IST PROJECT 2001-35283

Integrated Platform for Location-Based Services

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Abstract: This Deliverable provides an outline of the PoLoS project. The Deliverable was produced as a first result of Work Package 0.1 “Project Management”.

Keyword List: Location Based Services, Service Creation Environment, Service Deployment Platform, GIS, Positioning techniques

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The PoLoS Consortium consists of:

University of Athens (UOA)	Co-ordinator	Greece
ALCATEL SEL AG (ALCATEL)	Partner	Germany
CSEM (CSEM)	Partner	Switzerland
INTRACOM SA (ICOM)	Partner	Greece
EPSILON Consulting Ltd (ECCY)	Assistant Contractor	Cyprus
Telefonica I+D (TID)	Partner	Spain
EPSILON S.A (EPSILON)	Partner	Greece

1. Contract Number: IST-2001-35283

2. Project Acronym: PoLoS

3. Project Name: Platform for Location-Based Services

4. Key Action, Action line: Key Action IV, Action Line IV.3.2.

5. Project Logo:

(This is a preliminary logo that may change in the near future).

6. List of participants

Participant role	Participant number	Participant name	Country
C	P01	University of Athens	EL
P	P02	Alcatel SEL AG	D
P	P03	CSEM	CH
P	P04	INTRACOM SA	EL
A	P05	EPSILON Consulting Ltd	CY
P	P06	Telefonica I+D	ES
P	P07	EPSILON S.A.	EL

* C = Co-ordinator / P = Principal contractor / A = Assistant Contractor

7. Total cost (€): 3,572,616

8. Commission Funding (€): 1,755,000

9. Project Main Goals

The main objective of PoLoS is the design and implementation of an **Integrated Platform for Location-Based Services (LBS)**, covering the full range of related issues such as **Service Creation**, **Service Deployment** and **Provision**.

The proposed platform will be customisable to a wide spectrum of business domains. This capability will be demonstrated through the specialisation of the derived generic infrastructure in a domain such as automotive assistance. The domain specific service will be developed through the Service Creation Environment and run through the Service Deployment environment. Lastly, the project will adapt process models and process re-engineering methods from the business sector to propose a process structure for organisations specialising solely on the provision of LBS.

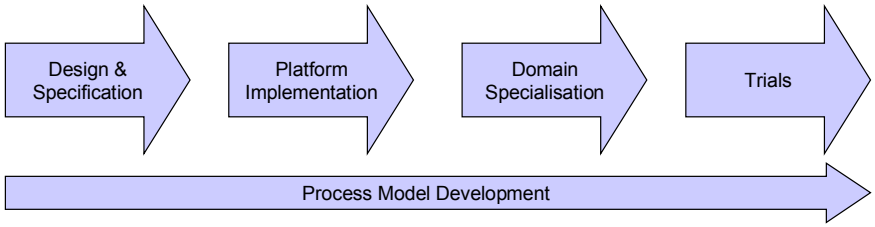

Figure 1: PoLoS Objectives

The most important characteristics of the pursued architecture are its

- **re-usability**, and,
- **independence** from networking platforms, positioning techniques, GIS systems and terminal technologies (e.g., GSM handset, PDAs).

The architecture will be applicable in GSM/GPRS/UMTS networks but also in small-scale infrastructures like WLANs. To accomplish the above-mentioned objectives the project will capitalise on technologies such as Open Service Architecture (OSA), MExE (Mobile Execution Environment) and eXtensible Markup Language (XML). The figure shown below provides a graphical illustration of the targeted system.

The specific objectives of PoLoS include:

- Survey of existing schemes for location based services (e.g., HTTP-based schemes, location servers by telecom manufacturers).
- Analysis of the MExE architecture, specification and development of the PoLoS platform interfaces for communication with the mobile terminals based on their capabilities using HTTP/IP, WAP, SMS or Corba/IP technology.
- Analysis, specification and development of the PoLoS platform interface for communication with GIS infrastructure.
- Analysis, specification and development of the PoLoS platform interface for communication with the network infrastructure and terrestrial positioning techniques using the OSA/Parlay interface.
- Detailed design and development of the PoLoS kernel for the co-ordination of the overall service provision. Design and development of components supporting intelligent service provision and advanced billing.
- Integration of the individual functional components and demonstration of a prototypical PoLoS implementation over existing mobile network operator infrastructures.
- Realisation of trials and PoLoS platform evaluation.
- Dissemination of project results.

- Survey of process engineering techniques.
- Development of generic business model for LBS provider.

10. Key Issues

The PoLoS proposal identifies and addresses three key areas: the architecture of the platform, the Service Creation Environment (SCE) and the process models and process re-engineering methods to be adopted.

The key issues of PoLoS are:

- PoLoS architecture: the main challenge is in integrating state-of-the-art technologies in order to create a platform capable of providing the full functionality needed to design, create and deploy location based services. To achieve this functionality, the platform will feature a component-based architecture, with each component having a specific and clearly defined functionality. PoLoS will cater for several models of operation that can be considered for location-based services:
  - Server Push (SP).
  - Client Pull (CP) (either Terminal initiated or Externally initiated)
- Service Creation Environment (SCE): the main challenge is in creating a Service Creation Environment possibly featuring a graphical interface which will be used for creating and deploying LBSs. The SCE will support a service creation language suitable for implementing sophisticated LBS and telecom services.
- PoLoS process model: the main challenge is in defining a generic process model including a re-engineering methodology to be used by service providers in order to fully realize the potential of the developed platform.

11. Technical Approach

PoLoS Platform Architecture

The PoLoS project aims to design specify and implement an Integrated Platform, which will cater for the full range of issues concerning the provision of Location Based Services (LBS). This platform will enable the specification, creation and deployment of such services within the premises of service operators, without any additional requirement in terms of network platforms or terminal devices. The Unified Modeling Language (UML) will be used for defining the PoLoS architectural and functional aspects. Languages like SDL may also be utilised if relevant need arises.

The PoLoS platform will provide the full functionality needed by both the Service Operator, which will deploy the location based service, as well as the end user, who will take advantage of the deployed service. To achieve this functionality, the PoLoS platform will feature a component-based architecture. Each component within this modular architecture will have a specific and clearly defined functionality. The two main entities defined within the PoLoS platform are the PoLoS Kernel and the Peripheral Components. The overall architecture of the pursued platform is shown in Figure 2.

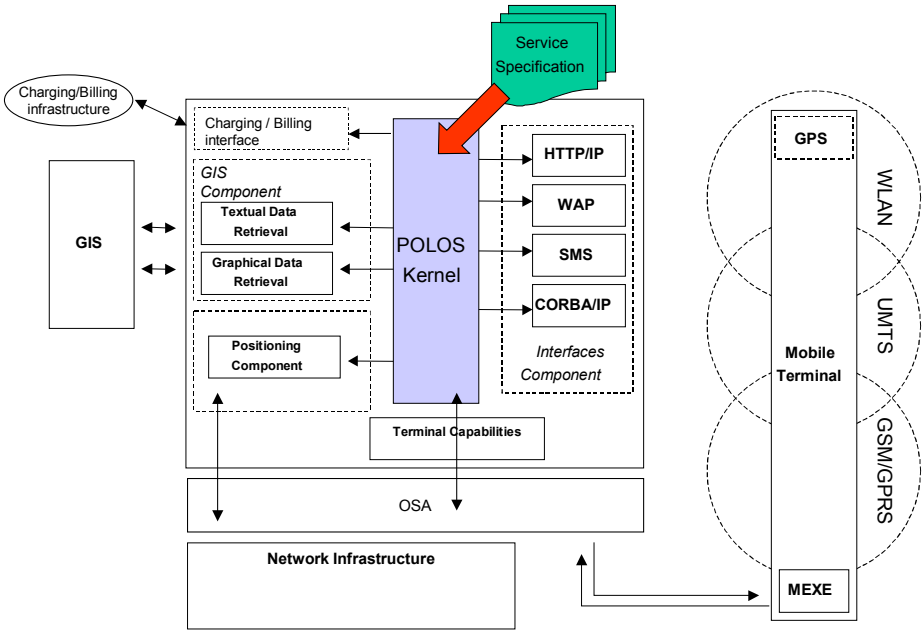

Figure 2: Target Architecture

Moreover, within the scope of the project is the development of a Service Creation Environment (SCE) for creating location-based services. More details on this environment is provided in following paragraphs.

PoLoS kernel

The PoLoS kernel comprises the primary component of the pursued platform. It will be developed using java-based technologies (e.g. JAVA, J2EE) and its functionality will be the co-ordination of the rest of the components in order to provide the functionality specified for each location-based service. Moreover, the PoLoS architecture will feature an interface, which will allow the PoLoS kernel to determine the capabilities of the mobile terminal. This interface will capitalise on the MExE technology.

Peripheral Components

Three peripheral components are clearly identified within the PoLoS architecture:

1. The GIS component

2. The Positioning component

3. The Interfaces component

Each of the above mentioned components is responsible for providing a certain function within the PoLoS platform. Communication between the components if required will be made through the kernel. Furthermore communication between the kernel and the peripheral components can be based either on XML formatted messages or implemented through well-defined APIs.

The GIS Component

The GIS Component is responsible for the interaction with deployed GIS repositories. It may include various software modules, as shown in Figure 2 to cover both visual as well as textual information. The purpose of these modules will be the exploitation of the wealth of information stored in GIS servers in order to create a graphical representation (e.g. map) of the area, where a specific service is going to be deployed.

The GIS Component will be invoked by the PoLoS kernel whenever necessary in order to provide the information needed for the provision of a certain service. This information can be used either internally (by the kernel or another component) or be transmitted to the mobile terminal (e.g., a graphics file) as part of the information provided by the specified service. A protocol between the GIS component and the GIS repository will be developed, possibly by exploiting the capabilities of XML. Such protocol will signal the information requirements of the Kernel to the remote end and retrieve information as needed.

The Positioning Component

The Positioning Component will be responsible for providing the PoLoS kernel with the appropriate information pertaining to the position of a mobile terminal accessing a particular service. In order to acquire this information the component will use available positioning techniques provided by the underlying network. Determining the position of a mobile terminal can be based either on satellite-based systems (e.g. GPS), terrestrial infrastructure-based systems (e.g. TOA, E-OTD) or hybrid systems (e.g. D-GPS). Access to the network will be implemented through the OSA/Parlay interface. Furthermore, special provision will be taken to (alternatively) interface the system to 3G network components like the Gateway Mobile Location Center (GMLC) as they become available in the operator's infrastructure.

The Interfaces Component

The Interfaces Component is responsible for communicating service specific information to entities external to the PoLos platform (e.g, to the mobile terminal). The interface will support different transport protocols from SMS and WAP to IP and the PoLoS kernel will invoke the appropriate, for each terminal, protocol in order to transmit service specific information to the terminal. Depending on the capabilities of the terminal and the requirements of the location based service to be accessed information exchanged could vary from simple textual data to downloading of small software modules in order to be executed in the environment of the mobile terminal (i.e. using MExE). Additionally, depending on the technology used by the terminal, protocols could be extended to accommodate geographical information (e.g., similarly to the longitude/latitude elements introduced in the so-called Dynamic URL scheme).

Service Creation Environment

Development of the Service Creation Environment (SCE) will focus on the design of an appropriate service specification language, capable to support the description of the functionality pertaining to each service. This language will be based on analogous languages that exist today hence it is highly probable that it will capitalize on XML technology. The language will be flexible, and easy to use in order to allow for the specification and easy deployment of any type of LBS without too much effort and cost from the service provider. Each service will be defined through scripts written in this new language. Such scripts will run in the PoLoS kernel, which in turn will invoke the peripheral components, in order to provide the functionality needed for each service. To render the use of the language as efficient as possible, the project will also pursue the design of an integrated development environment (IDE) that will greatly facilitate the development and deployment of new services.

12. Expected Achievements / Impact

At the end of this project the following will have been developed and demonstrated:

- a new platform that allows the deployment and provision of LBS over different network infrastructures.
- A service creation environment and a service specification language that allows easy service creation and deployment.
- Prototypical service deployment and provision using the developed platform over an existing operator's laboratory infrastructure.
- A generic process model allowing service providers to fully realize the potential of the developed platform.

The impact of these achievements is multi-faced:

- PoLoS will increase the network agility and functionality, and support service interworking and management, focusing on active and dynamically reconfigurable network technologies, methods and tools.
- PoLoS focuses on the study of novel concepts and architectures for networks offering significant advances in terms of performance, cost and service capabilities.
- PoLoS develops and validates open architectures, technologies and tools to allow for the provision of a variety of applications as networked services over a commonly available infrastructure.
- PoLoS enables experimentation with new business models to exploit to the widest possible extent the novelties incorporated in the underlying technology platform.
- PoLoS will increase the awareness of people with respect to advanced mobile network services and the potentials of Geographical Information Systems (GIS).
- PoLoS defines an open access method that allows user appliances and Internet applications to access location information from the wireless networks, irrespective of their underlying air interface technologies and positioning methods.

13. Coordinator Contact Details

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