Challenges and Success Criteria for Mobile Services in Tourism

Klaus Rechert

Albert-Ludwigs University
Freiburg, Germany
klaus.rechert@rz.uni-freiburg.de

Abstract

The biggest challenge of providing mobile services in tourism today is to enable small and medium sized institutions and individuals to develop location based content. Major obstacles are high demands on supporting infrastructure and technical expertise. Also the lack of standards in this area hinders a wider and diverse development of new services. Especially locals have the best knowledge of their region and can usually provide more useful and up-to-date information for travellers and residents than universal service providers could do. This article discusses success criteria for a portable LBS platforms and authoring tools. The goal is to enable a wide range of local institutions developing their own LBS applications, maintaining their content and protecting their investments.

Keywords: location based services; architecture; requirements; tools;

1 Introduction

Location based services like tourist or museum guides have a long history and certainly belong to the most common context aware applications so far. Research projects like Cyberguide (Abowd et. al, 1997) and GUIDE (Cheverst et. al, 2000) started at the end of the nineties and have shown first functional prototypes. Since then, also special aspects like position and location determination for in- and outdoor applications (cf. Sun, Chen, Guo & Liu, 2005), usability and application design (e.g. Ciavarella & Paterno, 2004) have been researched intensively. Furthermore, Dunlop & Brewster (2002) have defined first guidelines on developing mobile services. Especially tourism as one of the early researched fields on mobile and location based services seemed to be very promising for a wider commercial breakthrough. However, it was proven to be very difficult to establish successful solutions in this area. One reason was that many technical solutions did not meet the visitors' needs (cf. Brown & Chalmers, 2003). But what is at least of the same importance is to meet the requirements of potential service providers, especially local institutions in culture and tourism, like tourist offices and local cultural associations. Economou et al. (2008) have analysed the requirements of development kits and authoring tools for efficiently developing mobile services in the culture and tourist domain. Their study emphasises the importance of effective and easy to use tools but also the necessity of a portable and usable solution. Our paper discusses challenges and success criteria developing an easy-to-use LBS framework to enable small and local institutions to develop innovative mobile services for tourists.

2 Technical Platform

Location based services require suitable mobile devices with essential technical features like position determination, decent battery time and weight. Moreover, a display technology suitable for outdoor usage and network communication features are desirable. Today's available *Smartphones* usually satisfy these requirements. While the technical equipment of mobile devices is becoming more and more uniform, there is a tough competition on operating systems and software platforms. According to the latest studies (cf. http://www.gartner.com/it/page.jsp?id=910112 [Sep. 10, 2009]) the market on Smartphones is shared among Symbian (Nokia et al.), Windows Mobile, RIM, Apple and several Linux based devices (e.g. WebOS (Palm) or Android (Google)). The development of this market is incredibly fast and hardly predictable. Hence, it is crucial, especially for small providers, to choose a platform independent solution in order to protect investments on development and content.

2.1 Web based solutions

Since the introduction of the mobile internet, one of the major goals has been to enable the World Wide Web on mobile devices. In the beginning, limiting factors were bandwidth limitations, but also slow hardware and small displays and an ill-conceived usability model. Hence, the development focus was on simplification and feature reduction. The Wireless Application Protocol (WAP) was one of these attempts, but has never met the publishers' and the users' expectations. With the current generation of mobile devices many technical restrictions are gone. As memory and computing capacity aren't limiting factors any more, modern mobile web browsers have come closer to their desktop ancestors. Today's challenges are usability aspects (HCI), dedicated access to various location determination techniques and privacy protection. Therefore, it seems obvious to offer location based services using a browser based solution.

One example for a pure web based mobile service is a mobile guide through the botanical garden of Freiburg (Zhou, 2008). Solutions like these do not need to store anything on the visitor's mobile device. All data is kept and maintained on a central server. Therefore, any visitor has access to the same up-to-date data. Furthermore, the system can provide specific and tailored content based on the visitors' actions, usage history and preferences (Zhou & Rechert, 2008). Moreover, web based solutions offer seamless integration and accessibility to further either related or nearby services. Such a solution usually resembles the classic client-server approach and therefore requires a permanent internet connection. Small areas can be covered with WiFi infrastructure in a cost-effective manner, but GSM/3G connections impose difficulties on a web based approach. High bandwidth and low latency connections are usually only available in metropolitan areas and can cause significant costs, especially for foreign (roaming) visitors. HTML 5, today still an early draft, promises to remove some shortcomings for web based services (cf. http://www.w3.org/TR/html5/ [Sep. 10, 2009]). Beside a standard *Location-API*, also audio- and video-streams and generic drawing primitives (*Canvas*) will be included. Furthermore, off-line usage of complex sites is explicitly intended. In the long run, HTML 5 could be a veritable alternative for providing

mobile services. However, central data storage and the continuous transmission of one's position data might pose a significant privacy threat for most users.

2.2 Specialized Runtime Environment

An alternative approach to achieve platform independence is using a specialized runtime environment. Such a runtime is able to present data in a given specialized format and therefore allows separation of content and platform, very similar to a web browser, but more specialized. One of the most popular mobile runtime is the Java Micro Edition (J2ME). In general, the major advantage of specialized runtime environments is that they usually do not require a permanent network connection even though they offer such connections on demand. Any task, like user modelling or content selection and organisation, can be performed on the device itself. However, such engines typically have to balance two conflicting goals, development complexity and expressiveness. Either only applications and services with simple user interfaces and interaction options can be built, based on abstract descriptions like XML or templates, or a generic more expressive programming environment increases development complexity and the demand on necessary programming skills.

2.3 Service Development and Content Authoring

The technical platform is only the necessary base for running mobile services. The crucial part is developing the service concept, the application and content. This development process can be divided into two phases. First, the concept, the user interface and interactive workflows have to be developed. Thus, a technical and organisational frame for providing and presenting content in a context aware manner is created. In the second phase the content is created and enriched by location based contextual meta-data. Through an organisational separation of content and presentation, the maintenance of content could be done by the providing institution itself (e.g. through a traditional content management system). Through decentralized structures, content is created by different independent institutions delivering unique and specialized knowledge. Thus, both attractiveness and acceptance of mobile services could be increased.

3 Prototype and Practical Experience

If mobile services should get the same strong stimulus like the WWW in the late nineties some of its success terms will have to be combined with current research on mobile services. The WWW's decentralized structure and its low entry hurdles have made it possible for diverse individuals and institutions to create and publish content and create valuable and creative new services. Especially a standardized technical platform has encouraged development even in small niches and has given incentives for experiments. Also the seamless linkage of many different sources was a major success factor. Therefore, the biggest challenge for mobile service is to enable small, local providers to create a diverse, decentralized and interconnected LBS applications.

For developing our prototype we have followed these design criteria: *1.) Platform independence and interoperability between services of different providers, 2.) Low demands on technical expertise and supporting infrastructure, 3.) Expressive language to create interactive content and seamless rich media integration, 4.) Open and extensible architecture.*

In order to create an open and portable solution we have built an Open Source software stack for abstracting current mobile platforms (Fig. 1). It has been built on top of two different abstraction layers: one for hardware and one for operation system features. The basic abstraction of operating system calls is achieved by using a POSIX compatibility layer for platforms like WindowsCE and Symbian. The remaining abstraction of hardware and operating system features is done by using the *Simple DirectMedia Layer* library (SDL) (http://www.libsdl.org/, [Sep. 13, 2009]) which offers uniform interfaces for audio, video, threads, locking and timers.

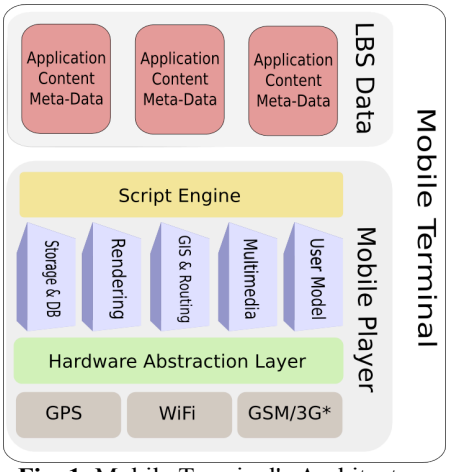

Fig. 1. Mobile Terminal's Architecture

Fig. 2. Screenshot NABU

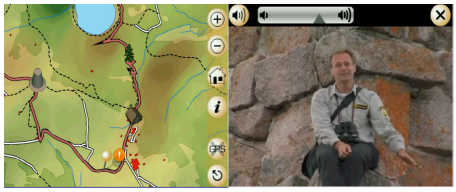

Fig. 3. Screenshot "Feldberg Ranger"

By choosing these two abstraction mechanisms, not only the majority of today's mobile devices are covered but we are also able to make use of a huge amount of Open-Source libraries. On top of the software stack we have built and developed a script engine for running LBS applications. We have chosen an easy to learn and easy to use, *JavaScript* like script language for the development of LBS applications. Beside the basic features, like arithmetic operations and string manipulation, we have compiled a set of custom classes specifically for the domain of LBS application. These classes allow users to handle LBS specific issues, like coordinate transformation and projection, handling maps and map data, position determination and proximity detection (Rechert, 2009). The framework is actively used for student research projects on topics like pedestrian navigation, positioning techniques and privacy aware location based services. However, we have also found two institutions which use our framework for public LBS applications successfully. Both focus on outdoor applications with educational and entertaining multimedia content. While the *Feldberg-Ranger (2006)* (http://www.feldberg-steig.de/fst/hosentaschen_ranger [Sep.

13, 2009]) guides hikers through a round course and displays mainly entertaining videos and some basic information about nearby facilities (Fig. 2), the *Sternberg-Entdecker (2008)* (http://baden-wuerttemberg.nabu.de/naturerleben/albentdecker/, Sep. 13, 2009] provides educational and interactive content for kids together with basic navigation. Furthermore, a context aware encyclopaedia displaying only content relevant to the current position and/or season together with a bounty hunt application has been developed. Both institutions do not only have the ability to maintain their content on their own but are also able to make changes to the user interface and improve the applications (Fig. 3).

4 Conclusion

Currently, there is a lot of development and research on mobile and location based services. Nevertheless, there are also a lot of loose ends. One major issue remaining is the lack of a platform independent runtime with low demands on supporting infrastructure and interoperability between different mobile services. Web technologies and languages as well as new standards look promising, but mobile services have different requirements compared to websites, especially with respect to privacy and limited network availability. Likewise, publishers and service providers need powerful and easy to use authoring tools for developing location based services.

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