Quality spatial information is the cornerstone of location based services

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Abstract

Location-based services (LBS) are a general class of computer program-level services that use location data to control features.

A location is a named geographical place (such as an airport, seaport, container freight station or terminal) that provides permanent facilities for movement of goods (such as customs, storage, and other support services) or is designated for a stated purpose. Location is permanent. Services based on location are reliant on the fact that the location is permanent and accurate. When the location is not credible, the house of cards collapse and the service is deemed unreliable.

Verified and accurate spatial information forms the foundation of location-based services. Spatial information is the accurate reflection of what is on the ground. When there is a discrepancy between what is on the ground and what is in the data, the service will not function properly.

Many networks and organisations monitor the geospatial world. The metadata and verification processes are subjected to standards and accountability within a global community.

We have to access the various governing organisations. We have to understand how they protect the geospatial community and thereby the location based services industry. We have to understand the standards that govern interoperability. We have to understand the methodology that controls the process with which spatial layers are monitored and verified. And we have to understand the ever-changing face of spatial information.

The better the spatial platform, the more reliant the service.

Keywords

spatial information, location-based services, interoperability, standards

Introduction

Quality spatial information is a quick way of saying and encompassing a huge concept. In the same way that beauty queens and politicians casually throw around the term “world peace”. In order to fully understand what it means we have to analyse the different components. We have to understand the commitment to maintaining the objective of quality and then we can begin to understand the role it plays in the bigger picture of location-based services and compliance.

In this paper we will endeavor to understand the way in which spatial information is compiled. We will look at the various governing bodies that preside over spatial information, and explore the ways in which spatial information form the foundation of the chain that assists individual and industry to locate, navigate and analyse the world around us.

We have all watched a movie and seen the little red dot blink on the hero’s GPS screen. We have seen the hero follow the dot to save the day and deactivate the bomb. Without spatial information we are all chasing behind little red dots on a black screen. We need the layers of data to give it meaning, interpret what we see, and to direct our focus.

For the purposes of this exercise we will look at the following spatial data components:

- Infrastructure
- Demographic
- Commercial (points of interest)

We will then look at the governance of each of these components on national and international level. Finally we can then understand the top billing the word location owns within the concept of location-based services.
Infrastructural data

Spatial data consists of a series of layers that interact in order to provide us with a clear view of the world around us. The spatial data we use for any purpose must be reflective of the world around us. It has to contain a certain amount of metadata to assist us and guide us. The infrastructural data we in South Africa use is built up of:

- Provincial boundaries
- Municipal boundaries
- Town boundaries
- Suburbs
- Streets
- Cadastral information from land parcel to farms
- Addresses

There are a great many other datasets that can be included in that list, but for the purpose of location and navigation this list will be the standard for our purpose.

Each of these on the list is governed by a separate entity. Boundary data falls to the authority of the Municipal Demarcation Board (www.demarcation.org.za). The published mandate of the board is derived from:

- Section 155(3)(b) which determines municipal Boundaries independently.
- Delimit wards in compliance with Schedule 1 to the Act.
- Section 6 empowers the Board to declare District Management Areas.
- Cabinet resolutions.

Section 3 stipulates that the Board is a juristic person, is independent, must be impartial, and must perform its function without fear, favor or prejudice.

Section 4 stipulates that the Board must determine Municipal boundaries in accordance with this Act and other appropriate legislation enacted in terms of Chapter 7 of the Constitution, and must render an advisory service in respect of matters provided for in this act and other appropriate legislation.

In terms of section 85 the Board must consider the capacity of District and Local municipalities to perform their function and to exercise their powers, and provide advice to MEC’s responsible for Local Government.

In 1998 Cabinet resolved that departmental service delivery boundaries must be aligned to constitutional boundaries (National, Provincial and Local) and should be finalized by departments in consultation with the Municipal Demarcation Board.

The Demarcation Board goes to great lengths to ensure that the data they provide is accurate and communicated to the relevant parties. The information is made available free of charge to industry and individuals.

The next level of the pyramid falls in the hands of local government. Local government is the custodian of address and street information. It falls on their shoulders to assign and make the data available to relevant parties.

The national roads agency provides clarity in terms of those national routes and finally all cadastral information is included under the umbrella of the Surveyor General. The property information is thus linked to the information as determined by the Chief Surveyor General.
After this quick overview of the various entities involved we have to look at the inherent dangers that can disrupt our quest for quality accurate spatial information. In order to obtain quality, reflective information, all these bodies have to work together in order to achieve a unified, South African, centralised infrastructural dataset. Unfortunately this is not the case. There is a communication breakdown on municipal level that hampers the building of a national puzzle complete with street names and addresses.

There are a multitude of reasons for this breakdown:

- **Cost**: Municipalities are reliant on the taxes paid to fulfill their duties.
- **Expertise**: Not all municipalities have access to GIS expertise.
- **Priority**: In the chain of requirements, basic needs such as water an electricity and above all housing needs to be met first. Only then can the function to assign and maintain addresses and street names fall in line.
- **Growth**: There are areas in our country where growth exceeds infrastructural ability. We see the birth of informal development in areas of economic growth as people migrate towards job opportunities.

There are a handful of data vendors in South Africa that have taken up the task to build and maintain quality spatial information. Data is then collected from all relevant role players and included in one growing and live dataset. AfriGIS is one of the companies that has taken on the immense responsibility to build a base map that is maintained to be reflective, ever-growing and changing with the face of our country. The cost to create and maintain such a base map is what stands between every South African and free spatial information.

**Demographic information**

Statistics South Africa is responsible for the next component in the puzzle. Now that we have a clear picture of where we are in terms of infrastructure, it is important to see whom we are surrounding ourselves with.

Demographic information supplies important information with regards to our peers. Location-based services in terms of its commitment to reporting and analysis relies heavily on this leg. It provides us with important overview information of a specific area in terms of:

- Age
- Gender
- Education
- Economic activity
- Housing

Statistics SA undertakes the massive task through census and community surveys to obtain the information as often as economically possible. In South Africa the last national census was conducted in 2011, and in 2016 a community survey will take the place of a comprehensive census.

The findings of the census and community surveys are published regularly by Statistics South Africa on their website. In order to access the data as published in the Supercross tables by Stats SA, various companies in South Africa have created products that display the various differentials in products. Various sectors then use the demographic information along with the infrastructure to plan and direct the growth of their companies and efforts.

**Commercial data (points of interest)**

We have seen the red dot become part of the texture of life. We have been able to locate it, we have been able to analyse the people around it. The last piece of this puzzle will be to direct his or her attention. We do this by giving the individual options. We can direct their attention to restaurants, commercial and retail activities as well as schools and medical facilities.

Commercial data is a net as far and as wide as the imagination can reach. It is inclusive of all the amenities and services we surround ourselves with and associate with modern living. In some instances the list will contain more options than others, but still a detailed and complex data entity to maintain.
This is the only instance thus far where the individual can play a part. Consumers can add data and assist in the growth of such a data layer. Internationally we see a huge growth in the creation of user driven datasets. Even to the level of infrastructural datasets.

The risks involved are many, but the advantages still outweigh the possible risks. It enables both the user and commercial side of the coin to have a clear view as to the entities vying for the available expendable income.

**Quality control**

As with all other aspects of life the same principle applies to spatial information. The proof of the pudding is in the eating. Only when you implement and start using the data as part of a concrete solution can you begin to find possible areas of concern and inadequate information.

Regular investigation, constant maintenance and communication between the various custodians and role players ease the burden of quality control and maintenance.

Data is a living organism. There is no company that can claim complete data or perfect data. As long as we have construction companies and developers, we will have constant change in the data we use.

Various companies adopt different methodologies whereby they maintain and verify their data.

**National and international governance**

Spatial information has grown more important in every aspect of the human condition. In our constant quest to locate, navigate, target and analyse we have given the spatial community a huge portion of dominance.

The growth in spatial awareness is one of the great movements of the past decade. We see it in the inclusion of GIS courses on tertiary level, the new career opportunities available because of it. In the pre-technology era military, surveyors and a handful of industries primarily used data and maps. Now we have a map featuring in everyday life. Children grow up in a world where mapping is equal to finding. What a privilege!

The responsibility of the creators of data is to ensure that we adhere to the standards as set within our own country as well as the international standards. The South African Bureau of Standards have a spatial information arm that monitors and stipulates the way we compile our metadata and the way we create addresses.

The primary goal of creating standards for data is to ensure that spatial data can be shared, is interoperable and understandable across borders.

The International Standards Organisation (ISO) has a committee dedicated to spatial information.

ISO/TC 211

The scope of ISO/TC 211 is: Standardisation in the field of digital geographic information. This work aims to establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth. These standards may specify, for geographic information, methods, tools and services for data management (including definition and description), acquiring, processing, analysing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations. The work shall link to appropriate standards for information technology and data where possible, and provide a framework for the development of sector-specific applications using geographic data. The overall objectives of ISO/TC 211 are:

- To increase the understanding and usage of geographic information.
- To increase the availability, access, integration, and sharing of geographic information.
- To promote the efficient, effective, and economic use of digital geographic information.
- Associated hardware and software systems; to contribute to a unified approach to addressing global ecological and humanitarian problems.

The works of these committees are evident in the way we understand GIS data, utilise GIS software and create relevant metadata. They study the differences on a global level and find the common ground to set the standard for future work.
Once spatial data is standardised we have to ensure its interoperability. Enter the Open Geospatial Consortium. This is a network of geospatial businesses and role players to create software, solutions and schemas to facilitate the demands placed on spatial information utilisation.

Summary

Quality spatial information is the foundation of reliable location-based services. Without quality information, we are back in the movie theatre. We are staring at a red dot on a black screen. Now we understand what the elements are that need to be in place to ensure that the spatial data we use in our solutions and location-based services applications are reliable.

We have an understanding of the work that goes into creating the data. We understand the standards and we are aware of the possible dangers. We can accept the standards that govern us and recognise their importance in moving forwards to a world that can cross administrative borders with the same ease as it crosses a street.

References


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