

# **INTEGRATED, INTEROPERABLE AND MULTIMODAL LOCATION-BASED ITS SERVICES**

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## **SUMMARY**

Existing infomobility services are only local, incomplete and offered by varying user interfaces and service delivery platforms. IM@GINE IT R&D project, co-funded by the European Commission, aims to develop one and single access point, through which the end user can obtain location-based, intermodal transport information (static and dynamic), mapping and routing, navigation and other related services everywhere in Europe, anytime, taking into account personal preferences of the user. Thus, IM@GINE IT targets the facilitation of seamless travel in Europe.

## **THE PROBLEM**

According to a recent study carried out by the magazine ONLINE TODAY (1), 69% of the internet users use the internet to compare hotel prices, 28% for booking flight or rail tickets and 25% for booking hotels. This vast market is gradually getting mobile. Experts from the GARTNER GROUP (2, 3) believe that in 2004 MMS will have a market of 23 billion € Figures 1 and 2 display the experienced and foreseen “boom” in the worldwide location-based services as well as mobile consumer service revenues in Europe.

While the end user (“passenger”) perceives the transport network as infinite and seamless, neither the supply of physical transport services nor the provision of travel information services is in reality close as such. The ITS industry supporting, or supposed to support, the intermodal transport, is quite segmented, as per geographic boundaries, transport mode (i.e. private vs. public), distribution of content, as well as communication means. Personal end users profiles, differences in culture/language and user interface preferences are rarely taken into consideration. Clearly, there is a need for intelligent and personalised infomobility

services, covering the whole travel chain and being Europe-wide and flexible: IM@GINE IT initiative intends to meet exactly this need.

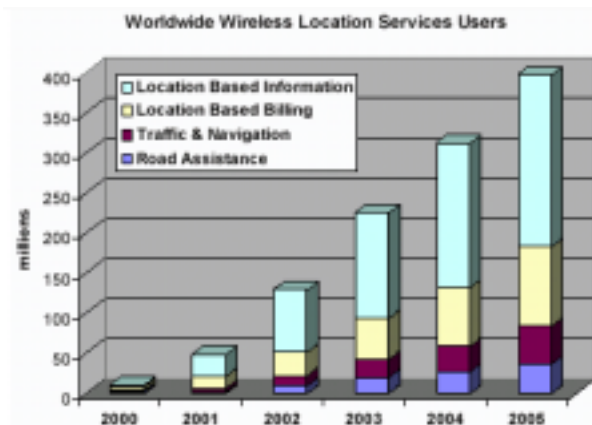


Figure 1: WLS Users worldwide.

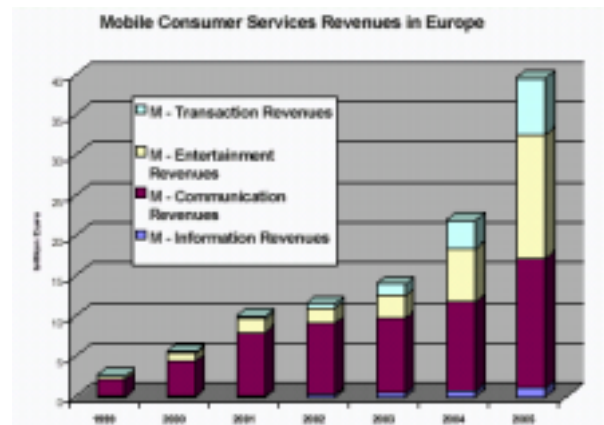


Figure 2: Mobile consumer services revenues by mCommerce sector.

## IM@GINE IT PROJECT OBJECTIVES

The main objective of IM@GINE IT is to provide one and single access point through which the end user can obtain location based, intermodal transport information (dynamic and static), mapping & routing, navigation and other related services everywhere in Europe, anytime, taking into account personal preferences. Thus, the key phrase behind IM@GINE IT is: **facilitation of seamless travel in Europe**. Therefore, IM@GINE IT aims to:

- Cater for intermodality & seamlessness of travel. The mobility network is in reality seamless, thus IM@GINE IT should synthesise information of all modes, and of both urban and interurban environments.
- Bridge the gap between in-vehicle and off-board information and navigation systems.
- Bridge the gap between vehicle and pedestrian navigation method to provide a seamless intermodal navigation.
- Be capable of collecting and managing data from different sources.
- Cater for interchangeability & seamlessness of communication technologies (access everywhere). The back end (platform) as well as the front end (device) should be able to accommodate and/or switch to different communication networks according to the needs of the moment and place.
- Be able to “roam” between different media providers.
- Be capable of always acknowledging the location of the end user wherever he/she is, thus switch between different positioning methods depending on the special requirements of the place or mode in which the end user is.
- Be capable of navigating the end user at all levels (micro, within an airport for example, middle, within a city or area, and macro during intercity travel), and for the whole intermodal travel.
- Provide other related location based or travel oriented services, such as booking/ticketing and emergency services.
- Perform complex tasks on behalf of the user, and according to his/her preferences. These tasks may include: automatic selection of best travel plan, intelligent filtering & synthesis of information & services, automatic change of travel plans according to unexpected events, booking and ticketing.

- Interface with external systems at the platform and/or the device point.
- Provide an external data editor, which allows to an external content provider to update and enhance a central IM@GINE IT database.
- Increase safety while driving by using IM@GINE IT personalised services to adapt accordingly the warnings and information coming from the vehicles ADAS and IVIS and by automate procedures like route planning, information filtering, etc.; allowing the driver to focus to its primary task.
- Increase also the safety of pedestrians by minimising any disturbing information or confusing tasks, which will reduce a drivers' attention to the possible dangers around.

## **STATE OF THE ART**

### **Technical Aspects**

The obvious tendency for integrating services and the trend to co-operations between content, service, and network providers will require the implementation of intelligent and open interfaces as it is increasingly realised in XML (Extensible Markup Language) and SOAP (Simple Object Access Protocol) technology. The latter one is known these days mostly because it is already one step ahead of pure XML and promising for the task of inter-connecting services and content of different market players with easy means. This so called “Web services” are based on a client – server architecture which is supported by both, SUN Microsystems (ONE) and MICROSOFT (.NET) (4). The idea is to make all available Web services public in a web directory, the Universal Description, Discovery and Integration (UDDI), thus enabling all interested parties to easily find and connect to the desired services. In this context UDDI is also a platform to present ones own company and it’s Web services. In addition to this development, intelligent and mobile agents are to be developed, which are able to perform self-triggered, autonomous and personalised interactions between different services and their content.

### **Safety issues**

As the ADAS and IVIS are becoming more mature their presence within the vehicle is increasing. This results, except of the benefits of course, also to an important increase of the driver’s workload, having this way implications to his/her safety. Until now these systems are working as stand alone devices and without taking into account the preferences and/or special needs and requirements of the drivers. By optimising the information provision to pedestrian and public transport users, it will reduce their workload and enhance their safety (they constitute the bulk of Vulnerable Road Users).

## **IM@GINE IT PROJECT WORKPLAN**

### **IM@GINE IT architecture, functions and logical elements**

IM@GINE IT will cater for the following personal needs: Being, Knowing, Wanting, Acquiring, Enjoying. This will be achieved by providing information (‘knowing’) that allows a choice of services according to user preferences (‘wanting’), arranging for the remote booking of those services (‘acquiring’), facilitating trip planning according to user preferences

(‘wanting’) through the provision of mobility information (‘knowing’), on-line booking and ticketing (‘acquiring’), in a way that ensures maximum comfort (‘enjoying’) and is customised to the consumer’s profile (‘being’). The objective of the system is thereafter to support the user in satisfying his/her basic needs for journey planning and trip support.

The following scenarios of use are therefore identified:

- Plan a new journey from origin, i.e. home (pre-trip).
- Plan a new journey while on trip.
- Plan a deviation to an existing trip.
- Bookmark or activate a planned journey.
- Ask for supporting services to trip execution (e.g. navigation according to planned route).
- See details of a bookmarked or active journey.
- Push events that may change the details of the active journey.

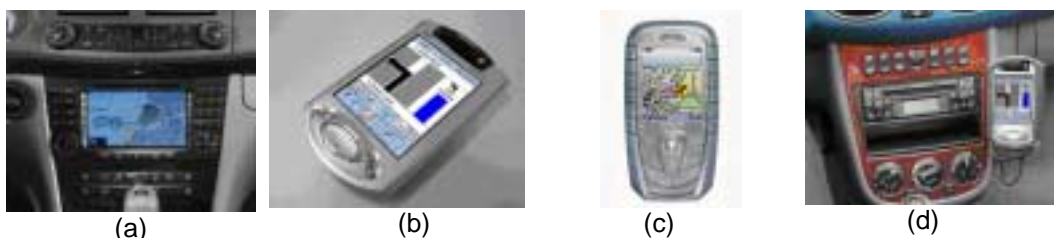
The overall architecture of IM@GINE IT is composed of the following main actors:

- the user;
- the service structure and the modality to access;
- the server side telematic platform, which manages content, services and user profiles;
- the device side application which hosts temporary users’ preferences, interaction with other applications and user interface;
- the infrastructure on the field.

IM@GINE IT system will constitute a platform comprised of Data management, Web services, Intelligent Agents and Communication gateways. The platform should interface with Content providers, Service providers, GIS systems, Ticketing systems, Added value systems and Media providers. The platform will be able to:

- Obtain data from different sources.
- Provide a data editor to allow the input of data from external partner.
- Perform data synthesis for specific requirements of transport modes and environments.
- Obtain external services.
- Perform service synthesis according to personal profile and user position.
- Geo-reference all data and services.
- Perform route referencing and logical localisation.

Four different local applications will be developed depending on the device’s type (mobile phone, PDA, in-vehicle, mobile PC; various sizes, communication means, computing resources’ capabilities, etc.).



Picture 2: (a) In-vehicle information (source: Daimler-Chrysler); (b) Navigation via PDA (source: PTV); (c) Mobile phone based navigation (source: PTV); (d) Interface of Nomad device (PDA) to the in-vehicle system (source: PTV).

The differences between the four types have mainly to do with: a) their technical characteristics, b) the usability and context of use aspects, and c) other local systems with which the IM@GINE IT system has to interface.

The functions accommodated by the mobile device, are envisaged to be as following:

- Local off-line applications, hosted in the device.
- Interface with the platform when appropriate (for example requested by the end user). Client-server as well as peer to peer communication is possible
- Switch to different communication networks.
- Switch to different user positioning means.
- Automatic identification and adaptation to different operational environments (i.e. in a car, in a different transport vehicle – airplane, train, pedestrian, stand-alone).

## Intelligent Agents architecture

One of the IM@GINE IT special characteristics is the development of an intelligent system based on agent technology that will integrate the existing information and services, adjust it to the personal preferences of the user providing thus seamless services according to the user needs. An original combination of four agent types will be designed and developed, each dedicated to a specific task:

- the provider agents will provide simple services offered by simple service and middleware providers. Thus they will be able to perform ticket reservation, plan urban or intercity trips, provide tourist and traffic information;
- the transport mode agents will assist the user’s travel depending on the mode that he/she will use (car, public transport or foot);
- the personal assistant agent (PAA) will work exclusively for one user, handling his/her personal preferences and adapt the offered services according to the user needs. This agent type will aggregate the simple services provided by other agents in order to offer to the user the IM@GINE IT complex services;
- the middle agent will participate to the localization of services proposed by different provider agents as well as to the transaction achievement between the PAA and the chosen provider agent.

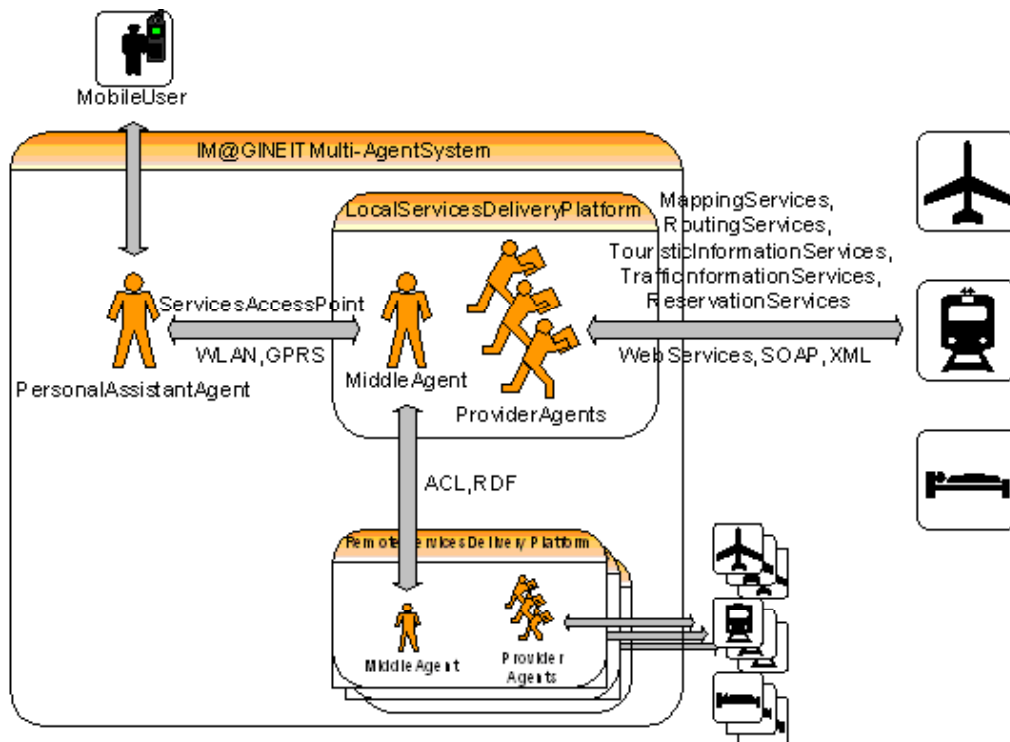


Figure 3: IM@GINE IT Agents.

IM@GINE IT, developing a common router for data gathering and interfacing, a single batch of georeferenced and navigation services and a common, personalised user interface for infomobility services provision across the whole travel chain, significantly contributes towards a long-awaited dream to come true: seamless travel and tourism information coverage across Europe; based upon advanced, reliable and high quality dynamic services.

## CONCLUSIONS

Infomobility services are currently very much clustered within Europe. Four different types of services (classic portals, advanced portals, distributed systems and service networks) are competing for supremacy, while a number of problems, such as lack of integration, different business models, legal and technological constraints as well as different platforms and VAS (i.e. in-vehicle systems, PT systems, pedestrian systems) limit the usability and thus market penetration of such services.

IM@GINE IT, developing a common router for data gathering and interfacing (Data Management module), a single batch of georeferenced and navigation services and a common, personalised user interface for infomobility services provision across the whole travel chain, significantly contributes towards a long-awaited dream to come true: **seamless travel and tourism information coverage across Europe**; based upon advanced, reliable and high quality dynamic services.

The necessary competences for it may only be found in a truly pan-European Consortium as IM@GINE IT, that can also bridge the different user needs and infrastructure / technological platforms across Europe; with application sites in North (Finland), Central (Germany), South (Italy, Greece) and Eastern (Hungary) Europe.

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