

Mobility Management

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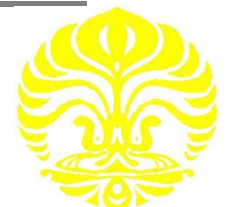
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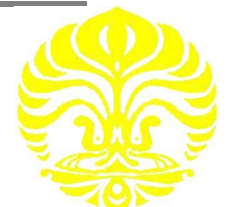


Slide 1



Introduction

1. Aspects of Mobility
2. Mobility in UMTS
 - 2.1 Introduction
 - 2.2 Handover
3. Mobility in other networks
 - 3.1 GSM
 - 3.2 WLAN – IAPP
 - 3.3 WLAN – Mobile IP



Requirements for IP-Based Mobility Management

- Mobility Management –
 - Location management
 - Handoff management
- Requirements –
 - Hierarchical architecture
 - Fast handoff
 - Paging functionality
 - Compatibility with QoS mechanisms

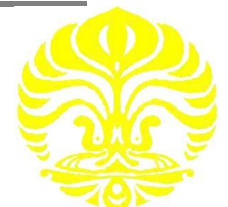


End-user aspects of Mobility

- Static mobility
- Nomadic mobility
- **Continous mobility**
 - **Cellular communication**
 - *Hot Spot communication*
 - Pervasive communication

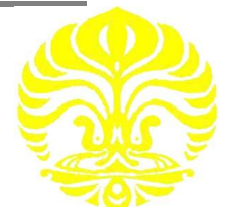
Mobility Scenarios

- Service mobility
- Network mobility
- **Personal mobility**
 - **Personal communication**
 - **Personalising operating environment**
- **Device mobility**

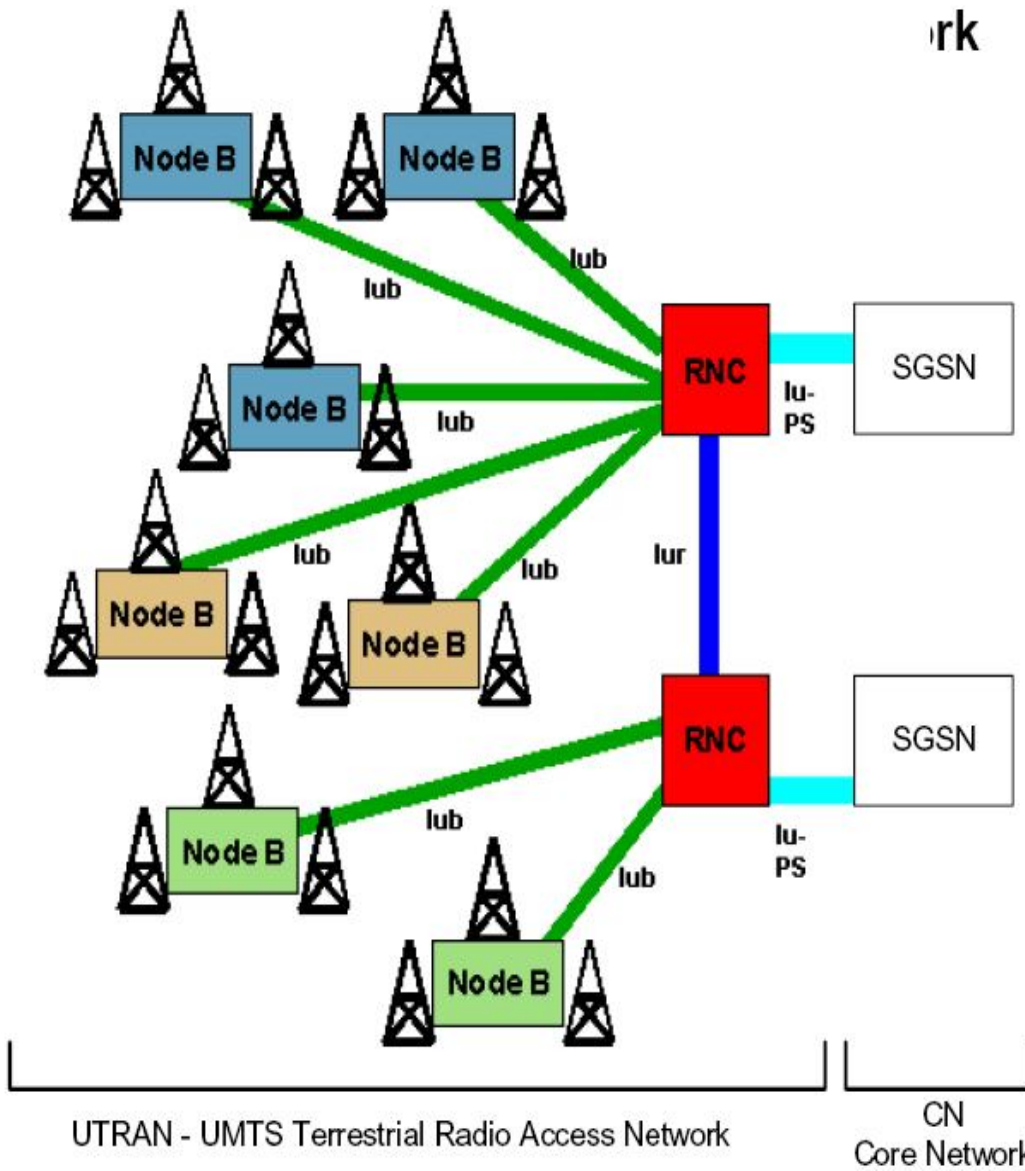


Functions of mobility management

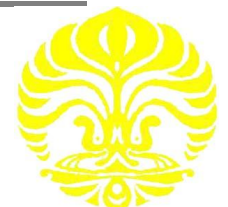
- Registration
 - Informs network which device is used and that it is ready to receive request.
 - Normally combined with authentication.
- Paging
 - In power saving mode only the area a device is located in is known by the network. Paging is used to find the cell a device is located in.
- Location Update
 - Informs the network of new locations of the device.
 - Triggered by movement or timer.
- Handover
 - Keeps link while moving by switching the link from one access point to another.
- Rerouting
 - Optimizes the traffic path by redefining routes after handovers.



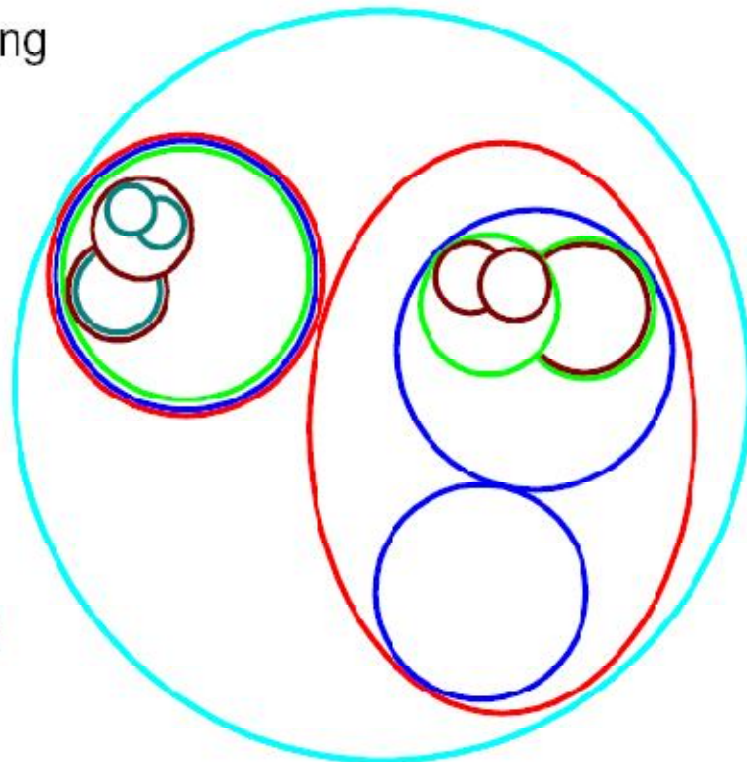
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UE:	User Equipment
RNC:	Radio Network Controller
RNS:	Radio Network Subsystem (RNC with all connected Node Bs)
Iub:	RNC to Node B interface
Iur:	RNC to RNC interface
Iu-PS:	RNC to CN interface for packet-switched data
UTRAN:	UMTS Terrestrial Radio Access Network
CN:	Core Network
SGSN:	Serving GPRS Support Node
GGSN:	Gateway GPRS Support Node

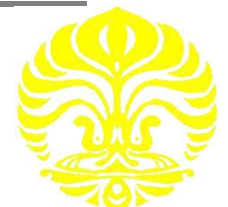


Location tracking



CN:	Core Network
UTRAN:	UMTS Terrestrial Access Network
SGSN:	Serving GPRS Support Node <i>(physical device)</i>
LA:	Location Area, used in CS-domain <i>(geographical area)</i>
RNS:	Radio Network Subsystem, RNC with all connected Node Bs <i>(physical device)</i>
RA:	Routing Area, used in PS-domain <i>(geographical area)</i>
URA:	UTRAN RA, used in PS-domain <i>(geographical area)</i>

	PMM-connected UTRAN cell connected	PMM-idle UTRAN URA connected	PMM-detached CN (SGSN)
Cell	Yes	No	No
URA	Yes	Yes	No
RA	No	No	Yes

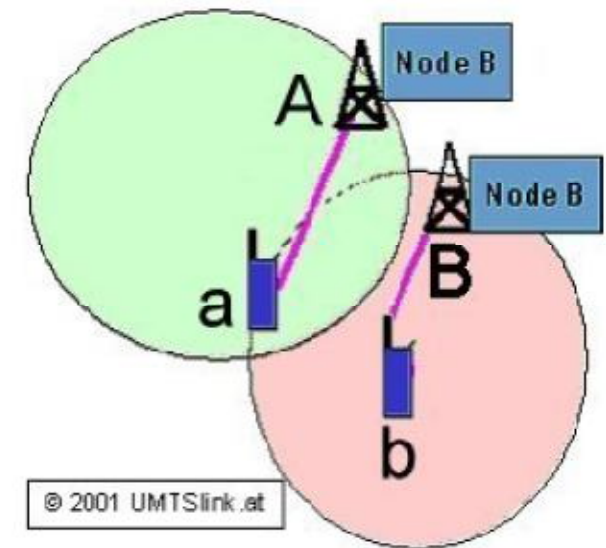


Macro Diversity

Codes used are only almost orthogonal, not enough orthogonal codes available. Similar codes are used by UEs in different cells to keep codes in a cell most orthogonal.

Example of a problematic situation: Code of UE a and b is quite similar:

1. a & A increase transmission power level, radio signals reach far into neighbour cell
2. b & B are not able to filter out their signals, signal with similar code of a & A is too powerful
3. b & B increase transmission power level, radio signals reach far into neighbour cell
4. a & A are not able to filter out their signals, signal with similar code of b & B is too powerful...

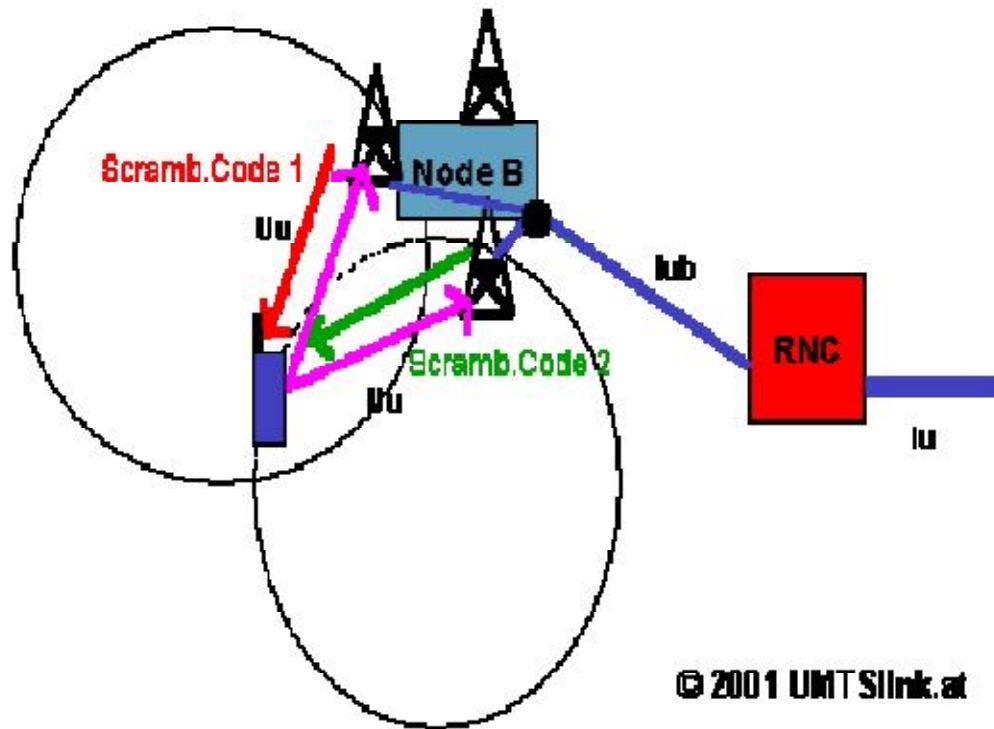


Solution: UE can be connected to several cells at the same time. Transmission errors are corrected by the UTRAN by comparing data received by the different cells. This is called *Macro Diversity*.

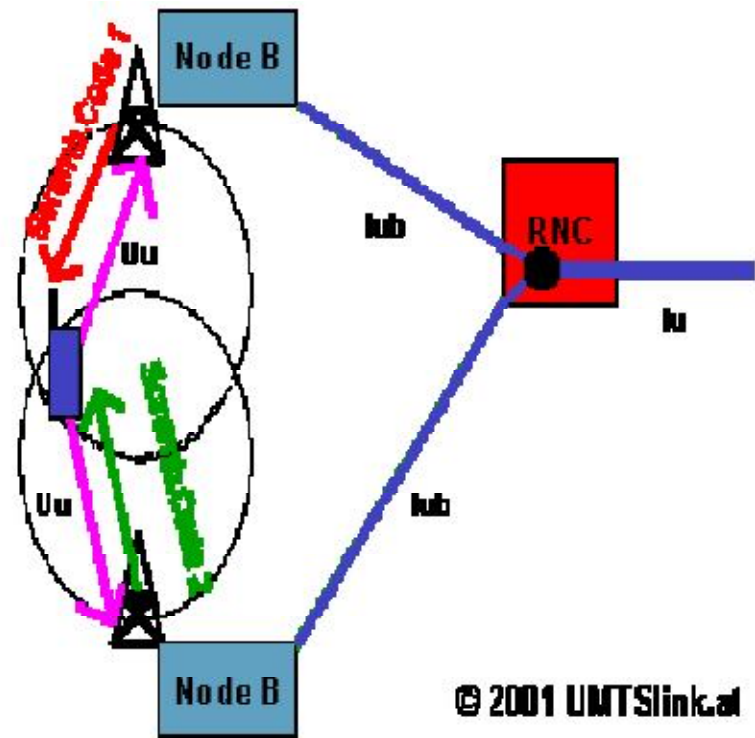
In such a case an UE is in a *Soft Handover* situation. This can be a permanent situation.

Soft Handover cases

1) Softer Handover
(intra Node B/intra RNS/intra SGSN)



2) Soft Handover
(inter Node B/intra RNS/intra SGSN)



Advantages & Disadvantages of Macro Diversity & Soft Handover

- + speech quality

Good speech quality because of seamless handover & good error correction methods.

- + lower radio transmission level

Because of W-CDMA more transmission errors can be corrected even at lower transmission levels.

- + power saving

Transmitting at low radio transmission levels saves power.

- + frequency planning and network expansion

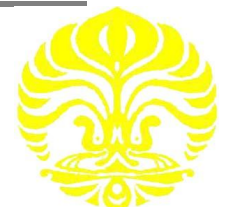
New cells can be added easily, detailed frequency planning is not needed.

- costs of computation

Error correction in soft handover situation cost computation power.

- complex to implement

The different soft handover scenarios are quite complex to implement.



WLAN – Mobile IP

Mobile IP works with 3 components:

- Home Agent (HA)

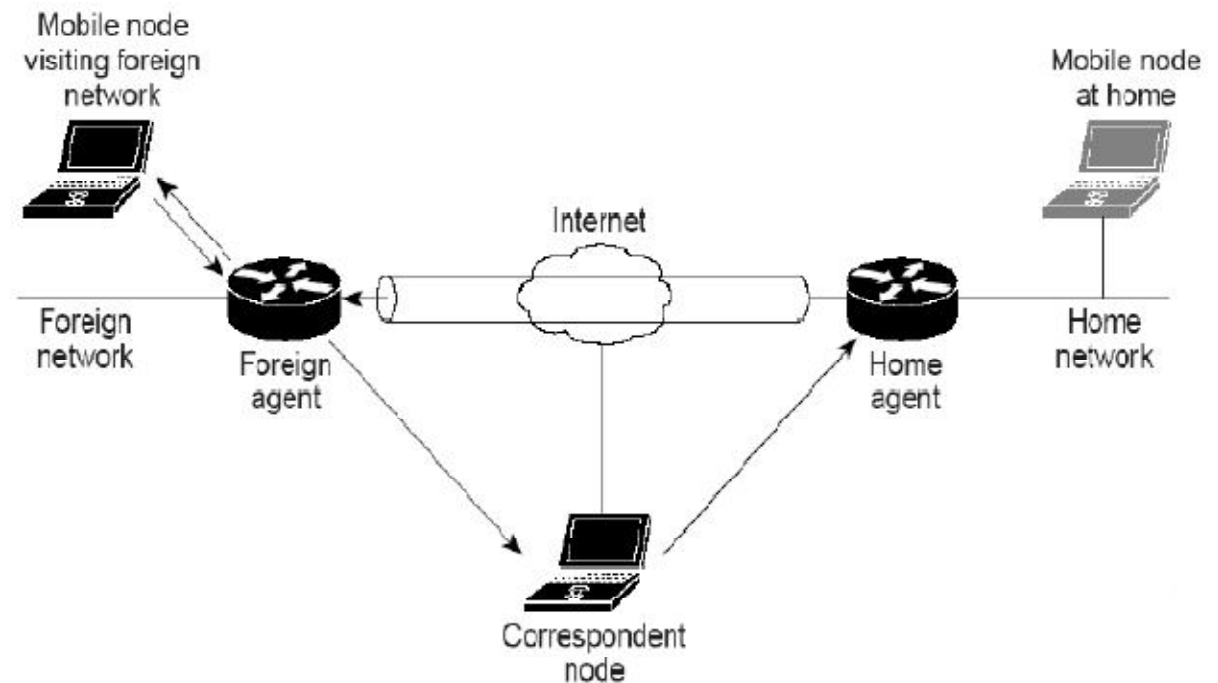
Router located in the home network of MN. Forwards packets for MN to the network MN is located in.

- Foreign Agent (FA)

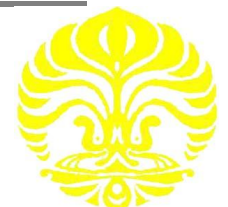
Assigns care-of-address to MN and forwards packets from HA to MN.

- Mobile Node (MN)

MN can be reached at its home address even while moving. Registers with current care-of-address at its HA (if located in foreign network).

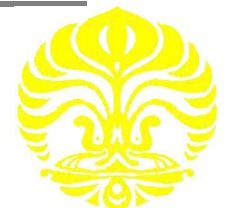


Traffic is routed in a triangular manner.

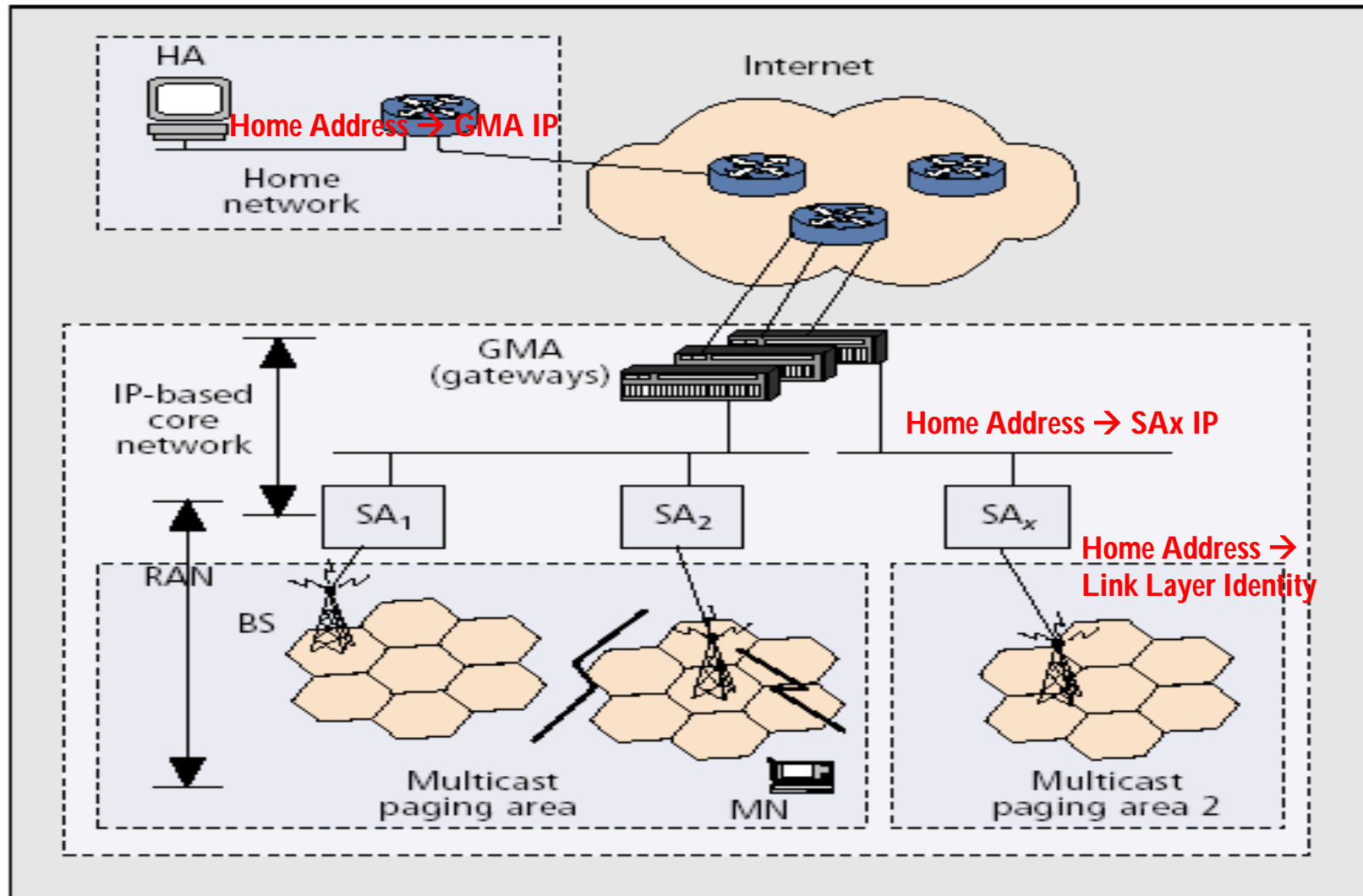


Micro-Mobile IP (μ MIP)

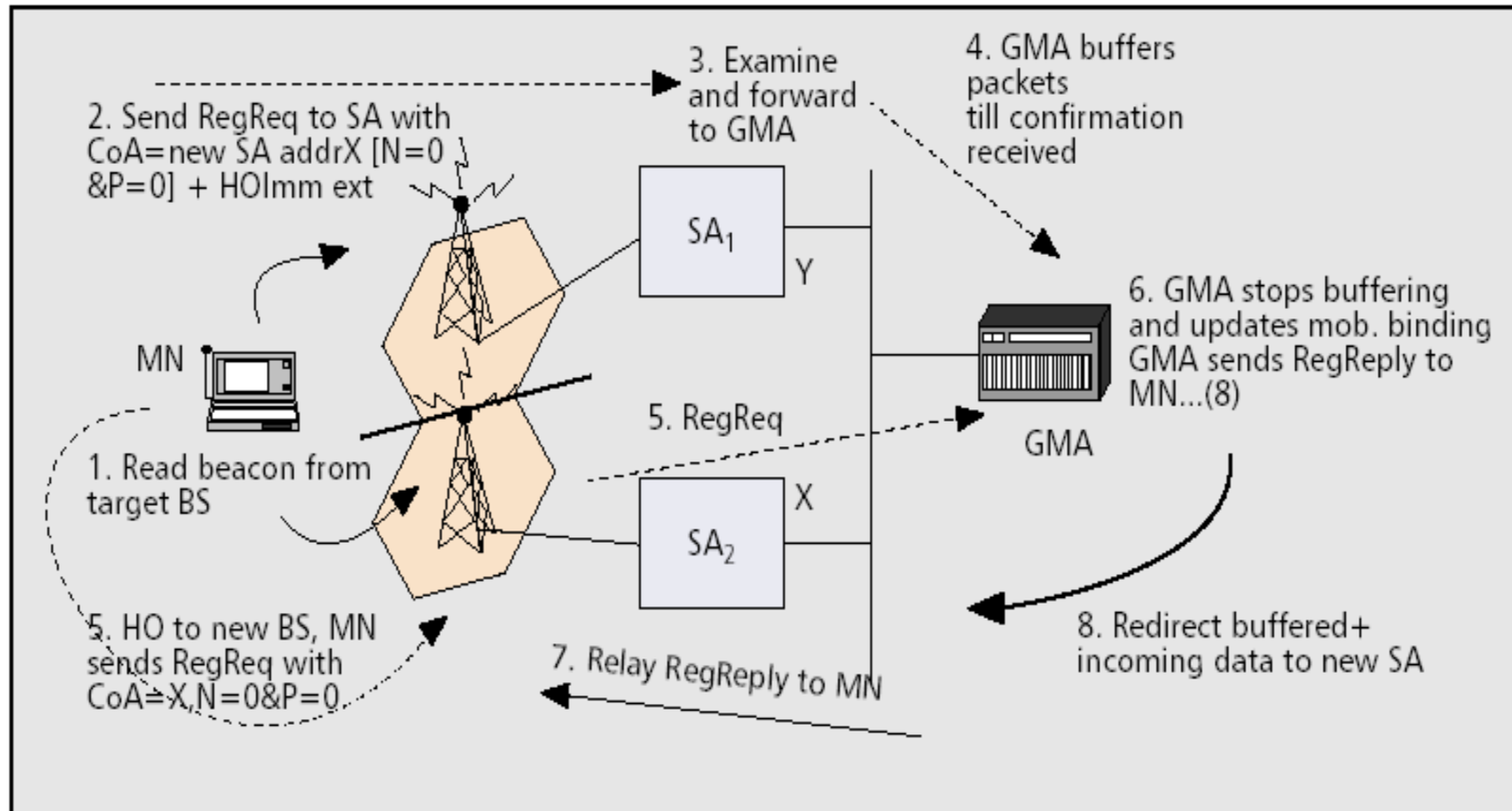
- μ MIP = Mobile IP + Regional Registration + Fast Handoff + Paging
 - Regional Registration – Reducing signaling cost.
 - Fast Handoff – Reducing packet loss.
 - Paging – Reducing signaling cost and power consumption.
- A group of Subnet Agents (SA) forms a multicast Paging Area group.
- The core network operates independent of the radio access network.
- Beacon – Domain ID, Paging Area ID and Gateway Mobility Agent Care-of Address.



Micro-Mobile IP (μ MIP) - Architecture



Micro-Mobile IP (μ MIP) – Fast Handoff



1. The original IP path restored faster while the handoff fail.
2. It also avoids duplicated traffic generated by multicasting.