

AlbatrOSS

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Architecture for Location Based Applications of Third generation Operation Support Systems

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ABSTRACT

This report represents a milestone and signals the initiation of the first series of Albatross trials. The report describes an overview of the 3G OSS Services and Components that are featured, demonstrated and validated through the First Albatross Trial. The OSS platforms and components described within this document are reported to be ready for integration into Albatross Trial 1.

KEYWORDS

Trial Infrastructure, Trial Sub-systems, 3G usage scenarios

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1 Introduction

This report represents a milestone and signals the initiation of the first series of Albatross trials. The report describes the 3G OSS Services and Components that are featured, demonstrated and validated through the First Albatross Trial in an overview form. The OSS platforms and components described within this document are reported to be ready for integration into Albatross trial 1.

Based on the business context, scenario descriptions and 3G OSS requirements defined by Albatross work package two, the first series trial seeks to test and validate specific areas of the first version of the Albatross Architectural Framework.

Trial 1 is sub-divided into four trial sub-systems that will feature 3G OSS Services and Components within the areas of

- ?? 3G Service Delivery
- ?? 3G Service Billing & Rating
- ?? 3G Service Usage
- ?? 3G Service Roaming between different Network Technologies

This report provides a functional overview of each of the trial sub-systems as well as highlights of the main usage scenarios for each of the systems. The usage scenarios are all derived from a common storyboard, which is described in chapter 2.2.

Details of the trial sub-systems and their associated usage scenarios are provided in the Albatross system specification document, “Albatross System Specification for trial 1”, E1.

Test cases, evaluation criteria and evaluation results will be provided in Albatross deliverable D6, “Evaluation of the Trial System Version 1”.

2 Trial System Overview

The trial sub-systems to be validated within the first Albatross trial consist both of pre-existing OSS components and OSS components developed within the Albatross consortium. Based on the Albatross Architectural Framework, the defined business context and the 3G service usage scenarios, the Albatross partners have selected a set of OSS functionalities and components, which will serve to validate the Architectural Framework, but also serve as a vehicle for further specifying and detailing the Framework.

2.1 3G Services and OSS Functionality

The OSS systems and components brought into the first trial seeks to exemplify, highlight and validate key 3G OSS functionality, which are derived from a selection of the 3G service usage scenarios as defined and described by the Albatross scenario description working group.

The figure below provides an overview of the featured OSS components and functionality as well as the network and service infrastructure making up the Albatross test bed.

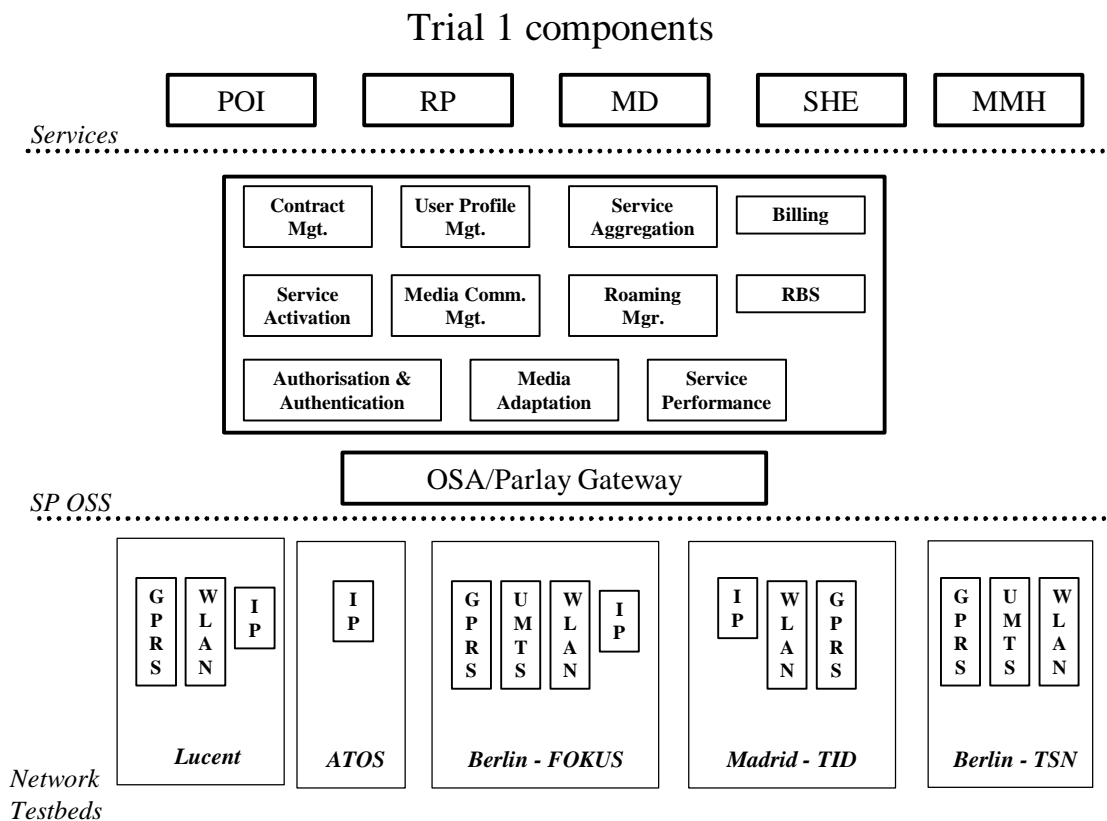


Figure 1. Trial 1 Functional Overview

Each of the Trial sub-systems is based on the concept of a 3G Service centric OSS and will implement features related to the OSS of a 3G Service Provider. Figure 1 illustrates the main OSS components of the first Albatross trial. Each of the illustrated components is detailed further in the descriptions of the trial sub-systems.

As can be seen in Figure 1, a number of different network technologies are featured in the Albatross test bed including UMTS and GRPS networks and OSA/Parlay gateways are used to access, control and use a number of network services, including user location, charging and account management.

Also shown in Figure 1 is a set of 3G Services, which are used to drive the trial sub-systems scenarios. The following 3G Services are used in Trial 1:

- ?? **POI:** A Point Of Interest Service capable of providing information about points of interest based on the present user location
- ?? **RP:** Route Planner Service capable of offering route-planning services based on the present user location
- ?? **MD:** A Mobile Dating Service
- ?? **SHE:** A Smart Home Environment that allows for mobile online access to Smart Home features and services
- ?? **MMH:** My Mobile Home is a service that allows users access to their e-mails and local information via GPRS/UMTS and WLAN hotspots.

The 3G Services demonstrated in trial 1 are further described in subsequent chapters of this report.

2.2 Story board

The usage scenarios and business context for each of the trial sub-systems are built around a common story board, which has been devised in order to provide a context to be used for highlighting sub-system functionality and usage patterns. The overall storyboard involves two business travellers, Jack and Jill, using various 3G services for both business and leisure purposes.

2.2.1 Jack and Jill scenario

Jack and Jill are currently advising on the modernisation of the water system for a rural community and are attending meetings in Brussels to negotiate EU financial support for this modernisation under its Rural Community Modernisation Programme. The negotiations last several days, during which they need access to papers and presentations as well as to their normal email, fax, and other messages that they receive when in the office. They use the Office Assistant Service to ensure that their messages can be received and sent on whatever terminals they are using, whether in a meeting with others, in private discussions with each other, or when working on further presentations.

After the first day of negotiations, they participate in a group conference with colleagues from the office as well as with those on site in the rural community in order to update and be updated before the second day of negotiation. This is a multimedia group broadcast and all participants can look at the presentation material. Jack and Jill also need to update some of the documents in order to take account of the results of the discussions, both in Brussels and as a result of the group conference. For this, they need access to certain statistical and financial documents, as well as to specialised maps and drawings. They can use the Personal Folder

Service to obtain the documents they need. They are subscribed to a specialised graphical and statistical applications as well as a more general editing application that they use to revise their discussion documents and to update their presentation, which is to be given the following day.

On the second day, Jill receives a message about a change of plans after the meeting in Brussels. She is being asked to fly to Madrid to participate in a water consultancy project that has developed problems, which requires her expertise. She uses the Travel Assistant Service to alter her flight schedule and to book a hotel in Madrid. On the third day, Jack is asked to stay for a further day to work in a specialist taskforce. He needs to contact his colleagues regarding this change of plan as well as download specific documents on the subject under discussion. He also needs to use the Travel Assistant to change his flights. Jack and Jill can both receive information on any change to flight times and gate numbers, as well as use electronic ticketing and boarding passes.

Before leaving for the airport, Jack and Jill use the Travel Assistant to get information on how to reach the airport with public transportation. When they arrive at the airport, they find their way thanks to an internal map of the airport, which is delivered to their PDAs.

Jack and Jill can also use recreational services on their PDA, such as finding a restaurant of their choice in Brussels, obtaining the weather forecasts for Brussels and Madrid, obtaining location-based shopping information, etc. Jill is interested in playing tennis one evening but she does not know anyone in the city. She uses the Mobile MeetMe service to search for a tennis player for that evening. She finds information about another woman who is willing to play tennis that evening. After a couple of exchanged messages, they agree on the time and place and Jill gets the directions to the tennis court via the route planner.

Before Jill leaves for the tennis court, she wants to check if everything is okay at home. With her laptop, she logs into her Smart Home service (through the hotel WLAN hotspot) to use her HomeCam to check on her kids. She also uses several other Smart Home services including the TV Automation service to switch off the T.V. in her kid's room.

3 Trial Sub Systems

3.1 Delivery of Integrated Services (DIS sub-trial)

3.1.1 General description

The DIS sub-trial aims at building and validating the core infrastructure of a service delivery system, whose main component corresponds to ATOS' Service Delivery Platform (SDP). This core infrastructure will implement a simple scenario that will be explained below. This scenario has been defined to enable the validation of the approach.

For AlbatrOSS trial 1, the SDP prototype will implement the following functions:

- ?? *Aggregation of services provided by content/application service providers into integrated services:* The SDP will aggregate a Network Service and a Location Based Service (LBS). Information coming from the network will be used to provide the user with location-based content.
- ?? *Transparent access to end-user services:* SDP prototype will integrate OSA/Parlay client to separate the service level from the network level.
- ?? *Presence & Availability Management:* SDP will provide a GUI to the user enabling to select preferences and OSA/Parlay will report information to the SDP concerning user status.
- ?? *Service adaptation:* The prototype will implement core functionalities to support the terminal adaptation process. This will only be illustrated on one terminal type.
- ?? *Easy integration to other NGOSS components like ordering and billing:* SDP will rely on the Shared Information Model that defines all the related information.

3.1.2 Scenario description

The stakeholder model is the following:

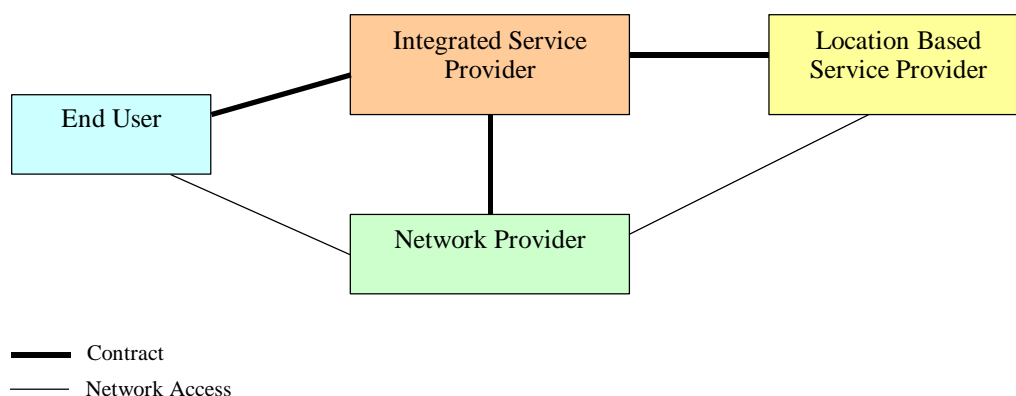


Figure 2: DIS sub-trial: Roles and Relationships

End-user: The end-user interacts only with the Integrated Service Provider in terms of Business Relationships.

Integrated Service Provider: It provides a focal point to the end-user for accessing services.

Network Provider: It provides network access services to the other stakeholders, as well as access to network resources and control information, through the OSA/Parlay gateway, to the Integrated Service Provider.

Location Based Service provider: It provides POI (Point of Interest) and RP (Route Planning) services to the Integrated Service Provider, which one will integrate these services for delivery to the end-user.

Scenario context: Jack and Jill are lost in a city and need to go to the airport very quickly. Their company subscribed to Travel Assistant services for remote workers with an Integrated Service Provider. Jack contacts this service from his mobile terminal.

The following items will be shown in DIS sub-trial:

1. Jack can request the map of his position with specific Points Of Interest, according to his preferences.
2. Jack asks for an itinerary to reach a specific place (an airport for instance) by bus. He also wants to know the different bus stops, the timetables and possibly to receive a map of this itinerary.
3. In order not to be disturbed while on the bus, Jack has configured his PAM in such a way that he will only receive important calls when he gets in the bus.
4. When approaching the destination (airport), he receives a detailed map of the place (a map of the terminals for instance). The map will directly be displayed on the user's phone.

3.1.3 OSS functionalities

This sub-trial will involve two services provided by an LBS platform: POI (Point of Interest) and RP (Route planning).

The trial will use an IP network infrastructure and will be run at ATOS (France) and Lucent (Netherlands). The software platform is completed using TID-Boecillo software adapters.

Three OSS components, as defined in the figure below, part of the *ATOS SDP*, have been developed and used for the sub-trial:

- ✎ Media-Communication Management is in charge of managing communications between end-user device and services.
- ✎ Service Aggregation is in charge of aggregating and integrating information provided by services (LBS and OSA/Parlay) and to present this as one integrated service to the end-user.
- ✎ User Profile Management is in charge of dealing with User Profile information allowing management of user preferences for Presence and Availability.

TID-Boecillo has developed *adapters* that allow accessing the OSA/Parlay gateway (Lucent platform: MiLife) from the ATOS SDP software platform.

MiLife (including SDK and ISG Simulator), Lucent OSA/Parlay Gateway, will be used for supporting and simulating the interactions between the network and the SDP.

Services used in this sub-trial are LBS, some of these services are running on the sub-trial testbed (*Opteway LBS platform, OpteGo*) and others are external web sites.

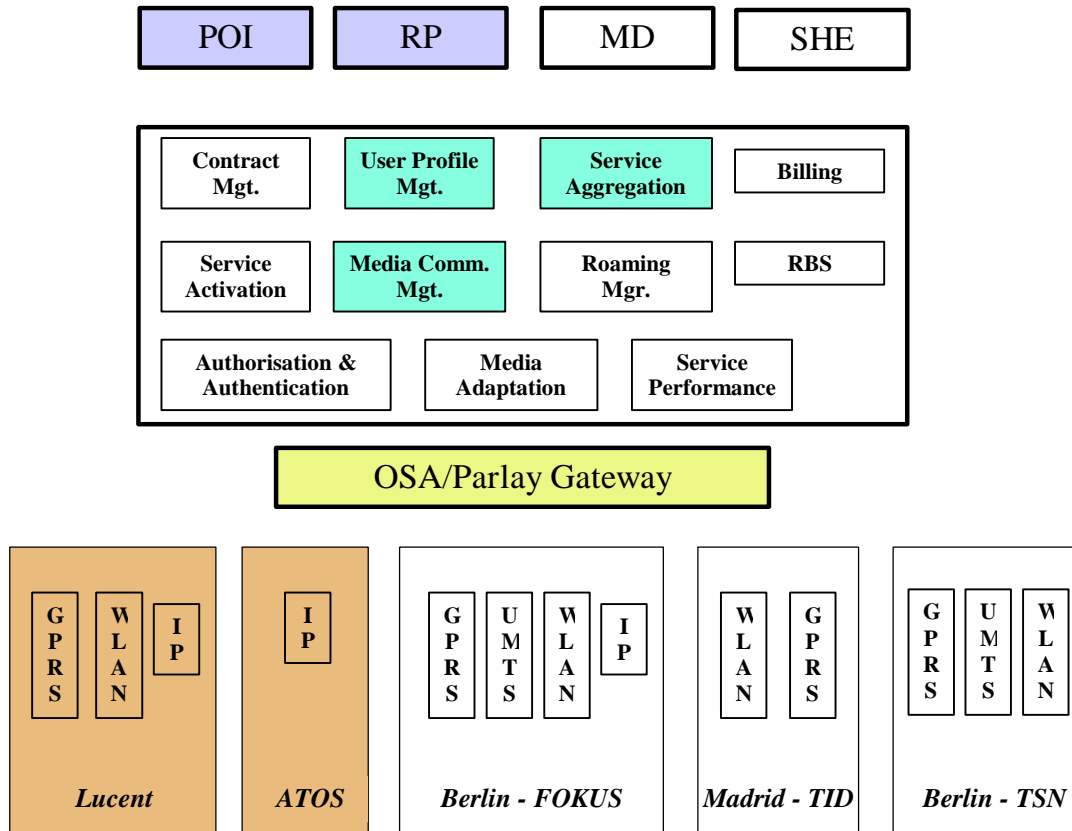


Figure 3: DIS sub-trial components

3.1.4 System Implementation and Components

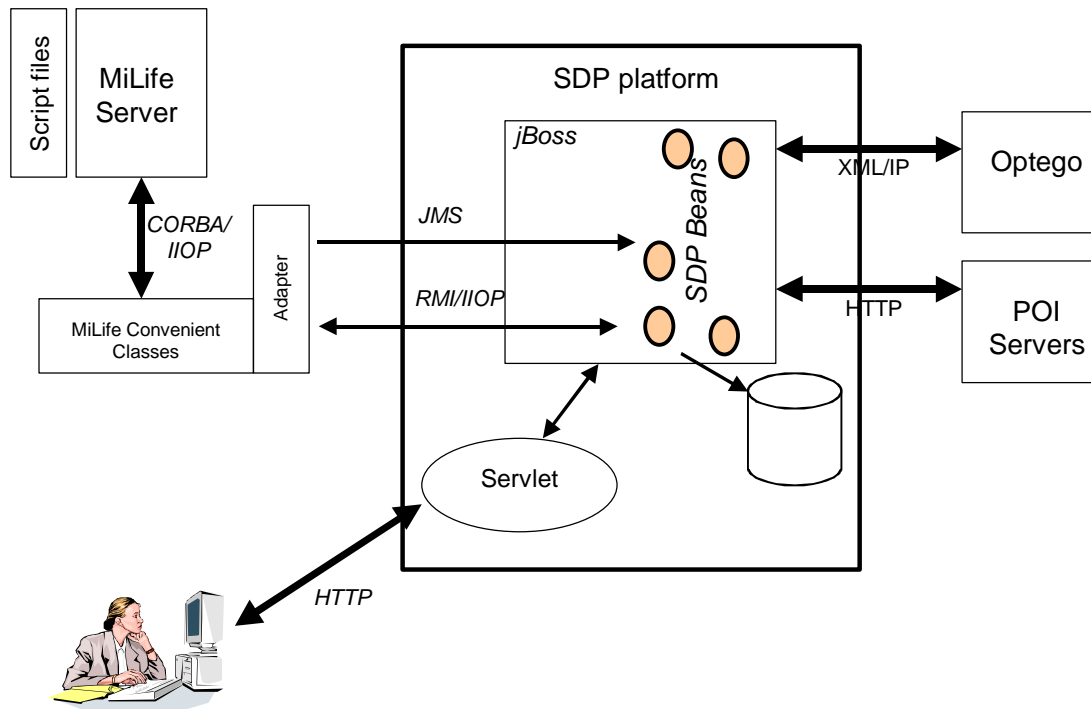


Figure 4: Components for DIS sub-trial

Figure 4 defines the main components and interactions used for running DIS sub-trial.

3.1.4.1 Hardware infrastructure

The testbed hardware infrastructure includes:

- ✍ Three PCs, 2 running Windows 2000 and last one running Unix (256 Mb RAM)
- ✍ Connection of the PCs to an IP network

3.1.4.2 Software Infrastructure

External Software/version

Product	Version	Comments/Purpose
Windows 2000		OS for two of the PCs
Linux	V7.2	OS for the PC running OpteGo
J2SDKEE	V1.2.1	Java environment
Jboss	V3.0	Application server
TomCat	V4.0.4	Servlet server
OpteGo	V3.0	Opteway LBS platform

3.2 3G Service Usage

3.2.1 General description

The 3G Service Usage sub-trial is intended to validate solutions to a number of OSS issues identified by the AlbatrOSS project, namely:

- ?? Service provisioning & monitoring
- ?? Service access
- ?? Service roaming
- ?? Location based services
- ?? Dynamic content adaptation based on terminal capabilities
- ?? User profile exchange

The sub-trial is concerned with providing OSS support to Mobile Portal service providers offering 3rd party services to roaming users. The main components that are being integrated in the scenario are the location-based Mobile MeetMe service, the Portal Framework, and the UMTS Testbed, including a WLAN. The aim of the sub-trial is to test the integration of the components and to evaluate the OSS functionality provided by the Portal Framework in a roaming scenario.

3.2.2 Scenario description

The sub-trial scenario assumes two Mobile Portal Service Providers, MPSP_NL in the Netherlands and MPSP_GE in Germany, each associated with a Mobile MeetMe service provider, MMM_NL and MMM_GE respectively. The Mobile MeetMe service is location based and also country specific so that, for example, users in Germany need to use the German Mobile MeetMe service to search for German dates in the area.

In the sub-trial scenario, the mobile end users Jack and Jill are roaming from their home network and service provider in the Netherlands (MPSP_NL in combination with MMM_NL) to Germany. Jill is interested in playing tennis one evening but she does not know anyone in the city. She uses the Mobile MeetMe service to search for a tennis player for that evening. She finds information about another woman who is willing to play tennis that evening. After a couple of exchanged messages, they agree on the time and place.

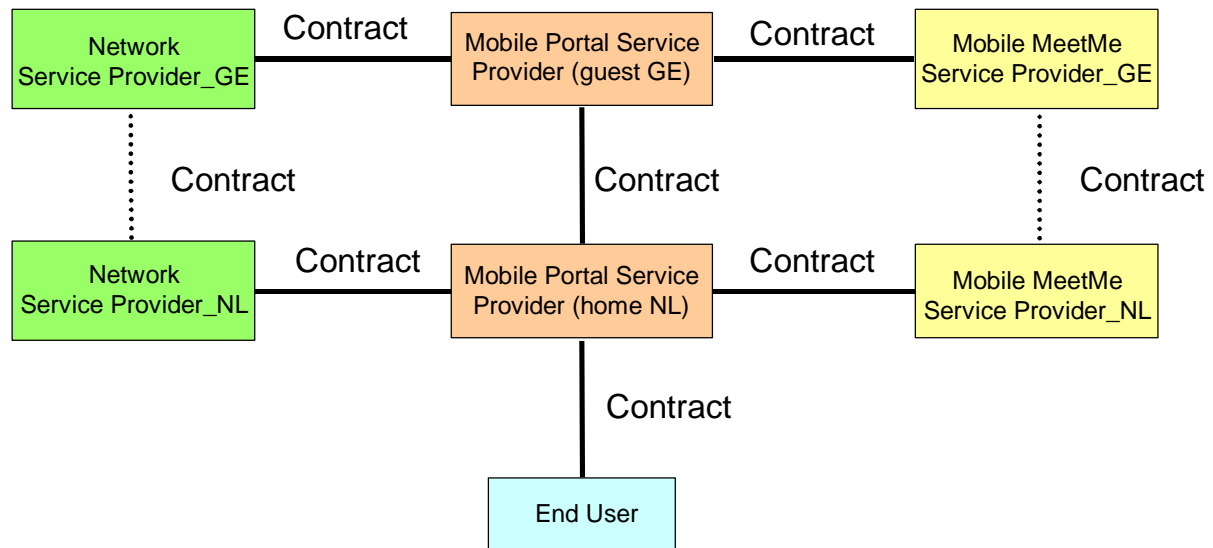


Figure 5: Subtrial 2 Roles and Relationships

The relationships in Figure 5 represent business contracts. Jack and Jill, the end-users, have only a contract with their home portal framework provider, MPSP_NL, which provides them with the Mobile MeetMe service. MPSP_NL undertakes all the customer relationship management functionality, such as subscription, customer care, and billing, associated not only with the Portal Framework service but also with the Mobile MeetMe service and with other services it offers via its portal. Customers can access their services wherever they are located as a subscription with the MPSP includes network access. The MPSP_NL has a contract with the MMM_NL to sell the Mobile MeetMe service via its portal to its portal customers and to bill for its usage. The contract provides details of the responsibilities and functionality expected from each side.

A roaming agreement has been concluded between the MPSP_NL and the MPSP_GE enabling customers of one portal to use the services of the visited portal when they are roaming in the visited portal's area. Again, the contract will detail terms and conditions of usage, including responsibilities, functionality required, and usage and billing mechanisms. There is also a similar kind of contract between the MMM_NL and the MMM_GE.

The Portal Framework service providers have contracts with the network service providers in their own domain so that Portal Framework customers can use the services offered by the Portal framework via the appropriate network access. The network service providers have agreements enabling users to roam between the networks they provide and to access the user services they require wherever they are located.

The following scenarios will be shown in Trial 1:

Service roaming scenario: This scenario will demonstrate that users can roam in visited networks where they are able to use the services that they are subscribed to in their home network. This will be demonstrated on a WLAN, which will have two instances of the Portal Framework. End users will be subscribed to the Mobile MeetMe service and will be able to roam and use the service. Key aspects of the demonstration include user authentication and authorisation, and the sharing of service and user profiles.

QoS measurement scenario: This scenario will demonstrate that the key performance indicators for data traffic can be identified, collected, and then used to ascertain the quality of service that the user receives. Key aspects demonstrated include service quality measurements of UMTS bearer service and application service resources.

The main features of the sub-trial are:

1. End users accessing the Mobile MeetMe service in the home network domain via UMTS
2. End users roaming to the Mobile MeetMe service in the visited domain via WLAN
3. Service quality measurements of UMTS network and service resources
4. Roaming support for end users provided by personalised user profiles

3.2.3 OSS functionalities

The sub-trial involves the UMTS testbed, the Mobile MeetMe Service, and the Portal Framework (see Figure 6).

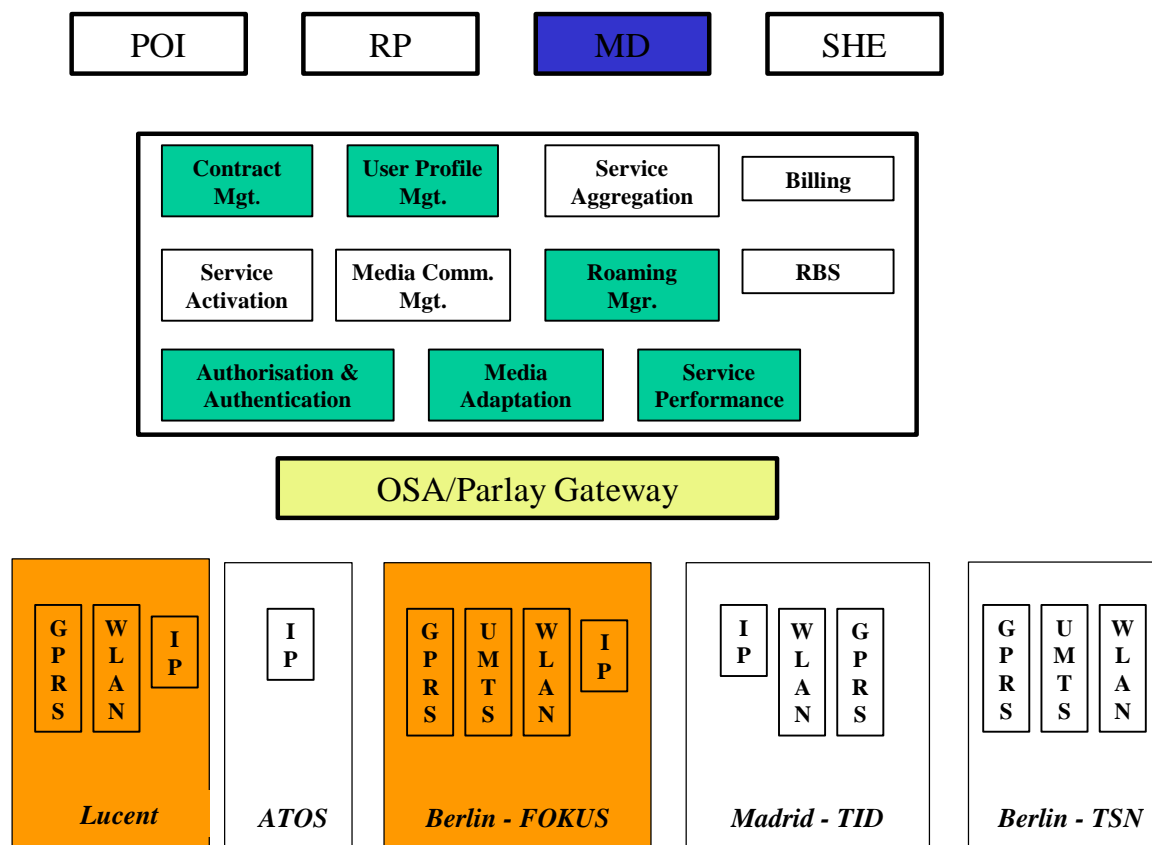


Figure 6: OSS Functional Blocks supporting the 3G Service Usage Subtrial

The following functions are supported in the sub-trial in order to implement the scenarios:

- ~~✍~~ **Authentication and Authorisation:** Authorises and authenticates users.
- ~~✍~~ **Contract Management:** Manages data relating to customers, services and contracts.
- ~~✍~~ **User Profile Management:** Manages user profile information.

Roaming Management: Enables roaming users to use their home services in a visited network

Media Adaptation: Converts and adapts media to end-user devices.

Service Performance. Monitors and reports on service performance

3.2.4 System Implementation and Components

3.2.4.1 Functional components description

The Portal Framework has been designed to provide OSS support to service providers integrating, offering and delivering services to mobile customers in a 3G environment. The components within the framework can be configured in a plug and play manner to suit the specific needs of the individual service provider and the role it is playing in a 3G value web. It can, therefore, be of benefit to service providers in a variety of 3G business models and meet several of the requirements identified in [Albatross02]. It can also be seen as an implementation instance of the functional architecture of [Albatross03].

The Portal Framework in Figure 7 includes the components described in the following subsections.

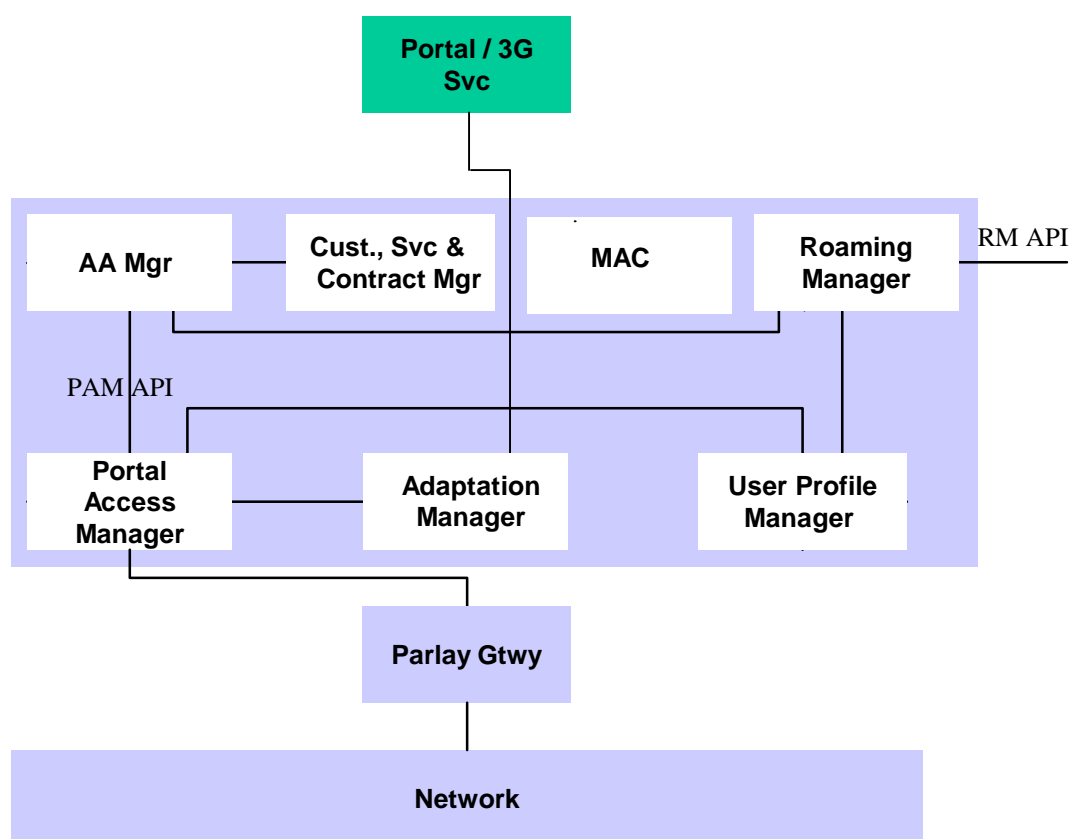


Figure 7: FOKUS Portal Components for Trial 1

Customer, Service and Contract Manager

This component is a generic storage for Customer, Service and Contract specific data. To manage services and to allow users to access them requires service contracts and relations with the user and customer to be stored. This data will be managed (retrieve, store and update). In addition, users need to be authenticated and their authorisation to use services must be checked.

The functions of the component are to:

- ?? Manage customer-related data
- ?? Manage service-related data
- ?? Manage contract-related data
- ?? Manage the authentication of users
- ?? Manage the authorisation of users and generate lists of usable services
- ?? Provide centralised security administration for administrators.

User Profile Manager

In order to provide personalised services and roaming to a user, the user's home network has to maintain the user's personalisation preferences in information objects called User Profiles (UP). Information contained in User Profiles can be classified as follows:

- ?? *The User Interface Profile (UIP)* comprises all data that delimit the end user's generic usage preferences and personalised features for service usage through any type of terminal. Seen as simply as possible, end users want to be presented with their services in a consistent way. The user preferences are specified through the UIP, which basically defines the preferred look and feel of the service session UI. Although the definition of the UIP is intended to be generic, it is more or less terminal dependent as its settings are automatically adapted to the terminal capabilities. In particular, the terminal-supported values for a given attribute are taken into consideration when specifying the UIP in order to adapt its attribute corresponding to the preferred value so as to fall within the terminal's predetermined range of values.
- ?? *The User Services Profile (USP)* comprises all data that delimit the service provision and service specific characteristics, such as the parameters required by the service logic, the application's user interface characteristics, security constraints and possibly (where applicable) content-based personalisation details. The USP is related to the service profile as selected by the customer and it is instantiated per service.
- ?? *The User Session Profile (USSP)* includes information concerning the use of a service at a specific time by a specific user. It includes information describing the user context (terminal, network, etc.) when accessing the service, it could include information relative to the use of the service by the user (accounting information). This profile will be created dynamically.

A combination of UIP and USP forms a User Profile, which determines the user settings for the user's entire personalised environment behaviour.

For the overall design the CC/PP standard has been used. The information model is an XML schema.

Roaming Manager

The main purpose of the Roaming Manager (RM) is to provide functionality that will enable the provisioning of location-based and time-dependent end-user services and roaming in a UMTS environment. This environment will consist of many network service providers that will deploy different types of technologies (GPRS, IEEE 802.11, WCDMA, CDMA2000). These technologies will be accessed by means of far more intelligent mobile terminals than those we have used thus far enabling the provisioning of advanced services.

In summary, *advanced network technologies*, *intelligent mobile terminals*, and *advanced services* are three of the main factors that will influence the development of the RM. Developments have been ongoing concerning roaming and hand-over for some time. However, the issue of roaming is required to be investigated in the light of these three factors. The users will be able to use or adapt to a wide variety of services. However, users will roam in a “visited” (as opposed to “home”) environment and use a foreign point of access.

The Roaming Manager will address the following requirements:

- ?? Automatic discovery of end-user services in “visited” network.
- ?? Update of portal in “visited” network.
- ?? Sharing of user and service profiles between “home” and “visited” SPs.
- ?? Roaming agreement between SPs.

RMs will be federated across several technology and administrative domains and, towards this end, client-server and peer-to-peer communication paradigms will be required.

Portal Access Manager

The Portal Access Manager delegates requests and information flows from the sender to the appropriate component. A portal GUI will be dynamically built for the end user. To provide a location-based 3G Service Portal, the Portal Access Manager needs also access to the user locator, which is provided by the Parlay Gateway included in the MediaGate server. Furthermore, this component handles internal (e.g. application) as well as external (e.g. web) sessions and maps them to each other if necessary. In the context of application servers this will be transparent to the user.

The functionality of this component is to:

- ?? Handle requests between different OSS components (agent functionality)
- ?? Dynamically generate a Portal GUI for the end user based on location and time as well as user preferences
- ?? Manage terminal, service and user session and map them to each other
- ?? Map sessions of the EJB server to terminal, service and user session

Authentication & Authorisation (AA) Manager

The AA manager will be responsible for functions such as:

- ?? Authorisation based on the PAM standard using Sun’s JAAS.
- ?? Single Sign-on for Users - Users need to remember many different passwords to access many different Internet Applications. This causes users inconvenience, typically resulting in poor security practices and increased

administrative tasks. Single Sign-On solves this problem by ensuring that the user enters the user name and password only once to access all the authorised applications. From the user's perspective, authentication to each application occurs transparently.

- ?? Fine Grained Security for Applications – This can offer a complete implementation Authentication and Authorisation Service to provide fine-grained security for Applications and Web Services.
- ?? Encoding and decoding of information that will be exchanged between components within the portal framework or application server. This can be done, for example, using Secure Socket Layer (SSL).

MediaGate/Parlay API

MediaGate provides access to generic messaging services and generic call control including media adaptation. It has a three-level architecture, which offers a more or less complex interface for either plain Parlay functionality or to functionality with implicit capabilities, such as media adaptation or personal service profiling. Using the MediaGate APIs, an application can contact a user or just an end device, as appropriate.

- ?? *eMGI Low level API* – Parlay API 3.0 (GCCS, GUI5, CUIS, GMS). The bottom of the MediaGate solution set is built on several objects, each realising one or more Parlay interfaces. Together, they cover network service specialities using a generally accepted standard.
- ?? *eMGm Medium level API* – Media conversion and media adaptation. When an application has to provide any kind of information to an end user, all necessary media conversions will automatically be carried out. Optionally, the framing of additional information, e.g. a short intro or header, can be requested.
- ?? *eMGh High level API* – User localisation, user availability and user service customisation
At this level, Unified Messaging System (UMS) functionality is provided. In an environment where user profiling, subscription and accounting are available, these features will be used, hidden behind the highest level of the MediaGate API. Additionally, a unified message box is integrated with different kinds of remote access possibilities.

Adaptation Manager

The portal Adaptation Manager enables service developers to create services that may be accessed by end users via arbitrary terminal devices. This section introduces the concept underlying the Portal Adaptation Manager, which enables services to be developed independently of the specific terminal device and network technology.

In order to adapt services to various terminal devices and networks, the user interface has to be adapted.

Monitoring Analysis Component (MAC)

The task of the MAC is to collect and aggregate KPIs (key performance indicators) from network and service resources and to analyse them using a transformation algorithm. The output of MAC is one or more KQIs (key quality indicators), which can be used by other OSS processes and which can be provided to a system administrator who needs performance reports.

Mobile MeetMe 3G Service Component

The Mobile Meet Me service provides a virtual meeting place for 3G environments for people to meet based on specified criteria. Mobile Meet Me is based on 3G technology that provides a spontaneous match and contact option for finding the right date, whether for a life-long partner or just a companion for a movie. Mobile Meet Me service includes the following features:

- ?? *Create profile*: allows users to create their own profiles (include gender, age, zip code, hobby, etc) that enable them to find a suitable date. In addition the user can specify his/her preferred alert type (SMS, email, voice, etc.).
- ?? *Profile management*: users can show or hide their profiles for greater flexibility in case they don't want to be searched.
- ?? *Database Search*: users can search someone based on their age, interests, location, etc.
- ?? *Photograph repository*: to store user pictures for imaging purposes.
- ?? *Auto match*: system automatically searches individual profiles with a built-in rules wizard to find a suitable match.

3.2.4.2 Testbed infrastructure

The network level architecture as presented in Figure 9 consists of a PC-based server and laptops running Windows 2000. These hosts are connected to each other by means of Fast Ethernet and WLAN. A UMTS cell, IP and a set of routers connect the hosts to the Internet. Laptops are equipped with access to the WLAN, GSM and GPRS. The UMTS cell will provide access to GPRS and GSM. End-user services will be accessed via laptops or any other hand-held devices. Software required to run Portal Framework components and end-user services are installed on the PC-based server and the laptop.

The table given below lists the communication technologies that are used in the network architecture.

Technology	Comments/Purpose
WLAN IEEE 802.11a	A WLAN will be used for the demonstration of the roaming scenario. Details of WLAN: <ol style="list-style-type: none"> 1. Manufacturer: Proxim (www.proxim.com) 2. Model name and number: Harmony 8570. 3. Number of access points: two. 4. Number of network cards: two.
UMTS/GPRS	This will be used for the demonstration of the MAC.

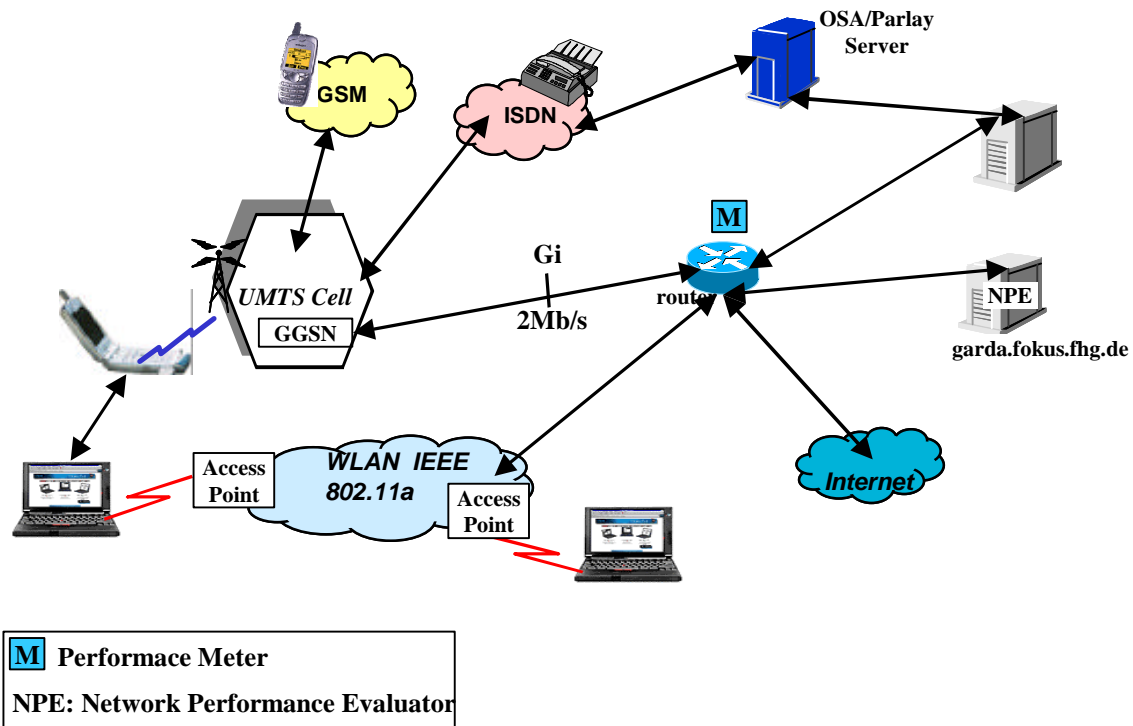


Figure 9: Network Level Architecture

3.2.4.3 Software infrastructure

Product	Version	Comments/Purpose
MediaGate/ Parlay API	3.0	This API provides access information on the user location (user location component) in a WLAN, which is required for the roaming scenario.
Oracle	8.0i	Repository for customer service contracts.
JDK	1.4.1	Used for user location component.
Jboss	3.0.4	J2EE compliant application server with Apache Tomcat web server. Required for Portal Framework components.
NPE	1.0	Provides network performance indicators, which are required for the monitoring scenario.
Windows 2000		Required for laptops running Portal Framework Components.
Internet Explorer	6	Required for Portal and MeetMe service GUI.

3.2.4.4 Hardware Infrastructure

Product	Host Name	Comments/Purpose
Windows 2000 Laptop	TTR4	For Portal Framework Components in domain Germany.
Windows 2000 Laptop	TTR1	For Portal Framework Components in domain The Netherlands.
Windows 2000 Laptop	TTR	For MeetMe GUI and Portal GUI.
Windows 2000 PC	Xenon	For Profile Manager and Adaptation Manager.
Windows 2000 PC	To be decided.	For NPE (Network Performance Evaluator).
WLAN IEEE 802.11a		A WLAN will be used for the demonstration of the roaming scenario. Details of WLAN: 5. Manufacturer: Proxim (www.proxim.com) 6. Model name and number: Harmony 8570. 7. Number of access points: two.
UMTS/GPRS Infrastructure		This will be used for the demonstration of the MAC.

3.3 3G Billing

3.3.1 General description

This sub-trial is concerned with demonstrating billing for Smart Home services usage and access. This will be achieved through the integration of components that comprise WIT's Rating Bureau Service and Billing Service, UHC's Billing mediator, TID's Smart Home Services and LAKE's WLAN.

The scenario focuses on the federated accounting for 3G Services, where access to services can be performed under roaming conditions. Federated accounting will be achieved by aggregating the cost of Smart Home Service usage with the cost of accessing the service through a WLAN Hotspot.

The demonstrator will require the integration of the various components (mentioned above) that will be modified to support the 3G Billing scenario. The demonstrator will also require the generation of innovative, flexible charging schemes for Smart Home Services and WLAN access.

The primary goals for the first trial are to:

- ?? Demonstrate the interoperability of the federated accounting components
- ?? Demonstrate the flexibility of 3G charging scheme generation
- ?? Demonstrate innovative 3G service delivery
- ?? Demonstrate the functionality required by 3G OSS Accounting, Mediation and Billing components

The trial involves the use of Smart Home Services provided through a portal and a residential gateway in a real demonstrator environment (Madrid and/or Boecillo in Spain). The scenario will be executed by demonstrating WLAN access to an Internet connection to the Telefonica labs. Once connected to the residential gateway, the user can perform automation actions. The execution of these actions will be viewable in real time using the Smart Home Home Cams.

The following items will be shown in the 1st trial:

1. The accounting for WLAN usage based on generation of real internet usage records
2. The accounting for Smart Home Service usage.
3. Mediation of WLAN/Smart Home Service accounting records into IPDR format.
4. Correlation of WLAN and Smart Home billing events
5. Aggregation of single session WLAN/Smart Home Service IPDRs
6. Consolidation, rating and billing for integrated WLAN and Smart Home service usage.
7. Generation of inter provider settlements records to allow the Smart Home Service provider to clear WLAN usage with WLAN provider.

3.3.2 Scenario description

- ?? Jill is in her Hotel room preparing for her tennis game.
- ?? She switches on her laptop and connects to WLAN operating in the hotel.
- ?? Jill accesses her Smart Home Service Provider and uses the following services:
 1. Home Cam service
 2. Light Automation service.
 3. TV automation service.
- ?? On completion of the services, Jill is able to view the cost of using the services.

Business models / Stakeholder models.

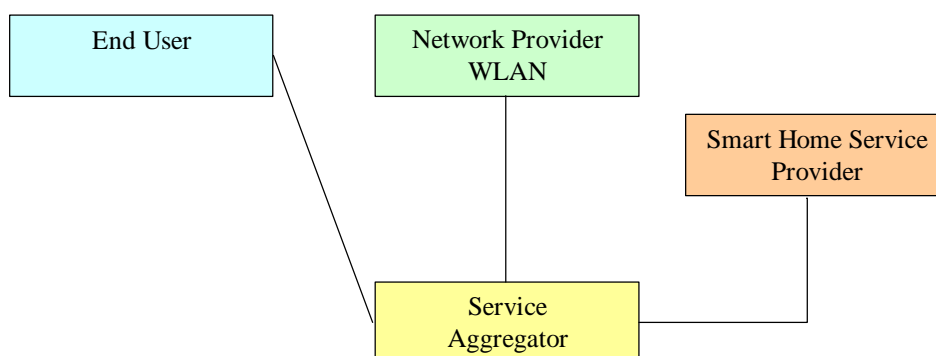


Figure 8: 3G Service Billing Roles and Relationships

List of all the stakeholders involved in the scenario

- ?? **End User:** consumes services provided by the Service Aggregator
- ?? **Network Provider WLAN:** provides the End User with an access network to connect to the Service Aggregator.
- ?? **Service Aggregator:** provides the End User with a single entry point to a collection of services.
- ?? **Smart Home Service Provider:** offers a set of services to the End User through the Service Aggregator.

3.3.3 OSS functionalities

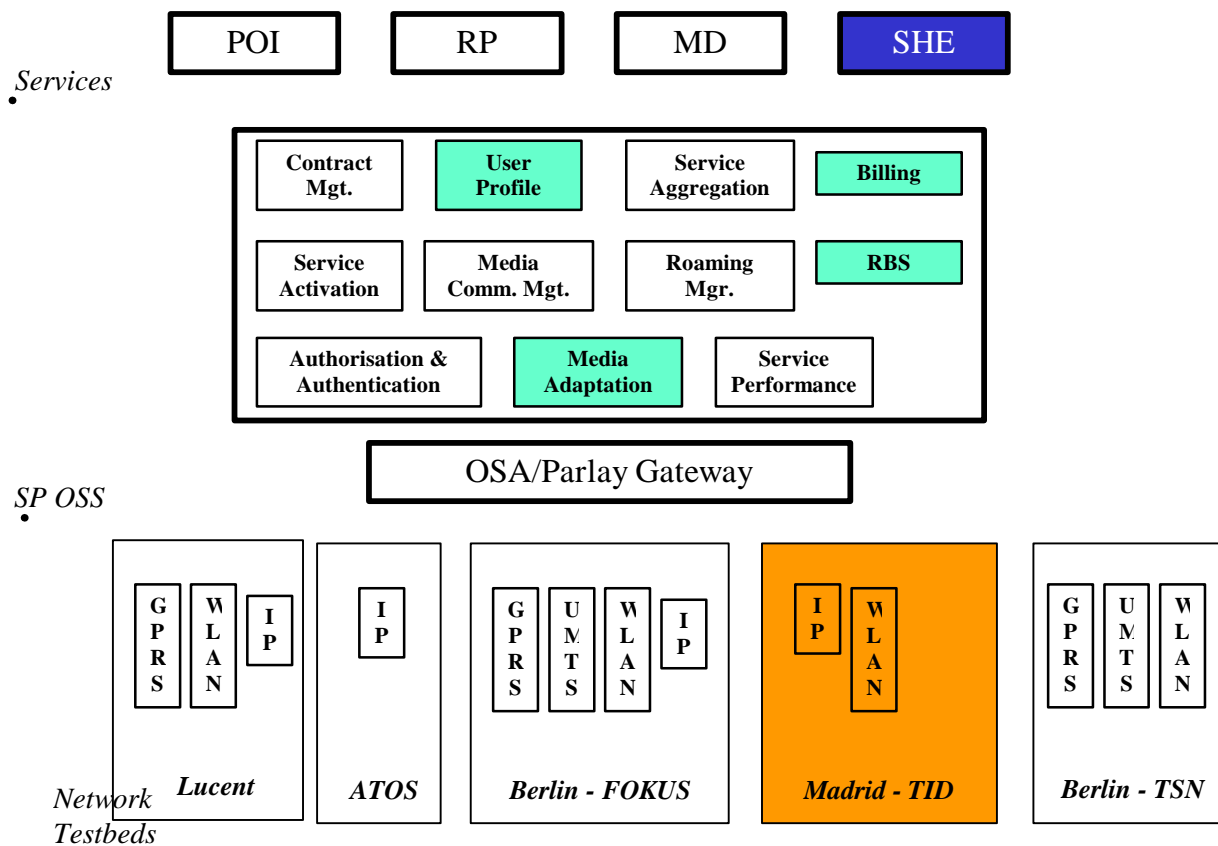


Figure 9: 3G Service Billing OSS Functionalities

The 3G Billing sub-trial incorporates the following OSS components:

- ?? Accounting Components
- ?? Mediation Components
- ?? Billing/Query Components

These OSS components will interact to support the following OSS functionalities:

- Collection of Service Usage Data. (Accounting)
- Aggregation and Transformation of Service Usage Data (Mediation)
- Use of standardised Billing/Accounting data record format and transfer mechanism.
- Application of arbitrarily complex charging schemes to accounting records to generate service charges and discounts.
- Generation of bills in various formats (PDF, XML, HTML, XHTML etc.) depending on preferences set in a user profile.
- Query support for near real-time viewing of service charges.

3.3.4 System Implementation and Components

3.3.4.1 Functional Components Description

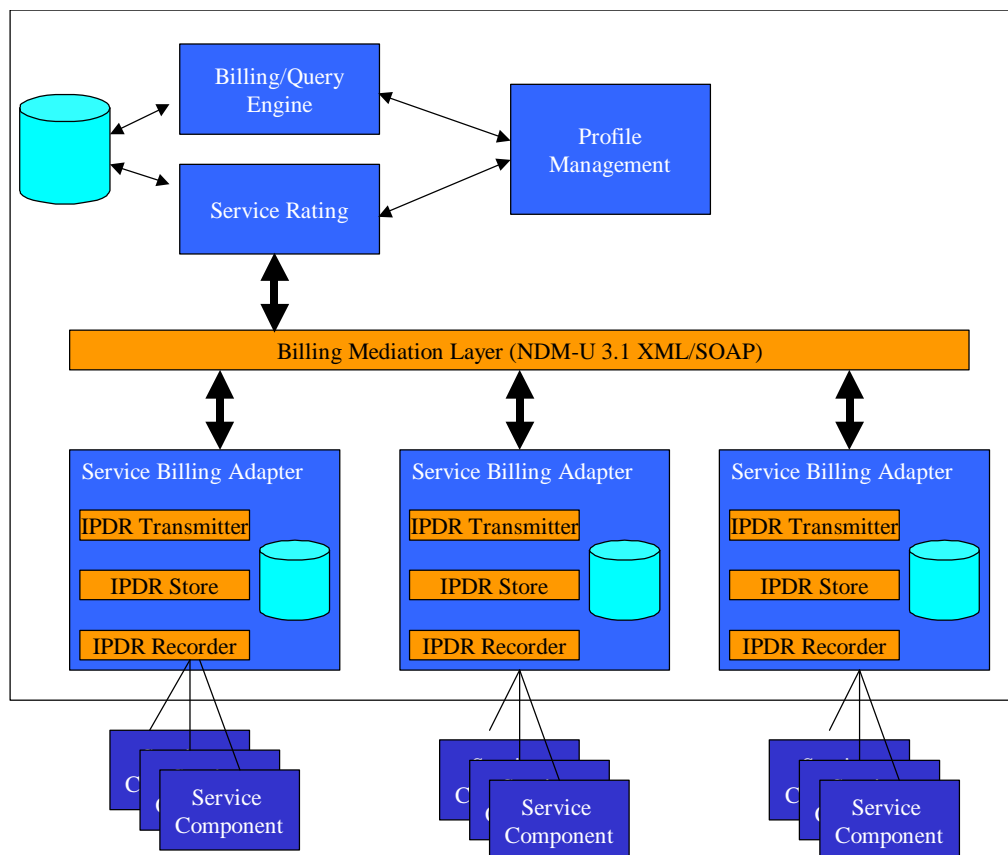


Figure 10: OSS Billing Components

The OSS billing infrastructure includes the following components:

Service Billing Adapters

The Service Billing Adapters are responsible for collecting and converting the Service Component usage data. It will adapt the usage data into the common format used by the OSS. The Service Billing Adapters may be stand-alone components or integrated directly into the Service Component, and can work in a one to one or one to many configurations with the

Service Components. The Billing Adapters will provide an abstraction of the actual type of Service, which may be anything from raw network transport to sophisticated location based services. The Billing adapters are made up of a set of sub-components: IPDR recorder, store and transmitter.

IPDR Recorder: This component generates IPDRs describing the usage details for a service session. This is achieved by mediating proprietary protocols and data transactions from a service element. The IR will present a stream of IPDR Documents to the IPDR Store. In the context of the billing trials, the IPDR Recorder is enhanced to record service usage from WLAN and Smart Home Services

IPDR Store: This component provides persistence to the IPDRs recorded by the IPDR Recorder. The IPDR Store will receive IPDRs from the IPDR Recorder and package them into IPDR Documents to be stored in a non-volatile medium. The IPDR Store is enhanced to provide IPDR record correlation across different service instances and offers flexible assignment of correlation parameters.

IPDR Transmitter: This component delivers IPDR Documents to other 3GOSS components using one of a set of transfer protocols. This component also groups usage/session related IPDRs.

IPDR Rating Engine (IRE)

The IRE offers the functionality to support the massaging of information contained in IPDRs, charging schemes etc. into a final customer charge to be included in a customer bill and also to be used in determining the settlement to be paid to the constituent provider (where billing is an outsourced activity). The IRE also contains details of the settlement to be passed back to originating provider.

This centralised billing approach supports the following billing scenarios:

- ✍️ Settlement with predecessor – each provider that participates in the delivery of the service bills the provider that requested the resource i.e. the requesting service provider is the customer and the actual user is irrelevant
- ✍️ Settlement with originator / retailer - each provider that participates in the delivery of the service bills the retailer of the service i.e. a service broker scenario, where a broker packages services and sells them as a single service
- ✍️ Settlement with customer - Traditional 1-2-1 billing i.e. each provider bills the customer directly

The billing components developed will support each of these billing scenarios.

IPDR Billing\Query Engine

This component supports the transformation of rated IPDRs into customer bills. The format of the bill will be dictated by customer preference as specified in the user profile, choices may include PDF, HTML, WML, XML, RTF or other device dependant formats. This component will also support near real-time access to charges (where appropriate) and querying for charge/service usage information.

Smart Home Service components

The Residential services Portal

The Smart Home services are provided via a residential services portal. This is an entity where different residential services and applications can be launched. This portal has the possibility to launch an aggregation management web application in order for the users to subscribe or unsubscribe to available services, this application is not part of the billing trial. The residential portal has the following services: Smart home management, Photo album, Notebook, Games, Telemedicine, neighbourhood community management, etc. The first service is the one that will be demonstrated in the sub-trial. This service is delivered through a system called Teledomo, which has a multi-user distributed configuration and contains two entities.

The service access entity

The application has to be installed in a server placed on the service provider (aggregator location connected to the internet.). This application has as main functions to gather all the user information: identity, smart home configuration, bookkeeping and process managers. The process managers are the ones handling the bi-directional commands and alarms that have to be processed on the residential gateways needed to act as the interface between the Public networks (ADSL for the trial) and the residential networks (HAN: Home Access networks). The latter are data, automation and entertainment networks. The process managers will be also responsible to generate the XML billing records that will be processed by the IPDR recorders on the service billing adapters (see Figure). The actions that will be billed for are: Web Cam viewing, TV on/off control and plant/garden watering. The information provided on the record would contain the user identity the time of the event, the type of operation and the result of it.

The service control entity

This entity is kept on the Residential Gateway that is installed on the smart home. This entity will consist mainly on Hardware control processes that will be responsible for driving the HAN's that are installed on the smart home. These processes are the ones talking to the process managers on the portal/aggregator premises via Internet, interpreting and implementing the automation and control commands and generating alarms and information queries.

The Residential Gateway and the Home networks

This is the physical layer of the smart home service infrastructure. The residential Gateway is at the moment a PC where the service control entity has to be installed. The PC has the HAN's Network Interface Cards and the drivers to control and communicate with the home appliances (lights, cameras, sensors, motors, PCs, etc...).

Wireless LAN components

Following the Technical meeting in Berlin in December 2002, it was decided to take a phased approach to the development of a WLAN usage logger, with the work focus in Phase 1 on the essential component of Trial 1, which was the generation of internet service usage records, which can then be ported to the next Phase in Trial 2.

The application sniffs packets as they pass through a network interface. Packets that are relevant to WLAN usage are logged. The logging happens in such a way that new logging components are created for each IP address the user connects to. Each logging component

then stores its start time, end time, bytes to the remote IP address, and bytes received from it. The logging components also store tracking information, this being the users ID, a session ID, first component flag, and last component flag. The source code was developed for the Windows 2000 platform.

The second part of the system is the ftp uploader. The uploader scans the logger's output directory every 30 seconds and uploads the files to UHC. Files that have been uploaded are then moved to a different directory by the uploader for storage. UHC mediation then mediates the proprietary CDRs into IPDRs compliant with the relevant Schemas. The relevant IPDRs for a session (identified by the common session ID) should then be inserted into a single IPDRDoc that is forwarded to WIT's IDPR Services.

WIT will open each of the constituent IPDRs in the IPDRDoc and rate it according to the appropriate charging scheme (identified by correlating the Service Provider ID and the Service ID). WIT's RBS will then deposit the rated IPDRDoc in WIT's IPDR Store. The WIT Billing/Query component will then retrieve the IPDRDoc from the IPDR Store and display it as a single charge in PDF format, email it to the user etc.

3.3.4.2 Testbed Infrastructure

The Billing trial infrastructure (See Figure 10) will be distributed over different locations:

- ? ? The smart home services will be implemented on a demonstration Lab in Boecillo-Spain. The lab is in fact a laboratory simulating a real flat consisting on a living room, kitchen, 2 bedrooms and on one Terrace. It is equipped with domotic networks and appliances (Lonworks and X10), data networks (Ethernet, home PNA and WLAN). Several Webcams are accessible via the Home portal to see the different rooms and observe the actions performed via the smart home GUI. In Boecillo, the residential Gateway and the residential services portal will be located on Windows 2000 servers. The latter can be accessed through the Internet using an ADSL line.
- ? ? The Billing components will be distributed over two locations: WIT in Ireland and UHC in Denmark. Both the IPDR Store and RBS will be connected to the public Internet. The IPDR Store will be running at UHC's premises in Copenhagen, whereas the RBS will be located at WIT premises in Waterford.
- ? ? The WLAN provider and infrastructure will be located in Ireland on the LAKE premises.

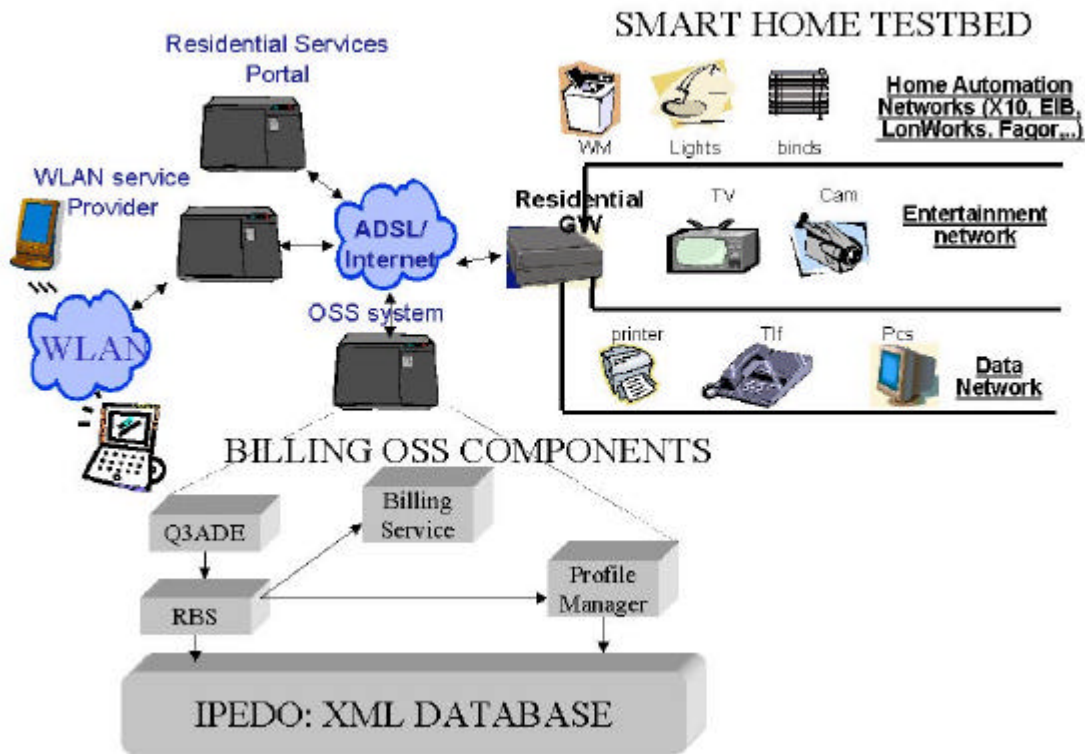


Figure 10: Billing Trial infrastructure

3.3.4.3 Software Infrastructure

Product	Version	Comments/Purpose
UHC Q3ADE 3G	5.05c0	Integration platform for IPDR Store components
Windows 2000		Required for laptops running IPDR Store.
JRE	1.3	Required for running IPDR Store configuration GUI and for Teledomo the smart home services system GUI.
Windows XP	Professional	Required for Rating Engine Components and Ipedo (Native XML database).
Ipedo	3.1.1	Required for storing rated IPDRs.
Windows 2000	Server	Required for User Profile and Billing components.
Windows 2000	Server	Required for Service aggregator portal and web service interface to rating components.
Windows 2000	Server	Required for the Residential Services portal and Smart Home applications
Windows 2000	Server	Required for the residential Gateway
Access	97	Data base required for the smart home services infrastructure.
Windows 2000	Pro	SW generating internet usage records for connectivity.

3.3.4.4 Hardware Infrastructure

Product	Host Name	Comments/Purpose
Windows 2000 Laptop	TBD	IDPR Store
Dell Precision 340	N/A	Rating Components, Ipedo XML database
Dell Precision 330	N/A	Billing/query components and user profile management.
Dell Dimension XPS D33	N/A	Service aggregator and web service interface to rating components.
Dell Power Edge 4400	Harry	Residential services Portal
ACER Pentium III	Rclie2	Residential Gateway
IBM PC	N/A	Internet Usage records generation
WLAN IEEE 802.11b	N/A	Airway TransPort (LAKE)

3.4 Prototype Roaming

3.4.1 General description

The main goal of this trial is to investigate the interactions between mobile network providers (including Hotspot Providers - MNO) and service providers (SP) to guarantee smooth roaming through WLAN-GPRS/UMTS. We focus our work here on the access control and accounting aspects, concretely:

- ?? Interoperation between SP and MNO regarding exchange network access information (including network authentication)
- ?? Interoperation between SP and MNO regarding exchange tariff/accounting
- ?? Tariff information for customers/users

A part of OSS of both MNO and SP, called *roaming platform* (or *roaming manager*) offers the necessary functionalities to support these interactions. It consists of the components developed by Lucent and T-Systems.

In the trial 1, the core infrastructure will be set up. It enables user roaming between WLAN – GPRS and provides the basic functionalities for access control as well as metering of network resource usage, collecting accounting data and offering simple tariff information.

3.4.2 Scenario description

Jack and Jill subscribe the service called *My Mobile Home* offered by T-Online Germany. Using My Mobile Home, Jack and Jill can access their e-mails, local information via GPRS/UMTS mobile networks of public network providers T-Mobile and KPN or via WLAN hotspots at all airports in Germany and Netherlands.

This scenario shows the authentication and accounting processes in OSS of SP and MNO while Jack and Jill roam between the GPRS public and the WLAN hotspots. This sub-trial consists in the demonstration of 2 scenes:

- ?? *Scene 1*: Jill was preparing for a project meeting the Brussels in her office, downloading some documents and e-mails on her IPAQ. A small text line on the bottom right corner of the display indicated that she was using the WLAN networks in her office: “Home WLAN (bandwidth 10Mbit/sec, charge free)”. When Jill was leaving the office for the airport Berlin Tegel, her IPAQ indicated that it changed to the public network of T-Mobile: “T-Mobile (bandwidth 64kBit/sec – power user tariff (19 cents/100kbit))”.
- ?? *Scene 2*: In the bus into airport Berlin Tegel, Jill was using her IPAQ to read some new e-mails. When she was arriving in the airport building, the IPAQ of Jill called her attention by showing a message: “The WLAN of the Berlin Tegel airport are available, bandwidth 10Mbit, tariff 2cents/Mbit”. Jill clicked on the button “connect to WLAN Tegel” and continued reading e-mails.

Business model

Figure 11 shows the stakeholders and their relationships:

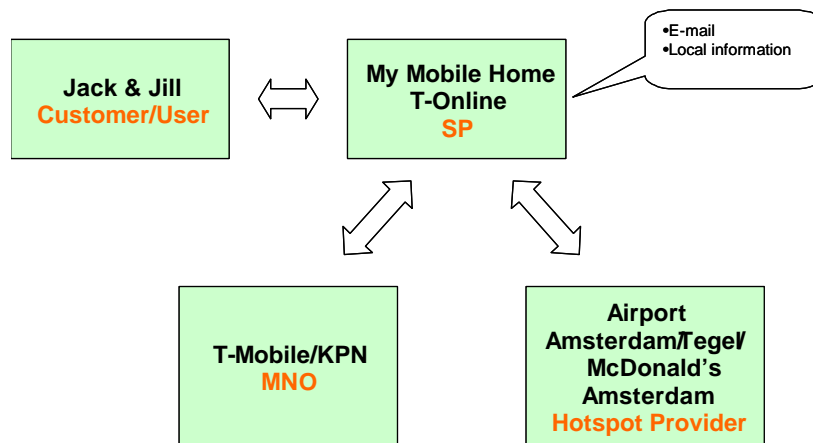


Figure 11 The stakeholders of the roaming scenarios

Mobile network operators (MNO)

Two kinds of MNO are considered in this scenario:

- Public mobile network providers who own GPRS/UMTS networks: T-Mobile and KPN as examples
- Hotspot providers own WLAN networks: Airports, McDonald's in Amsterdam/Berlin

Service provider

Germany's biggest ISP T-Online was taken as the Service Provider.

T-Online offers to Jack and Jill the service *My Mobile Home*, which contains e-mail and local information services. T-Online has a contract allowing their customer to access to the *My Mobile Home* service via mobile networks of public networks providers T-Mobile and KPN, and hotspot providers at all airports in Germany and Netherlands as well as all McDonald's restaurants in Amsterdam and Berlin.

Since the beginning of 2002 the regulators in Germany and Netherlands dictate the Service Providers like T-Online to inform customers about the tariff in realtime.

3.4.3 OSS functionalities

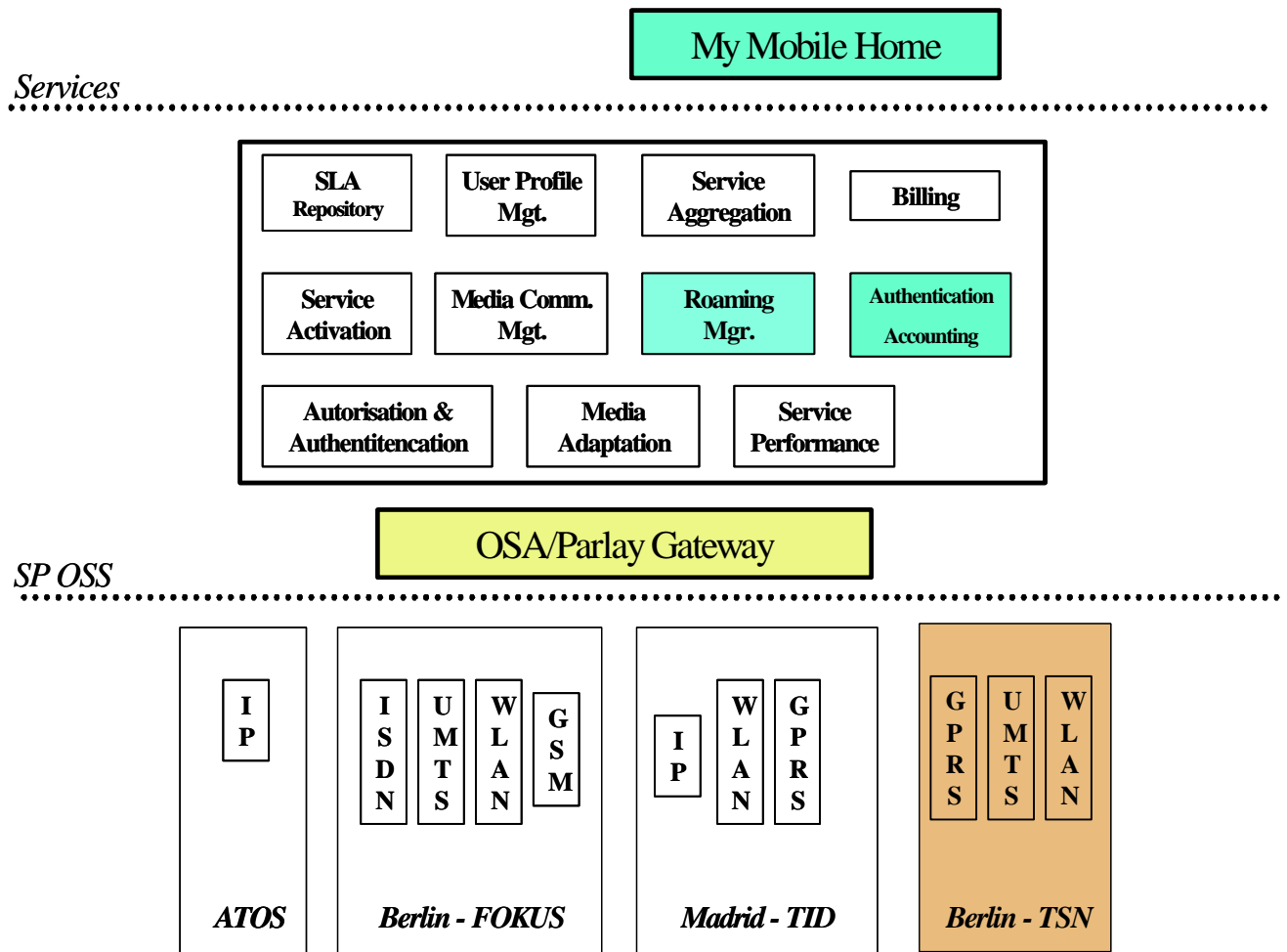


Figure 12 Overview of functionalities of the Roaming trial

The Prototype Roaming sub-trial incorporates the following OSS components:

- ?? Authentication & Accounting Component which offers the basic authentication mechanisms, authorising for use of network access and resources as well as supports for collecting of relevant data for charging.
- ?? Roaming Manger Components which supports:
 - Interoperation between SP and MNO regarding exchange network access information (including network authentication)
 - Interoperation between SP and MNO regarding exchange tariff/accounting
 - Tariff information for customers/users

3.4.4 System Implementation and Components

3.4.4.1 Functional Components Description

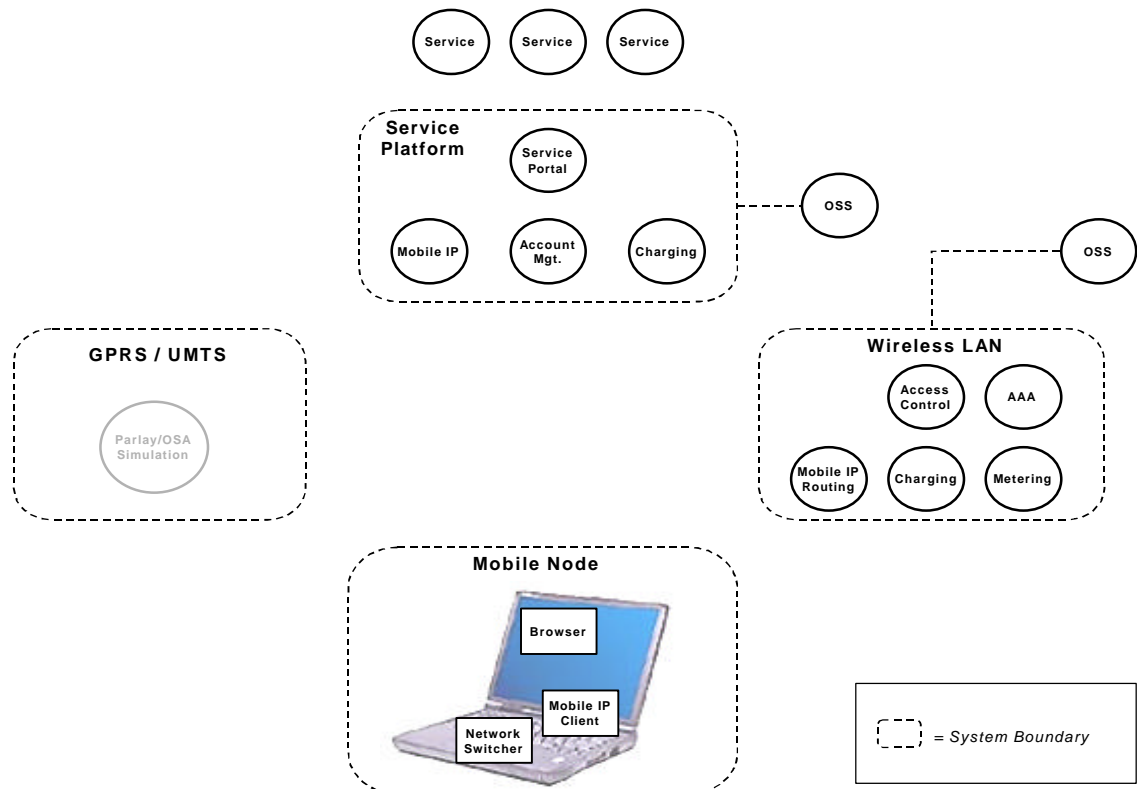


Figure 13 System boundaries

The system contains following components:

Component	Functionality
Browser	Internet Browser on the Mobile Node through which the Billing Service interacts with the User
Network Switcher	Switch entity on the Mobile Node that initiates network handovers and controls the Mobile IP client
Mobile IP Client	Part of the Mobile IP routing solution running on the Mobile Node, communicates with Home and Foreign Agents (HA, FA)
Mobile IP Home Agent (HA)	'Central' node of Mobile IP routing in IPv4, i.e. traffic always traverses this node.
Mobile IP Foreign Agent (FA)	Traffic is rerouted through this Mobile IP node to the Mobile IP Client.
WLAN Access Point	Wireless LAN 'base station', handles authentication, encryption, metering.
Metering	Collects metering data from the WLAN Access Point and Mobile IP components. Processes and forwards metering

	information to Service Platform.
Radius	Communicates with WLAN Access Point for authentication of Mobile Nodes. Optionally communicates with other Radius entities, possibly in other domains.
Charging & account mgmt.	Charging and accounting entity in Service Platform and possibly in the WLAN. Charges based on metering information from network.

3.4.4.2 Testbed Infrastructure

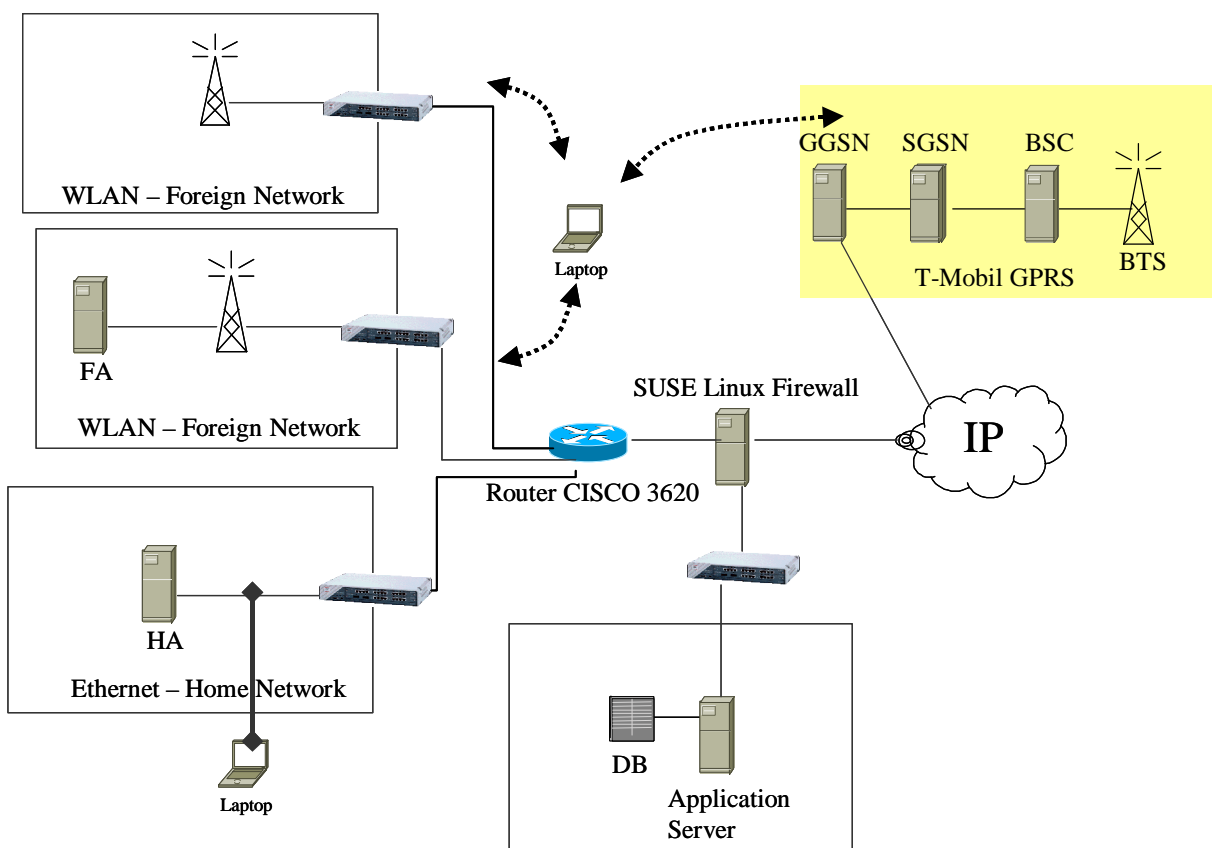


Figure 14: The hardware infrastructure of the Prototype Roaming trial

Figure 14 shows an overview of the technological architecture of the Prototype Roaming trial. The WLAN access network will be connected to the core network of the trial directly. The GPRS public network of T-Mobile Germany will be used as the GPRS access network and connected to the core network via IP network. The network server (with operating system Linux) in core network hosts the Radius proxy and the metering software for the WLAN access network. The roaming platform server (Linux) is also connected in the core network. It runs the Radius server and the Charging component. A separated Linux server acts as application server and offers executing environment for applications like the Tariff-Info

Application. The mobile node will be a mobile PC under Windows XP operating system containing a WLAN and a GPRS device.

The Tariff-Info application will be implemented as a WEB application, which can be accessed by using a browser.

3.4.4.3 Software infrastructure

External Software/version

Product	Version	Comments/Purpose
Linux		Used as operating systems of diverse servers
MySQL		Database server
JSP		Used for programming WEB application like the tariff-info application
Apache	2.0	WEB server
Secgo Lifix	1.0	MobileIP protocol implementation
Microsoft Windows XP		Used as operating systems for mobile node
Internet Explorer	6	Used as browser
FreeRADIUS	0.8	RADIUS server for WLAN authentication

Other software components

Product	Version	Comments/Purpose
MIP Home Agent Accounting & Metering API		This API provides information about the access network, resource usage, especially for GPRS network.
Tariff-Info application		This application informs users about the tariff of the current access network.

3.4.4.4 Hardware Infrastructure

Product	Host Name	Comments/Purpose
Windows XP Laptop		A Fujitsu-Siemens notebook will be used for demonstration of roaming scenario and Tariff-Info application
WLAN IEEE 802.11b		Two WLAN 802.11b APs (Avaya Access Point I) will be used for the demonstration of the roaming

		scenario
GPRS Infrastructure		A GPRS handy will be used for simulation of roaming between WLAN and GPRS. The GPRS infrastructure will be the TD1 public GPRS network.
Linux PC		A Fujitsu-Siemens PC will be used for installation of the Mobile IP Home Agent
Linux PC		A Fujitsu-Siemens PC will be used for installation of one Mobile IP Foreign Agent, and a Radius server
Linux PC		A Fujitsu-Siemens PC will be used for installation of the Application Server

4 References

- [Albatross02] Albatross Consortium, *Requirements Business Model and Scenarios Definition*, Public Deliverable D2, July 2002.
- [Albatross03] Albatross Consortium, *AlbatrOSS Initial Architecture*, Public Deliverable D3, July 2002.