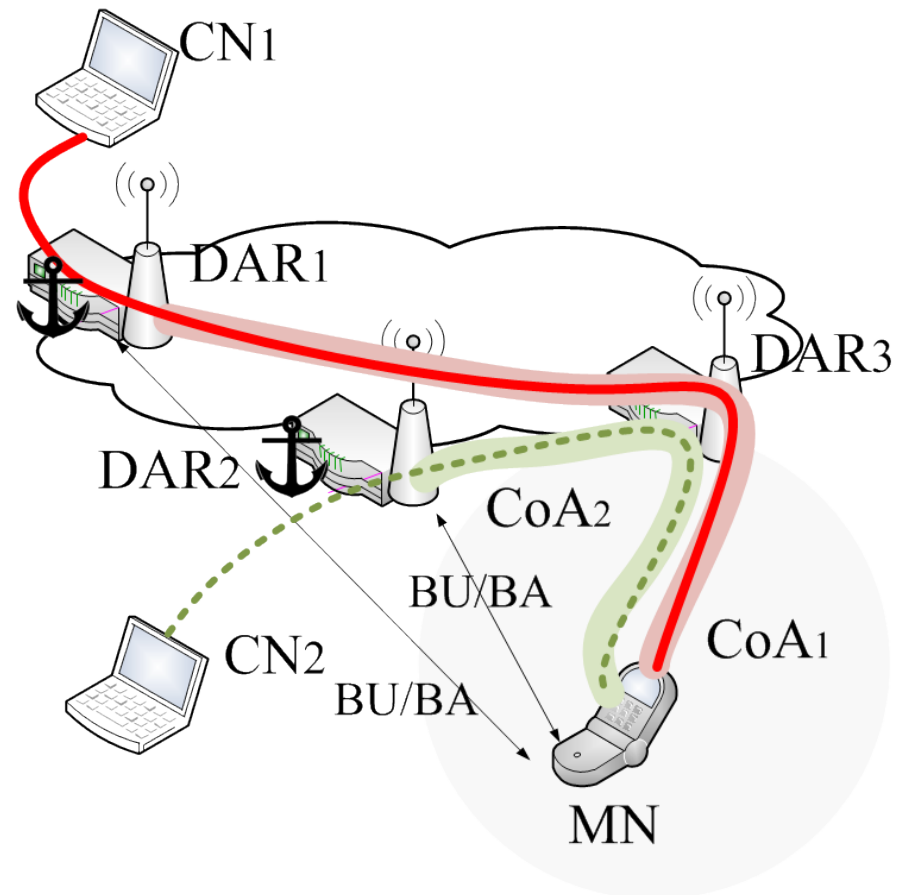
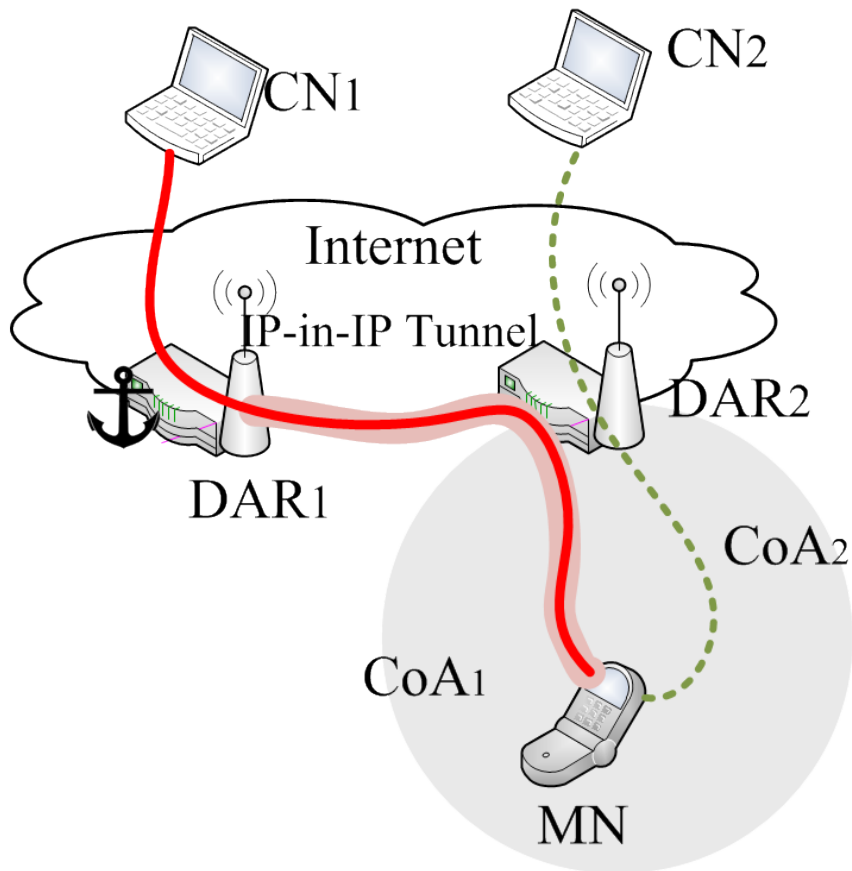
# Client-based DMM. Operations (i)

- When the MN moves to a new DAR, it can keep the old address reachability by notifying the corresponding DAR with a BU



# Client-based DMM. Operations (ii)

- The address configured at the new DAR is used for new sessions
- Old sessions are redirected through the IP tunnel





# Net-based DMM. Overview

- Network based DMM approach
  - Based on Proxy Mobile IPv6 (RFC 5213)
- Mobility management pushed to the edge
  - Access router level
- Partially distributed solution
  - Centralized control plane kind-of LMA
    - A central node stores the mobility sessions of MNs
  - Distributed data plane
    - Only the edge routers handle the data forwarding

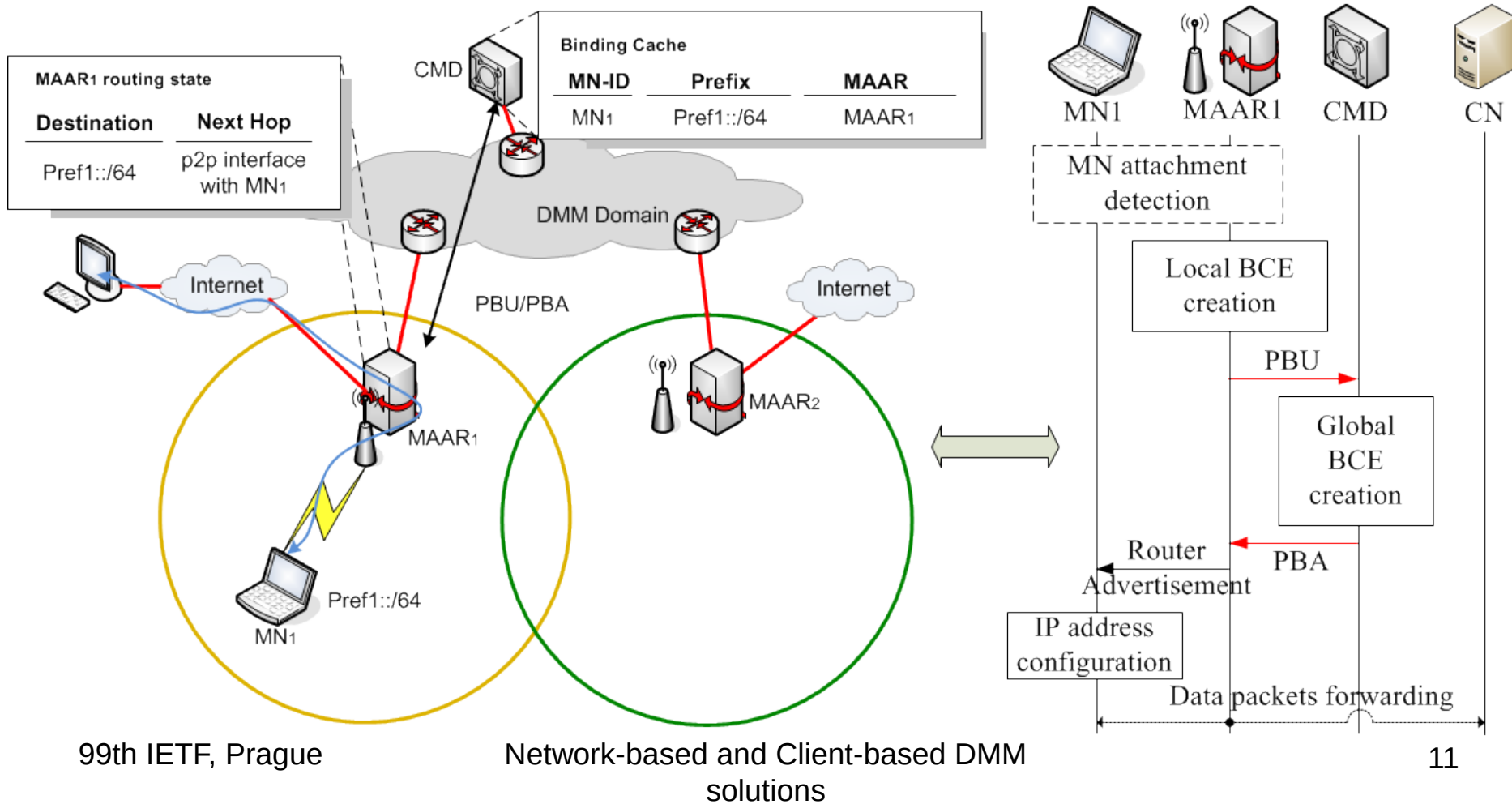
# Net-based DMM. Entities

- Mobility Anchor and Access Router (MAAR)
  - One IP hop distance from the MN
  - Concentrates AR, LMA and MAG functionalities on a per-MN, per-prefix basis
  - Delegates and anchors an IP prefix to each MN attached
    - Serving MAAR (S-MAAR): MAAR which the MN is currently attached to
    - Anchor MAAR (A-MAAR): previously visited MAAR anchoring a prefix used by an active flow of the MN
  - Forwards data packets to/from IP networks
- Central Mobility Database (CMD)
  - Central node storing the BCEs of all the MNs in the domain
  - It plays the role of the LMA for the control plane
  - Not traversed by data packets

# Net-based DMM

## Operations: initial registration

- The S-MAAR registers the MN at the CMD through a PBU/PBA handshake



# Net-based DMM

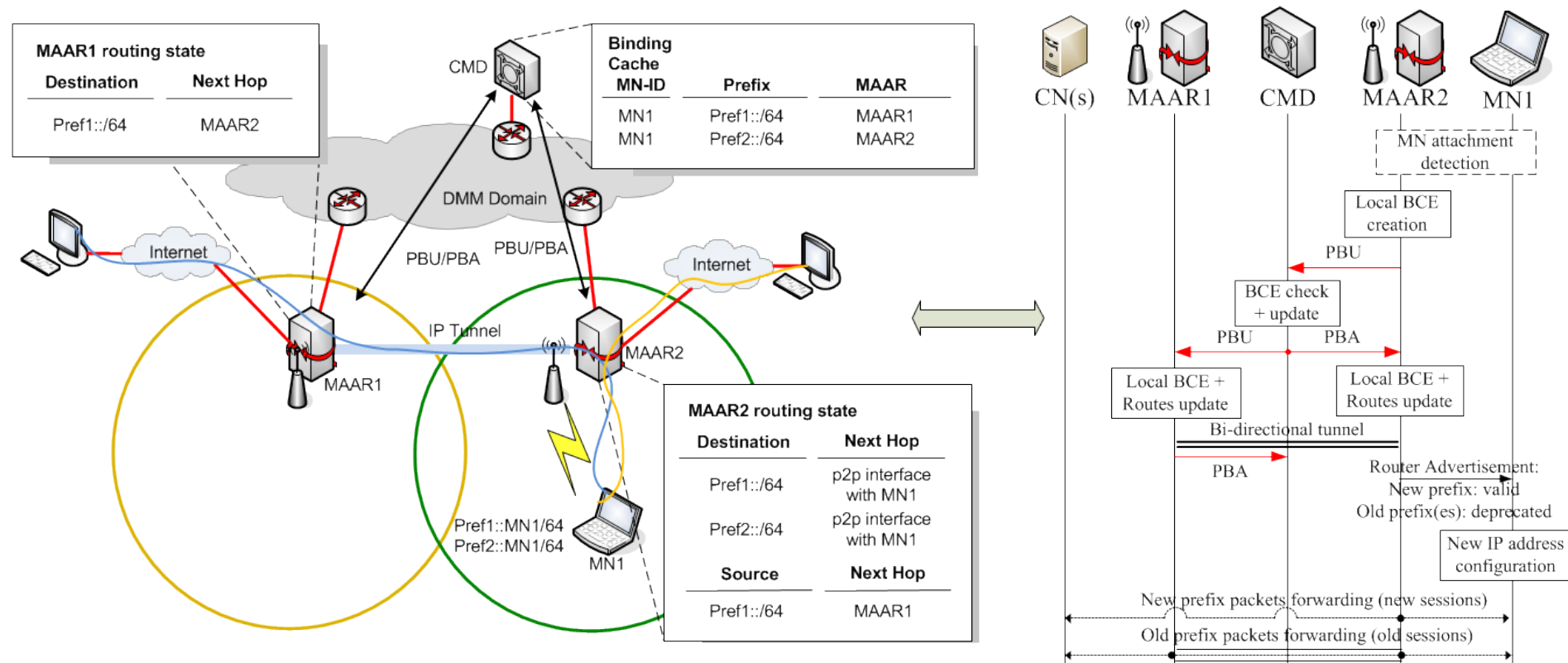
## Operations: handover

- 3 operational modes:
  - CMD as PBU/PBA relay
  - CMD as MAAR locator
  - CMD as PBU/PBA proxy
- Conceptually they are similar
  - The difference mainly consists on the message order
- We focus on the “proxy” mode
  - Already implemented

# Net-based DMM

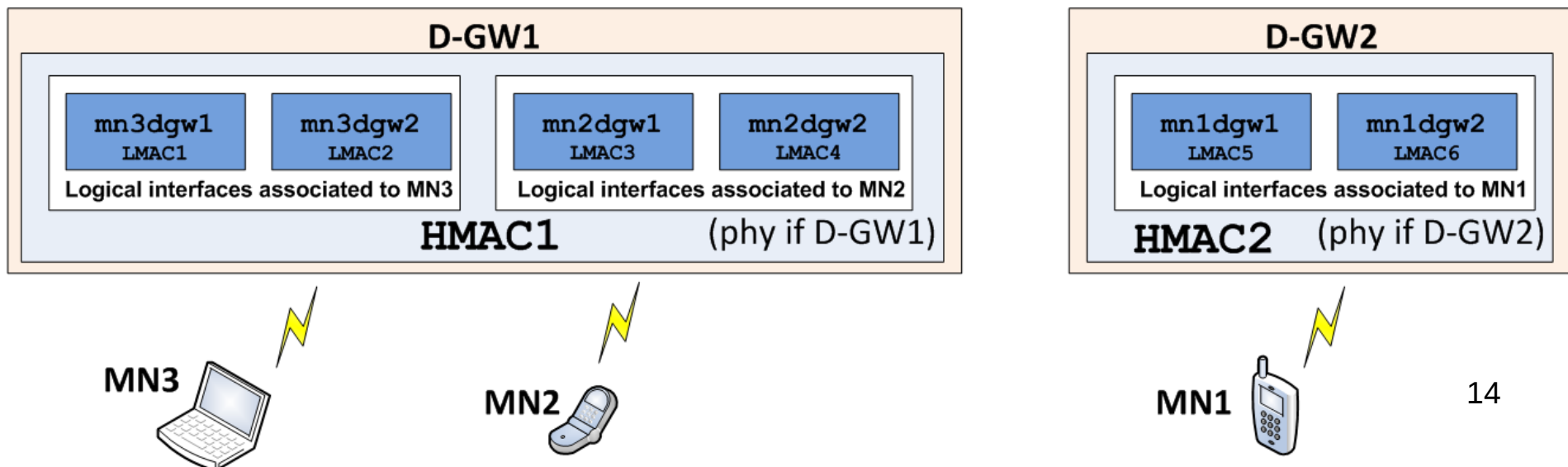
## CMD as PBU/PBA proxy

- The CMD receives a PBU from the new S-MAAR announcing the MN attachment
- The CMD sends instructions to the S-MAAR and A-MAAR(s) on how to establish the proper routing configuration

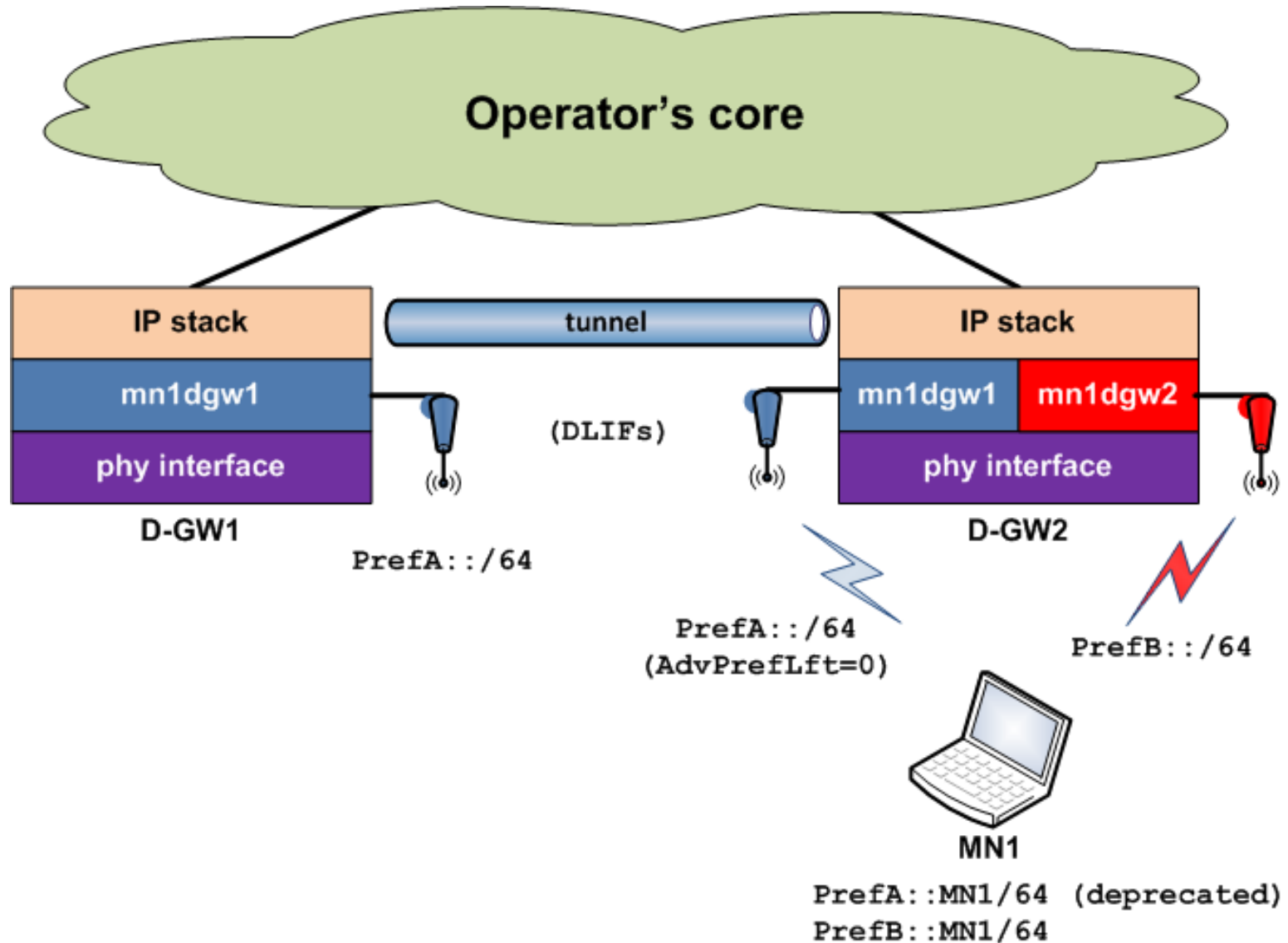


# Distributed Logical Interface

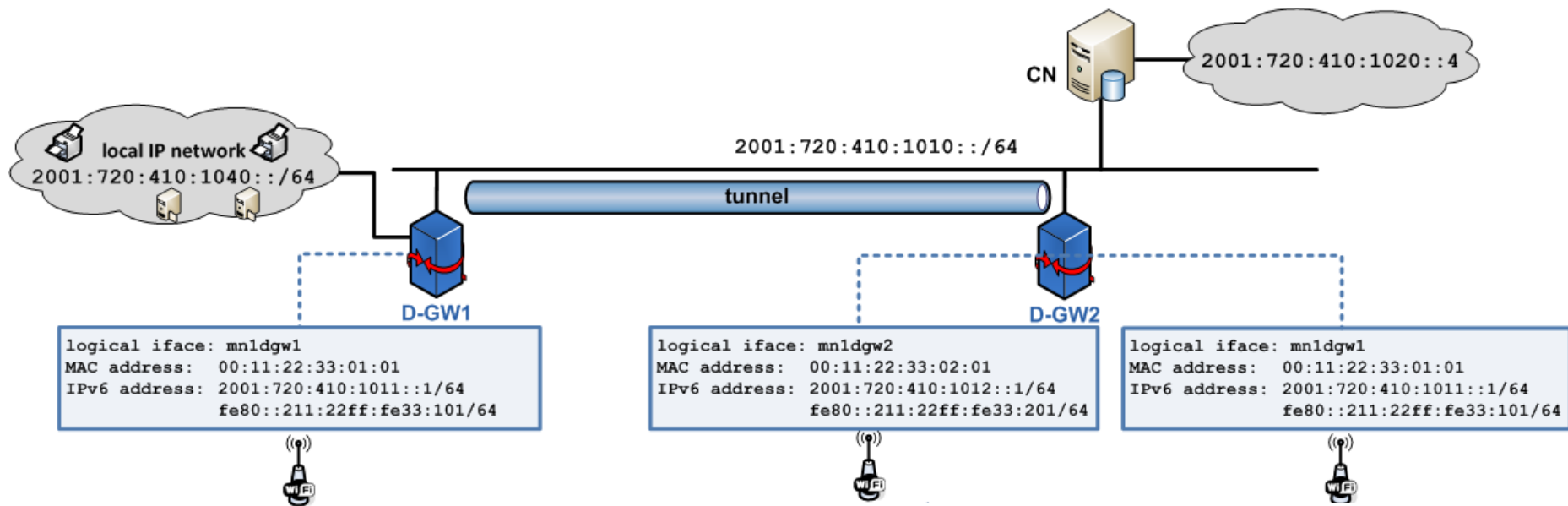
- Distributed Logical Interface (DLIF) concept
  - The DLIF is a software construct allowing to hide the change of anchor from the MN
  - Each serving D-GW exposes itself towards a given MN as multiple routers, one per active anchoring D-GW associated to the MN
    - This is achieved is by the serving D-GW configuring different logical interfaces
    - From the point of view of the MN, anchoring D-GWs are portrayed as different routers, although the MN is physically attached to only to the serving D-GW
  - The DLIF concept is also applicable to other network-based solutions



# DLIF. Solution overview



# DLIF. Solution overview





# Demos & Open Source

- Network-based DMM demonstrations



83<sup>rd</sup> IETF, Paris (March 2012)



87<sup>th</sup> IETF, Berlin (July 2013)

# Demos & Open Source



- **ODMM: Open platform for DMM solutions**
  - <https://www.odmm.net>
    - GitHub repo <http://github.com/ODMM>
  - Platform hosting Open Source DMM implementations
    - Mobility Anchors Distribution for PMIPv6 (MAD-PMIPv6)
      - <https://odmm.net/node/12>
      - draft-bernardos-dmm-pmip & draft-bernardos-dmm-distributed-anchoring
    - Client DMM over MIPv6 (C-DMM)
      - <https://odmm.net/node/11>
      - draft-bernardos-dmm-cmip
    - OpenFlow-DMM
      - Software-Defined Networking (SDN) implementation
      - L. Cominardi, F. Giust, C.J. Bernardos, A. de la Oliva, “Distributed Mobility Management solutions for next mobile network architectures”, Computer Networks 121, 124-136, 2017

# Next steps

- Is the WG interested in standardizing (Proxy) Mobile-IPv6 based solutions?
- These 3 drafts can be taken as starting point
  - Been discussed several times
  - Published as academic papers
  - Open source implementations available
    - Used in EU-funded projects