

# Mobile IP

Und was die Kunden wirklich wollen



22. Treffen der VDE/ITG-FG 5.2.4

Mobilität in IP basierten Netzen

Deutsche-Telekom-Allee 7

64295 Darmstadt


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# IP Mobility and Mobile IP

IP Mobility means the access to data services from different locations and over different access networks with the same device.

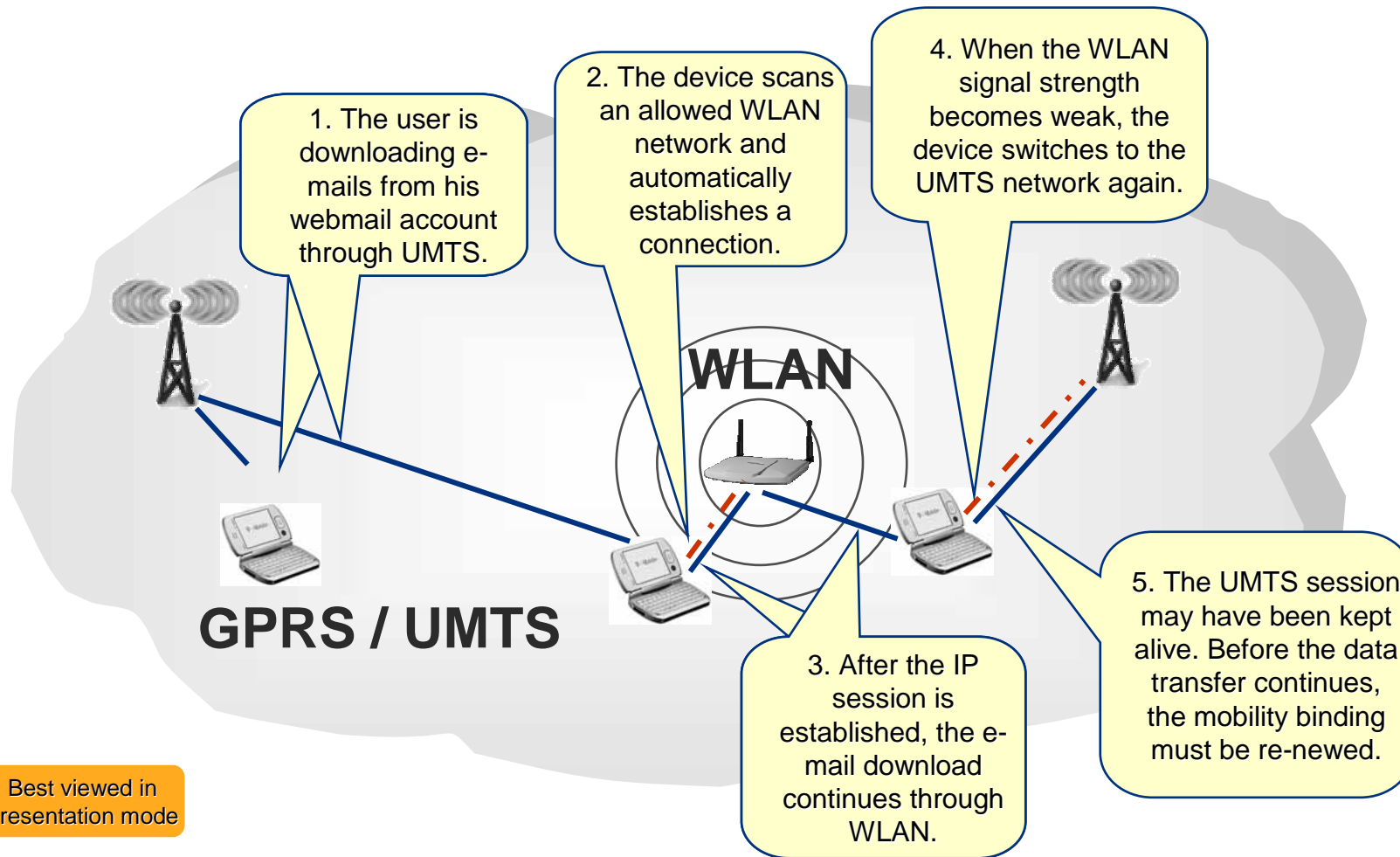
- Mobility across **different radio access technologies**, e.g. GPRS, UMTS, WLAN, WiMax
- Public, residential or corporate networks
- May be supported by network operators on **various levels of sophistication**, from “common bill for different networks” to “seamless continuity of all services”
- **Mobile IP** is an IETF protocol useful as a common denominator supporting the mobility management across networks

- 
- Complements UMTS / HSDPA to provides high-speed wireless data to subscribers.
  - Commercially launched by Mobilkom Austria, Swisscom Mobile, Optus (Australia), ...
  - T-Mobile Germany launched 3GPP R'6 compliant cross bearer mobility service in 2006
  - The total **market potential is uncertain**

# IP Mobility User Experience

## Automatic change of bearers

In the ideal case, the user does not notice the change of bearer, except possibly for a changed download speed. Exact requirements depend on application.

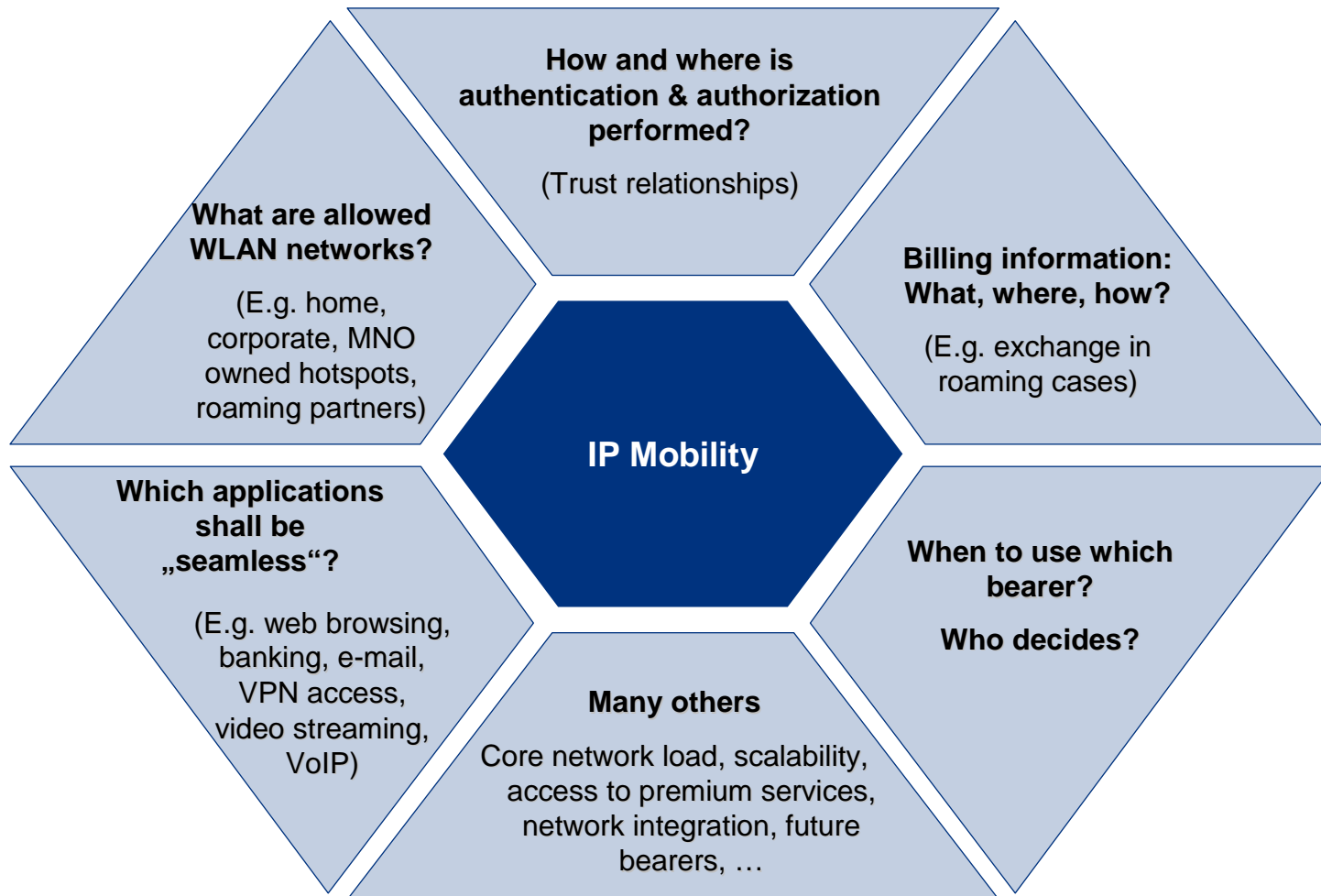


Best viewed in  
presentation mode

# IP Mobility User Experience

Questions to be considered

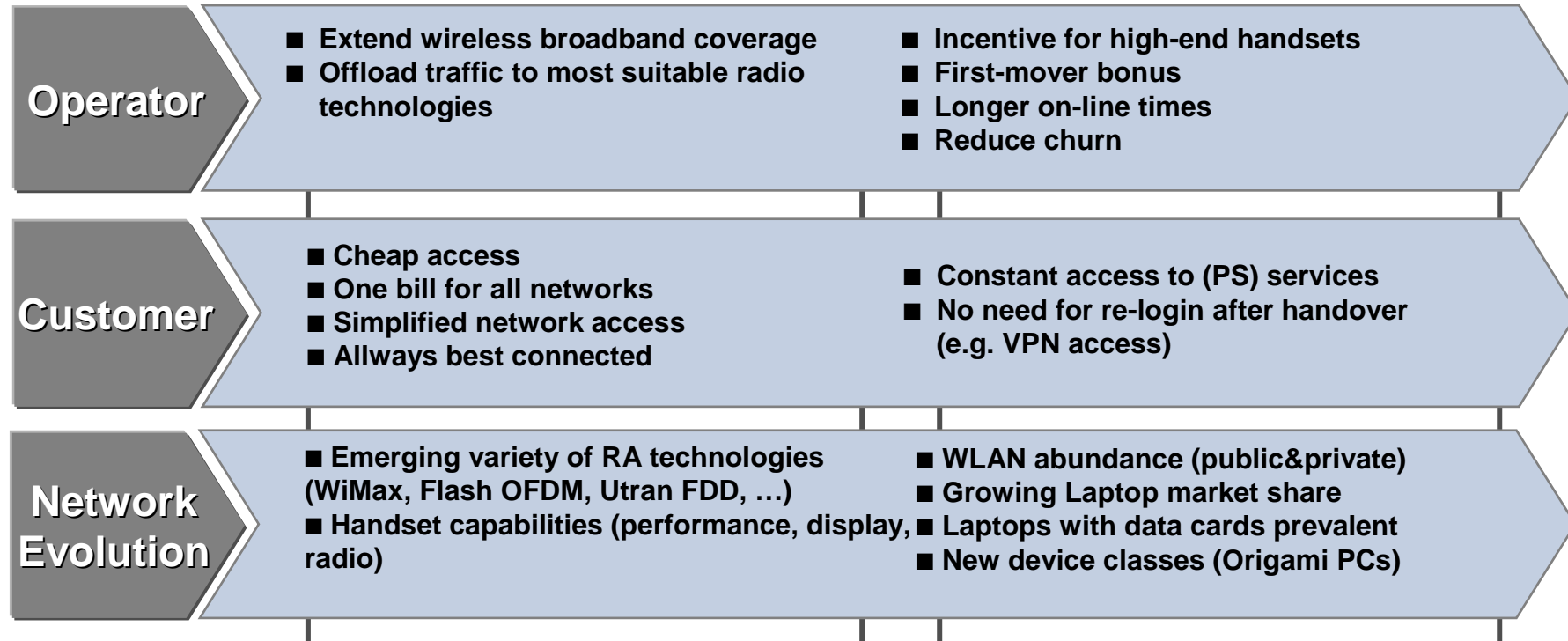
The complexity / implementation effort of the scenario depends on the detailed requirements.



# IP Mobility – Potential Benefits

## Product Analysis

Technologies pushed into the market as well as consumer habits ultimately will make IP Mobility an indispensable commodity.



There is little apprehension for IP Mobility as a service on its own. Therefore, defining the business case is tricky.

# IP Mobility – What You Should Keep in Mind

## Product Analysis

**Currently, a restricted number of subscribers will benefit from seamless mobility. A staged approach limiting initial investment may be most suitable for most operators.**

...The predominant mobile data device is still the laptop. The typical use scenario involves nomadic rather than seamless mobility.

... PDA like handsets with multiple radio interfaces are high-priced and mostly used by business customers. To be considered for tariffing and service selection.

... Client SW may only be available for a subset of suitable devices (e.g. display adaptation, operating system, other HW/FW requirements).

...“Always best connected“ involves a high battery load (e.g. keep alive, network scanning, WLAN procedures) – frequent recharging diminishes positive perception.

... Selection of best available network and automatic log-in can be achieved with a suitable client software and minimal effort on network side.

**Feasibility study has to comprise addressed customer group and the development of suitable tariffing models.**

# IP Mobility

What is needed in which case?

**The need for bandwidth is coupled with the existence of a large display. The need for seamless handover is given for few applications only.**

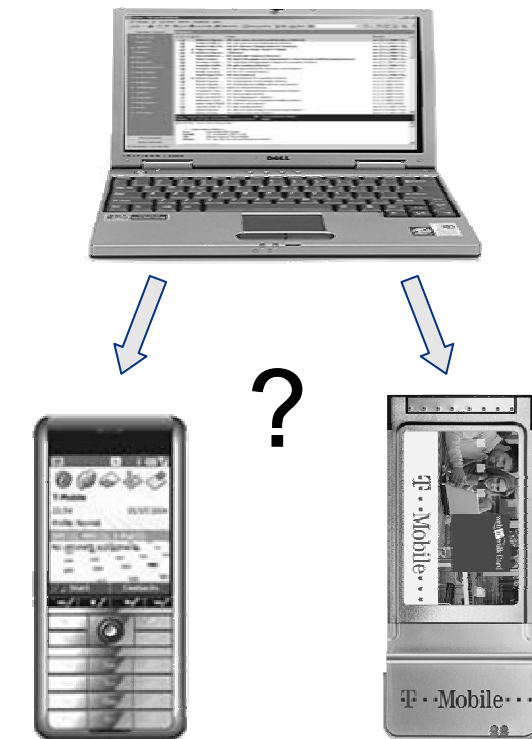
## Basic requirements

Minimum requirements:

- Data speed comparable with DSL,  $\geq 384$  KBit/s
- Coverage at the most interesting populated places
- Easy roaming (national and international)
- Easy handling, simple billing
- Handover is nice to have, re-connection is mainly sufficient

**Several radio bearers are suitable for the mobile broadband service: WLAN, WiMax, CDMA and others**

Why should I connect my PC to the net through my phone



# 3GPP R'6 IWLAN Architecture

SIM based WLAN access



The GSMA is an organization of Mobile Network Operators. The Seamless Access WLAN project addresses basic requirements for WLAN roaming and easy access.

## Participating MNOs



## Project Objectives

- Promote EAP-SIM as the mainstream solution for WLAN user authentication
- Promote the standard to be adopted by hardware and software vendors in order to support the SIM as a means of identification and authentication
- Initiate a multi-access roaming deployment campaign and eliminate remaining technical issues
- Motivate operator and 3rd party deployment of 802.1X in WLAN networks to enable EAP-SIM as the solution for roaming

## Supporting Vendors



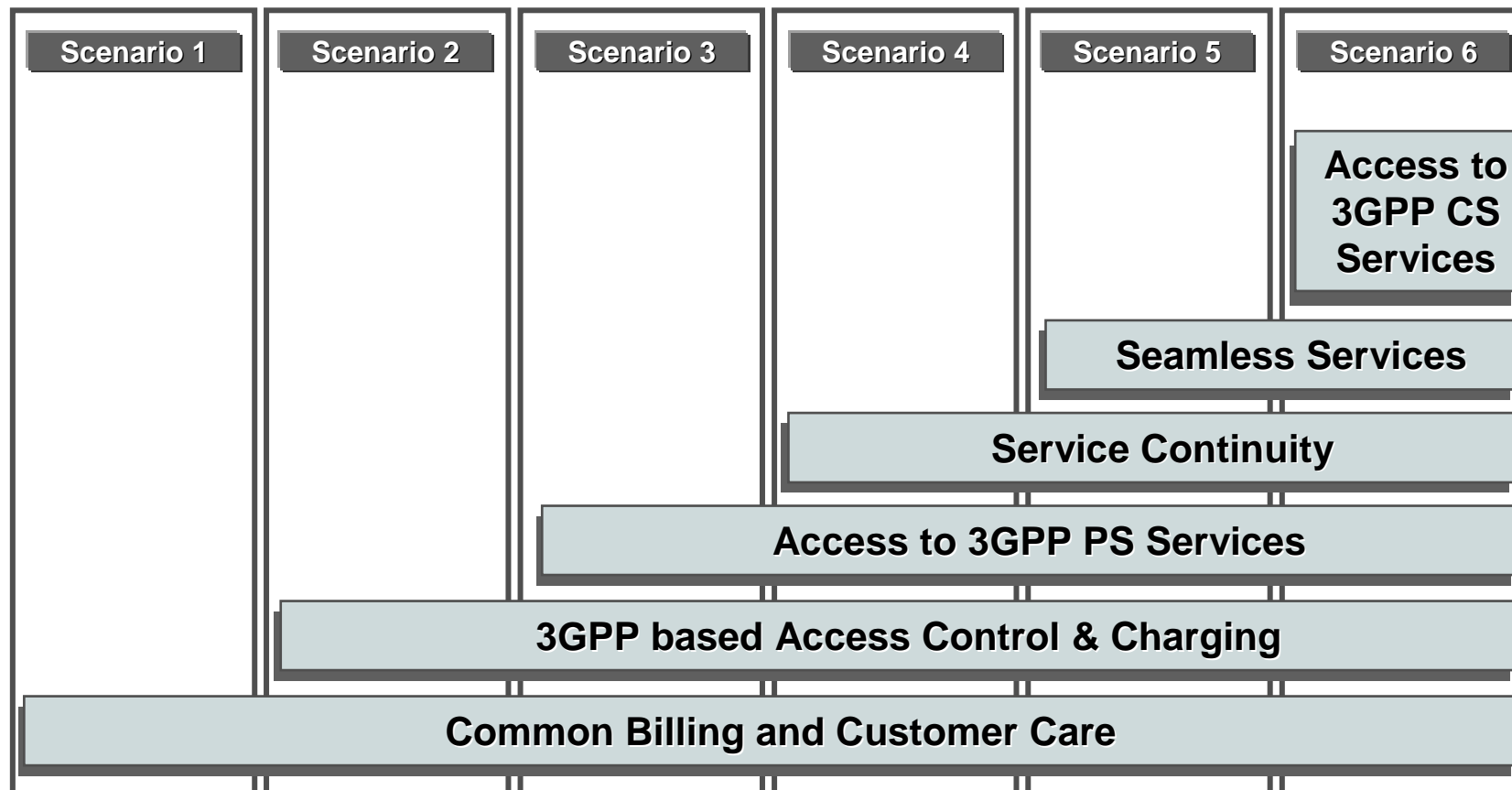


# 3GPP R'6 IWLAN Architecture

Cellular – WLAN Interworking Scenarios



In 3GPP R'6, six scenarios of increasing complexity are defined for the interworking between cellular networks and other radio technologies.



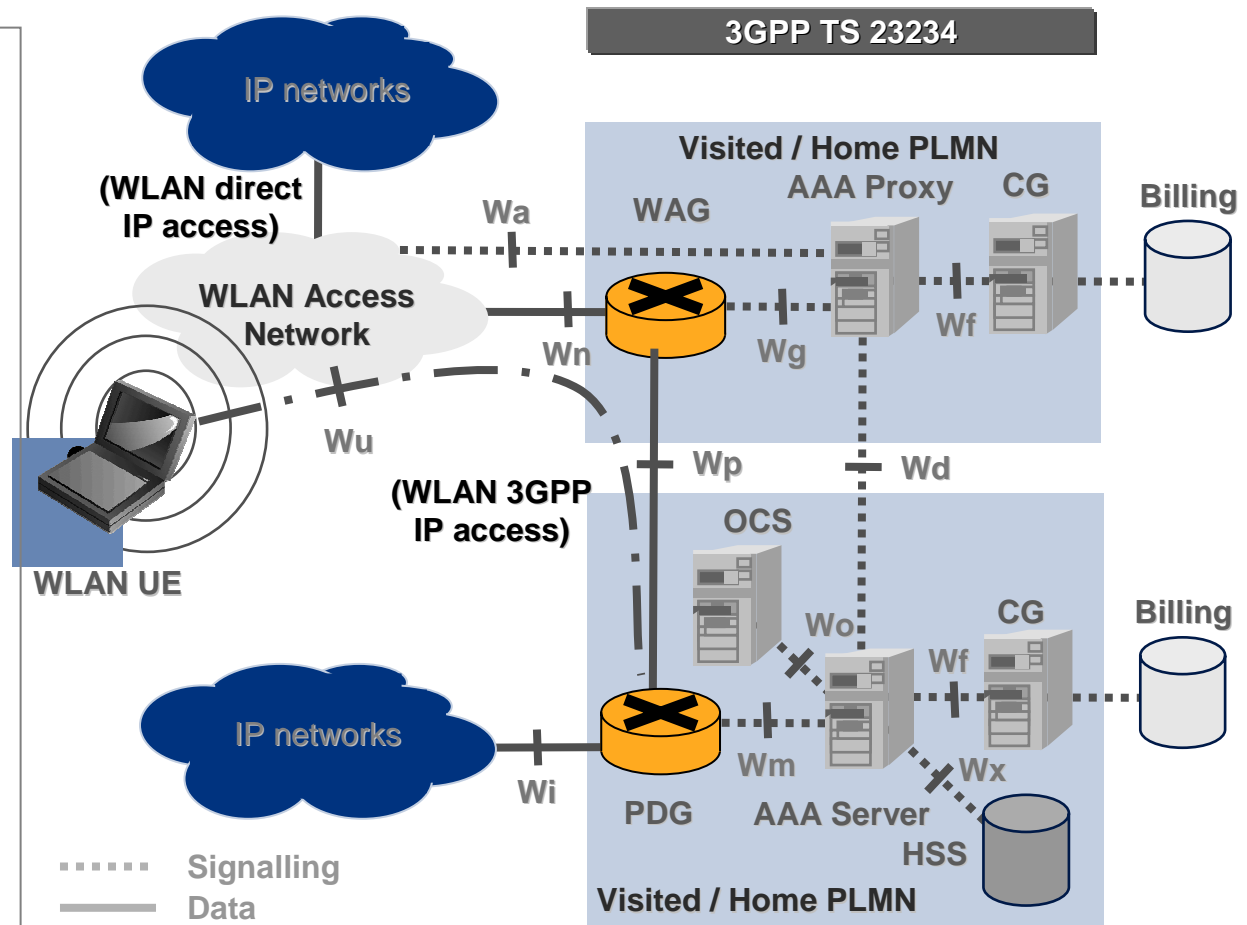
# 3GPP R'6 IWLAN Architecture

Access to 3GPP services via interworking WLANs



The current specifications consider the access through a WLAN isolated from the access through a 3GPP RAN. Re-use of existing functionality is intended.

- **WLAN Access Gateway (WAG):**
  - Filtering & routing enforcement through PDG
  - Accounting information for visited network
  - Policy enforcement
- **Packet Data Gateway (PDG):**
  - Accept / reject sessions
  - Tunnel termination
  - Handling of local & remote IP addresses
  - Traffic filtering & routing
  - Generate charging information (IP flow based)



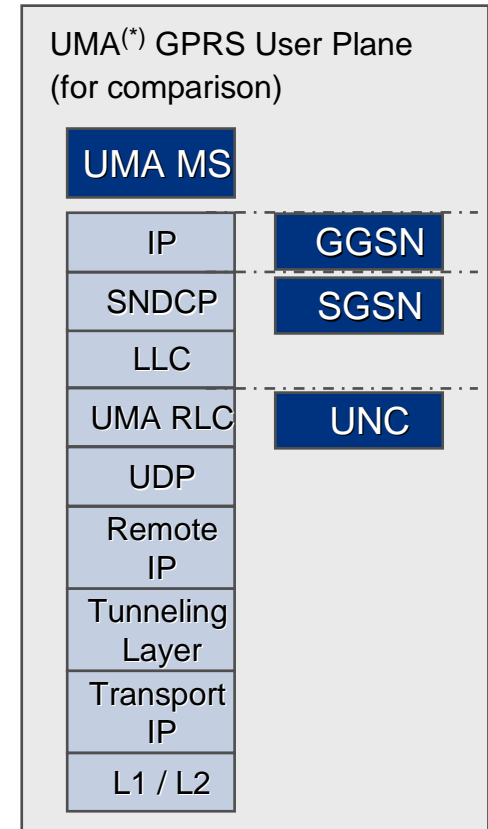
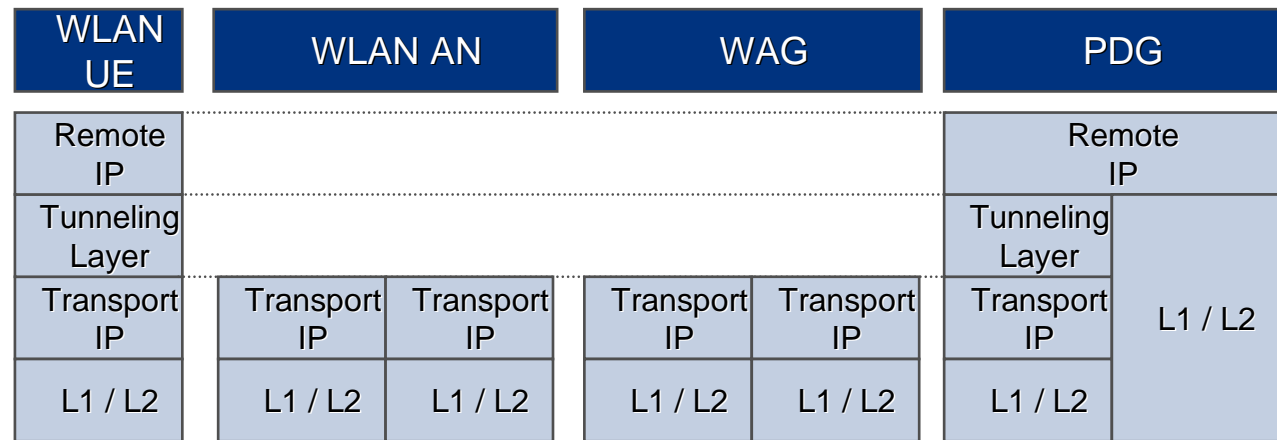
# 3GPP R'6 IWLAN Architecture

IWLAN protocol stack



The WLAN 3GPP IP session is hidden for the transport networks by encapsulation in a secure tunneling layer between WLAN UE and PDG.

- Lower IP layer only has local significance ( local IP address)
- Remote IP address handled / assigned by PDG
- IPsec (ESP) used as the tunneling / encryption protocol
- **Note:** MIP tunnel inserts additional layer above the **Remote IP** layer



(\*) By Alcatel, AT&T Wireless, BT, Cingular Wireless, Ericsson, Kineto Wireless, O2, Nokia, Nortel Networks, Rogers Wireless, Sony Ericsson, Siemens, T-Mobile USA. Now fully transitioned to 3GPP GAN.

# 3GPP R'6 IWLAN Architecture

Re-use of existing GGSN

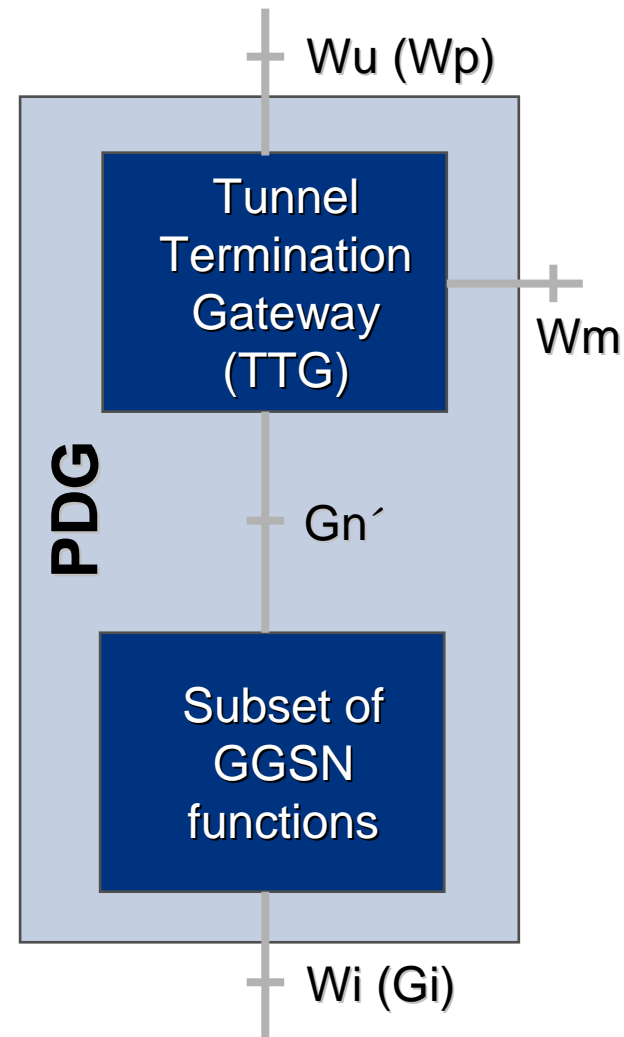


An important part of the PDG functions is identical to corresponding GGSN functions. Re-use simplifies network integration (e.g. billing).

- User authentication & authorization
- End-to-End tunnel establishment with UE
- PDP context handling towards GGSN (SGSN like)
- One-to-one mapping of E2E tunnel into GTP tunnel



- Remote IP address allocation
- Authentication towards external networks
- Charging Gateway interface
- Single access to 3GPP PS domain services
- Online / offline service data flow charging

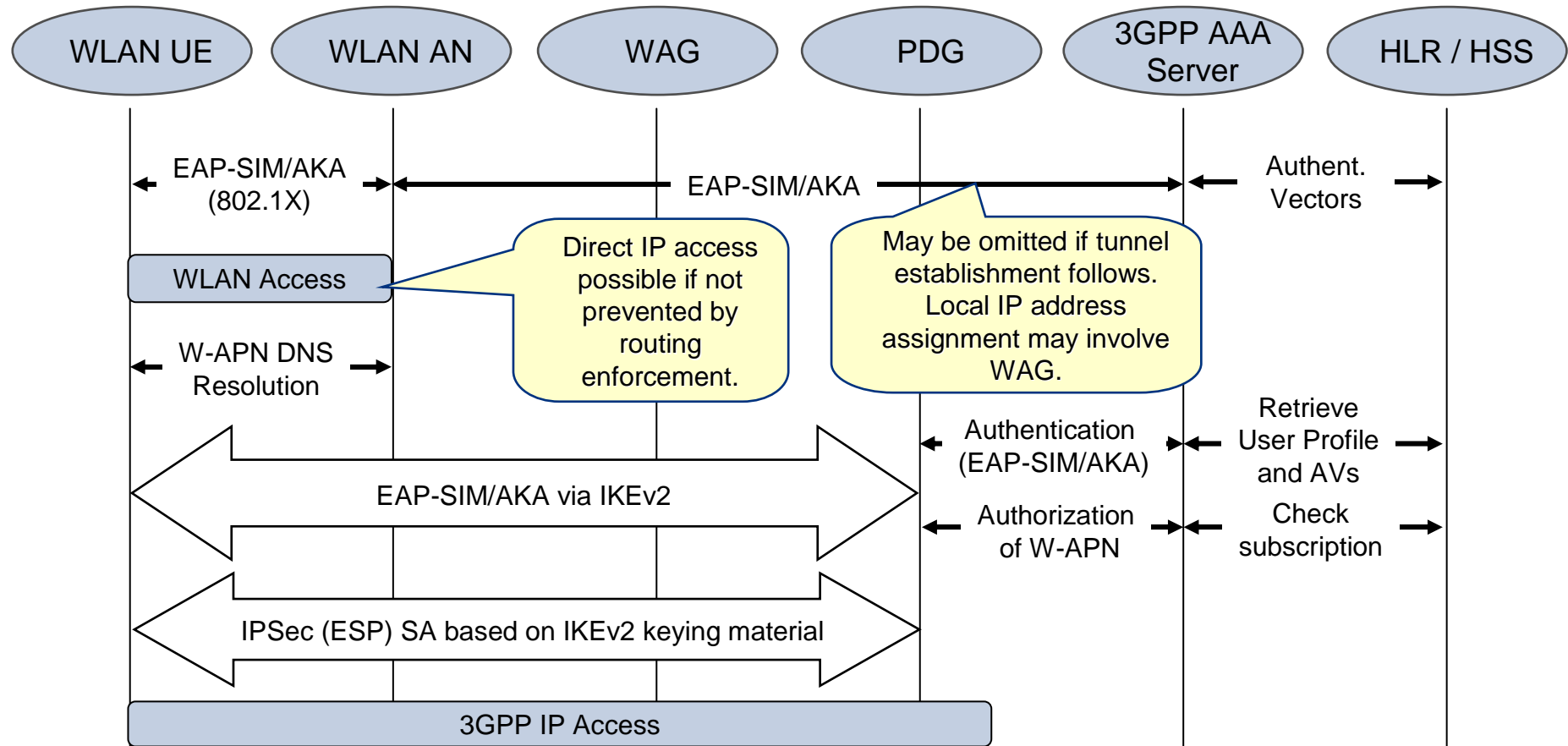


# 3GPP R'6 IWLAN Architecture

Tunnel establishment procedure (Home Network)



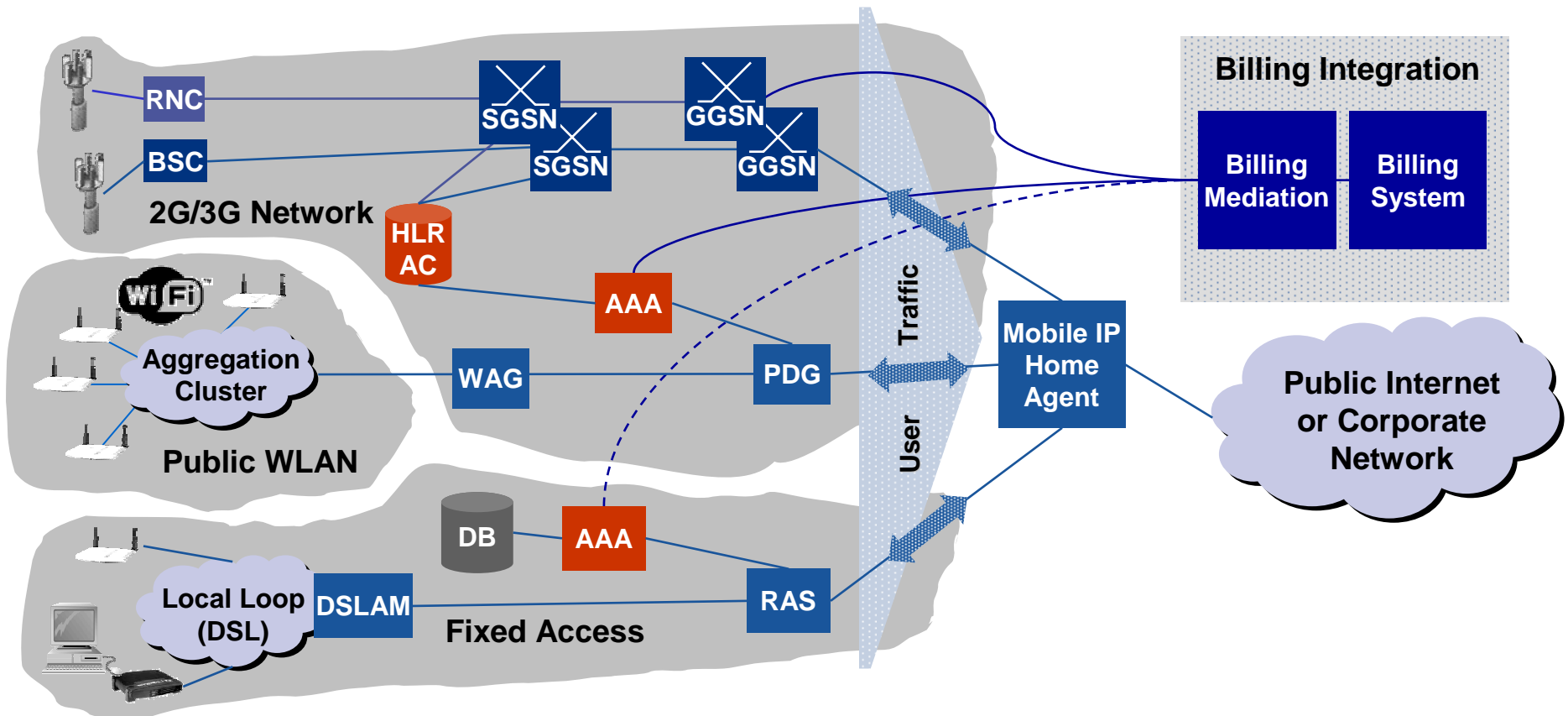
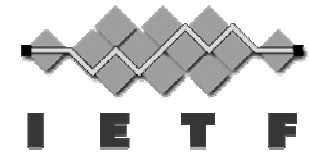
Automatic session establishment using validated security protocols based on SIM or USIM.



# 3GPP R'6 IWLAN Architecture

The mobility bracket across access networks

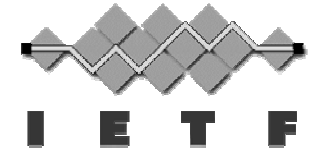
With Mobile IP, the Mobile Node appears to the outside world at the same IP address independent of the current access network.



Mobile IP does not integrate network functions for user authentication, user authorization, access control, policy enforcement and charging.

# 3GPP R'6 IWLAN Architecture

Candidate for IWLAN mobility management



Mobile IP it is considered sup-optimal in several aspects.

## Advantages of Mobile IP

- Well established base standard. Integrated by default in IPv6.
- In use supporting mobility management of Flash OFDM and CDMA 2000.
- Mature technology from a multitude of vendors allowing realization of services in short term.
- Terminal devices integrating different access technologies are available.
- Mobility across access networks can be added without impacting existing network infrastructure.

## Drawbacks of Mobile IP

- Replicates functionality that is already available in GPRS; introduces overhead.
- The handover decision is left to the Mobile Node / client software
  - May lead to inefficient resource usage
  - Difficult to optimize for all use cases
  - Operator has to give up control.
- Additional effort for (content) billing and lawful interception.
- Load sharing concept still under discussion.
- No QoS management within MIP tunnel

Future integration in 3GPP IWLAN unclear. Opposed by some operators.  
Alternatives: GTP extension or NETLMM (NTT DoCoMo).

## The implemented solution

T-Mobile "Cross Bearer Mobility" Project

**T-Mobile planned to launch a Scenario 4/5 compliant product in Germany in 2006. Finally it was not promoted.**

- 3GPP IWLAN compliant approach
- Mobile IP used for mobility management.
- Pilot launch in T-Mobile Germany Q3/2006.
- Provides service continuity through GPRS, UMTS / HSDPA, Public WLAN (>5000 T-Mobile / T-Com hotspots), residential access.
- Client SW for Laptops and Windows Mobile 5.0 Smartphone (MDA Pro / MDA Vario II)
- Is available to subscribers of "**Web'n'Walk XL**" data tariff (quasi flat rate)
- **Involved vendors:** Nortel Networks (Home Agent, integration & project management), Azaire (TTG, AAA & client SDK), Aramova (Laptop client GUI), V2R (Windows Mobile 5.0 client GUI)

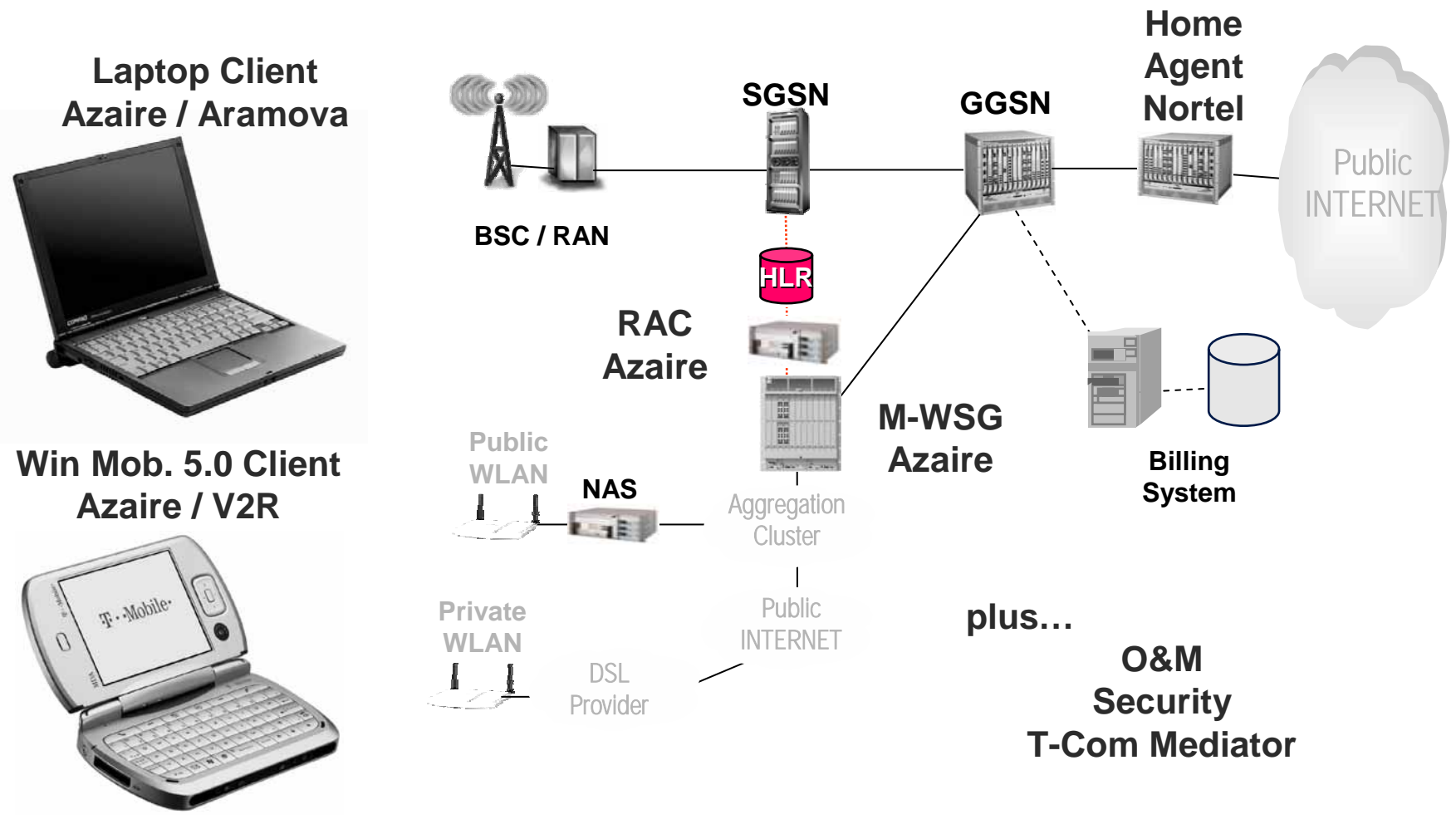




# The implemented solution

Additional Network Components

Cross Bearer Mobility is implemented by adding three core components to the T-Mobile network.



Laptop Client  
Azaire / Aramova



Win Mob. 5.0 Client  
Azaire / V2R

# Summary

**Technologisch ist heute fast alles möglich. Die Herausforderung besteht in der Sicherung der bestehenden und der Erschließung neuer Märkte**

## **Funktechnologien haben einen ungeahnten Reifegrad erreicht, Mobile IP verbindet verschiedene Träger**

- Mit der Kombination verschiedener Funktechnologien (z.B. WLAN, DVB-T oder DVB-H & GSM/UMTS) lassen sich interaktive Breitbanddienste kostengünstig realisieren. Der Schlüssel zu ihrem kommerziellen Erfolg liegt jedoch weit entfernt von den technischen Details der Funktechnologien in Marketing- Preis- und Dienstkonzepten.
- Mobile IP für die Realisierung von Handovern in der Sprach- oder Videokommunikation ist sehr ineffizient.
- Korrektes Billing verursacht einen enormen Aufwand in der Netzlast und –architektur, der in keinem Verhältnis zum Mehrwert für den Kunden steht.
- Den meisten Kunden genügt ein sauberes Sprachnetz einerseits und ein automatischer Verbindungsaufbau der Datenanwendungen beim Wechsel des Trägers

## Kontakt



**Herzlichen Dank für Ihre Aufmerksamkeit  
und Ihre interessanten Diskussionsbeiträge**



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