



Location Based Services on Mobile Internet

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Summary

Location as a context element is seen as a promising enabler for further rapid penetration of Mobile Internet. Navigation, Location Information, Tracking and Tracing, Community and Entertainment are five application areas requiring wide availability of location services. Various location techniques are used across these application areas dependent on availability, usability and cost.

Currently manual input of postal code or city (geocoding) is the commonly used technique. Another popular technology, with limited availability in the Netherlands, determines location by means of Operator Cell-ID. Due to increased penetration of mobile internet and the lack of nation-wide operator cell-ID location services, handset based cell-ID is an emerging alternative to operator Cell ID. GPS positioning technology is currently on board in 4 % of phones sold (e.g. Nokia N95 and Apple iPhone 3G). Nokia announced it will include GPS technology in the majority of their mobile handsets by 2012. Hence, a strong growth of GPS enabled phones is expected.

With the growing availability of LBS new business opportunities emerge. Therefore, many parties form strategic partnerships with content providers, mobile network operators, wireless application service providers and others. With the involvement of different parties and the bright perspective of LBS, different revenue models are emerging as well.

Whilst sharing your location with third parties can be intrusive, privacy and LBS are often mentioned in one breath. Introduction of privacy frameworks across the entire LBS value chain should cater for privacy issues. OMI² drafted a code of conduct for Operator Cell-ID LBS and will, on behalf of consumers, ensure that privacy issues are adequately dealt with in the industry.

1. Introduction

This white paper aims at stakeholders developing services for mobile internet. Location is likely to be a context-aware feature used to develop innovative mobile applications and enhance existing mobile services. Location Based Services (LBS) is subject to several developments which create new potential in the Dutch mobile market within the next 12-24 months. The most important recent developments and favorable conditions for provision of LBS are:

- Emergence of GPS-capable mobile devices
- Emergence of Web 2.0 and Mobile 2.0
- Introduction of 3G and 3,5G mobile broadband networks
- Growth of mobile phone users with flat fee data plans (currently estimated at 1.5 million and growing fast)

These developments create a platform on which LBS will flourish, and a lot of opportunities are seen for LBS by numerous parties. Gartner in their 'Hype cycle for Consumer Mobile Applications 2008' document classify LBS -with 3 other mobile technologies out of 40- as one with high benefits. Gartner expects the number of subscribers of LBS worldwide to rise from 16 million in 2007 to 43.2 million in 2008 (+170%) and revenues from \$ 485 million in 2007 to \$ 1.3 billion in 2008 (+168%). These Gartner figures demonstrate that additional revenue per subscriber of LBS services is \$ 30 per annum. Gartner expects that between 5 and 20 % of target audience will actually use location based services.

Many software and hardware companies released a broad range of LBS capabilities for both mass and niche markets and laid the foundation for a new generation of LBS. Companies started development and release of many services; the more services out there that people are willing to use, the more LBS will become an enabler for the growth of mobile internet.

As will be illustrated in this paper, LBS creates a range of service opportunities and services are likely to be based on different location techniques Furthermore, a lot of parties are involved and new revenue models are emerging. Making the right choices in developing and bringing LBS to the market is critical, especially taking into account complexities of the mobile channel. On the other hand, new platforms like the iPhone and Android and services like Nokia or Google maps offer integrated and easy to apply LBS technology. These developments should accelerate massive uptake of LBS in the near future and might marginalize the role of the telecom operator. In the following chapters we will further elaborate on attractive application areas, technical solutions, revenue opportunities and privacy.

Hopefully this paper gives readers a clearer picture into what LBS really entails.

2. Mobile Location-Based service segments

Mobile location based services utilize geographic location of the handset to provide services with new capabilities. To illustrate this, we selected five segments where LBS plays a key role. This refreshes readers about what value LBS actually brings to a service and provides examples of the capabilities of LBS.

Navigation Services

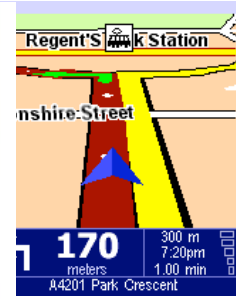
Navigation services range from advanced turn-by-turn navigation based on GPS-positioning and voice instructions to basic mapping applications that primarily use Cell-ID to display the user on a map.



Google Maps



Nokia Maps



TomTom Mobile

Location Information

Services provide some sort location-enhanced search and information service. These services allow users to search for categories of their interest.



Weather info



House search



Restaurants



Yellow pages

Tracking and Tracing

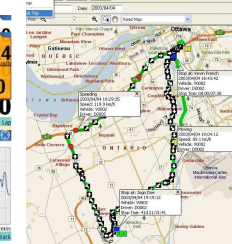
Services provide all sorts of tracking and tracing - consumer oriented as well as business oriented - people can track their own or other peoples (kids, friends) movements, businesses may track, for example, service engineers and delivery vehicles.



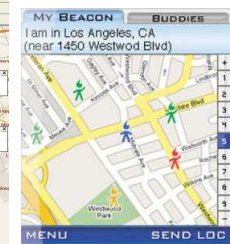
Trail tracking



Sports tracking



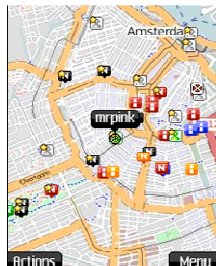
Fleet tracking



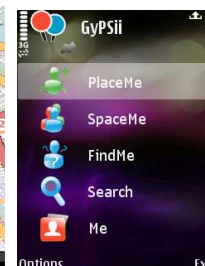
Buddy finding

Community and Entertainment

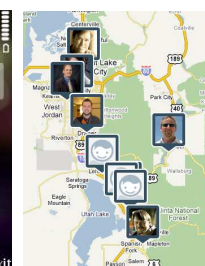
Social communities are brought to the mobile phone with the addition of location information often self-generated by the users. Messaging and gaming applications also do integrate location information. Users can chat with or play against other users around them.



LBS Communities



Instant messaging



GPS games

Other services

Many other services exist and more will arise as LBS becomes widely available to mobile users. A lot of opportunities emerge for example mobile advertising and emergency services.



Location advertising



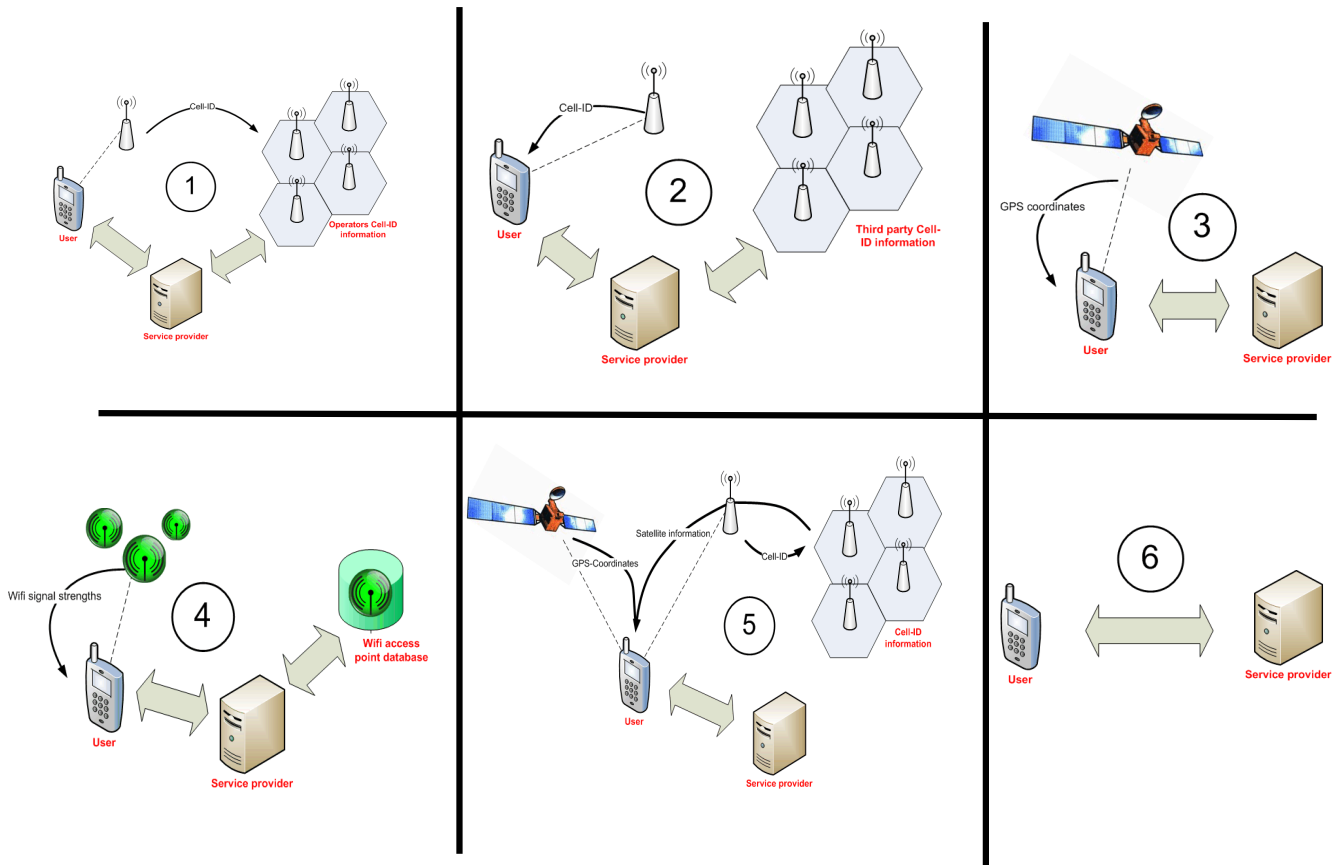
Emergency services

3. Positioning Technologies for LBS

A critical success factor of LBS is to locate the user with a required accuracy and latency. Positioning technologies usually require modifications in either the networks (installing soft- and hardware) or the mobile phones (installing GPS chips and applications), and in some cases in both. We categorize different location techniques into four classes, dependent on the component calculating the position of the handset. In the network based mode the handset requires a location, the network calculates the user position and sends it to a service provider. In the handset based mode the positioning is carried out by software on the handset and then sent back to the service provider. Then there is a hybrid class in which the handset and the network work together to position the user. Finally, there is the class where the user manually inputs his/her location. In the table and pictures below, we present and compare different positioning technologies.

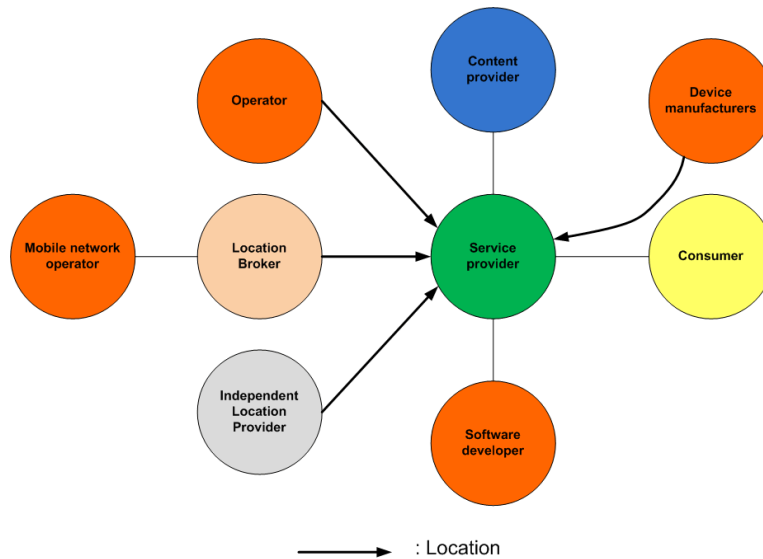
Positioning Technology		Accuracy	Indoor	Software installation needed on handset	Availability in NL	Enabling Costs	User Costs
Network Based	1. Operator cell-id	250m- 5 km	Yes	No	No	Moderate	Low
Handset Based	2. Cell-id	250m- x km (depends on database)	Yes	Yes	High	Low	Low
	3. GPS	10m – 50m	No	Yes	Low	Low	Moderate
	4. Wifi	20m-40m	Yes	Yes	Very Low	Low	Low
Hybrid	5. A-GPS	10m – 50m	Yes/No	Yes	Low	Moderate	Moderate
Manual	6. Manual input	Street-level	Yes	No	High	Very Low	Very Low

*For continuous tracking & tracing and navigation services, it should be noted that battery life becomes an issue for GPS/Wifi techniques



4. Roles in the LBS value network

Provisioning LBS to the consumer requires involvement of a range of parties in the LBS value network. The service provider has a variety of options to receive location information leading to different partnerships. In this paragraph we will discuss the different roles in a bit more detail, and present the playing field of all the parties involved.



Roles	Description	Interests	Example
Contextual roles	This role entails the social, political, technological and economical context and also the more concrete role of the regulator, who keeps the model within the regulatory and social context	A safe and secure mobile internet environment for the user	OMI, EU
Software developers	Develop software for service providers with build-in location functionality	Enable LBS services for service providers by selling them their software	Phasefour, Service2Media
Device Manufacturers	Manufacture devices with build-in GPS capability.	Sell devices	Nokia , Apple
Mobile network Operators	Consumers are connected 24x7 and have access to internet via a mobile network. This network is always needed, whether it is just an internet connection or also used for delivering location information	Offer attractive services to customers to make more profit out of mobile internet and keeping customers using their network	KPN, Vodafone, T-Mobile
Service providers	These are the parties creating services that will be used by the end-user. The services need a network, hard- and software to work properly. Also many services need content provided by content providers to be interesting for end users.	Reach as much consumer as possible and creating successful services, by using the most easy to use and accurate technology	llocal , NS, Nulaz , Hyves
Content providers	These are the providers that provide location rich content. Advertisers are also content providers.	Present their content to relevant customers in a relevant way, sell content on LBS services.	Ilse Media, Telegraaf
Consumers	Of course the consumer plays an important role, as the network revolves around them.	Use easy-to-use , cheap services wherever and whenever and on their phone (whatever that is)	You and me
Independent location provider	Parties that are building up their own cell-ID database because operator's database isn't available.	Sell location information and thus trying to launch the LBS market, thus creating more and more clients	Navizon, Telmatica/Service 2Media
Location broker	Parties that are acting as aggregator of operators information and acting as wholesale party for service providers	Making it easy for operators and service providers to connect, thereby becoming an essential actor in the LBS value network	MXTelcom , Mobile Commerce (UK)

5. Revenue models for Mobile LBS

As mobile location services are in the early stages of business development, it is not clear yet what the preferred revenue models will be. There are however various ways to recover the investments in location based services – both for network operators and service providers involved in facilitating or offering location based services.

Apart from the direct revenue models like charging per location request or charging the service provider and / or the consumer a fixed fee, there is a range of options in indirect revenue models available which could be considered when developing LBS services.

➤ **More data subscriptions**

Location Based Services extend their value proposition of Mobile Network Operators and is very likely to increase sales of (flat fee) data subscriptions.

➤ **Cost per lead or sale**

Whilst Location Based Services are mostly triggered by a consumer question / request (“Pizza, near me”), a Cost per Lead or Sale model is very likely to be attractive. Some examples:

Example 1: Cost per Digital lead (Click through)

Guus is hungry and looking for a pizza. He opens up a location service on his handset and enters ‘pizza’ ‘near this location’. Domino’s pizza has paid the service provider for being on top of the results for these keywords and/or pays the service provider for leading through to his website to place the order.

Example 2: Cost per Physical lead (Coupons)

Claire walks through the Kalverstraat. When passing by H&M, she sees a poster showing ‘download a promotional code now on your mobile – show it at the cashier – and get 20% discount’.

Example 3: Cost per Digital sale (Digital content)

Sander wants to treat his parents to a guided city tour of Amsterdam. He buys a GPS-phone tour from ‘Amsterdam Phone Tours BV’, complete with turn-by-turn maps, images, videos and real stories about famous citizens.

➤ **Display advertising**

‘Presence where your potential consumers are’ is a rather interesting revenue model in particular in the mobile space. Location based services as such are highly relevant for users and hence it will be interesting for advertisers partner with these sites and services. Display advertising has different shapes, for example:

- Banners and adwords
- Sponsored articles, themes or sections (‘Axe night guide for Museumplein’)
- Sponsored service (‘Heineken buddy finder’)
- Video bumpers (‘this video on the Rijksmuseum was brought to you by...’)

➤ **Analytics**

Both MNO’s and content and service providers offering location services generate a unique amount of information and analytics on the movements of the owners of the phones. These analytics can generate additional revenues in various ways, for example:

- Using (de-personalized) user info for new applications (like HD traffic in the Vodafone – TomTom partnership)
- Using permission-based personalized user info

6. Privacy issues

Protection of privacy is always a key issue for the general public. Naturally people are concerned when their location is known by someone not known to them. Therefore, the EU has adopted some directives dealing with privacy of users of LBS: according to the Privacy legal framework EC directives (95/46/EC, 97/66/EC and recent amendments), there are the following privacy principles that must be followed when designing location-based services:

- **Disclosure**: Any company that acts as a location data collector in some way should disclose to consumers what kind of data is collected about them and the purpose or use of such collection. Transparency by the data collector is key in this principle.
- **Consent**: Data collector should obtain the data subject's consent before collecting or using his/her personal data. This is also called opt-in and opt-out for the use of location.
- **Data Security**: Data collected should be protected by adequate security measures against accidental loss, theft, disclosure, destruction, illegal processing or similar. Archiving of personal location data can only be done with explicit approval of the user.

Privacy laws are drafted in general terms, therefore the industry needs to translate the privacy legal framework into business practices taking into account the interest of the industry, the interest of wireless users, wireless privacy issues and jurisdiction issues using the stringent privacy framework. Privacy requirements are based on the nature of the application and its potential for abuse.

From a privacy perspective there are two distinct ways to apply LBS, e.g.

a. Active use or '**pull**': the location is requested by the consumer. Typical examples are: location information (weather, local search) and navigation.

b. Passive use or '**push**': the request for location is not initiated by the consumer. Typical examples are: buddy finding and fleet tracking.

Operator Cell-ID is a unique technology in the sense that it uniquely provides accurate passive LBS with minimal latency. The impact of LBS on privacy is virtually non-existent with active LBS. Passive LBS, however, is vulnerable to abuse. Key in privacy protection is explicit approval by the consumer. Reports from UK, where Operator Cell-ID LBS is provided to content providers by LBS brokers, show that consumer privacy is fully protected when proper governance is in place. LBS is a topic on the agenda of the OMI² cluster dealing with consumer trust. The cluster drafted a code of conduct focusing on Operator Cell-ID LBS in particular. Furthermore, work is conducted by OMI² to ensure adequate governance in the LBS value chain.