Chapter 3
A Component–Based Software Architecture for Delivering Location Based Services

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ABSTRACT
The combination of position fixing mechanisms with location-dependent, geographical information, can offer truly customized personal communication services through the mobile phone or other type of devices. Prompted by the avalanche of technology advances in the aforementioned areas, this chapter presents a generic framework for delivering Location Based Services (LBS). The framework is capable of providing the full functionality required for delivering LBS, starting from the specification of the service, covering issues like its deployment and maintenance of services, the service invocation and the final delivery of the produced results to the calling user. The main focus of the chapter is on the technical specification, the design and the functionality of the framework. However, with the purpose of assessing the proposed architecture, a prototype implementation based on the discussed specifications was built and its performance was evaluated using a series of pilot services.

INTRODUCTION
The mobile communications market experiences an unprecedented boom in the recent years. New handheld devices with increased capabilities are introduced, while mobile operators are striving to gain a significant portion of the market by delivering new state-of-the art value added network services, that can fully utilize the given technology. Location
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Location Based Services (LBS) is just one such category of services, on which both manufacturers and mobile operators have invested a lot (Kaasinen, 2003). However delivering new services requires developing means and tools that will assist in their creation, provision and maintenance.

This paper presents an extensible cross-platform framework, which facilitates the provision of LBS services with minimum effort from all involved sides (e.g. service provider, mobile operator etc.) and with no change to the wireless Internet infrastructure. Moreover, the framework is based on open standards so that it can accommodate future evolved technologies and be fitted in future telecommunication infrastructures.

LBS PROVISIONING PLATFORMS REQUIREMENTS

The development of a provisioning platform, which would cover all aspects of LBS provisioning is a primary goal of all vendors involved in the world of LBS software systems. The set of requirements and desired characteristics for such platform includes:

- Means for supporting the service creation process without the need for special programming skills.
- Support for service deployment and operation through automatic procedures, which do not require special IT personnel or programming skills.
- Service provisioning through a variety of access protocols so that the service is accessible from different networks.
- Portability over different operating systems and hardware platforms, so that integration to different infrastructures is possible.
- Reusability: The same platform may host a number of different services, with different requirements and functionality. The introduction of new services should not require changes to the platform and changes to the platform should not affect the execution of existing or future services.
- Access to the system should be possible through a variety of devices, using different transport protocols.
- Independence from underlying positioning and GIS technologies: The platform should not bind to any specific networking technologies. GSM/GPRS and WLAN interfaces should be treated in a unified way, while the introduction of UMTS and 3G networks will not require changes to either services or the platform. This also applies to the GIS interface which should be open enough so that integration with different implementations to be possible.
- Security. Interfaces with external entities have to be secure and privacy should be maintained. These characteristics will make the user feel safer and as a result more receptive to using the platform.
- Roaming across different infrastructures. Both indoor and outdoor environments should be supported.
- Scalability. Possibility of hosting large number of services, each capable of serving numerous concurrent requests, is sure to enhance the marketing potential of the platform.

Currently, to the best of our knowledge, no integrated platform, which covers all these aspects, exists. Most of the existing platforms facilitate LBS operations by providing very simple functionality, which fulfills only a subset of these requirements. During the design of the discussed framework the goal was to cover all the aforementioned requirements and provide all these features that could maximize the benefit from the adoption of the provided system.