3G Vision: Integrated, Ubiquitous, Efficient High QOS Personal Service

PCN / PCS vision: "To enable anyone to communicate instantly with anyone else anywhere"

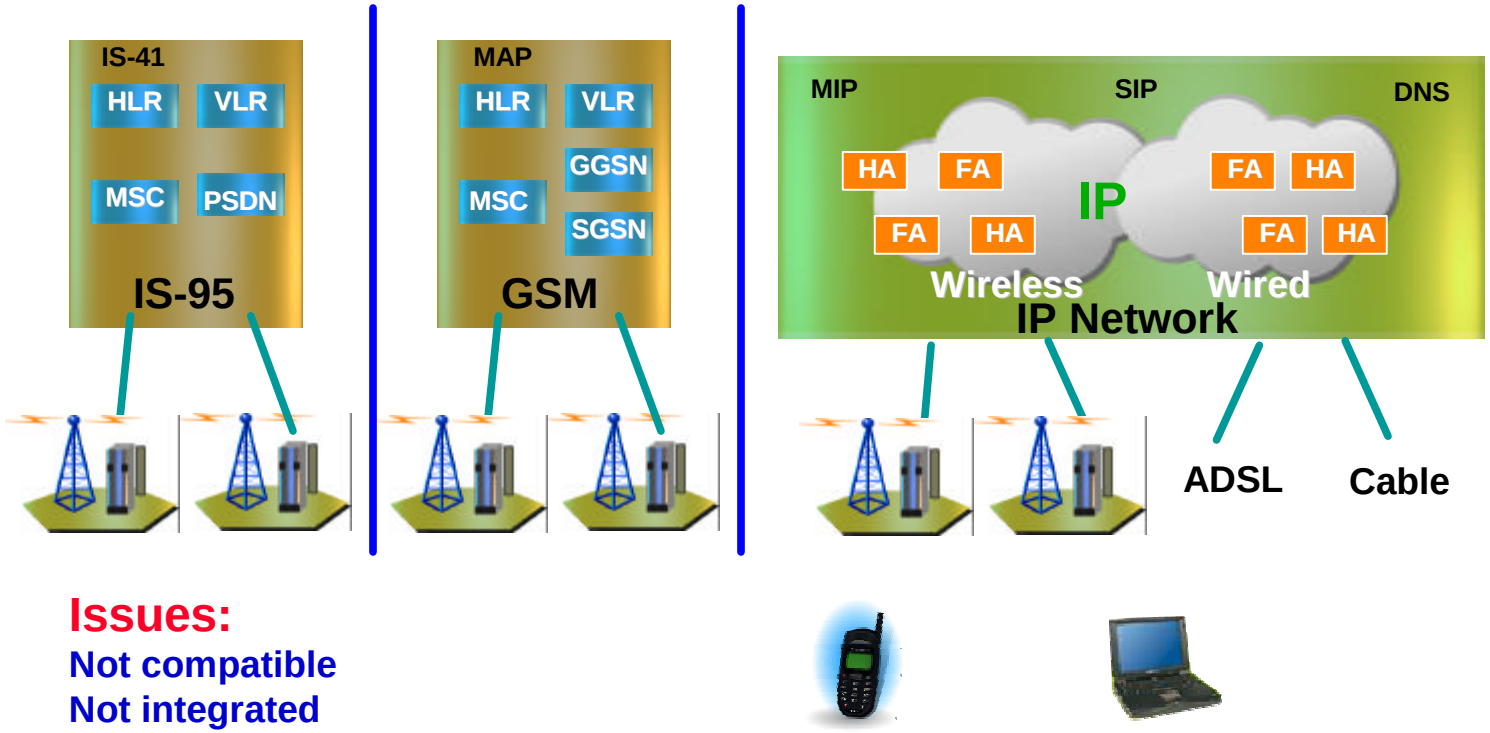
UMTS vision: "Providing communication services from any person to any person at any place and at any time without any form of delay through any medium using one pocket-sized unit at minimum cost with acceptable quality and security through using a personal telecommunications reference number"

IMT-2000: "provide telecommunication services to mobile and fixed users via a wireless link, covering a wide range of user sectors, radio technologies and coverage (cellular, satellite, cordless, etc.) and accommodating a wide range of user equipment"

Motorola CE vision: "Creating integrated solutions to customers' problems"

NSS Vision: "To be the global leader of end-to-end wireless network solutions to operators and service providers worldwide for all their telecom needs"

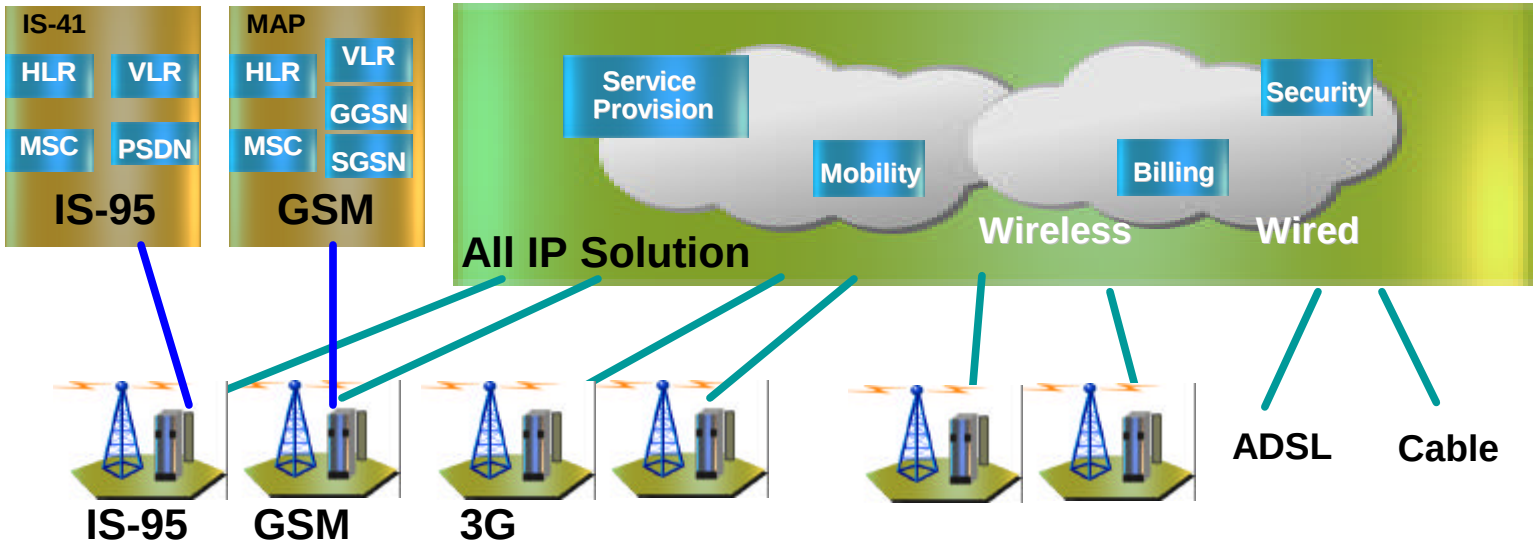
2G Reality



Issues:

- Not compatible
- Not integrated
- Not efficient

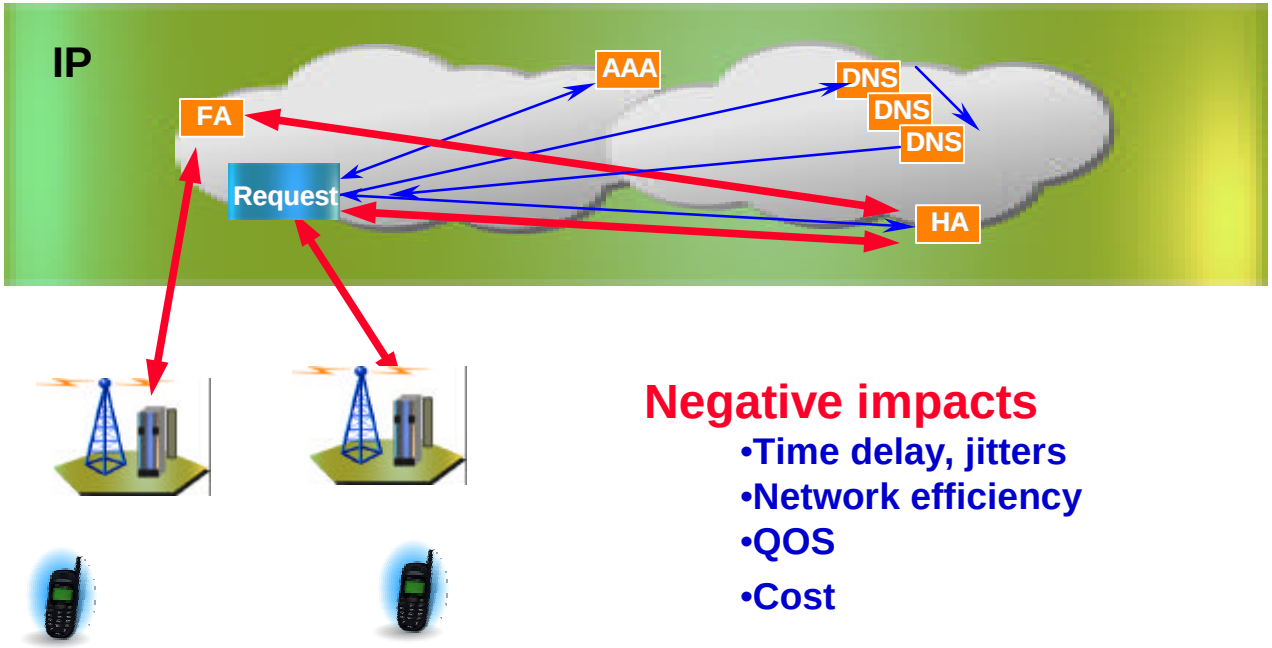
3G Needs Integrated Solution



Requirements

Integrated **User Mobility**
Ubiquitous **High QOS**
Efficient

Existing IP Solution for User Mobility



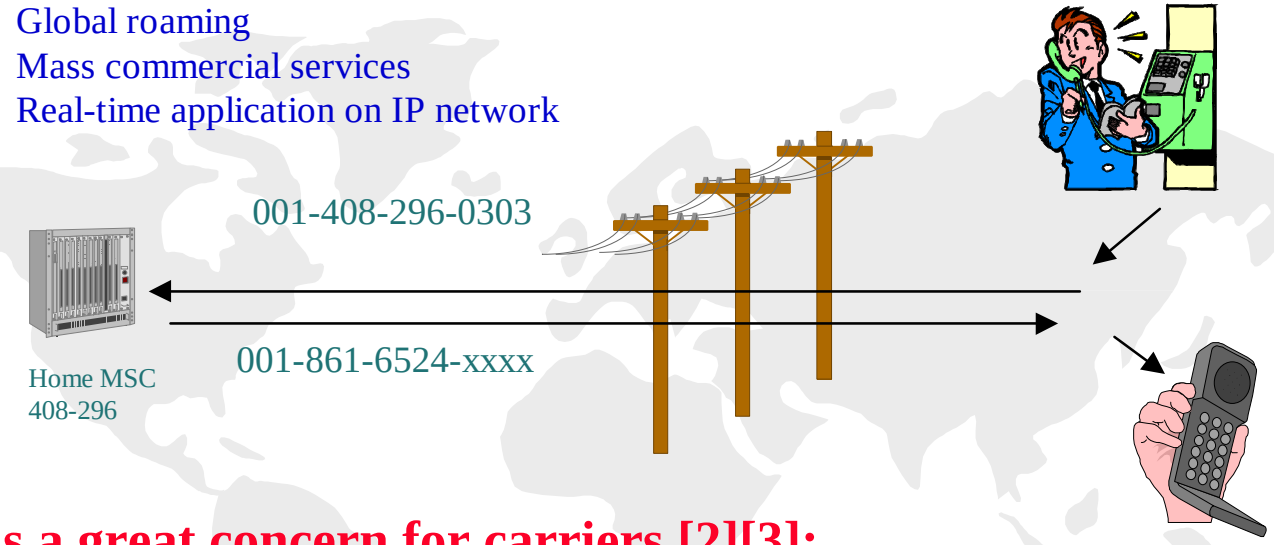
Negative impacts

- Time delay, jitters
- Network efficiency
- QOS
- Cost

3G Needs more Efficient Solution

The bottom line is cost and quality of service

Global roaming
Mass commercial services
Real-time application on IP network



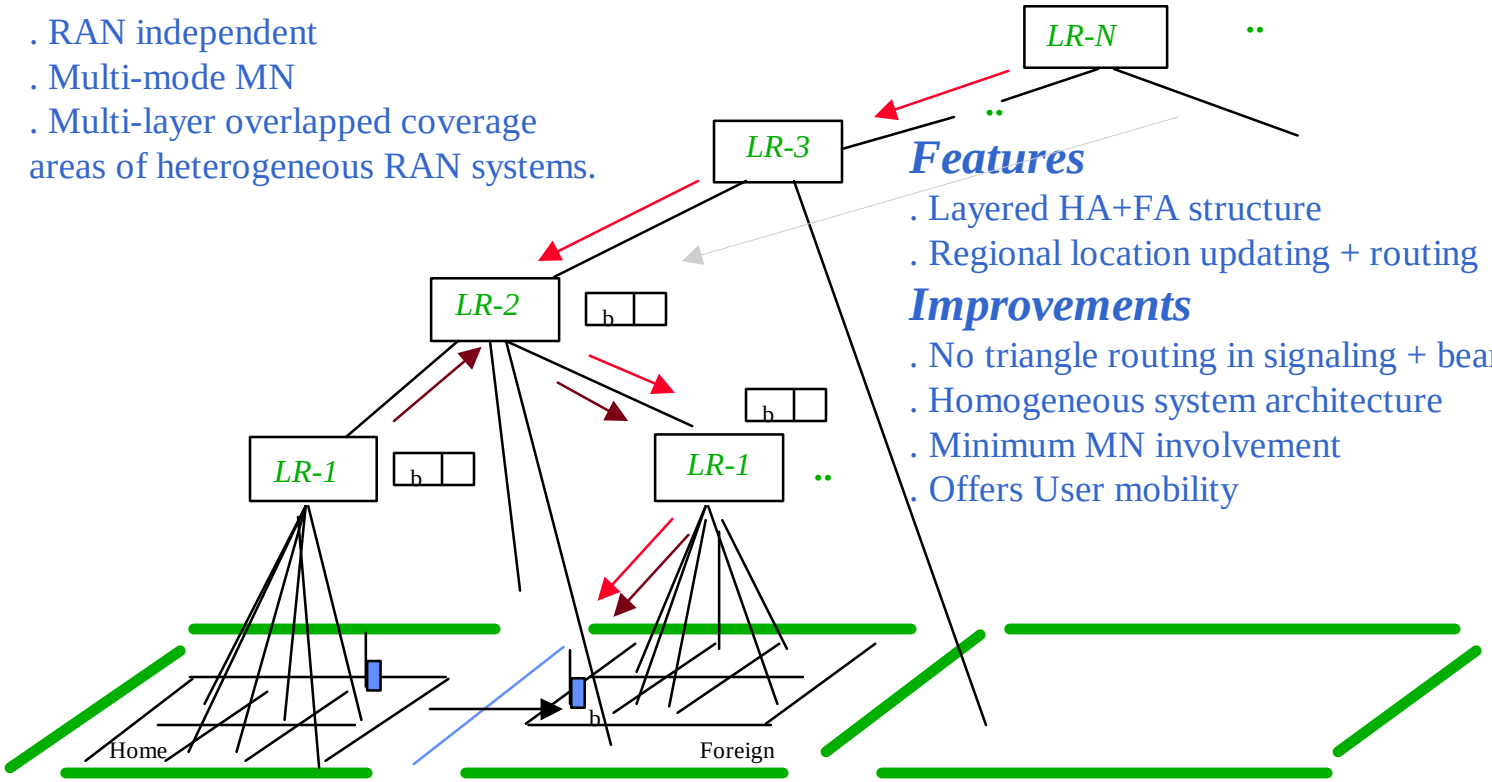
It is a great concern for carriers [2][3]:

"Routing of signaling and transport need to be optimized. Tromboning of the user's voice of data communication session back to their home environment should not be used to provide the user with services when roaming outside their home network" **(AWS)**

Universal Mobile IP (UMIP)

Environment

. RAN independent
. Multi-mode MN
. Multi-layer overlapped coverage areas of heterogeneous RAN systems.



Features

. Layered HA+FA structure
. Regional location updating + routing

Improvements

. No triangle routing in signaling + bearer
. Homogeneous system architecture
. Minimum MN involvement
. Offers User mobility

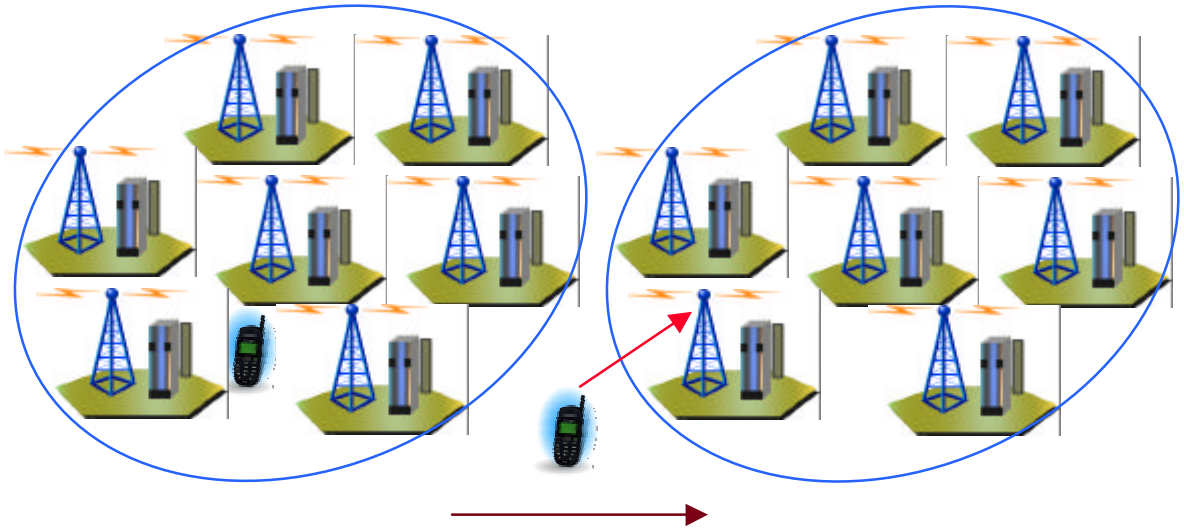
Minimal MN involvement

Trigger: change of Zone ID

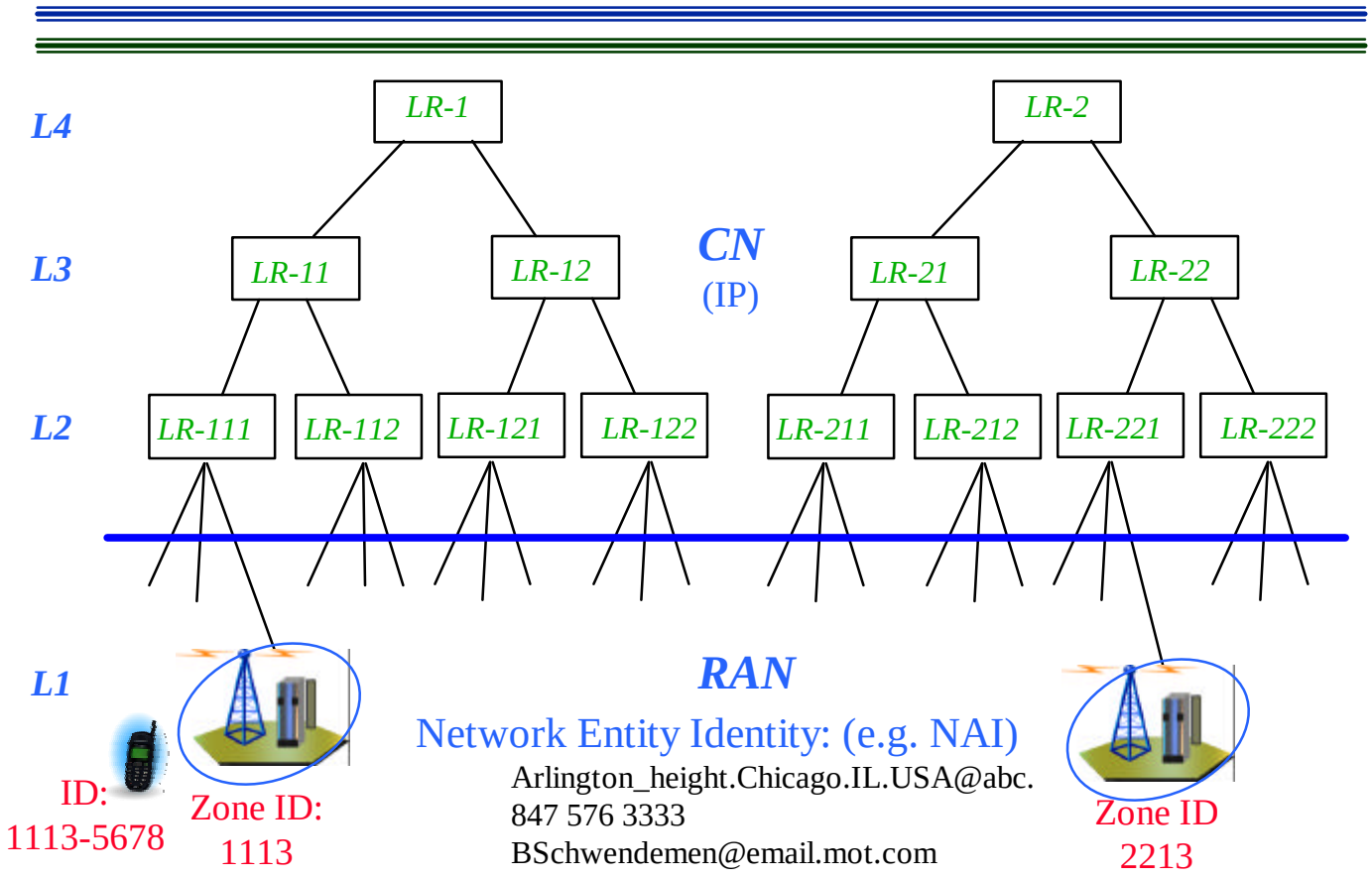
No knowledge on CN architecture details
Not involved in location info update

Benefits for MN

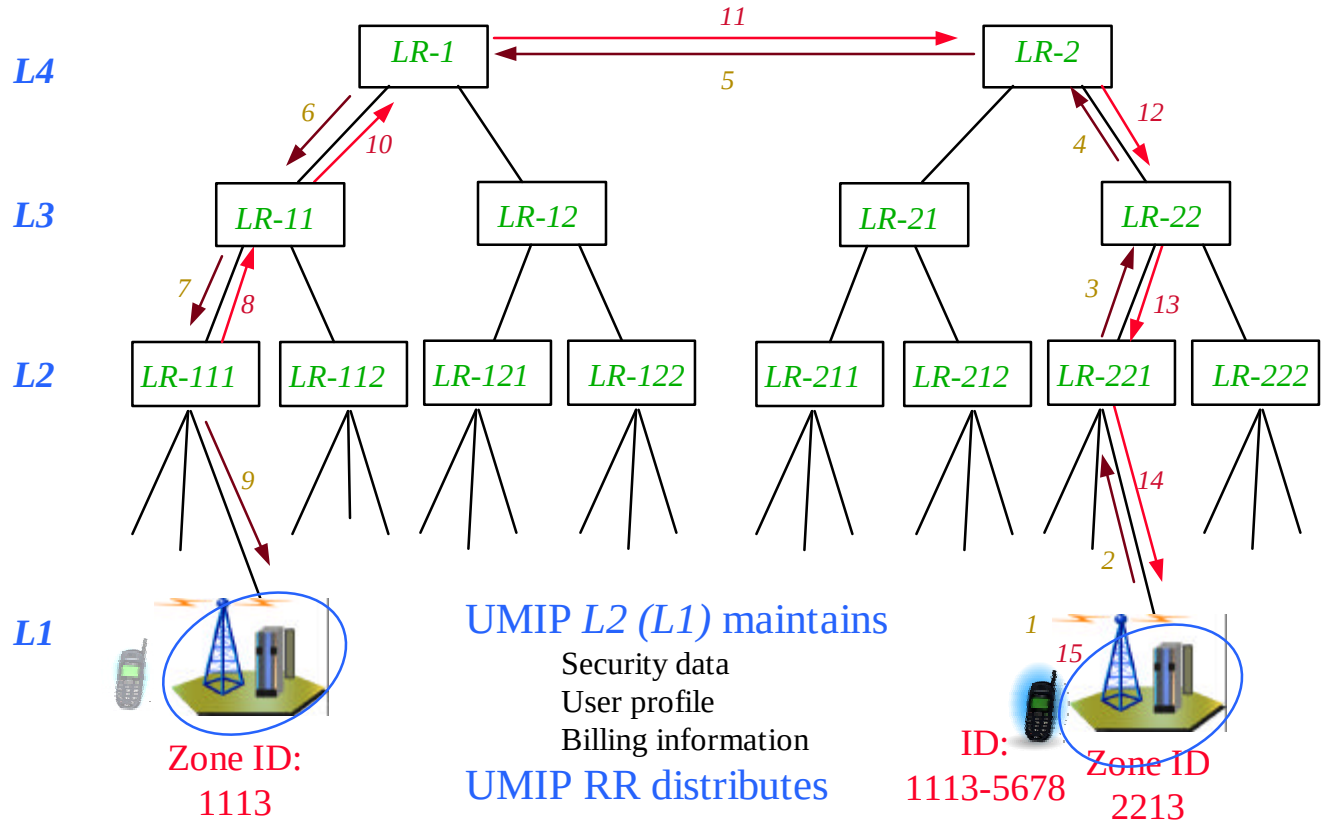
Simplified
Low cost
Long battery life



UMIP Architecture



UMIP Location Chain Setup Process



UMIP LR Table

Key Index	Pointer	Status	Lifetime	Replay Protection

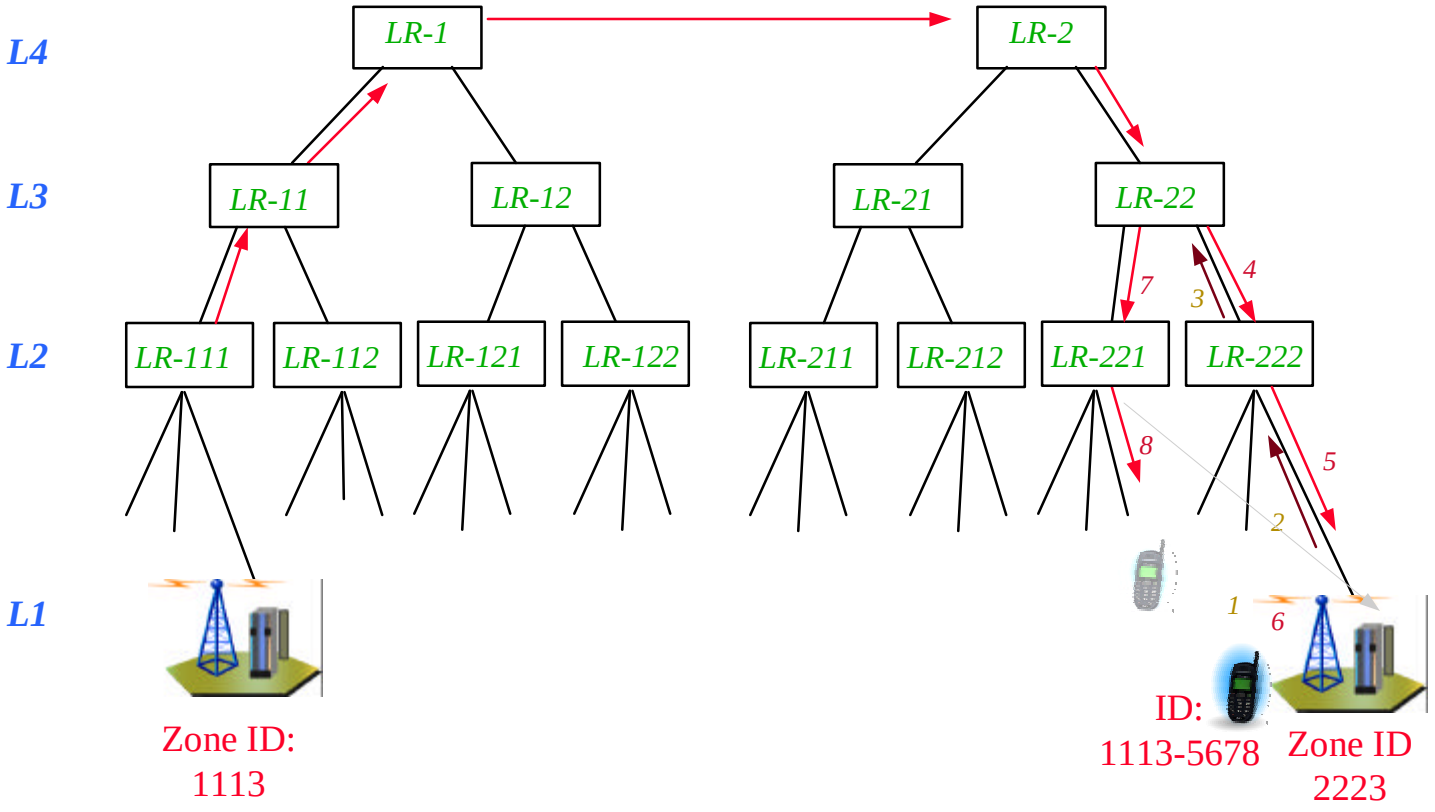
Key Index: UID (NAI)
Pointer: Next hop LR IP address
(care of address)
Status:
- Pending
- Active
- Forwarding

Lifetime: (Time in seconds)
Replay Protection
- Backward compatible

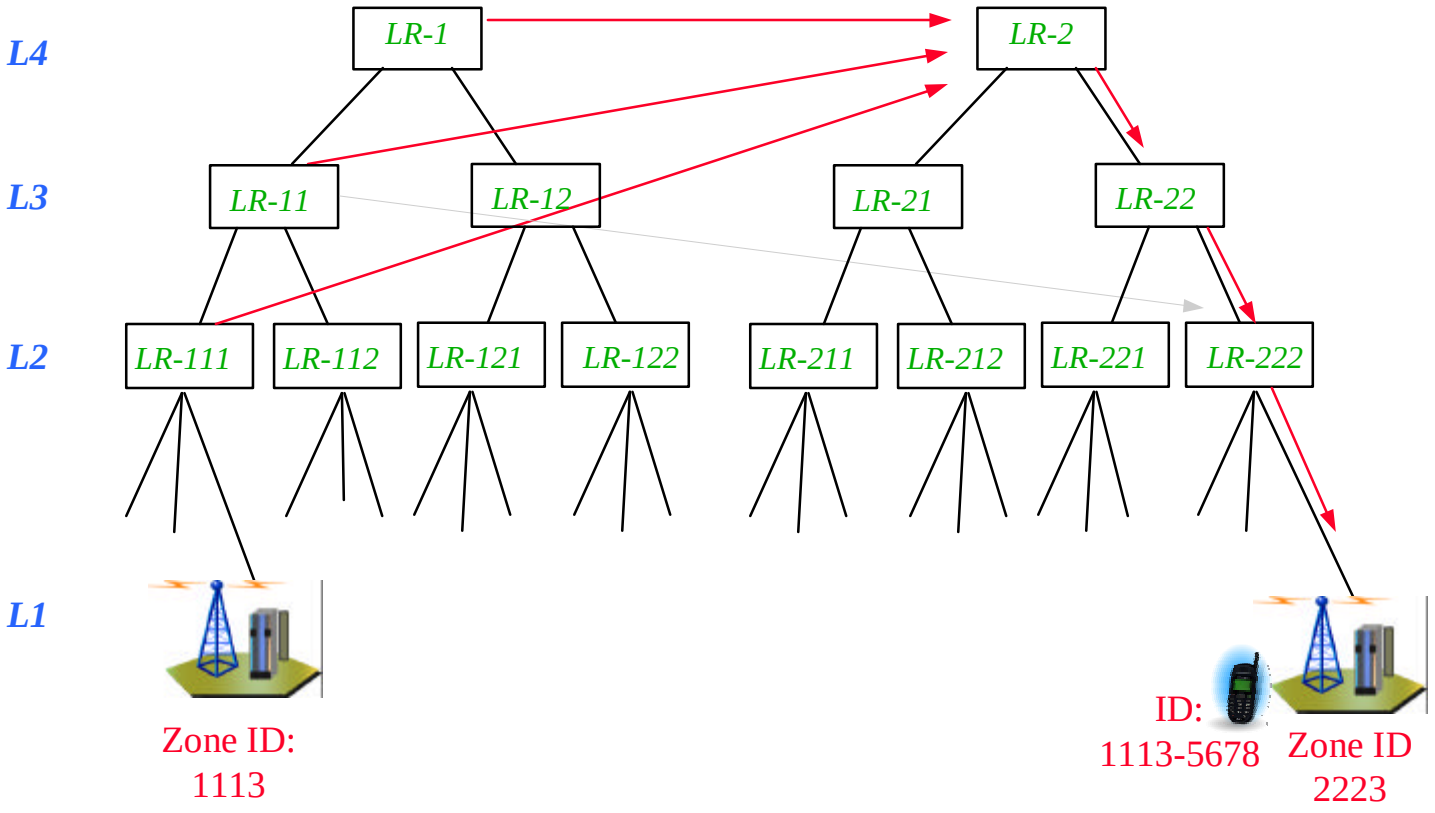
Other Information
- User profile
- Security data
- Billing information

There is a Location Entry only for
- Foreigner
- Native roamer
- Native traveler

UMIP Location Chain Update Process



UMIP Location Chain Optimization



Well Recognized Technology

UMTS applications

- Performance evaluation and architecture optimization [5]
- DDB architecture, process and functional specifications, consistency, reliability, integrity and security considerations, etc. [6]

ATM network applications

- Multi-tree PNNI (Private Network-Network Interface) structure [7]
- Performance evaluation, architecture optimization [7]

Well Supported Technology

Architecture optimization

- V. Anantharam, et.al., DB location selection, Bellcore (1994)
- N. Tabbane, et. al., structure, ESPTT, TUNISIA, (1996)

Performance improvement

- R. Jain., chain, caching strategy, Bellcore (1996-1999)
- J. Ho, et, al. Chain references, NorTel (1997)

Error detection and recovery

- K. Asdal, et. al., Aalborg University, Denmark (1995)

Fault-Tolerant Location Management

- K. Ratnam, et. al., Northeastern University (1996)

Summary

Fully distributed solution: minimal triangle routing in signaling and bearer traffic

Supporting user mobility (UID: e.g. NAI)

Integrated UID mapping, MM, AAA, user profile to support real-time application

Integrated service for heterogeneous access networks

Integrated Macro / Micro Mobility management

Minimum MN involvement

Minimum LR routing table (orders less than host based routing tables [4])

Scaleable and software re-configurable

Compatible with VHE, Dynamic DNS, Dynamic Home Agent assignment, RTM[1], and RO[8]

UMIP is an enabling technology for 3G real-time commercial applications with high QOS, low cost and global coverage

References

[1] E. Gustafsson, et.al. Mobile IP Regional Tunnel Management, draft-ietf-mobileip-reg-tunnel-01.txt

[2] 3GPP, TSG Services and System Aspects; Architecture for an All IP network, 3GPP TR23.xyz V0.1.4 (1999-9)

[3] Proposed Baseline Document for 3GT.IP Call Control and Roaming Models, 3G.IP/99.08.17.XX

[4] J. Wang, The Tracing Strategy for Universal Personal Communication Systems, August 1993, IEEE JSAC

[5] C. Eynard et. al. " A Methodology for the Performance Evaluation of Data Query Strategies in UMTS", IEEE JSAC, VOL 13 NO 5

[6] RACE, MONET, UMTS System Structure Document (Revised), R2066/BT/PM2/DS/P/113/b1

[7] M. Veeraraghavan et. al., "Mobile Location Management in ATM Networks", IEEE JSAC, VOL 15, NO 8, 10/97

[8] C. Perkins, et.al., Route Optimization in Mobile IP, draft-ietf-mobileip-optim-08.txt