Abstract—This paper describes a study of the issues surrounding location-based services (LBSs) and the lack of sufficient LBS development facilities in the Mobicents JAIN-SLEE service delivery platform. A discussion of important location-based services standards highlights a protocol-independent model that includes a Location Generator (LG), a Location Server (LS) and a Location Receiver (LR). This paper proposes the use of the Mobicents service delivery platform as a Location Server for LGs and LRs developed with a location-based services toolkit tailored for the Mobicents environment.

Index Terms—JAIN-SLEE, LBS, Mobicents, PIDF-LO

I. INTRODUCTION

A ccording to market research organizations Berg Insights and Gartner, Location-based services (LBSs) are a breed of growing services and an estimated three hundred million subscribers are expected by 2011 [7]. People are demanding applications that are customized not only for them but also for their current location. With mobile phones having Geographical Positioning System (GPS) receivers becoming more commonplace, they (mobile phones) have become a very attractive option through which these LBS applications can be delivered [7]. Furthermore, Open standard telecommunications environments (such as openIMS and Mobicents) provide service developers with architectures to create, deploy and manage multimedia services and applications over all-IP networks [5,6]. Mobicents is the most popular Open Source SIP Application Server for the Java platform [6]. It facilitates the quick implementation of services combining voice, video and data in a simple way and also enables the development of a market oriented and cost-effective service delivery platform [6]. The Mobicents environment, however, currently lacks sufficient and transparent support for the development of location-based services applications. This is the motivation for an investigation of the construction of a cost-effective Java Mobile Environment toolkit for developing location-aware mobile phone applications tailored to work with the Mobicents framework. The envisaged solution should allow for the Mobicents platform to perform the functions of a Location Server. The solution should also ease the integration of location data gathered from mobile phones (Location Generators) into voice, video and data services and other applications developed within the Mobicents environment.

II. BACKGROUND

A. Location-based Services

The OpenGIS Consortium (OGC) defines a Location-based Service as “A wireless-IP service that uses geographic information to serve a mobile user. Any application service that exploits the position of a mobile terminal”. The growing trend towards location-aware applications has necessitated the development of standards to promote interoperability and data sharing with new and existing systems. The Internet Engineering Task Force (IETF) Geographic Location and Privacy (GEOPRIV) defines a protocol-independent model for the secure and private access to geographic information [3]. The model includes a Location Generator (LG) that determines location information (a mobile phone in the case of this project), a Location Server (LS) that authorizes access to location information (the Mobicents server in the case of this project), a Location Recipient (LR) that requests and receives location information, and a Rule Maker (RM) that writes authorization policies. (The LG and RM could be one.) The standard defines the Presence Document Information Format – Location Object (PIDF-LO) that carries location information (in the OGC Geographical Mark-up Language (GML) format) and policy information that dictates the redistribution of the private location data [2]. The PIDF-LO format is an extension of the Presence Document Information Format (PIDF) which carries sensitive presence data securely. The PIDF-LO document format is a protocol-independent XML document format and can be carried in any protocol defined by the IETF as a “using” protocol [2, 3]. This could be any protocol capable of carrying XML payloads like the Session Initiation Protocol (SIP), XMPP or HTTP. The Location Generator (LG) publishes location Information to a Location Server (LS). The LS then distributes the location information according to policies set by the Rule Maker which might be the same as the LG.
B. Mobicents

As mentioned in the introduction, Mobicents is an Open Source application Server for the Java platform and it complements J2EE to enable convergence of voice, video and data in next generation intelligent applications. It uses the Java APIs for Intelligent Networks – Service Logic Execution Environment (JAIN-SLEE) for asynchronous real-time event processing [6]. JAIN-SLEE allows for the composition and re-use of entities known as Service Building Blocks (SBBs) which provide execution logic applied to events (an event could be location information from LG) from the network. Well-known protocol stacks such as SIP or XMPP could be plugged into the Mobicents JAIN-SLEE environment as resource adapters [6].

Mobicents comprises four main servers namely the SIP Servlets server, the Media server, the JAIN-SLEE Server and the Presence Server. For the purposes of location-based services, the Mobicents platform could be employed as a Location Server (LS). It will manage the publication of location information by Location Generators and handle the subscriptions of the Location Receivers according to privacy policies. The presence server supports the PIDF document format used for the secure distribution of presence data. The Mobicents Presence Service could be reused to implement the functions of a Location Server by the addition of support for PIDF-LO document format support. The protocol used to carry this data could be SIP, XMPP or HTTP. Alternatively, the Mobicents environment can be configured to work with an XMPP server, because the XMPP protocol offers an extension to carry geospatial information. However, in the author’s opinion, the XMPP extension does not offer privacy options that are as flexible as the ones offered by the GEOPRIV standards. Also GML is a much richer location data carrier than XMPP. But as a part of the project, both approaches will be tried out and evaluated.

III. RELATED WORK

The University of the Western Cape proposed the use of a data format to carry geospatial data. They created the Location-Enhanced Presence Information Data Format (LPIDF) [1]. A Peer-to-Peer architecture was chosen and SIP Back-to-Back User Agents (B2BUA) were used as endpoints with access policy and authorization. SIP was used to carry the LPIDF format. The results were found to meet the privacy requirements for sharing location data. At the Telecommunications Research Centre in Vienna, similar research was undertaken to investigate the extension of the SIMPLE protocol to implement location-based services in the IP Multimedia Subsystem environment (IMS) [5].

IV. OBJECTIVE AND METHODOLOGY

The objectives of this research are:

1) the preparation of a mobile location-based services toolkit that will be used to build applications (Location Generators and Recipients) that communicate with the Mobicents server (as a Location Server);
2) Addition of modules to the Mobicents environment to support and use mobile services built with the toolkit. Server functions will include managing publications and subscriptions to location data, authorising access, managing policies and combining it with video, voice and other data for new services.

To meet the objectives, specific location-based services will be built, tested and evaluated. These services will be built using the Java Mobile Environment (JME) for mobile phones (these services will generally be Location Generators and Location Receivers). They will interact with the Mobicents platform, which will act as the Location Server. The commonalities between these services will then be meshed into an initial toolkit (JME library) for the client applications and APIs and Service Building Blocks (SBBs) on the Mobicents side. The toolkit will then be further refined with the cyclic repetition of this process.

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V. REFERENCES