
Multiple Interface Management for Mobile Network Platforms

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- ☞ **Highlights**
 - ☞ *UMTS Testbed*
 - ☞ *Campus WLAN*
- ☞ **Mobile Internet Protocol**
 - ☞ *Mobile IP Testbed*
 - ☞ *Mobile IP Software*
 - ☞ *Filters for Bindings*
- ☞ **Mobile IP Presentation: GSM/802.11b Handoff**



UMTS Pilot Project

- ☞ Cooperation „Bremen in TIME“ between T-Mobil and Hanseatic City of Bremen
- ☞ Schedule 2001-2005 (50 Mio €)
- ☞ Isolated Application
- ☞ Development of multimedia products and services
- ☞ Building research groups to promote the domestic economy
- ☞ First UMTS applications on air in 2002

<http://www.umts-bremen.org>



Campus WLAN

- ☞ Campus provisioning by WLAN 802.11b wireless access points
- ☞ Purchase of notebooks and PCMCIA interfaces for internal students
- ☞ Promotion of WLAN infrastructure by internal projects (e.g. NOM@D)
- ☞ Design of mobile services (m-work)
- ☞ Synergy between UMTS-Testbed and Campus-WLAN network (new research projects)

<http://www.comnets.uni-bremen.de>

Mobile Internet Protocol

- ❖ Enables roaming between subnets

- ❖ Introduces to IP

 - ❖ Home Agent

 - ❖ Foreign Agent

 - ❖ Mobile Node

- ❖ Basic Operation ?

Post-Office forwarding service:

Mobile Node

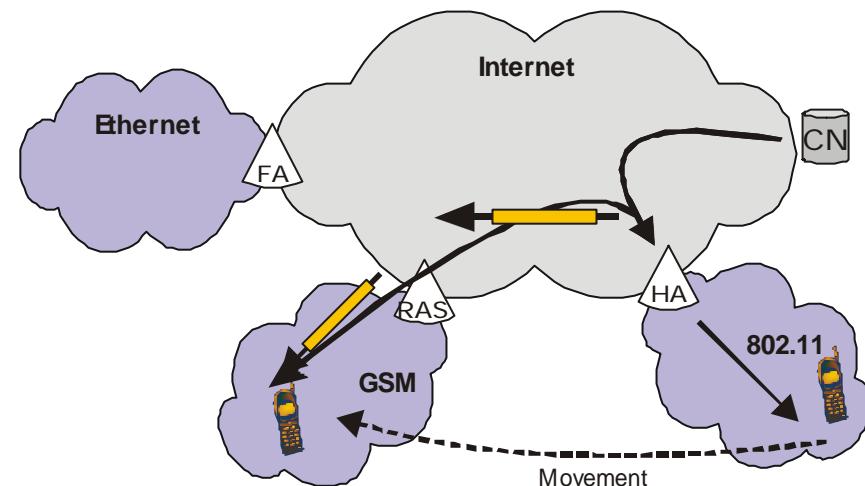
1. Acquire roaming address
2. Register roaming address

Home Agent

1. Intercept incoming traffic
2. Tunnel to new location
 - ❖ Tunnel endpoint is FA when present or mobile node itself in case of collocated care-of address

- ❖ Independent of higher and lower layers

- ❖ Integration of heterogeneous network = problem of routing



Mobile IP Testbed

Home Agent (HA)

- ☛ *IGEL-J Thin Client*
- ☛ *IGATE IEEE 802.11b AP*

Remote Access Server (RAS)

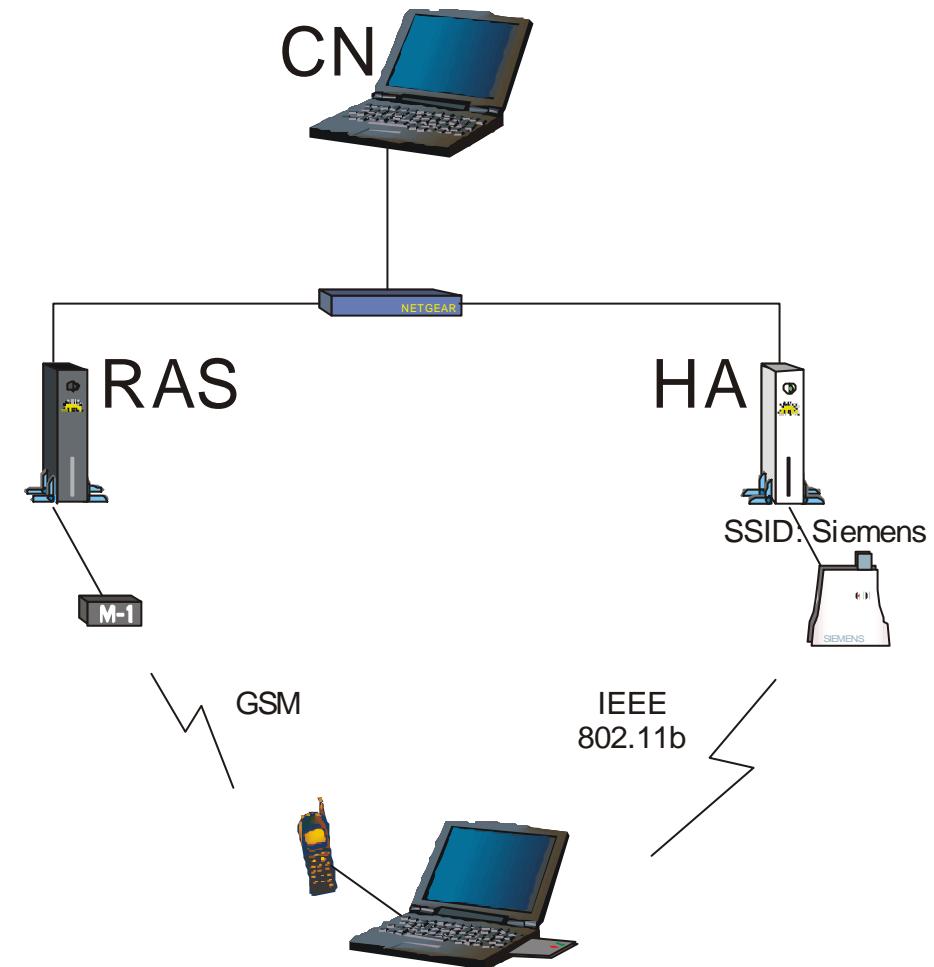
- ☛ *IGEL-J Thin Client*
- ☛ *Siemens M1 GSM Modem*

Mobile Node

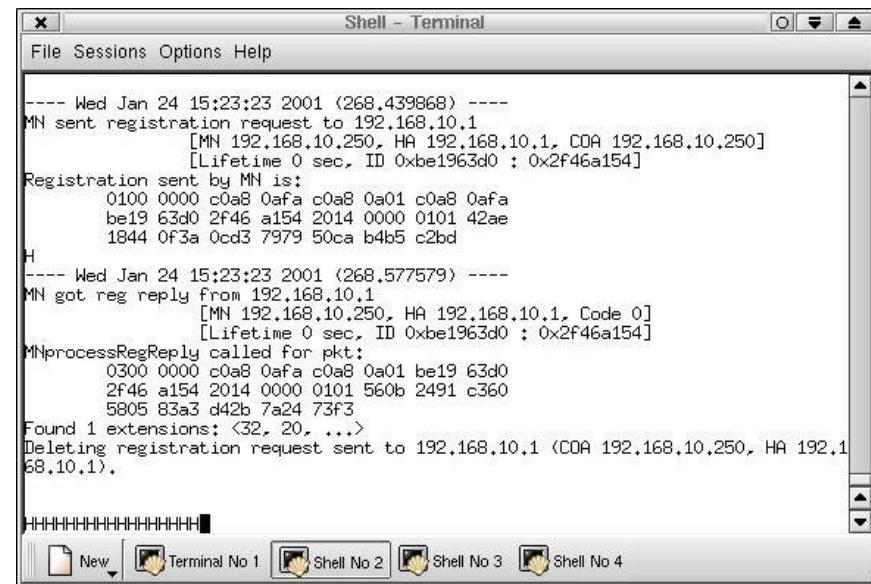
- ☛ *Siemens S-Series Lifebook*
- ☛ *S-35i Mobile Phone*
- ☛ *IGATE IEEE 802.11b PCMCIA*

Correspondent Node (CN)

- ☛ *Samsung Laptop*
- ☛ *Xircom Ethernet PCMCIA*



- ☒ Port of SunLabs Mobile IP for Linux
- ☒ Extended to support:
 - ☒ *Multiple interfaces*
 - ☒ *Move Detection algorithms*
 - ☒ *Hierarchical Mobile IP*
 - ☒ ...
- ☒ Debugging information
 - ☒ “H” in home network
 - ☒ “F” in foreign network
 - ☒ “C” in foreign network without FA



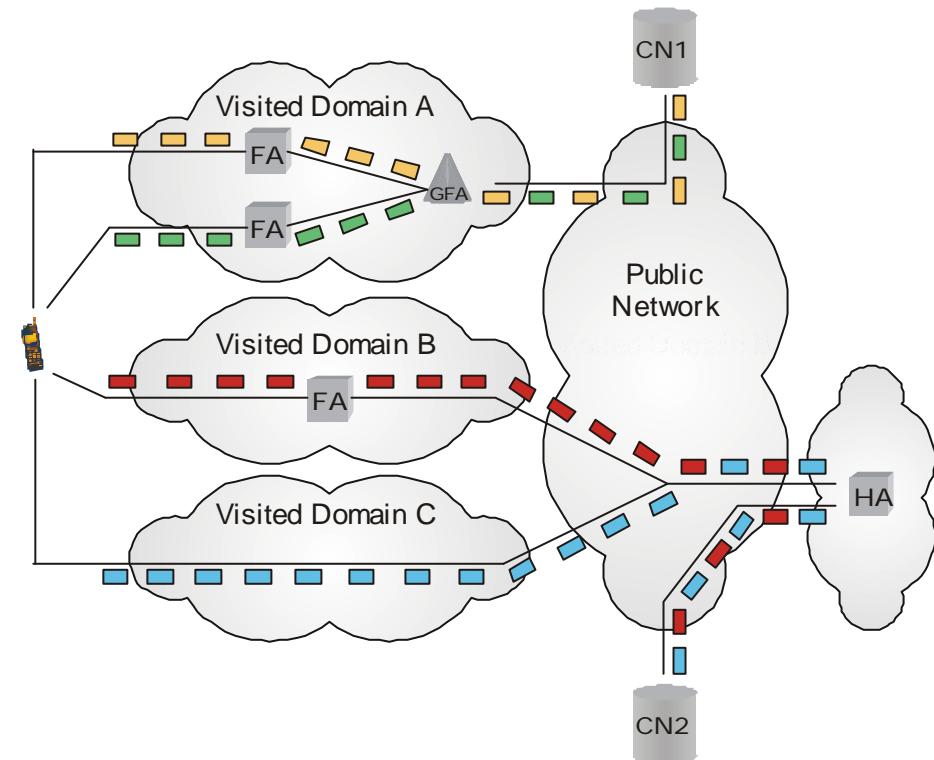
The screenshot shows a terminal window titled "Shell - Terminal". The window displays two log entries from a mobile node (MN) performing a registration request. The first entry shows the MN sending a registration request to the Home Agent (HA) at 192.168.10.1, with a COA of 192.168.10.250. The second entry shows the MN receiving a registration reply from the HA, with a lifetime of 0 seconds and ID 0xbe1963d0. The terminal also shows the MN processing the registration reply and deleting the registration request.

```
---- Wed Jan 24 15:23:23 2001 (268.439868) ----
MN sent registration request to 192.168.10.1
[MN 192.168.10.250, HA 192.168.10.1, COA 192.168.10.250]
[Lifetime 0 sec, ID 0xbe1963d0 : 0x2f46a154]
Registration sent by MN is:
0100 0000 c0a8 0afa c0a8 0a01 c0a8 0afa
be19 63d0 2f46 a154 2014 0000 0101 42ae
1844 0f3a 0cd3 7979 50ca b4b5 c2bd
H
---- Wed Jan 24 15:23:23 2001 (268.577579) ----
MN got reg reply from 192.168.10.1
[MN 192.168.10.250, HA 192.168.10.1, Code 0]
[Lifetime 0 sec, ID 0xbe1963d0 : 0x2f46a154]
MNprocessRegReply called for pkt:
0300 0000 c0a8 0afa c0a8 0a01 be19 63d0
2f46 a154 2014 0000 0101 560b 2491 c360
5805 83a3 d42b 7a24 73f3
Found 1 extensions: <32, 20, ...>
Deleting registration request sent to 192.168.10.1 (COA 192.168.10.250, HA 192.168.10.1).
```

- ☞ IP/Mobile IP does not distinguish between flows
- ☞ One registration (binding) applies for all traffic
- ☞ Only one interface may be active

Proposed Solution

- ☞ Filters for Bindings. IETF draft-nomad-filters-mobileip.txt
- ☞ Agents associate flows with different bindings



Thank you!

Questions?