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The extent of horizontal coverage of LBS has virtually covered all the walks of life from selecting the restaurants to emergency services to aid in navigation

Location Based Service or LBS, is the ability to find the geographical location of the mobile device and provide services based on this location information. For an example a person at shopping mall calls for the nearest restaurant with economy budget, he needs only names and addresses of those restaurants which are within his reach, say within one sq.km., out of the database of say 2000 restaurants in the city spread over 1600 sq.km.

The foundation stone of Location Based Services was laid by the Federal Communications Commission of US (www.fcc.gov) ruling which required the network operators to provide emergency services by locating the user of the mobile device within 125 metres. It required wireless network operators to supply public emergency services with the caller's location and callback phone number. This hastened the emergence of new and dynamic field called LBS, where the service was based on the geographical location of the calling device. Further, the developments in the field of Positioning Systems, Communications and GIS, fueled the imagination of the industry people with regards to the LBS. This ability to provide the user a customised service depending upon his geographical location could be used by telecommunication companies to restaurant owners.

In the days to come, the LBS will be benefiting both the consumers and network operators. While the consumers will have greater personal safety, more personalised features and increased communication convenience, the network operators will address discrete market segments based on the different service portfolios.

The Prospects of LBS

According to a poll by Integrated Data Communications, Inc. (IDC), two-thirds of Americans want wireless location-based services, with safety and security issues (emergency call, roadside assistance, and driving directions) as the primary reasons for wanting location-based services. Respondents to the survey on LBS are said to be even willing to pay a premium to have location capabilities in their handsets or receive advertising on their handsets to reduce or eliminate telematics service charges.

The Strategis Group predicts market size of LBS will be \$3.9 billion by 2004 in the United States.

Allied Business Intelligence Inc (ABI) report, "Location Based Services: A Strategic Analysis of Wireless Technologies, Markets and Trends" report indicates that world LBS revenues will grow from approximately \$1 billion in 2000 to over \$40 billion in 2006. This growth will represent a compound annual average growth rate of 81%.

For the Asia-Pacific market, Strategis Groups says the wireless Internet users will reach 216.3 million by 2007, representing a ten-fold increase from the 20 million users in 2000.

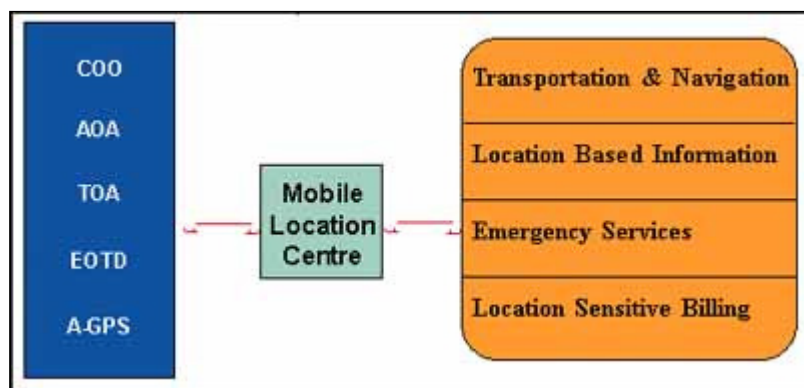


Fig. 1: The flexible architecture based upon Mobile Location Centre

Locating the device

Location-finding equipment vendors, both handset- and network-based solutions provide the actual location technology. While Network Centric asks for improved handset, the Handset Centric needs more sophisticated mobile network infrastructure. Handset Centric Technology solutions includes those of GPS, Overlay Traingulation technologies and Cell of Origin information. Of these Cell of Origin, although not so accurate, is the most widely used by the network operators. The better accuracy of location will not only improve the current services, but also allow the introduction of new services.

Cell of Origin (COO)

COO uses the network base station cell area to identify the location of the caller. The accuracy depends upon the cell area and the accuracy can be upto 150 metres for an urban area. Although the accuracy is not high and cannot be applied for emergency usage it is popular amongst the operators as it does not require any modifications in the handset or the network, hence it is comparatively cheap to deploy.

Time of Arrival (TOA)

Here the difference in the time of arrival of the signal from the mobile to more than one base station is used to calculate the location of the device. This needs synchronisation of cellular network using GPS or atomic clock at each base station. The cell sites are fitted with location measurement units (LMUs). By measuring the signal from the mobile phone, the LMUs can triangulate the user's position.

The cost benefit analysis is not very much in favour of the usage of this technology, as the cost of implementing this is very high as compared to the enhancement in the performance. While TOA is more accurate than COO technology, it is expensive because of the large number of LMUs required.

Angle of Arrival (AOA)

AOA requires a complex antenna array at each cell site. These antenna in principle work together to determine the angle (relative to the cell site) from which a cellular signal originated.

Enhanced Observed Time Difference

Enhanced Observed Time Difference (E-OTD) systems operate by placing location receivers, overlaid on the cellular network as a location measurement unit (LMU) at multiple sites geographically dispersed in a wide area. Each of these LMU has an accurate timing source. When a signal from at least three base stations is received by an E-OTD software enabled mobile and the LMU, the time differences of arrival of the signal from each BTS at the handset and the LMU are calculated. The differences in time are combined to produce intersecting hyperbolic lines from which the location is estimated.

E-OTD schemes offer greater positioning accuracy than cell of origin, between 50 and 125 meters, but have a slower speed of response, typically around five seconds, and require software modified handsets.

Assisted GPS (AGPS)

The last main category is assisted global positioning services (AGPS). AGPS can be accurate upto ten metres, but is expensive for the end-user as they would have to invest in a GPS-equipped handset. Besides this, GPS handset necessarily needs to be in sight of three or more satellites, hence making it's implementation difficult in built areas and more so from indoor.

Flexible Architecture

The architecture being adopted today by many network operators is based upon mobile location center (MLC). The MLC separates the location technology to locate the device from the application the location information will be put into. Since many applications can function quite well with cell of origin information, network operators can deploy advanced location technology gradually and not wait for 100-percent coverage to offer new services.

With this flexible architecture in place, network operators can apply new applications.

Applications

The extent of horizontal coverage of LBS has virtually covered all the walks of life from selecting the restaurants to emergency services to aid in navigation, it is all there. Some of the fields where network operator are moving in are:

- The ability to pinpoint location is going to revolutionise customer billing in the wireless industry as carriers move from flat-rate billing to location-sensitive billing models. For an example, a family could receive better rates for residential location.
- Fleet management using the remote tracking of taxis and trucks will be common place. One could know the proximity of their trucks or packages and in years to come even the precise location of their goods.
- Roadside assistance and driving directions will become more prevalent with the availability of improved location service. It could later turn out to be turn-by-turn driving directions a complicated location service.
- If you're driving to the theatre and are low on gas, your handset will know there's a gas station three blocks ahead on the right. It will display directions to the theatre and even indicate that you can upgrade your tickets to orchestra seating if you request it in the next few minutes.
- On the leisure and sports sector, golfers would "tag" their ball with a satellite transmitter before and after each shot. The location data would be shot to a satellite and tracked. When users go back to their home they would be able to track their performance on a Web site, complete with maps of fairways marked with the flight of their ball.

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