

# “I’m here”: improving voice location tools with Cell-ID

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## ABSTRACT

Mobile phone market is still lacking a satisfactory location technology, i.e. a technology which is accurate, but also economic and easy to be deployed. Nowadays, most of proposed technologies with a good accuracy, require substantial technological and financial efforts. Our work show how the simple and economic Cell-ID location technique can be effectively exploited to implement more effective and efficient voice location services.

## Keywords

LBS, Cell-ID, VXML.

## INTRODUCTION

The current push for location-based services in North America started in 1996, when the U.S. Federal Communications Commission passed the Enhanced 911 (E911) mandate. U.S. mobile operators, motivated by E911 requirements, are experimenting new and effective location techniques (GPS, A-GPS, TOA, E-OTD, etc.). Nevertheless, all these techniques require substantial technological and financial efforts. E112, the European equivalent of the American E911, does not impose any accuracy or technology mandate in delivering location capabilities. For this reason, most of E.U. wireless carriers are first expected to use the economic Cell-ID positioning. This very basic form of location technology uses latitude and longitude of the antenna handling the communication as an approximation of the actual phone position. Cell-ID is simple and economic and it does not require any upgrade of handsets or network equipments, but since the handset can be anywhere within a cell, accuracy depends on cell size (ranging from few meters to few kilometers). This poor accuracy strongly limit the use of Cell-ID. Indeed only very basic form of Location Based Services (LBSs) have been deployed on the market. Nevertheless in the next section we briefly show how Cell-ID can be effectively exploited in the context of Voice LBSs.

## IMPROVING VOICE LBSs WITH Cell-ID

In this section we present a new Voice-XML (VXML) platform which takes a great advantage from the knowledge of the approximate user location estimated by Cell-ID. VXML allows a user to interact with the Internet through a voice-recognition/synthesis technology. Using VXML, users interact with voice browser by listening to audio

	Addresses	T(upload)	T(query)
<b>FULL</b>	3405	7sec.	2sec.
<b>REDUCED</b>	21	0.6sec.	0.6sec.

**Table 1: Results on correct and complete inputs.**

output and submitting audio input through the user's natural speaking language. The audio input recognition process is performed by the ASR (Automatic Speech Recognizer), which uses a grammar to recognize words or sentences from the user's spoken speech. The recognition process effectiveness and efficiency strongly depends on the grammar size. Consider the following scenario: a user calls a VXML server and says “I’m in via Margutta 45”. In such a case, the number of addresses, and consequently the recognition grammar size, would be possibly made of thousand of entries. The knowledge of the Cell-ID can be used to limit the grammar size, thus improving recognition process, to only the addresses in the cell handling the user communications. Indeed by cell-ID we can reduce the research domain from all the addresses in a city to all the addresses in a specific cell (i.e. a circle with an average radius of about 500m). In order to better evaluate how Cell-ID can improve VXML LBSs, we ran some experiments in Rome. We ran our experiments over 720 Cell-IDs. If we limit our attention only to correct and complete inputs the full grammar is made of about 3400 addresses (see Table 1). The VXML server takes about 7 sec. to upload the grammar and 2 sec. to answer a query. Using Cell-ID information we can reduce the grammar size to an average of 21 addresses and therefore reduce T(upload) and T(query) by an order of magnitude. These advantages are even more evident if users are allowed to provide even partial addresses. The WLAB exploited this technique in the development of a novel multimodal LBS prototype.

## SHORT BIOGRAPHY

Andrea Vitaletti, Ph.D. at the University of Rome “La Sapienza” is contract professor at the same university. Research interests: wireless and sensor networks, LBS, VXML, algorithms. Some papers in international workshops and journals. In 2003 he founded the WLAB Ltd. a startup mainly focused on innovation and applied research in the wireless area. He is consultant for some Italian and U.S. companies.

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