

Open Standards A Must for Hybrid

After several years of missed expectations, the location-based services market is now expanding significantly. But, can an open source LBS toolkit based on open standards help unleash the full potential of 'hybrid' indoor and outdoor LBS? **By Stefano Piffer, Prof. Ki-Joune Li, Massimo Barozzi, and Dr. Giuseppe Conti**

LBS

It is said that we spend on an average 80-90% of our time indoors, yet the large majority of mapping and navigation systems which are available in the market today are essentially designed for outdoor use. Conversely, it is widely acknowledged that integrated indoor/outdoor location, tracking and management of assets (human and material) are key drivers for several domains, potentially enabling high value-added scenarios ranging from e-government services to eHealth, from personal mobility to logistics, from facility management to retail.

The rapid technological development of indoor location technologies, which now allow up to sub-metre precision, together with the cultural readiness of the general public to use mapping and navigation applications for a variety of activities during their daily lives, has created the ideal conditions for significant uptake of LBS technologies.

Market relevance of indoor LBS

Several analysis highlight the market relevance of indoor location and mapping applications which are set to “revolutionise how businesses reach mobile consumers and enhance their experiences in a variety of public places, particularly indoors”. In fact, while 3D and turn-by-turn directions have become a commonplace within most navigation systems, indoor localisation is now being regarded as the next big market op-

portunity in the navigation market. As noted by ABI Research, “the indoor location market sits on the cusp of a wave, with the market set to reach a significant number of installations in 2015-2017.”

While, historically mobile operators played a leading role in the LBS value chain, in recent years, big corporates and small start-ups have started entering the indoor location market. According to a recent market report by IndoorLBS, there were around 150 plus companies working in the domain of indoor LBS (as of March 2013). Small but fast growing companies such as Micello, Aisle 411, Point Inside and Qubulus are acquiring a leading role in the market. At the same time, there has been a clear interest from large corporates such as Apple, as testified by their acquisition, for US\$20 million, of Wifislam, a company specialising in indoor location.

However, there are still few key barriers that prevent innovation and business activities on a large scale in this domain, including, most notably:

- Widespread availability of indoor mapping information on a large scale.
- Lack of technological ecosystems that can be used to facilitate take-up of innovative services based on location within hybrid indoor/outdoor scenarios.
- Lack of policies balancing the technology of location with the need to assure locational privacy.

- Limited support to hybrid indoor/outdoor LBS by current standards.

Open vs closed indoor data

Major corporates are investing significantly to create large-scale indoor mapping databases. Especially in the case of public buildings or publicly accessible buildings (eg a shopping mall or an airport), having access to the interior geography can allow creation of innovative businesses or services with high economic and/or social benefits leveraging on:

- **People presence and navigation:** To better assist users or to support specialised operators. For example, customer support within retail space, hyper-local marketing campaign etc.
- **Asset tracking and management:** To improve localisation of devices and machinery in order to improve their management, maintenance and use.

Players such as Nokia, Microsoft or Google, to name a few, have started large-scale acquisition campaigns of indoor venues. The result is the availability of indoor maps of thousands of locations through their mapping products. Analysts by IMS Research predict that, as result of this trend, up to 1,20,000 indoor venues could be mapped by 2016. Even more optimistic figures have been predicted by ABI Research, which foresees that by 2017, up to 5,00,000 indoor venues will be mapped and made available to consumer applications.

An increasing number of experts argue that, in the medium to long term, a ‘closed’ approach to indoor data may be of limited success. ‘Closed’ or otherwise proprietary systems, do not grant any control to the owners of indoor spaces. This could discourage owners of public spaces (eg public administrations) or of publicly accessible spaces (eg retail spaces, shopping malls etc.), which would find themselves depending on the third party service providers to ensure that the maps of their premises are published or promptly updated.

The advocates of open data argue that, in the aforementioned cases, ‘open’ indoor geographic information (GI) ensures a more successful strategy. Those in favour of the development of indoor mapping repositories as open data quote the example of OpenStreetMap (OSM) which has shown how open geographic information can become a strong driver for innovation and a catalyst for new businesses and services.

Technological ecosystem

If we analyse the fast-evolving technological landscape, an increasing number of accurate indoor localisation devices based on technologies such as Bluetooth, ZigBee, Wi-Fi and UWB, allow real-time location within indoor spaces. While there is a long list of specialised companies offering indoor LBS solutions for specialised markets (both hardware and software), the general market is held by players like Apple,

Google, Microsoft, Cisco, Skyhook, Navizon etc.

However, such diversified technological landscape presents a critical challenge. There is no single hardware-independent software system that can be used on top of different hardware technologies. In fact, most location technologies rely on non-interoperable software solutions and therefore cannot be easily integrated within a common technological framework. This obviously limits the widespread uptake of indoor LBS.

Open data, standards for hybrid LBS

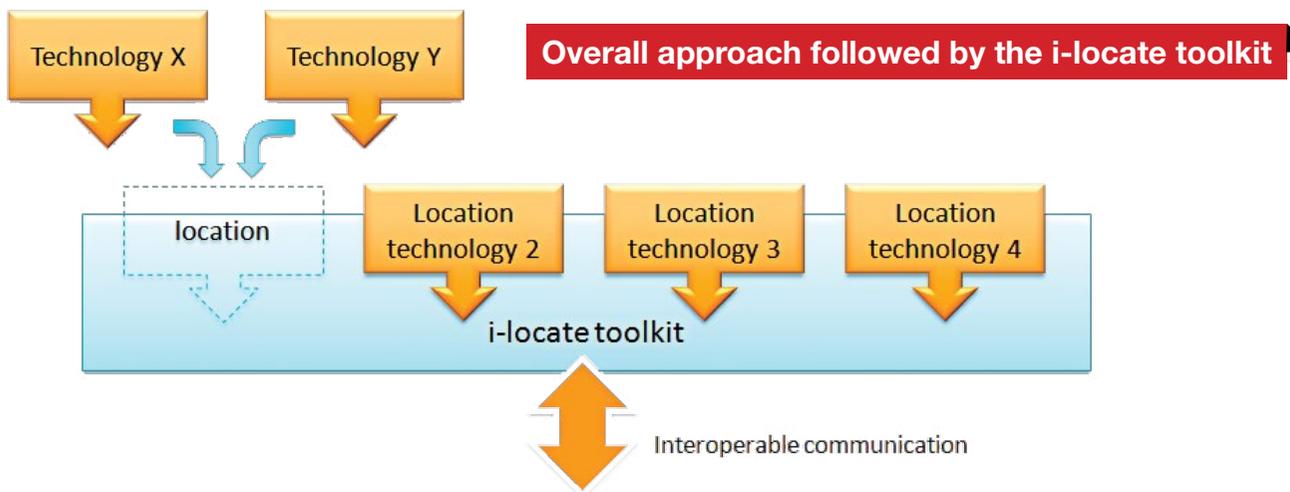
The two aforementioned barriers are being addressed by the project i-locate, indoor/outdoor location and asset management through open geodata, (www.i-locate.eu). The project is funded by the ICT-PSP programme of the European Commission within a specific strand on ‘open data experimentation and innovation building on geographic information’.

In short, the goal of i-locate is two-fold. First, it will create a ‘virtual hub’ for user-friendly creation, sharing and publishing of indoor maps as open data. The ‘virtual hub’, which has been designed as a geoportal, will be publicly available and will ensure access to indoor maps of public or publicly accessible spaces such as hospitals, public offices, shopping malls etc. Interoperability of the portal will ensure maximum accessibility to indoor data via OGC standard services (eg WFS, WMS). Most notably, the portal will be designed to allow support to IndoorGML, the forthcoming standard by the



Courtesy: KTNET

Fing's indoor map of Seoul's Gangnam Station shopping mall



Open Geospatial Consortium (OGC) which is set to become the reference standard for indoor location based services.

The portal will allow creation and management of all the features necessary for indoor LBS, from upload of CAD files to their re-projection, from the definition of indoor zones and sub-zones to the semantic qualification of spaces (eg to identify 'check-in areas' from 'waiting lounges') etc.

Secondly, i-locate is developing an extendible open source software 'toolkit' specifically designed for convenient creation of location based services. The toolkit is designed in a hardware-independent fashion in order to provide an abstraction on top of the underlying location technologies.

The LBS that will be developed by i-locate will be accessible from mobile devices that will complement the service toolkit, allowing crowdsourcing of information regarding indoor spaces as open data. Due to the extensive use of location technologies, i-locate has paid specific attention to the development of a privacy impact assessment (PIA) and privacy threat vulnerability and risk analysis (TVRA). The technology has been designed to ensure sound privacy and security policies, for the highest protection of personal/critical data.

Both the portal and the toolkit will be validated for one year in a large number of pilot locations across Europe (currently 15 locations in several countries) focusing on e-Health scenarios (e.g. hospitals, retirement houses) and other public services (e.g. museum, public offices). The results of the pilot phase will be analysed to perform economic and social impact analysis.

Business relevance of i-locate

i-locate has been engineered to address very clear market requirements emerging from a core of specialised SMEs. The strategy followed to ensure significant economic business impact gets delivered is based on three pillars.

First of all, the technology that is being developed will act as a facilitator to enable a number of indoor/outdoor (based on existing open data) businesses. The open source nature of i-locate will stimulate innovation and business activities around indoor geographic information. To this extent the project will also leverage on the smeSpire community, the largest network

of geo-ICT SMEs in Europe, to ensure that the relevant critical mass is created around the results of i-locate.

Secondly, the support of open standards from OGC will ensure convenient scalability to other technologies through support of common communication protocols. At the same time, adoption of open standards for the portal will ensure access and sharing through the Internet of open GI related to publicly accessible indoor spaces.

Thirdly, the i-locate portal for indoor GI will follow the open data paradigm. The portal is expected to grow far beyond the boundaries of the pilots. This will create a significant impact at the EU level facilitating start-up of businesses based on indoor mapping data of publicly available spaces. 🌐

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