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LOCATION BASED SERVICES (LBS) - 2013

Transforming Coordinates to Business

June 3, 2013, FICCI, Federation House, New Delhi

BACKGROUND PAPER

Location Based Services

An overview of prospects and applications



Background Paper

Authors:

Maneesh Prasad, Member - FICCI Committee on Geospatial Technologies and Executive Editor, Directions Magazine India

Sonal Bahuguna, Sub-editor, Directions Magazine India

Sincere thanks for editorial inputs to:

Suchismita Mukhopadhyay, Senior Asst. Director, FICCI

Lt. Col. MC Verma (Retd.), Director, Telematics Wire

Osamazaid Rahman, Senior Asst. Director, FICCI

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Table of Contents

Location Based Services **4**
Definition & Perspective 4
Historical Perspective 5
Technical Elements of LBS **6**
Positioning Technology 6
Spatial Data 7
User Interface Device 7
LBS Ecosystem **8**
Global Perspective **11**
Applications of Location Based Services **14**
Emergency Services 15
Traffic Management 15
Navigation 15
Mobile Work Force Management 16
Tracking 16
Advertising 16
Social Networking 16
LBS News in India **17**
Governance 17
Emergency, Safety & Security Services 19
Public Utility Service 19
LBS in India – What Next? **20**
Annexure -1: White Papers on Location Based Services in India **22**
Annexure – II: References **24**

Location Based Services

> *The term '**location**' helps to identify a point or an area on the Earth's surface or elsewhere. The term 'location' generally implies a higher degree of certainty than "place" which often has an ambiguous boundary relying more on human/social attributes of place identity and sense of place than on geometry.* [1]

Definition & Perspective

Espinoza et al. (2001) emphasize that position specific information has been transported from a person-to person communication by post-it notes and graffiti. On the other hand methods to locally inform a mass-audience are posters (e.g. of concerts in the town) or simply traffic signs, which submit navigational information. But, these communication forms are usually one-way communications. [2]

Virrantaus et al. (2001) defined LBS as information services accessible through mobile devices through the mobile network and utilizing the ability to make use of the location of the mobile device. [3]

According to **Brimicombe (2002)** LBS is intersection of technologies. It is created from New Information and Communication Technologies (NICTS) such as the mobile telecommunication system and hand held devices, from Internet and from Geographic Information Systems (GIS) with spatial databases [4]

Similar definition for LBS was given by the **International Open Geospatial Consortium (OGC, 2005)**: "A wireless-IP service that uses geographic information to serve a mobile user. Any application service that exploits the position of a mobile terminal". [5]

According to **Jochen Schiller and Agnes Voisard (2005)** LBS can be defined as "services that integrate a mobile device's location or position with other information so as to provide added value to a user". [6]

Andras Kangyal and Laszola Laufer (2009) said it is also important to treat the location as a form of information, which is being used up in a communicational process. [7]

Bin Jiang and Xiaobai Yao (2010) described LBS as service driven from "both online map services (e.g. MapQuest) and the internet GIS, as they provide the kind of geographic information services via the internet or mobile-networked environments to mobile devices". [8]

Historical Perspective

Location has been an important attribute for businesses since ages. The ability to locate the geographical location of a user or an object and to deliver information which is a function of location and context in which the information is required has now evolved as **Location Based Services (LBS).** From a historical point of view location based information is not new which has come up with the invention of mobile phones.

LBS started in the form of regulatory push from the government in several countries. In 1996, US Federal Communication Commission (FCC) issued rules requiring all US mobile operators to locate emergency callers to meet the requirements for E911 (Enhanced 911). E911 was chosen as the easy access code, wherein the system tries to automatically associate a location with the origin of the call, which is further used to dispatch police, fire, emergency medical and other response resources.

Similarly, in European countries, 112 is the number to reach emergency services. In Japan 119 is a direct-dial free emergency number that connects the caller to fire and emergency medical services. The regulatory norms in US and other countries in late 1990s required the telecom operator to provide the location of the caller to be identified within 100 metres from the actual location of the call. This was further improved to 10 metres.

Government regulations to offer emergency services initiated a thought process for a new industry. Soon after, in late 1990s LBS was being seen as a 'Killer Application'. Today, almost a decade and half later, the 'Killer Application' of the 1990s seems to have started rolling to deliver the decade old expectation.

Technical Elements of LBS

The basic elements that form the core of any LBS are:

- Location through positioning technology
- Geospatial data set and it's supporting spatial analysis tool
- User interface device

Positioning Technology

There are various ways through which it is possible to identify the location of 'mobile device'. Some are as follows:

- **Cell ID tracking**: The technology utilizes service provider's network infrastructure and triangulation technique to identify the location of the device.

  The use of Cell ID based tracking is quite common in India with law enforcement agencies using it for tracking mobile devices both from historical/archive data or on an online basis. This technology also holds promise for vehicle and asset tracking, and some of the leading telecom operators are already offering such services. However, it is yet to take off significantly in India.

- **Global Navigation Satellite System (eg. GPS, Glonass, Beidou, Galileo)**: GNSS/GPS embedded in the device can obtain the location coordinates and send information to the service provider. GPS based devices can provide precise location during outdoor coverage.

  With 'GPS' becoming common in smartphones and the availability of reasonably priced GPS based vehicle tracking devices, today it is one of the preferred and widely used positioning technologies.

- **Wi-Fi Based Positioning System (WPS)**: Wi-Fi-based positioning system (WPS) is based on the intensity of received signal which is used for positioning.

- **Communication Signal:** It is a process of determining the location through triangulation. The geographical position of a device can be calculated based on the time of arrival of the signal or angle of arrival of the signal etc.

Spatial Data

The availability of map data provides the reference plane against which a service request having a location reference can be looked at. It can be a base map having geospatial data such as streets, buildings, terrain, mountains, rivers etc., along with points-of-interest (PoIs) data such as location of hospitals, ATM, parks, restaurants, etc.

The spatial data set also includes geo-referenced satellite images, aerial photographs and panoramic views of streets and localities. The need for geospatial data and its granularity may vary from application to application.

In India, the base map is provided by the Survey of India (SOI), which has been a leading government agency for map data products and services. But the base map from SOI is more suitable for geospatial services in infrastructure and utility applications. LBS may not necessarily need the accuracy of sub-decimeter, but granularity and updation is required. Industry has been preparing its own maps and, with due permission from government agencies, has been using these maps for various applications, including LBS platform. Leading map data providers are:

1. MapmyIndia
2. Satnav
3. Bing
4. Google
5. Yahoo
6. Nokia
7. Government initiatives

   [*Recently a group of government departments: Deptt. of Science & Technology, National Remote Sensing Centre and National Informatics Centre have come together to offer spatial data web services for map data along with satellite imagery.*]

User Interface Device

Typically mobile handsets are devices, for which the location is determined for providing services. Today mobile devices range from: Tablets, in-dash car navigation panel, mobile

phones, laptops etc. Many of these devices are either fitted with GPS/GNSS or their location is computed through telecom service providers. Convergence of technology indicates that mobile phone may become 'The Device' for most of the location based services.

LBS Ecosystem

Technology availability does not necessarily drive the usage of location based services by the people in a region or country. This section will look at some of the factors, in addition to basic elements of LBS, which influence the growth of usage of LBS. **Usage of a service is associated with its utility for an individual depending on its cost benefit equation**. 'Cost of service' being a relative term for different users in the 'Class Pyramid'.

The vibrancy of the LBS ecosystem is driven by:

1. **Directives/Policy or 'push' from the government**. Many a times, to address an issue which is in interest of the public at large, government issues a directive which drives the industry to walk an extra mile in order to meet the requirements of the directive. The outcome may not be fruitful in short run. But over a period of time they have always given positive outcome for both the industry and the public. As we saw in the United States and elsewhere.

   Emergency services in the United States and across the world has provided significant push in driving the ecosystem for LBS.

2. **Pull from the industry and the public**. The industry is driven by 'Return on Investment' (RoI) and business improvement. The need to track asset or workforce for operational efficiency and transparency is providing the fillip to usage of LBS.

In the infographic representation of the LBS Ecosystem, usage is driven primarily by the user. Some of the likely driving factors are:

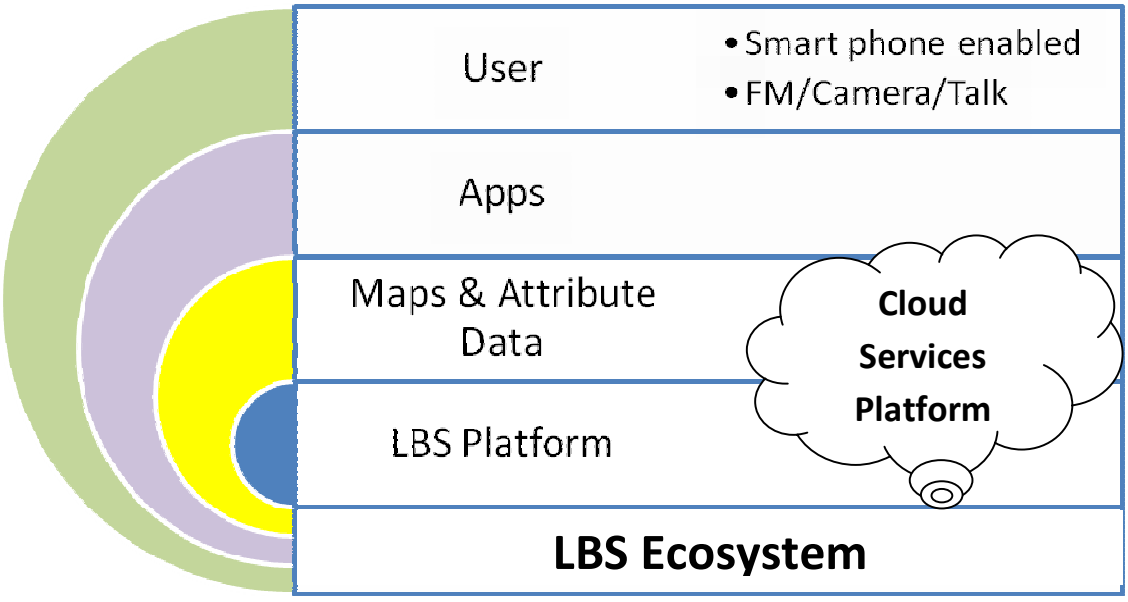
1. **The Usage Segment**
   LBS utility addresses the needs of a large cross section of the 'Class Pyramid'. For example, weather alerts in rural parts, storms/hurricane alert in coastal regions, rainfall forecast for agriculture, health related broadcast in blocks/talukas etc. Depending on the kind of devices in use, LBS will remain divided in India under the following categories:

a. **Apps, maps and more**: This is the smartphone enabled section of the society which is tech-savvy and aware of the benefits of LBS. This section of smartphone users can afford to avail the service, but are mostly confined to urban areas.

b. **FM, camera and mobile phone**: These are the basic features available in most entry level phones that are widely used in the rural areas. For them, convergence of camera and video recording with the mobile phone itself has been a landmark development, which has taken the 'digital camera' to the masses. Having FM Radio or music player has been an additional benefit to them, which has resulted in the device becoming a source of entertainment for many in rural areas. With increasing literacy and multilingual options in mobile phones, the ability to read alerts and warnings certainly looks like a possible way to reach out to the masses.

2. **Cost of availing the services**

While one may pay Re. 1/- to listen to songs and eventually spend Rs. 15/- over a month, it may not be the same when asked to pay Rs. 10/- per month to avail weather alert. Utility services such as weather alerts, etc. should be driven by government subsidy.



3. **The Big Data & Cloud Services Platform**

   The volume of data being collected for use in many of the industry applications has increased phenomenally over the last decade or so. In LBS too we have seen high resolution satellite images, aerial photographs, panoramic views etc, becoming common. This has resulted in explosion of volume of data. Not to mention tools like Gigapan which provide an extremely high resolution data capture for a locality which are being used in various applications. This big data is making it increasingly necessary to move the storage and processing from individual machine owned by the user to a more sophisticated data storage and processing system. Thanks to broadband connectivity now available in many regions, one can access the processed output in their handsets as an integral part of the cloud services.

   Leading software principals are now coming up with 'Cloud Services Platform', an online scalable services which provides required information for use in desktop and mobile applications. In the context of LBS, the platform can provide or facilitate location data collection, aggregation, storage and analysis.

In our context we have seen the push coming from the directives from government for usage of location technology for governance in waste management in urban areas, public distribution system etc. Scientific organizations such as, Indian National Centre for Ocean Information Services (INCOIS) which has been into ocean forecasting is now providing critical inputs to the Meteorological Department for their ‘nowcasting’ and ‘forecasting’. Presumably these inputs are also being sent as alerts to respective agencies in given areas and as SMS alerts to the public.

Global Perspective

Globally, LBS is recognized as a utility for public good. Government in many regions has mandated LBS to be used for emergency services. With government directives in place, telecom companies were required to ramp up the necessary infrastructure for these services. Soon, the industry started providing various kinds of services such as navigation, online search, friend finder, social networking, and location based advertising etc. However, usage of LBS varies from region to region, and different applications have gained ground in different parts of the globe.

According to an ABI Research, although, it appears that LBS is largely concentrated in North America and Europe, LBS industry seems to be under transition both geographically and from the point of view of utility. The market is shifting geographically to BRIC countries and vertically with devices like tablets, cameras, etc. creating new application opportunities.

Although new application under LBS has come up over the last few years, navigation is still the most preferred usage, particularly in North America and Europe. According to Technavio, LBS advertising market will grow at nearly 50% CAGR over the period 2012-2016. One of the key factors contributing to this market growth is the increasing use of location-based application-enabled mobile media.

According to Pyramid Research, there are a number of different factors driving market growth, including increasing GPS and smartphone adoption, success of new business models, continued growth of mobile advertising, and the wider coverage and higher speeds of mobile networks. **Growing adoption of GPS devices is the key driver, helping a whole host of different applications and services to develop. For mobile operators, this is providing an opportunity to drive new revenue streams, but it is also a threat because it means access to location information is no longer the monopoly of the operators.** In 2008, operators gained around 80 percent of all location-based services revenue, which has fallen to around half. However, the total market has grown more than fivefold since then.

North America

According to Frost & Sullivan reports for the US, the LBS market is currently experiencing robust growth, due to the rising popularity of smartphone and high-speed cellular data plans. LBS services are getting widely adopted in navigation and family-finder applications, although augmented reality, gaming, and fitness applications have significant potential for growth. It is anticipated that navigation applications will remain the largest sellers from Tier I carriers, while

new applications that use LBS technology for unique services will also gain importance. Additionally, navigation and family-finder applications will continue to evolve and the end-user experience will subsequently improve.

According to a Berg Insight report, in North America where adoption of smartphone and GPS-enabled handsets is higher, an estimated 50 percent of all handset users now access LBS regularly. However, the significant growth in usage and number of active LBS users has not yet resulted in a substantial growth in revenues. Revenues are forecasted to grow from US $835 million in 2012 to about US $1,295 million by 2017.

Europe

Total LBS service revenues in the European Union reached €325 million in 2012 and Berg Insight forecasts LBS revenues to grow to about €825 million by 2017. Already a significant percentage of mobile subscribers in Europe use some kind of location-enhanced application on a regular basis and it is estimated that by the end of 2013, about 40 percent of mobile subscribers in Europe may use at least one location-based service. Local search, social networking and navigation services are the top application categories in terms of number of users. The social networking category is forecasted to experience the highest growth in the coming years. [Berg Insight]

Russia

LBS are being used to track resources such as taxis, service people, rental equipment and fleet scheduling. Russia announced an initiative called ERAGLONASS (ERA: emergency roadside assistance). It stipulates that by 2016, every vehicle in Russia will have a GLONASS tracking device. New vehicle registration and annual renewal will be subject to the tracking device installation. The device will enable people in the control room to receive an alert in case of an accident, locate the accident site, monitor the situation, assess the severity, and accordingly decide the best response mechanism.

Japan & Korea

Far East Asian region of Japan and South Korea, are offering location-based services for people finding and advertising.

Emerging Regions

In emerging markets such as Africa, the Middle East and Latin America, with lower GPS and smartphone penetration, there are lesser opportunities for traditional location-based services. Regulatory factors are driving investment into some markets while some operators are launching location-based services to make a distinction in competitive markets such as Nigeria.

China

According to TechNavio, LBS market in China is set to grow at a CAGR of 57.9 percent during the period 2011-2015. One of the key factors contributing to this market growth is the increasing use of LBS in mobile devices. The LBS market in China has also been witnessing an increasing number of mergers and acquisitions. However, the lack of reliability and accuracy of information could pose a challenge to the growth of this market in China.

India

With enormous mobile subscriber base and burgeoning smartphone and tablet penetration, LBS has good potential in the Indian market. Many new services are being offered and explored in India [LBS in India - News, Page 16], that extend beyond privileged consumers to a larger section of society in towns and villages. There is potential for providing utility based services across the country that range from weather alerts for fishermen to monsoon alerts for farmers etc. According to the Boston Consulting Group (BCG) report commissioned by Google, geographic mapping and LBS (geo services) generated $ 3 billion in revenue and created 1.35 lakh jobs in 2011 in India. In India, geo services help Indian businesses drive $40-45 billion in revenue, save $70-75 billion in costs and affect 8-9 million jobs in India. The BCG report also found that Indian consumers are also willing to pay $1.5-2 billion more than they currently do for geospatial services such as online maps, navigation systems and local searches.

With the need for improved governance and ways to adopt G2C approach, we may see a push for digitization of government services where location could play a key role in services related to health, education etc. There is huge potential in LBS that can help government to serve citizens in better way. Combining alerts to the LBS can act as an excellent tool for better governance.

Therefore, in the coming years, location-based services could have significant influence on our day to day life.

Applications of Location Based Services

Today there are numerous applications of LBS like locating coffee shop in a nearby locality, locating friends, tracking and monitoring patients, asset tracking, fleet management etc. Availing taxi service without prior knowledge of local number or calling an emergency service by dialing a short and generic number have become a reality in many parts of the world today.

> *Local search and information services is now the leading LBS category in terms of unique users, driven by the adoption of handsets with improved capabilities and changing user habits. Most leading social networking services are now focusing more on their mobile offerings as users increasingly access services from mobile devices. Many of these services have various forms of location support ranging from sharing geo-tagged content to location sharing and check-in features. Also mobile workforce management services that aim to improve operational efficiency for businesses are gaining traction as the cost of hardware and software declines. [Berg Insight]*

Some of the applications of LBS have been segmented below under Government, Industry and Public Utility.

Table 1: LBS application across sectors

Government	Industry	Public Utility
Governance	Navigation	Mapping & Navigation
Emergency services	Asset Tracking	Local Search
Health	Advertising	Social Networking
Traffic Management	Mobile Work Force Management	Recreation & Fitness
		Family & People Locator

Mapping and navigation is the leading segment in terms of revenues and the second largest in terms of number of active users. Although the number of active users of mapping and navigation services is still growing, revenues under these categories are slow due to cut throat competition from low-cost service providers.

Emergency Services

Emergency service can be used to locate a person, for emergency health service for security related incidences, in search & rescue operations in the case of natural disasters etc. Children can be tracked by their parents through the location of their mobile device.

Mobile phones are emerging as an alternative to deliver warning notifications and emergency alert information. Broadcast of emergency information through SMS or CBS to the disaster prone area is gaining grounds in many of the emerging markets for LBS.

Short Message Service: SMS is capable of transmitting limited size of binary or text messages to one or more recipients. SMS offers virtual guarantee for message delivery to its destination (European Telecommunications Standards Institute, 2006).

Cell Broadcasting Service

Cell broadcasting technology is a service delivered by mobile providers where uniform text messages are broadcast indiscriminately to all mobile handsets in a specific geographic area. The messages could also be broadcast to all towers in a carrier network covering a whole country or to a specific cell covered by a single tower. CBS does not require the foreknowledge of mobile phone numbers.

Traffic Management

LBS can also play an important role in disseminating information about traffic condition.

Navigation

Turn-by-turn vehicle navigation assistance through smartphones is quite popular. This will help people navigate to their destination by the shortest route. Navigation can be categorized into:

- **Directions**: LBS helps in determining an individual's location (positioning), selecting and providing guidance on the best route available, mode of transport etc.

  Indoor Navigation: Indoor services extend to personal navigation services to the indoor environment. The user can obtain more detailed guidance and information on the sites in which he/she is interested. The technical basis for the development is provided by

rapidly developing wireless local area networks (WLAN, Bluetooth etc) and their associated positioning methods.

Different kinds of guidance and marketing information and their linkage to a certain location in a department store, museum, terminus and other such public spaces may be the most important aspect of indoor navigation.

Mobile Work Force Management

LBS has been helping in Mobile Work Force Management (MWFM). Location of field resources are used to provide better decision making and optimization of services through 'location-awareness' of field staff.

Tracking

From tracking of assets, high value consignments, hazmats etc. to tracking of individuals and wildlife etc. are very common today. Location based tracking technology is being used to streamline supply chains for faster movement of products, asset monitoring and prevention of inventory loss. It is assisting logistics and supply chain firms to monitor their trucks/fleet to provide better services to their clients.

Advertising

Location-aware marketing is gaining momentum nowadays. Location is playing a critical role in enabling successful consumer engagement through and with the mobile devices. Location Based Advertising delivers relevant ads for products and services that are in close proximity to consumers' current location or in the area of the advertiser interest. It is very helpful for a business to know if a consumer is in close proximity and offer them an incentive to make them visit the store.

Social Networking

International giants such as Foursquare, Places of Facebook are examples of social networking services. People like to share events associated with location. Social networking applications like Loopt notify consumers when their friends are nearby and Foursquare and Gowalla let consumers "check in" at specific locations. Social networking services may collect and retain location data along with photos, status updates and comments, and information about friends, interests, gender and more.

LBS News in India

Many governance projects in India are now using the location as key data for projects or routine operational activity. In many states police vans have been fitted with GPS enabled vehicle tracking system to help police control room reach out to the 'location of emergency' in the shortest possible time. Likewise, water tankers are being fitted with GPS to help curb water pilferage. Transport department has made it mandatory for chartered buses and 'Gramin Sewa vehicles' in Delhi to have GPS, which will provide the location of vehicle and also assist the police to provide emergency service when required. District administrations have issued directives for location based monitoring under MGNREGA projects in Jharkhand. Several municipal corporations are having vehicle tracking system to track any deviation in regular routes and also to calculate the gross distance travelled vis-à-vis fuel consumed.

Some of the examples where location is playing a role in governance, emergency service and public service are compiled below:

Governance

Kochi: New Police vans to be fitted with Smart VTS and GPS

Kochi Police are having their multi-utility vehicles fitted with GPS and smart vehicle tracking systems (SVTS) guided and controlled through the city police control room. It will help the police track the nearest police van at the time of an emergency and increase the efficiency in reaching the required location on time. [April, 2013]

Delhi: GPS fitted tankers to curb water wastage

Delhi Jal Board (DJB) announced the use of GPS fitted tankers to curb water wastage in the capital. In peak summer due to water shortages people often pay private tankers Rs 600 to Rs 1,500 per fill, while DJB tankers are supposed to supply free water in areas where there is a shortage. [March, 2013]

Delhi: Chartered buses and Gramin Sewa to be deployed with GPS as a mandate

The transport department released a public notice directing owners of contract carriage buses and Gramin Sewa vehicles to install GPS devices in their vehicles. The Special Task Force, headed by Union Home Secretary, constituted to look into the safety issues of women in the capital, had instructed Delhi government to install GPS devices in all public vehicles. [March, 2013]

Gujarat: Rajkot Municipal Corp to use vehicle tracking system

Rajkot Municipal Corporation (RMC) has decided to monitor its vehicles with GPS based vehicle tracking system. The project will be executed under the central government's Jawaharlal Nehru National Urban Renewal Mission (JnNURM). [February, 2013]

Himachal Pradesh: High Court orders GPS deployment for commercial vehicles

The Himachal High Court has ordered the transport authorities to make it mandatory for all commercials vehicles to have tracking system installed from April 2013. [January, 2013]

Delhi: GPS chips in walkie-talkies to track police movement

Delhi Police announced the use of GPS enabled communication system, which will keep track of the policeman and will reflect his movements on the computer screen in the police control room. [December, 2012]

Bihar: Trucks carrying foodgrains fitted with vehicle tracking system in 12 districts

Vehicle Tracking System has been installed in trucks carrying food grains from Food Corporation of India godowns to state storage in 12 districts of Bihar to prevent pilferage of grains. [March, 2013]

Karnataka: GPS to help in keeping an eye on Corporation vehicles

Mangalore City Corporation Commissioner had asked for installation of vehicle tracking system in all vehicles outsourced by corporation in order to monitor their movement and prevent misuse. Initially tracking system have been installed in the vehicles of the electrical wing responsible for maintaining street lights and other electrical works. The system will make sure that the complaints are attended to without any delay. [October, 2012]

Jharkhand: GPS tracking system for waste management in Jamshedpur

Under solid waste management project in Jamashedpur, all vehicles used in collection of wastes either through door-to-door or from dustbins and vats would be installed with GPS tracking system for better accountability and ensure that even small localities and by-lanes are covered for collection of wastes on a daily basis. [October, 2012]

Emergency, Safety & Security Services

Andhra Pradesh: CM launches centralised 'Dial-100 emergency service

Under the 'Dial 100 project launched by Andhra Pradesh government , the AP police department has partnered with GVK EMRI to build and operate a unified command and control centre for the entire state. The integrated 'Dial 100 centre would also co-ordinate other emergency services like medical, fire and other disaster-related response services. Citizens seeking police assistance during emergencies can lodge a complaint from a mobile phone or landline by dialing the toll-free emergency number '100'. [April, 2013]

Kerala: GPS in public transport vehicles for women safety

Electronic Development Corporation (Keltron) announced to introduce GPS-based technology solutions- including vehicle surveillance, vehicle and passenger tracking, passenger emergency call and emergency assistance – for women safety in public transport vehicles in Kerala. [March, 2013]

Public Utility Service

Kochi: Commuters on move to get information about traffic

AmidRay Technologies announced to launch community Android application "Blockout Traffic", which informs people of choked traffic within a 25-30 km radius. It is "first free-and-easy traffic mobile application" for those on the move. The application will display the name of the roads and locations in the users' area, indicating where there is a traffic block. In addition, the application works with a community, called the "Blockout Community". Members can post accounts of traffic blocks whenever they encounter one. Blockout Traffic locates the exact position of a user by using GPS mobile devices. The phone should have internet connectivity in order to post blocks and get block updates. [April, 2013]

Paytm and redBus introduces real-time GPS tracking for passengers

Paytm, an online recharge service provider which also entered the bus ticketing space in December 2012, has unveiled a GPS tracking feature to determine the exact location of a bus in real time. The new feature has been launched in association with YourBus.in, a Bangalore-based startup that monitors bus location in real time and sends the information via SMS. The feature will enable commuters to track the exact location of a bus and its arrival time, depending on whether the bus has real-time GPS system

installed in it. A commuter will receive an SMS an hour before the boarding time, giving him details of the current location of the bus and the estimated time of arrival at the boarding point. At any point of time, a user can refresh the link to know current vehicle status. [March, 2013]

Kerala: GPS and PIS to be installed in KSRTC buses

The Kerala State Road Transport Corporation (KSRTC) installed GPS and passenger information systems (PIS) in all its buses so that passengers can track and find the location of a running bus at any given point of time. KSRTC also plans to install monitors at bus stations, which would provide the location of moving buses, their speed, details of buses running late, expected time of their arrival at a particular station, etc. [December, 2012]

LBS in India – What Next?

At present, India uses several different numbers such as 100 (police), 101 (fire), 102 (Ambulance) and 108 (Emergency Disaster Management), while a number of states have also notified various helpline numbers like, women in distress, missing children and women, crime against women, anti-extortion,, 'police headquarter helpline etc. Justifying the need to move away from the present system, TRAI (Telecom Regulatory Authority of India) in its consultation paper says, 'it would be difficult to remember so many numbers during an emergency'.

According to TRAI, such a system will only be effective if telcom companies start providing improved location of the cell phone user to 100 metres or 50 metres or 30 metres, rather than the present location which is based on the base station geographic coverage area.

In May 2011, on the recommendation of some security agencies, the Central Government had unveiled new rules mandating telcos to install within 12 months, system for providing the location of the caller to a minimum 30% of their customers within 50 metres of accuracy and 80% of their customers within 300 metres of accuracy. In the second year, telcos were mandated to further enhance this facility to ensure that 50% of the customers can be tracked within 50 metres of accuracy and 95% within 300 metres.

In March 2013, TRAI submitted a consultation paper on ’Universal Single Number Integrated Emergency Communication and Response System’. The paper advocates a single number for all emergency services such as fire, police, ambulance etc unlike the existing system where we have multiple emergency and communication response members.

Content & Map Data

We have seen a significant change over the updated 6-7 years in the availability of spatial data set in public domain which is granular and update, with players like Google Maps and MapmyIndia making significant impact in the public domain.

NIC maps are for government agencies and the Survey of India is mandated to provide topographical maps and survey which are for infrastructure development etc.

Mapping policy has been interpreted differently by different players of the industry and hence there has been conflict in approach to update maps, as was seen in the media coverage in March-April 2013.

Annexure -1: White Papers on Location Based Services in India

Internet & Mobile Association of India (IAMAI)

In 2008, IAMAI published a white paper 'Location Based Services (LBS) on Mobile in India'

> **Abstract**: In India LBS is at early stage. With about 8 million subscribers being added on every month in India, the LBS wave cannot fail to envelop the country. However, country characteristics are different and a successful LBS strategy would need to address the needs of the rural masses, with low income and high illiteracy. Applications are numerous e.g giving weather alerts to fishermen on the high seas, using interactive voice response technology to give LBS services to the illiterate, fleet and mobile workforce management for small enterprises etc. Though there are technological and infrastructure constraints currently holding back the growth of the LBS provision, these are likely to get resolved in due course of time, given the moves in the international arena. But the concern in the Indian context is that the mobile industry market structure as determined through policy and regulation has not favored the growth of competition and innovation in value added services such as LBS.
> http://www.iamai.in/upload/policy/lbs_draft_indicus.pdf

Telecom Authority of India (TRAI)

In 2008, TRAI published a consultation paper on 'Growth of Value Added Services and Regulatory Issues'

> **Abstract**: Value Added Services have matured globally and form a considerable portion of the revenues. People are now focusing on mobile entertainment, mobile-commerce, location based services and new enhanced services in next generation network (NGN) environment. In India the revenue (estimated) from mobile Value Added Services (VAS) is over 10 to 14% of the total revenue of mobile telecom service providers. The VAS has great revenue potential. The mobile revenue through VAS is expected to reach beyond 30% of the mobile telecom service provider's revenue in the next 5-7 years as revealed in various studies/position papers. Today SMS constitutes major portion of the VAS revenue. While entertainment service would be popular with the consumers, there

remains a scope for utility based services like location information, mobile commerce (M-Commerce) for mobile transactions etc.
www.trai.gov.in/trai/upload/**ConsultationPapers**/147/c**paper**28may08.pdf

In 2012, published a consultation paper on 'Recommendations on Application Services'

Abstract: Various services are being provided through telecommunication network to consumers. However the growth of application service has been limited, particularly for applications like e-governance, e-education, e-health, e-commerce etc. Considering the enhanced market potential for application services due to rollout of 3G & BWA services, deployment of 4G services in the coming years, implementation of National Broadband Plan and migration to Next Generation Networks (NGN), there is a need to deploy an enabling framework for realizing the potential of application services.

A framework will enable flow of investments in the applications and services industry, contribute in enhancing the lifestyle and capability of consumers, promote entrepreneurship and at the same time create additional revenue stream for the service providers. The recommendations contained in the document are an outcome of the consultation process. The recommendations cover important issues such as Licensing through Authorisation for Application Service Providers allotment of short codes through a short code council and utility applications.
www.trai.gov.in/WriteReadData/.../**Document**s/AS140512.pdf

In 2012, TRAI published an article on 'Location Based Service'

Abstract: Location Based Services (LBS) refer to a broad range of services that you utilize the knowledge the geographical position of a mobile device in order to provide services based on that information. It allows consumers to receive services and advertising based on their geographic location. Such services can be provided in response to consumer manual input of his/her location information into the handset or by using the technology to track the location of the consumer automatically. Through LBS information about traffic, restaurants, retail stores, travel arrangements, routes, vehicle tracking etc. can be provided. In addition, LBS can also help in law enforcement and emergency services.
http://www.trai.gov.in/WriteReadData/Publication/Document/20121031011231937441 3Issue-14.pdf

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To be the thought leader for industry, its voice for policy change and its guardian for effective implementation.

Our Mission

To carry forward our initiatives in support of rapid, inclusive and sustainable growth that encompass health, education, livelihood, governance and skill development.

To enhance efficiency and global competitiveness of Indian industry and to expand business opportunities both in domestic and foreign markets through a range of specialised services and global linkages.

Contact us

Mr. Sumeet Gupta (Director)
Ms. Suchismita Mukhopadhyay (Senior Assistant Director)
Mr. Gaurav Gaur (Assistant Director)
FICCI, Federation House, Tansen Marg, New Delhi - 110 001, INDIA
Tel: +91 - 11- 23487443, 23765088
Fax: +91-11-23320714, 23721504
Email: sumeet.gupta@ficci.com, suchismita.mukhopadhyay@ficci.com, gaurav.gaur@ficci.com