Location based Search for Big Data in Government Sectors

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ABSTRACT
World is heading rapidly towards a global computing revolution that will contain billions of wirelessly connected devices. Many of which will offer location based services to their mobile users anytime, anywhere. Sooner, users will take ubiquitous wireless access to information and services for granted. Growth in wireless subscribers will lead to a drastic increase in the amount of data associated, which in turn will give rise to Big Data. Big Data is supposed to be a $25 billion industry and India has the great opportunity to take a large share from it. The government has been a driving force in creating platforms and large datasets which will require the acquisition and manipulation of massive amounts of data. Wireless users access data from various locations across the world. There are multiple area where massive data is been generated which need to be accessed by user belonging to diverse geographic location. There comes the need of location based search for big data to track right information at right time.

By means of this paper we are trying to present use cases related to location based services on massive data to provide efficient and real time services to the citizen accessing government services.

Keywords
Big data, government sector, location based search, applications of big data.

1. INTRODUCTION
Big Data refers to datasets that grows so big that it is hard to capture, store, share, examine and visualize using the typical database software tools.

Big Data is a new movement in today's age which is widespread, increasing and moving very fast, and is essential for smart management. Today, data and cloud are reviving organizations across multiple industries and provide huge opportunity to make organizations more active, more efficient and more modest. To capture that change, government require a modern Information Management architecture.

Big Data is the latest catch word which is used to describe a giant size of data, both structured and unstructured data that is so big that it's difficult to process using traditional database and software techniques[1].

Big Data And Its Characteristics
The world of Big Data is gradually being defined by the 4 Vs. i.e. these Vs become a practical test as to whether a Big Data approach is the right one to accept for a new area of examination. These 4 Vs are[1]:

A. **Volume:** The proportions of the data: This aspect refers to the fact that the quantity of generated data has increased extremely the past years. The amount of data that is generated is very significant in this context. It is the capacity of the data which defines the value and potential of the data under consideration and whether it can actually be considered Big Data or not.

B. **Velocity:** The term velocity in the context refers to the speed of generation of data or how quick the data is generated and managed to meet the demands and the tasks which lie ahead in the path of growth and development. This aspect captures the rising data manufacture rates. The rate at which data is being received and has to be performed is becoming much more real-time.

C. **Variety:** With the growth of data sources comes the explosion of data plans, ranging from organized information to free text. Since information is not digitized variety of data being managed is becoming gradually different.

D. **Value:** This extremely subjective aspect refers to the fact that until recently, large capacities of data were recorded (often for archiving or regulatory purposes) but not misused[1].There is a huge opportunity offered by Big Data technologies to learn new insights that can lead to important business value.

2. CHARACTERISTICS OF BIG DATA
There are various properties of big data which make them more efficient and scalable are listed below [4] :

a. Robustness and fault tolerance
Systems need to behave properly regardless of machines going down randomly, the complexsemantics of uniformity in distributed databases, repeated data, concurrency, and more. Making a Big Data system robust is avoiding these difficulties so that you can easily reason about the system.

b. Low latency reads and update
The popular applications require reads to be satisfied with very low latency, typically between a few milliseconds to a few hundred milliseconds. The most important thing is you can achieve low latency reads and updates without compromising the robustness of the system.

c. Scalability
Scalability is the ability to maintain performance in the face of growing data or load by adding resources to the system.

d. Extensibility
You don't need to reinvent the wheel each time you add a related feature or modify to how your system works. Extensible systems allow functionality to be added with a least development cost.

2.2 Big Data Framework and its uses

An integrated big data framework depicted in Fig 1 consists of multiple layers consisting of different applications used which includes[2]:

1. **Data sources**: There can be various data sources like sensors, mobiles, web/unstructured and various enterprise database types like Oracle, SAP ,customer, systems etc.
2. **Data Management**: Its consist of extraction and management. It basically extract semi-structured and unstructured data. The data can be managed by various techniques like distributed file system, data storage , data cleaning, data security , etc.
3. **Data Analytics** : Here analysis of data has been done using following techniques. It includes data mining , machine learning, statistics, network analysis .
4. **Access and Application**: Data is visualized and displayed via directed actions to machines and directed actions to humans respectively. Directed actions to machines can be done through web services, File Transfer Protocol(FTP) and Secure File Transfer Protocol(SFTP) , Java Message Service (JMS) and sockets. Directed actions to human can be done through browsers , mobile devices, custom hand held devices.

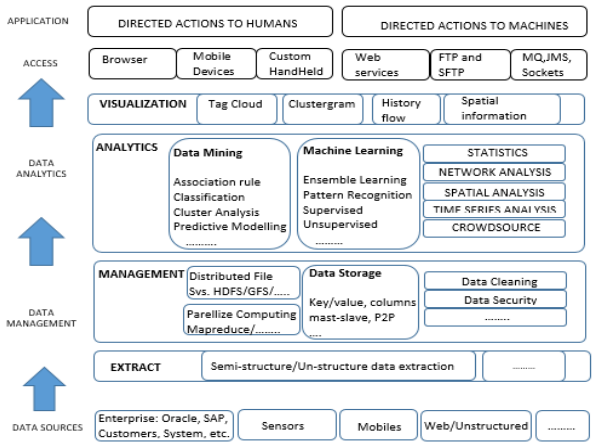

Fig. 1 The Framework of Big Data

3. OVERVIEW OF LOCATION BASED SERVICES

3.1 Introduction to location based services

- Location based services (LBS) are a part of geospatial or geo-information systems that depend on a mapping representation, positioning information (through GPS, cell-tower etc.) and content or service providers who can modify or improve their contribution (eg: find nearest shop, share one's location, see nearest deals, etc.)[5]
- The geo-spatial industry in India was estimated to a $3 billion business in 2011 employing over 135K people in a BCG report prepared for Google[5].
- LBS have a wide range of applications for people, enterprises and government services: mapping, navigation, local search, business intelligence and analytics, task force and vehicle tracking, crisis and disaster management solutions, etc.

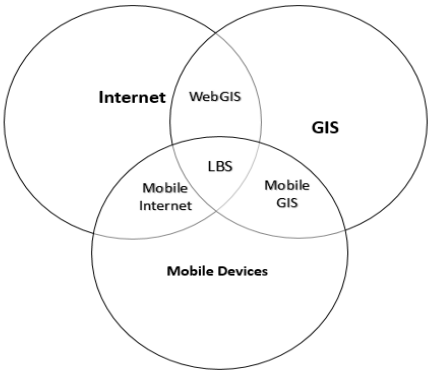

Fig. 2 LBS- Convergence of Multiple Technologies

Factors driving the progress of location based services include:

There are multiple factors driving the growth of lbs services which have brought a new paradigm in the field of technology

1. Availability of low-cost GPS enabled devices
2. High interest in identifying services based on workers' location information and history
3. Advancements in analysis skills
4. Changing business models like mobile advertising, global deployments of 3G and 4G wireless services promising global connectivity
5. Cost benefits by deploying solutions like vehicle tracking and task force management
6. Government guidelines regarding use of data.

3.2 Application of Location Based Search

There are various areas where Location Based Search is applicable. Some of them are listed below:

- **Mapping, discovery and infotainment** makes use LBS for finding places, or friends nearby, maps, add location to post, etc.
- **Tracking** makes use of LBS in resource tracking with dynamic distribution, taxis, rental equipments, etc. like supply chain and inventory.
- **Advertising** makes use of LBS to pinpoint consumers location and provides location-specific ads on their mobile phones, for ad retargeting, etc.
- **Location based games and augmented reality** uses LBS for a new range of location and AR services including overlaying digital information on physical objects for discovery or gaming such as real life gaming like Google Ingress, etc.
- **Emergency support and disaster management** makes the use of LBS to help planning urban facilities and elements like locating emergency services, directing help during emergencies and disaster, etc.

4. NEED OF LOCATION BASED SEARCH IN GOVERNMENT SECTOR

Development of Smart cities

Description & services :

- GIS systems help in urban city planning by accumulating information about various city initiative like sewage, electricity lines, fiber cables, water connections, etc.
- They also help authority by keeping track of land records, population density, availability of governmentservices, police patrolling, providing a spatial view for city planning[5].
- GIS platforms support visualization, data queries, analysis of spatial information and enable partnership between multiple organizations for large-scale applications such as regional, environmental, ecological and natural resources planning and management[5].
- Planning organizations can use these in fields such as property evaluation, emergency response, planning, infrastructure planning and land use, etc.

Drivers :

- Limits of long-established methods for planning in a rapidly changing urban landscape[5].
- Availability of geographic statistics for analysis and the capacity to join various datasets for analysis, stylish calculations and alternative solutions
- Improving resource requirements in cities require smarter
- Solutions to optimize infrastructure and capital expenditure
- Capability for active query and analysis, display of information and a more understandable representation.

Challenges:

- Awareness of solutions and profits for planning
- Unstructured planning and absence of coordination between various city administration agencies
- GIS data worries & fundamental issues of data security
- Shortage of skilled human resource base and cost of gathering and maintaining information in the quickly changing urban landscape

Realtime Traffic Management

Description & services

- GIS can help incorporate critical information for effective traffic planning, monitoring, road closing information, etc. and provide access to interactive maps, real-time information for analysisor visualization.
- Authorities can run traffic situations in a short span of time which permits them to transform traffic information real time and plan traffic signals to minimize traffic jamming
- GIS applications also include traffic alert features where the system makes use of satellites tuned into real-time traffic reports to alert the public of unexpected traffic delays and plot a new course around the heavy traffic.

Drivers :

- Capability to analyze patterns and anomalies to reduce congestion and travel period
- Ability to use traffic data for resource planning like road expansion etc.
- Potential to analyze accidents on road to respond with strategies for traffic regulation, routing and placing emergency services[5].

Challenges :

- Low compatibility of existing traffic management systems with GIS structures
- Possibly high initial investments in GIS infrastructure

Public Transportation

Description & services:

- System consists of GPS tracking devices that are fixed in some or all public transport vehicles that send back position, timing and speed information to associated GIS backend
- Benefits transport authorities in coming up with effective routes, operations and integrated transport systems, dealing with the vast knowledge, tracking and observation services, security systems, all contributing towards delivering a a lot of effective public transit for the people[5].
- Lets consultants with a dynamic, robust, dependable, and cost-effective management system providing information about the routes which are busy, routes which are affected by crowding, peak hours and non-peaks hours, etc.
- Lets travelers to see location of buses, expected time for the next bus arrival, expected travel time and the choiceof routes with real-time updates directly to web or mobile device and decreases the uncertainty related with public transportation[5].

Drivers

- Active monitoring and management of public transport vehicles for enhanced safety and security.
- Efficient route coming up with and capability to perceive holdup points
- Accessibility of tracking devices and solutions at lower value points

Challenges

- Cost implications and deployment across public vehicle
- Deployment and maintenance of GPS trackers in public vehicles
- Infrastructure and upkeep costs associated

Emergency Response Services and Security Management

Description & services

- GIS allows consultants to envision activity patterns, map locations, and the multi- layered geospatial context in real time to help identify, prepare and respond quickly to security threats, natural disasters, terrorist attacks, and others to reduce exposure of risk and plan reclamation
- Various cities or countries provide an emergency services that automatically identify locations and direct response services when citizens call the helpline number or send a distress SMS in case of emergencies

Drivers

- Capability to quickly react to emergencies to plan, respond, mitigate and improve
- Use situational awareness to track potential security threats and doubtful configurations
- Capability to simulate conditions of emergency in advance to plan response appropriately

Challenges

- Absence of reliable, consistent data across country which prevents true interoperability between all levels of government
- Necessitate synchronization between multiple government and corporate firms like carriers, data providers, different government bodies, etc.

5. POTENTIALS of LOCATION BASED SEARCH

- LBS can be used in Urban planning divisions by means of 3D tools to generate cities before these are actually built by integrating planning, zoning, and density guidelines. Some of the examples are ESRI, Mapinfo, Navmart, Autodesk, Intergraph, etc.
- With the help of LBS, Traffic Management can be done by collecting traffic information to approximate travel times at different times of the week which can be used for improved public transport timings. Various examples are TransModeler, NAVTEQ, ESRI, etc.
- Public transport tracing is anticipated to become mandatory in future as consultants look to boost this system and encourage additional takers for conveyance. Tracing systems with the display units for arrivals and ETAs deployed close to the bus stops are expected to open new opportunities of publicity financial gain for the public sector transport authorities. Some examples are Mentor Engineering, RouteMatch Software, Indra, etc.
- Emergency Response Services and Security Management use LBS for 3G network standard multimedia broadcast/multicast service (MBMS), can be accustomed to transmit (push) emergency messages to outlined areas with rich multimedia system content like voice instructions, etc

6. USE CASES OF LBS FOR BIG DATA IN GOVERNMENT SECTOR

Insurance Industry

At the latest insurance industry trade displays, big data was the base talk[6]. The broad, inaccurate term means different things to different people though, and like many suffers a bit from overexposure. But most people see the potential of progressive data and analytics to make insurance operations more proficient and effective. Here are few of the use cases that are very related to Insurance industry and has high Return On Investment(ROI) potential

- Fraud Detection & Analysis.
- Personalized Pricing.
- Catatrophic Planning.
- Call Detail Record.
- Management of Loyalty.
- Social Media Analytics.
- Agents Analysis.
- Customer Value Management.
- Underwriting and Loss Modeling.

Utility Industry

With the outburst of smart meters, utilities are finding themselves busy with data as they build out the Internet-enabled, interactive power system called the smart grid[6]. But according to Oracle survey, many utility companies have yet to utilize that data as they revolutionize the grid. “Despite improvements, 45% of utilities still struggle to report data to business managers as fast as they need it and 50% miss chances to deliver useful information to customers”. Here are few of the cases that are nominee for big data application and analytics

- Smart Meters – Real-time Usage Pattern Analysis.
- Smart Meters – Analytical Analysis for Division of power.
- Smart Grid – Weather Pattern and Real Time Usage.
- Manage Disasters and Outages.
- Compliance Checks and Audits.
- Customer Sentiment Analysis.
- Customer Feedback and Call Detail Record Analysis.

7. CONCLUSION

In developing country like India where technology revolution is taking place, everyday it is giving rise to growing expectations of the users who plays an integral part in information extraction. There is a need to incorporate emerging technology like Internet of Things (IoT) in ordet to make location based search more automated and accurate. By employing such communication technology, user will experience a whole new pardigm in computing and get personalized services on their tips with minimum time and efforts. IOT claims to enhance the quality of Location Based Search, thereby increasing the accuracy of search. Use of powerful sensor will also aid the betterment of Location

Based Search in the sectors of traffic, emergency services, infrastructure management, resource management, etc.

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