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Development of client application for Fleet Management

SUMMARY: *Fleet Management is a result of the development of several technologies and it is one of the most widely used LBS (Location Based Services) scenarios. The use of these systems is to reduce costs, make greater efficiency and optimization in the fleet management. The system for Fleet Management – MobTrack:24, owing to its open architecture based on Web services offers the possibility of easy further development of the system. Due to this fact, a group of students has developed an application that allows end-users easy access to the system by using any Web browser. This project has been realized within the subject named »Location-based services«. This solution enables the display of the current position and the basic data, as well as a history of movement for one or more vehicles.*

KEYWORDS: *Location Based Services, LBS, Fleet management, Web Services, Thin Client*

1. INTRODUCTION

Location based services – as the name says, are services that are primarily based on location. LBS market is constantly growing and it is considered as one of the most prosperous in Telecommunications and Information Technology. Location based services are a natural consequence of development and use of modern software technologies. The result of their use appears to increase profitability, cost savings, efficiency and safety.

Vehicle tracking occurs as one of the most common form of LBS and it is used to manage a fleet of vehicles. Such systems are very popular nowadays and they are mostly used by companies, urban transport services, taxi services, etc. all with the aim that fleet of vehicles use on the best and most economical way.

This paper describes the concept of LBS, the main components and characteristics. It gives a brief description of the project that students have done in cooperation with the Serbian company - MapSoft that provides monitoring and tracking of fleet vehicles. The conclusions that indicate what the future holds for LBS services are also presented.

2. THE COMPONENTS OF AN LBS SERVICES FOR VEHICLE TRACKING

Through LBS mobile users get services based on the spatial information. LBS is a technology that has great expansion and increasing use.

Infrastructure of any LBS is comprised of the few components (figure 2.1). First of all it is about: Communication Network, Positioning, Service Provider, Content Provider and Mobile device.

The term Communication Network in the vehicle tracking systems is primarily associated with the GSM (Global System for Mobile Communications) network, but it is also associated with the Internet, which is an important component of the solution and the basis for user access as well.

For the purpose of positioning GPS method is the dominant method. Almost all fleet management services are based on this method of positioning.

Mobile devices are the heart of the system. It would be impossible to imagine LBS services without mobile devices. The location is linked to these devices and they can range from GPS and PDA devices, mobile phones, to laptops and so on.

Content Provider is yet another LBS component. It provides information necessary for the functioning of the system. The term Content encompasses maps, points of interest, traffic information. Address system could be a very important component for vehicle tracking as well.

Beside a Content provider there is a Service Provider that integrates the entire system and provides it as a service.

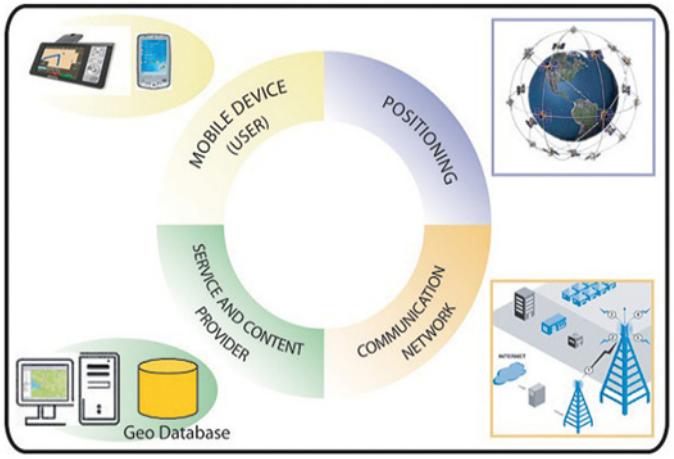

Figure 2.1. The basic components of an LBS (URL-1)

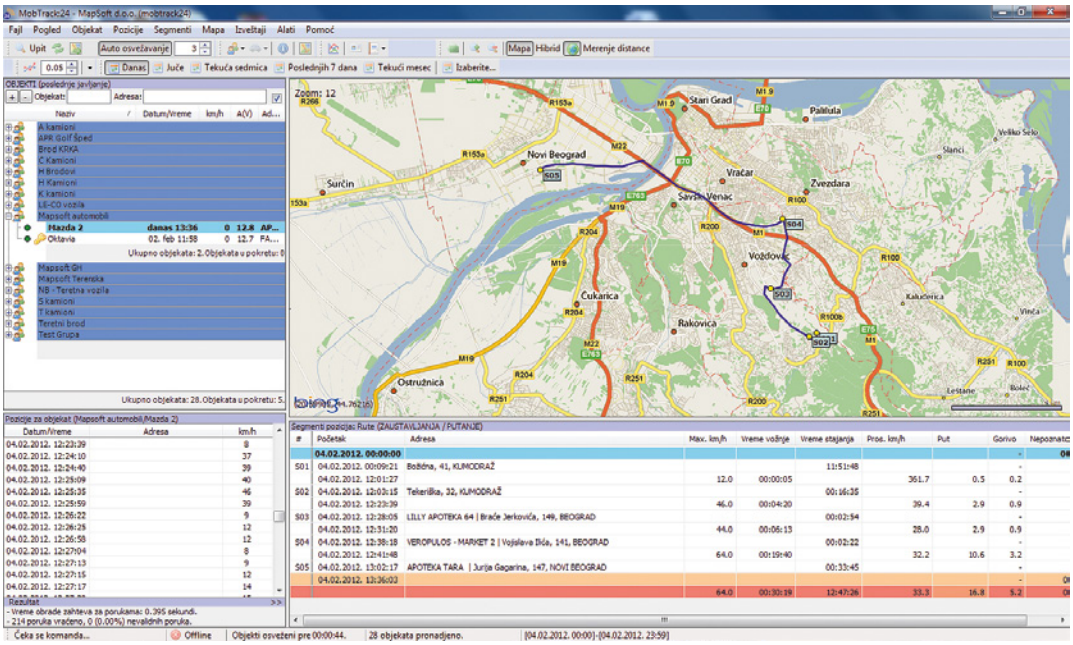

Figure 3.1. User interface – MobTrack:24

3. PROJECT IMPLEMENTATION

Group of students (authors of the paper and their colleagues Stevan Milić and Mitko Aleksandrov) in cooperation with the MapSoft Company (URL-3), has developed a client application for the vehicle tracking system - MobTrack:24. Project is realized within the course »Location Based Services« that is part of curriculum at the master module Geoinformatics at the Faculty of Civil Engineering.

Project is based on existing technology and infrastructure of the MobTrack:24 tracking system (URL-4) that was developed by the MapSoft company. The smart client user application has been developed (Microsoft Smart client, (Vojinović et al., 2011) as one of the system components. The user interface is shown in figure 3.1.

This application is a desktop application with web access. It has a rich user interface and it is primarily intended for professionals who are dealing with logistics activities in companies that use this system.

The aim of the project was to develop an application that would have a simple user interface and that would allow vehicle tracking in real time, displaying routes and their analysis. It is intended for a wider range of users, for example clients who operate with carriers of goods and want to monitor the delivery of their goods, the management who wants to have easy access to the situation on the field or for the broadest range of users - the citizens for monitoring public transport vehicles.

3.1. ARCHITECTURE OF MOBTRACK:24

System Architecture of MobTrack:24 which includes Map server, Application server, Database server, TCP /IP .NET server, other software and hardware components (VPN, firewall, router, etc.) provides efficient, safe and stable functioning of the system (figure 3.2, (Vojinović et al., 2011)).

It was very important for the project development that the architecture was open and that it allowed access to the Application server through a Web services.

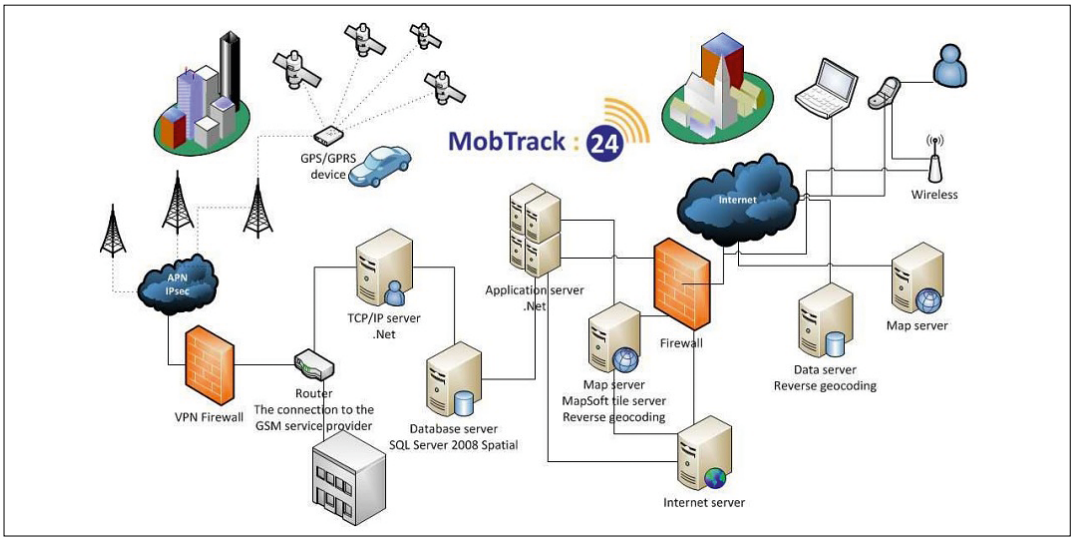

Figure 3.2. System Architecture of MobTrack:24 (Vojinović et al., 2011)

3.2. THE DEVELOPMENT OF APPLICATION ON CLIENT SIDE

The most important factor for the development of this project is that the MobTrack:24 has an open architecture. MobTrack:24 Web services API contains documented Web services of the system and these are available for the further development of application. A large number of services is available: login to the system, access to a current positions of vehicles, and various reports on the movement of vehicles as well as reports on the status of various telemetric parameters that the system monitors.

The implementation of project is based on .NET technologies. It is a Web client service, which is implemented in C# and ASP.NET technology. Beside these technologies, JavaScript was used for loading maps, drawing content (displaying routes, position ...). Various maps could be used as cartographic background. For example, free maps from provider such as OpenStreetMap or Microsoft Bing maps could be used.

Project was developed as an ASP.NET application, and the most important feature is the use of Web services to access the MobTrack:24 system.

Logging on to the system is one of the functionalities that has been developed. A user has to open a Web page and to enter a username and a password. MobTrack:24 Service login was used for this purpose.

3.3. CHARACTERISTICS OF THE DEVELOPED APPLICATION

In this project, the client part of application (figure 3.3) is developed as a Thin Client. Mobile devices, database systems and communication networks are the backbone of the system. The development of the application was quite successful and this is primarily reflected in application's performances and its ease of use within the vehicle tracking system. These are the most interesting aspects for users. Customers today want a simple solution, where they can find all

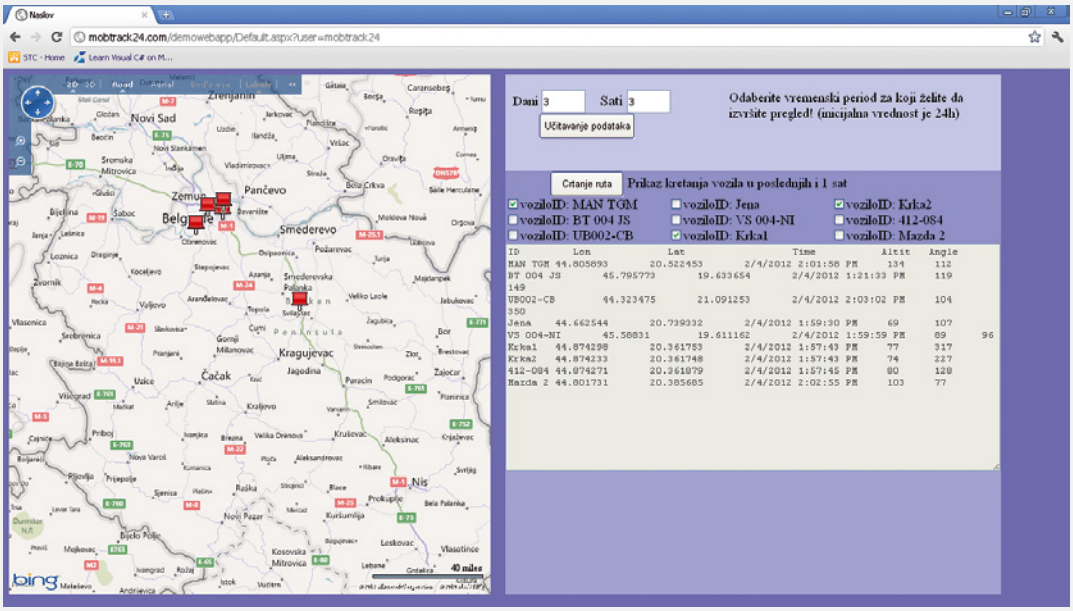

Figure 3.3. User interface of the developed application

the necessary information in one place. It was the initial idea in this project and the result is a solution where users using the Internet and a Web browser can track vehicles. There is no need for special software installations, so they can track vehicles even with using a mobile phone.

Potential possibilities of this system are enormous, and application for displaying routes of the vehicles might just give directions to the realization of many other parts that might be a future of the system.

User directly access application via a Web browser. Maps which were used as the cartographic background for mapping vehicle position are displayed within the Web browser. After logging, application directly shows the current vehicle position for authorized account. Additionally to these elements, the edit control for entering time (filter for selecting vehicle positions from the database) and windows with tabular data about the vehicles are also displayed within the Web browser. Vehicles' information are related to the last epoch, i.e. to the last available position for each vehicle and they include: vehicle ID, position by latitude and longitude, recorded time position, and so on.

Also, there is a possibility to use other parameters for vehicle tracking such as: speed, fuel consumption and so forth. This is enabled by using the equipment which is standardly installed in vehicles and which has already been implemented in many projects of this type. User enters the desired time before the routes are to be displayed. This function is required so that period from the past for which user wants to get insight into the vehicle data is clearly presented to the system. Then application downloads data from the server and this process is the most time-consuming. Logically, if user specified a longer time period, the number of parameters and data will be bigger, so the transfer time will be longer. After downloading data from the server, user only needs to select the vehicles for which he wants the routes to be displayed and to initiate the command for displaying routes. This process is very simple and quite fast. Checkbox fields where the user can select vehicles are displayed within the Web browser.

After displaying is finished, user can analyze movement of the vehicle on the map. The application also contains some advanced analysis, but that part of the user application is only touched upon as an indication of the possibility for further development. The current vehicle position is indicated with arrow that shows the direction of the movement, which is a very interesting addition. Also, if mouse cursor is moved over the route, the window with information related to the position will be displayed. There is a lot of space for improvement of this application and it could be an excellent opportunity for a new project that might be important for students in terms of acquisition of new knowledge and skills.

4. CONCLUSIONS

Topic of this paper (Fleet Management system) is very relevant and interesting. Huge savings, especially on consumption of energy resources (fuel) and time, can be achieved if a high quality system for vehicle tracking is used. Even in cases of using the system just for a couple of vehicles savings are so large that they cover the costs of using this system. In addition, opportunities for the progression of this type of services are enormous. This application only partially demonstrates the potentials of using Web technology and LBS services in real implementation.

This project represents a sublimation of the knowledge acquired at bachelor and master studies within the following subjects: Geoinformatics, GIS programming, Web programming, Web GIS and Location-based services. The project was implemented on a system that is in commercial exploitation and which is also one of the best systems of its kind in Serbia (Vojinović et al., 2011). Implementation of the project was enabled by the modern and open architecture of MobTrack:24.

This project has shown the necessity of cooperation between students and geomatics industry. Such cooperation enables similar projects to be initiated and realized and the results will be better education of students. Students will also become more familiar with the real problems in the industry, and they will have the opportunity to apply theoretical knowledge and practical skills gained at the faculty.

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