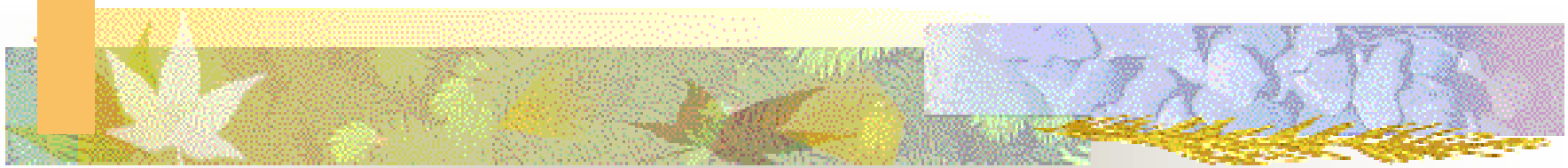
Mobile Networks in IPv6



李威廷 2002/1/17

Outline

- MIPv6
- HMIPv6
- Mobile Networks
- Issues of Mobile Networks
- Future Works
- Conclusions
- References

Mobility Support in IPv6 (1/4)

- Destination Headers
  - Binding Update
    - MN sent to HA and CN
    - Authenticated
  - Binding Acknowledgement
    - Sent in response to an Update
    - Authenticated
  - Binding request
    - To request MN for an Update

Mobility Support in IPv6 (2/4)

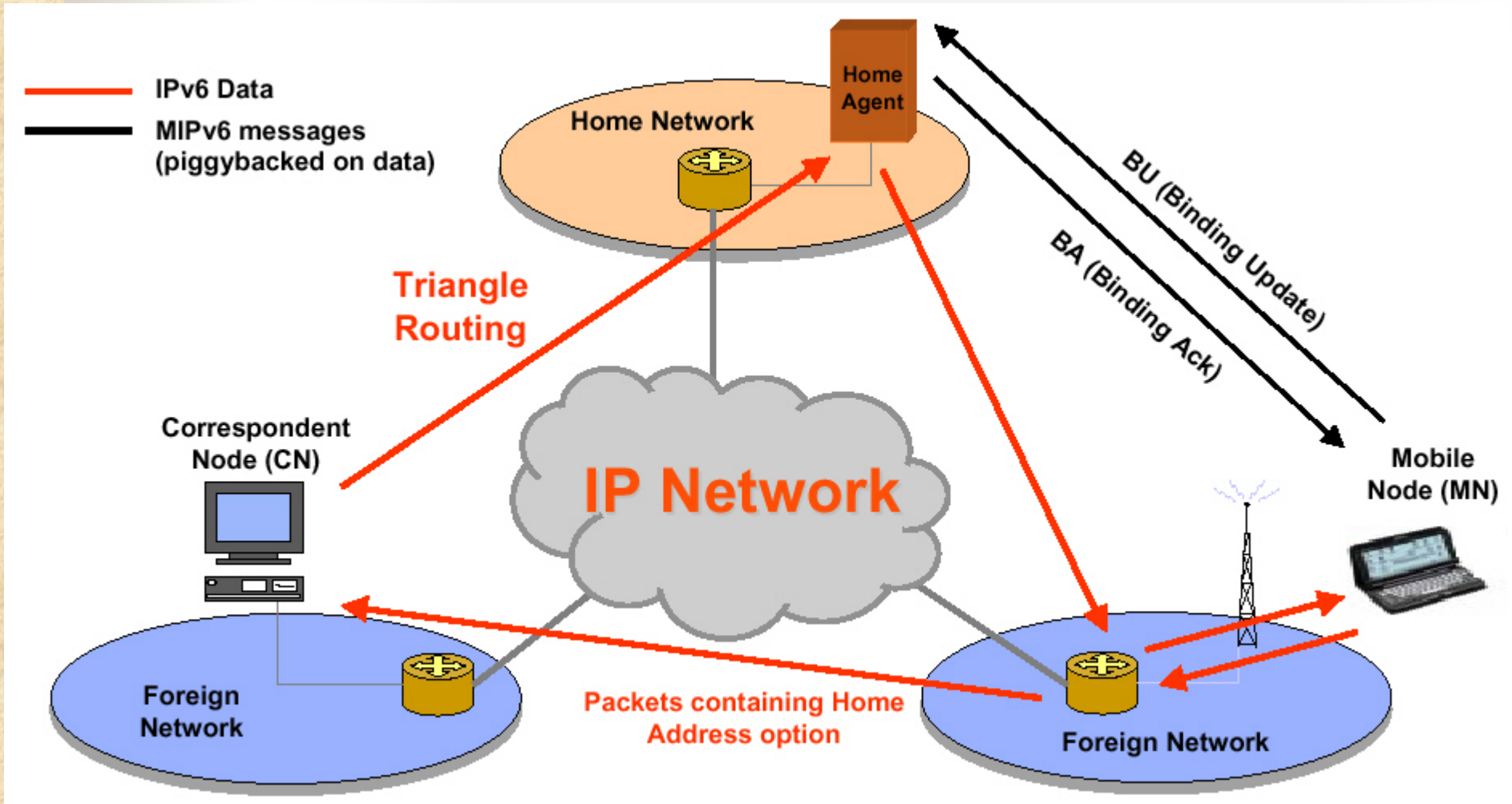
- Routing Headers
  - Route optimization
  - 1st Hop : care-of address of the mobile node
  - 2nd (final) Hop : home address of the mobile

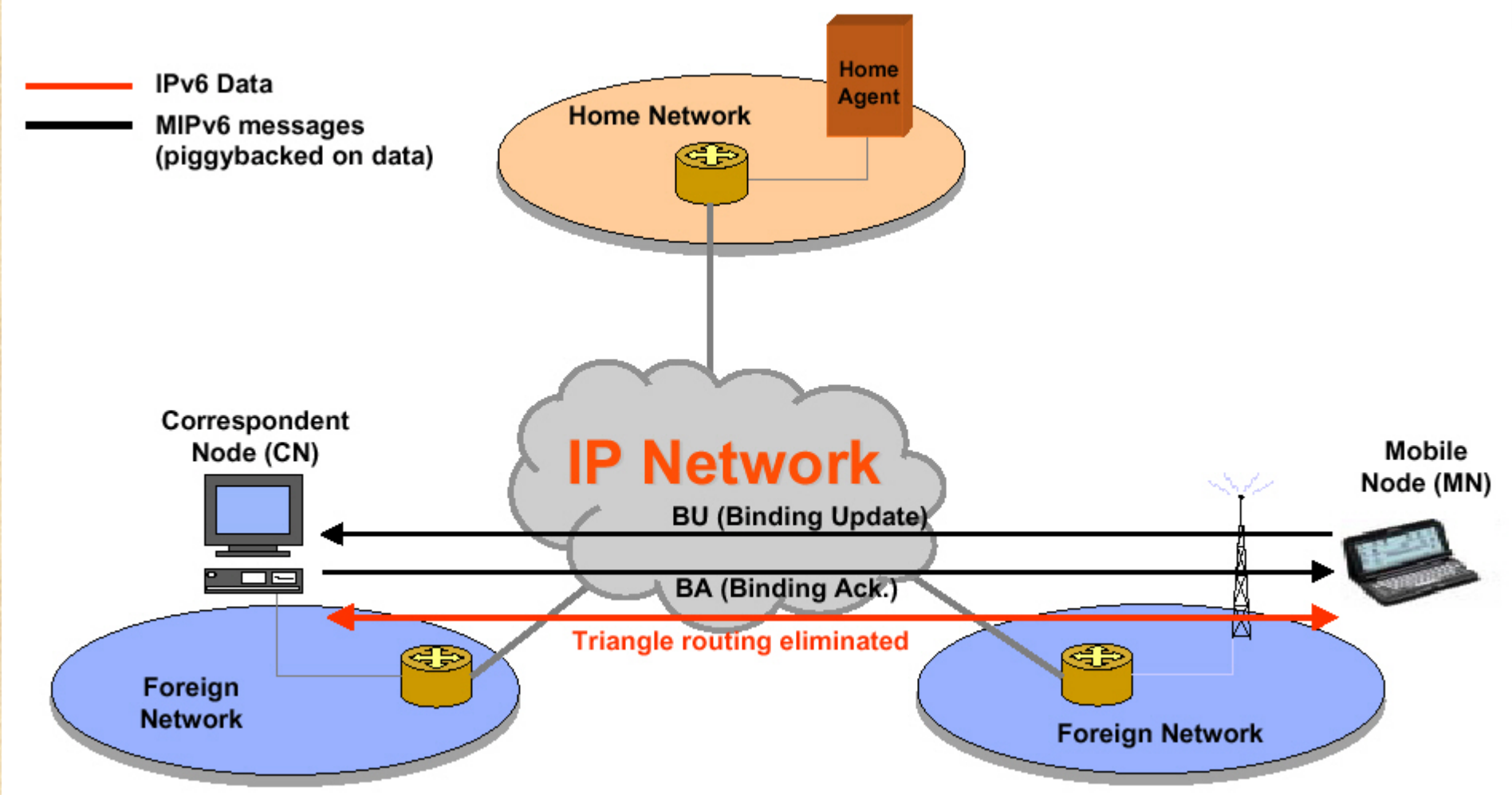
Mobility Support in IPv6 (3/4)

- No foreign agents (FA)
  - Large address space of IPv6
  - MN updates HA and CN with current CoA
- Anycast address
  - Dynamic Home Agent Discovery

Mobility Support in IPv6 (4/4)

- Neighbor Discovery (RFC2461)
  - Router Discovery
  - Prefix Discovery
  - Parameter Discovery : ex. MTU, TTL
  - Address Autoconfiguration
  - Address resolution : determining MAC address
  - Next-hop determination
  - Neighbor Unreachability Detection
  - Duplicate Address Detection
  - Redirect : give a better first-hop to a particular destination

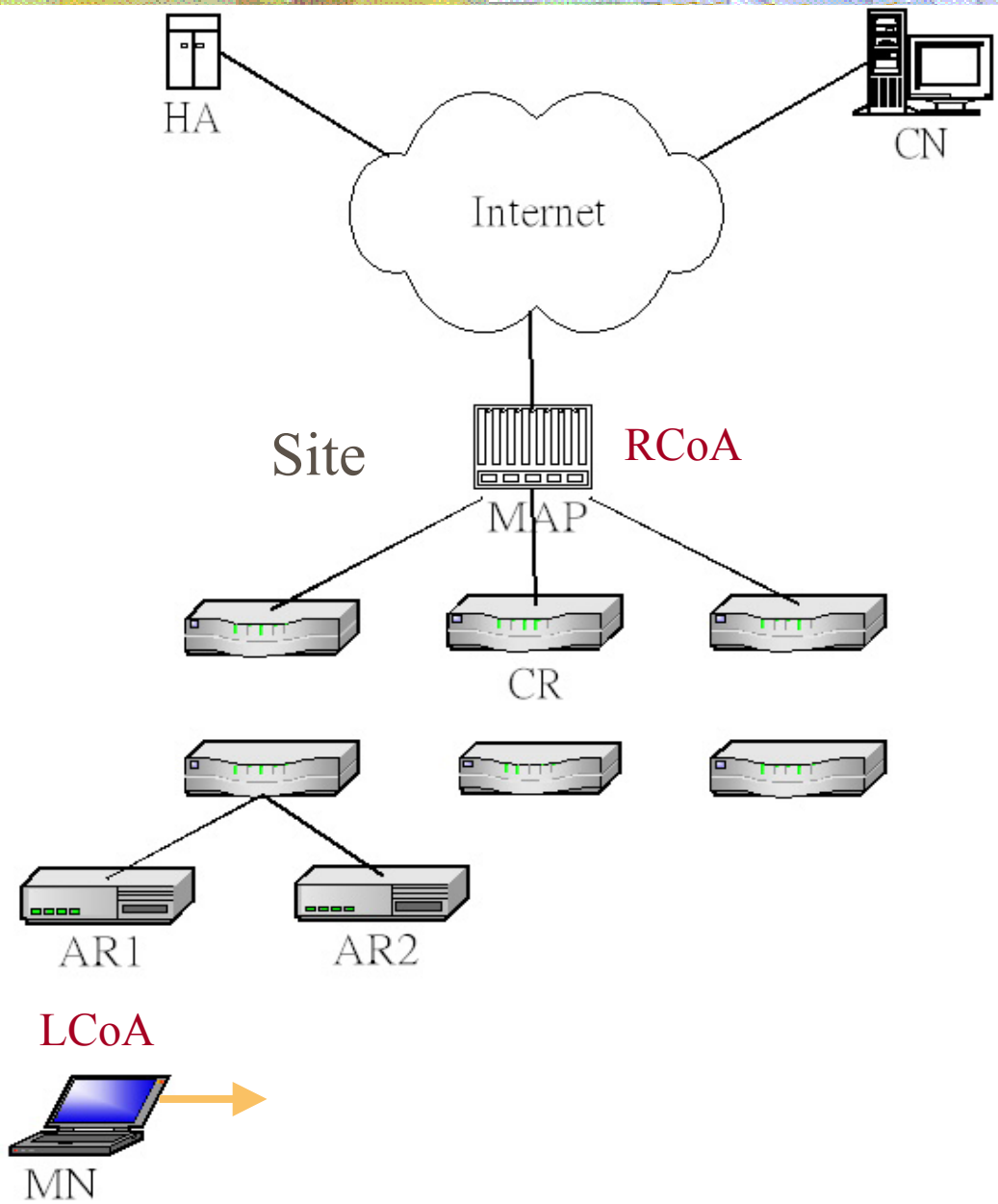

IPv6 Data
MIPv6 messages
(piggybacked on data)
Home Network
Home Agent
BU (Binding Update)
BA (Binding Ack)
Triangle Routing
Correspondent Node (CN)
IP Network
Mobile Node (MN)
Foreign Network
Packets containing Home Address option
Foreign Network


IPv6 Data
MIPv6 messages
(piggybacked on data)
Home Network
Home Agent
IP Network
Correspondent Node (CN)
Mobile Node (MN)
BU (Binding Update)
BA (Binding Ack.)
Triangle routing eliminated
Foreign Network
Foreign Network

HMIPv6

- In [3]
  - Intra-domain movement: 69%, while
  - Inter-domain movement: 31%

- Terminology
- Mobility Anchor Point (MAP)
- Regional Care-of-address (RCoA)
- On-link CoA (LCoA)
- Access Router (AR)
- HMIPv6-aware Mobile Node



HMIPv6

- Mobility Anchor Point (MAP)
  - Used to help reduce the signaling message
  - Acts as the local HA
  - Handles the intra-domain mobility

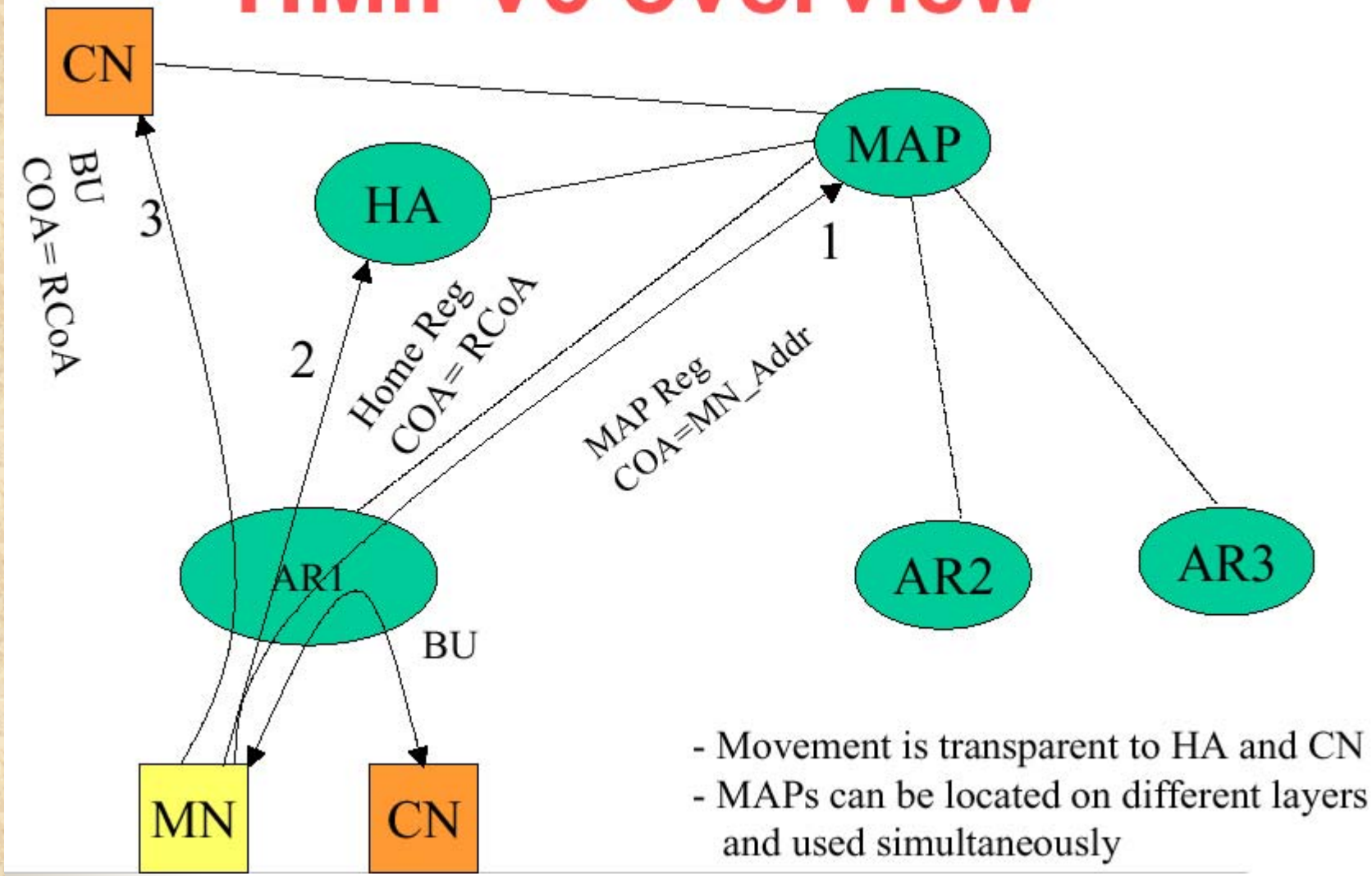
HMIPv6

- Intra-domain Mobility
  - The MN moves within the site scope
  - MN only informs MAP
  - MN will get a new LCoA
  - RCoA does not change
  - HA and CN do not aware of the local movement of the MN

HMIPv6

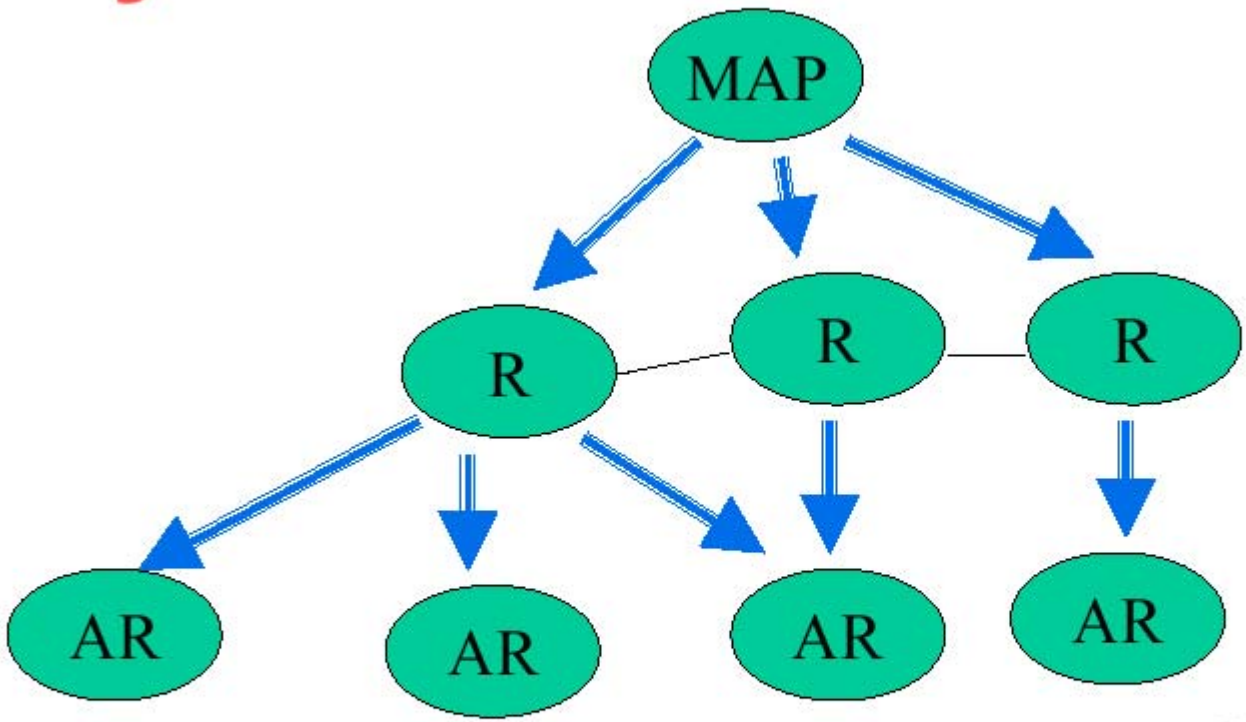
- Inter-domain mobility
  - The MN moves cross the site scope
  - MN will inform CN and HA
  - MN will get a new RCoA and LCoA

HMIPv6 overview



- Movement is transparent to HA and CN
- MAPs can be located on different layers and used simultaneously

Dynamic MAP Discovery



RCoA = MAP

MAP Option

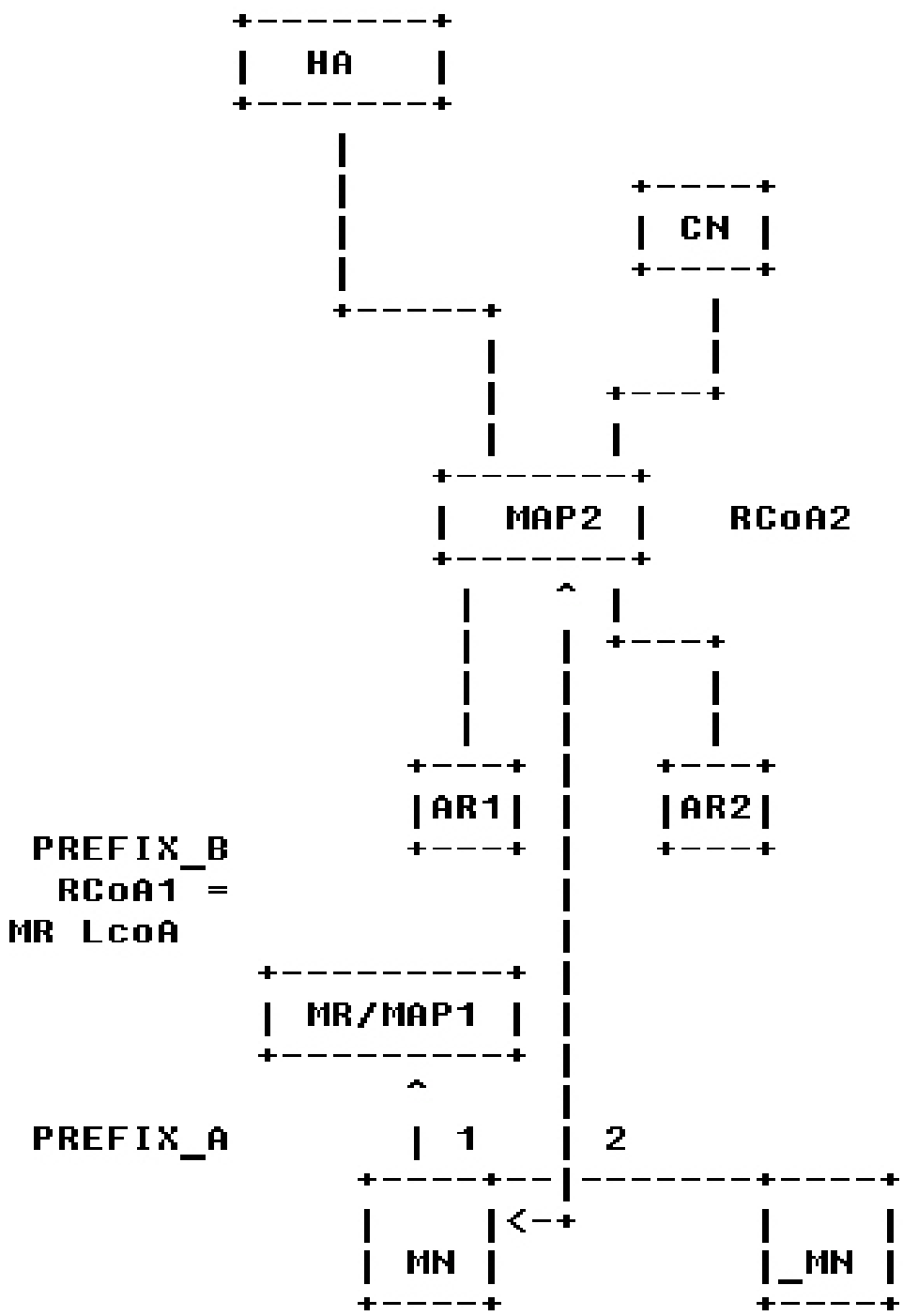
MN

Movement

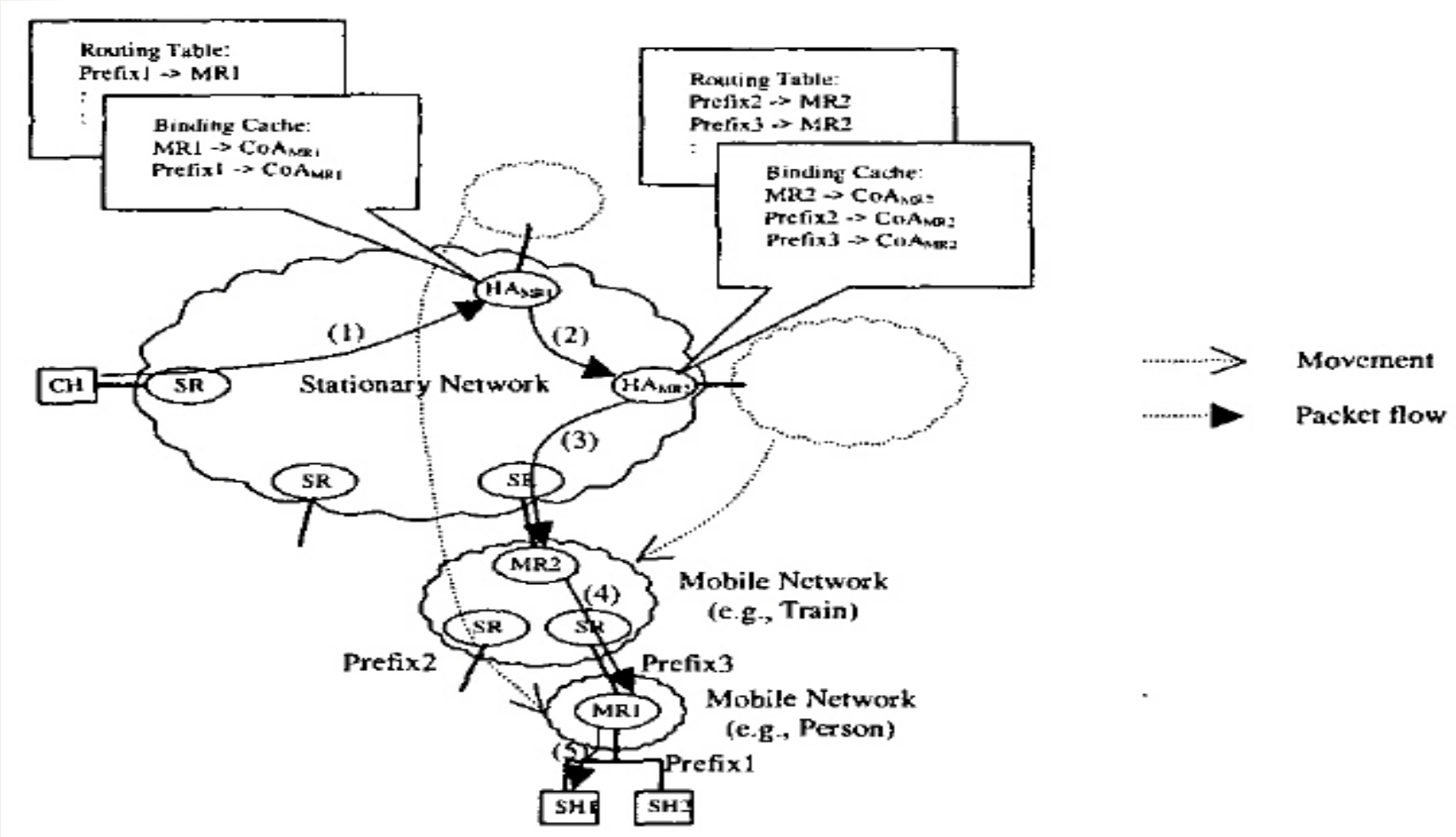
MAP option is propagated on chosen interfaces via Router advertisement

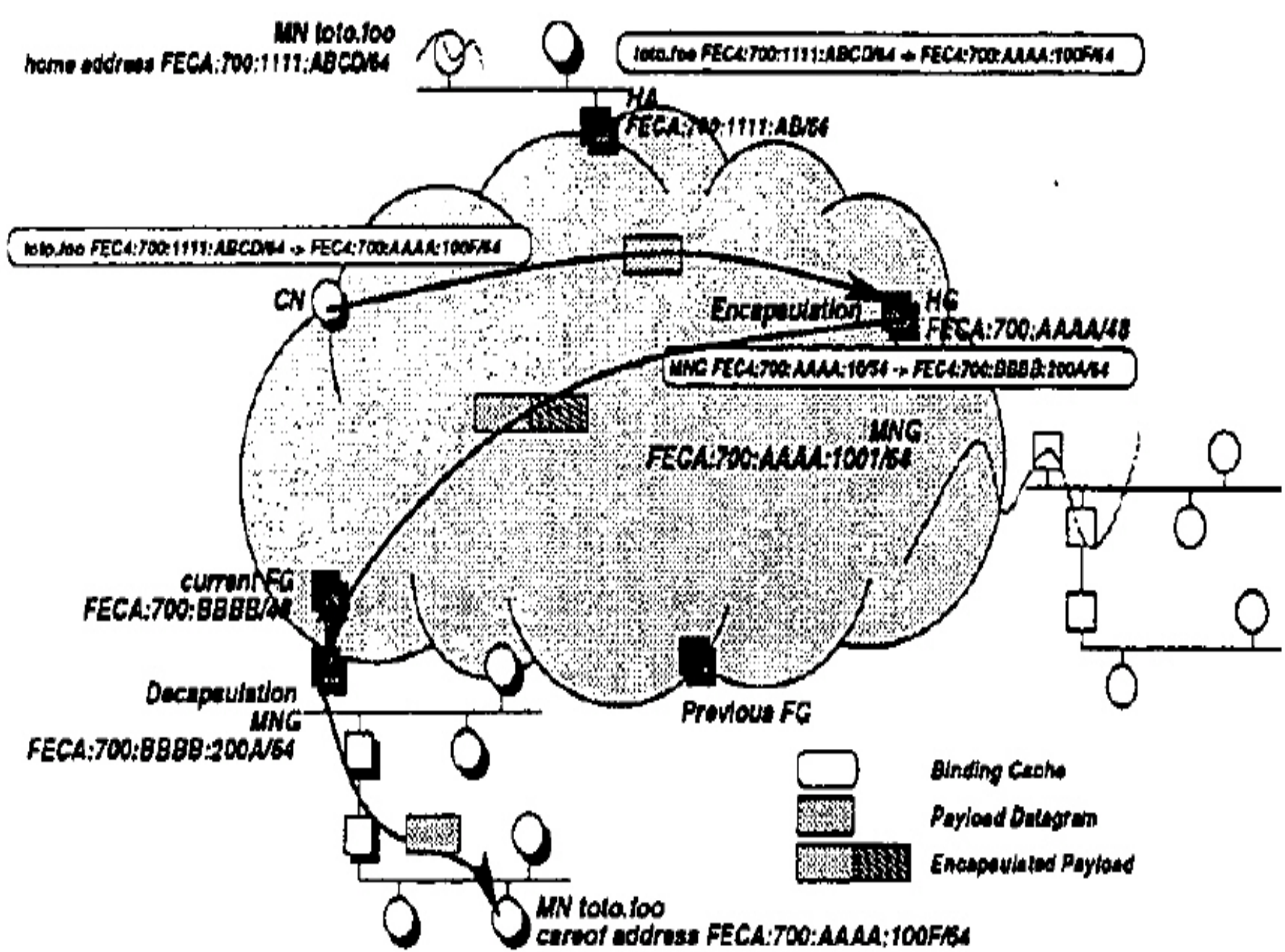
Mobile Networks

- Mobile Router (MR) works as a MAP

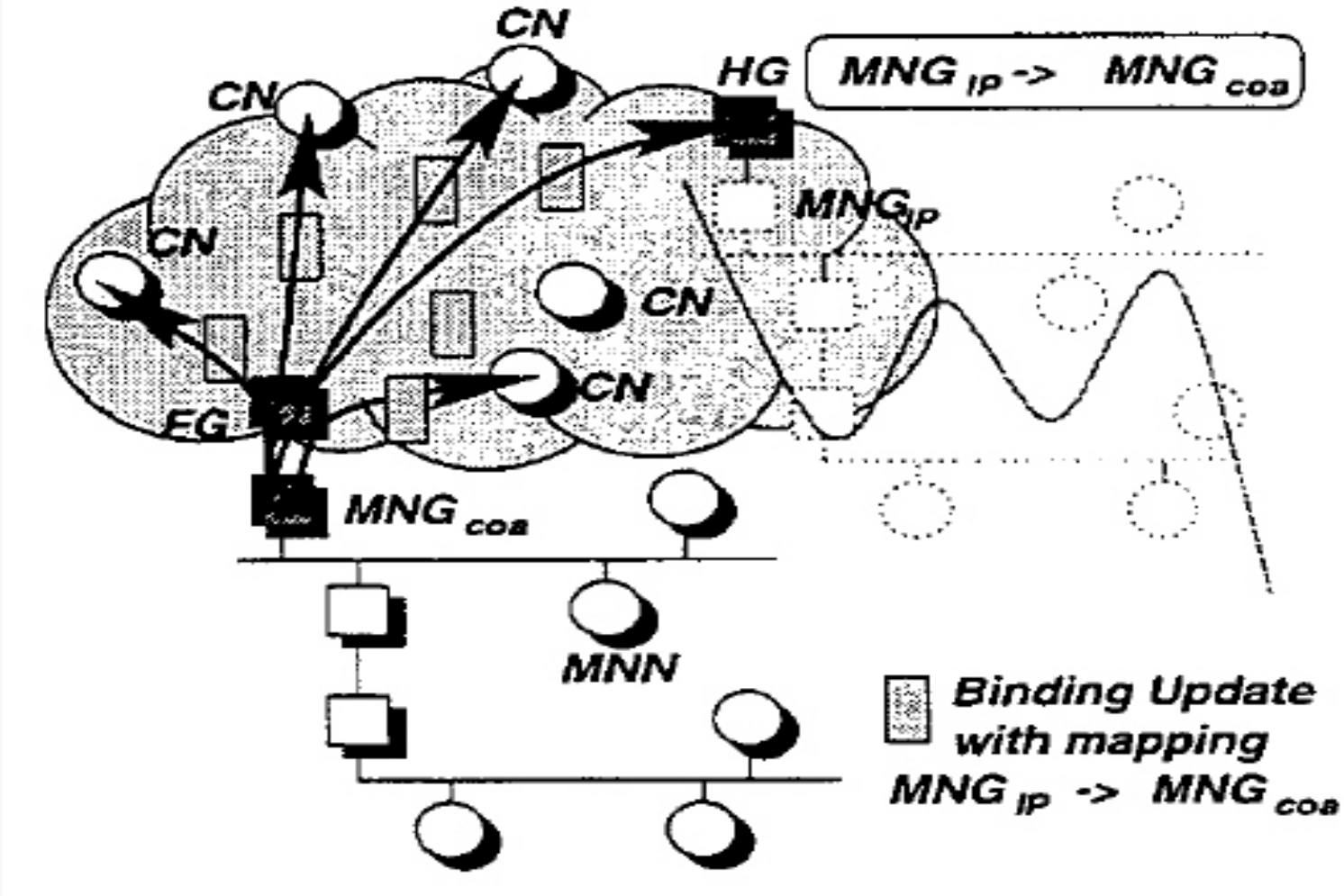


Mobile Networks




MN toto.foo
home address FECA:700:1111:ABCD/64
toto.foo FECA:700:1111:ABCD/64 -> FECA:700:AAAA:100F/64
HA
FECA:700:1111:AB/64
toto.foo FECA:700:1111:ABCD/64 -> FECA:700:AAAA:100F/64
CN
Encapsulation
HG
FECA:700:AAAA/48
MNG FECA:700:AAAA:1054 -> FECA:700:BBBB:200A/64
MNG
FECA:700:AAAA:1001/64
current FG
FECA:700:BBBB/48
Decapsulation
MNG
FECA:700:BBBB:200A/64
Previous FG
Binding Cache
Payload Datagram
Encapsulated Payload
MN toto.foo
careof address FECA:700:AAAA:100F/64

Multicast BUs



Issues of Mobile Networks

- A large number of BUs increase the network load
  - Multiple HAs, MNs and CNs cause amount of BUs
- Should DNS be notified with BU?
- The efficiency of hierarchical tunneling may be very poor.
- Different MTUs between mobile networks may bring additional MTU discovery procedures.

Future Works

- QoS supports
  - RSVP or DiffServ?
- Paging supports
- Seamless handoff
  - Especially in inter-domain seamless handoff
- Combined with AAA architecture

Conclusions

- HMIPv6 will reduce MIPv6 signaling over the expensive radio interface
- HMIPv6 will assist in providing near optimal routing and speeding up MIPv6 handovers
- Mobile networks will provide location privacy
- Mobile networks will scale to a large number of users and introduce minimal changes

References

[1] H. Soliman, C. Castelluccia, L. Bellier, *Hierarchical MIPv6 mobility management (HMIPv6),* Internet-Draft (work in progress), draft-ietf-mobileip-hmipv6-05.txt, July 2001

[2] David B. Johnson, Charles Perkins, *Mobility Support in IPv6,* Internet-Draft (work in progress), draft-ietf-mobileip-ipv6-15.txt, July 2001

[3] G. Kirby. Locating the User. Communication International, 1995.

[4] I. OKAJIMA, N. Umeda, and Y. YAMAO, NTT DoCoMo, *"Architecture and Mobile IPv6 Extensions Supporting Mobile Networks In Mobile Communications"*, VTC 2001.

[5] T. Ernst, C. Castelluccia, and HY. Yach, *"Extending Mobile-IPv6 with Multicast to Support Mobile Networks in IPv6"*, Universal Multiservice Networks, IEEE, 2000.