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**MANAGEMENT INFORMATION OF CZECH  
ORIENTEERING FEDERATION MAP ARCHIVE**

**Master Thesis**

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## **ABSTRACT**

The map server application of the Czech Orienteering Federation Map Archive is providing information about maps for orienteering since 2004. With time this archive was no longer suitable for users' requirements. In the old application there were not enough good possibilities of viewing data and it was impossible to insert or edit any data.

Before this application was developed it was necessary to do some analysis. Inputs to this analysis were suggestions from the previous application users and map archive administrator. Outputs from this analysis were catalogue of requirements, case study and a new data model.

Nowadays there are plenty of technologies that provide visualisation and on-line editing of geographic data in web browser. Technologies from Google Company were chosen due to analysis. Data are stored in Google Fusion Tables. For data visualisation in map application is used Google Maps API.

As a first step it was necessary to migrate geographic and table data to Fusion Tables and put watermark on raster images and resize them to 96DPI.

Main result of this master thesis is the application that uses jQuery and JavaScript programming languages for client-side scripting and PHP for server-side scripting.

Developed web application displays maps for orienteering sports in web browser. It supports a combination of graphic searching in map window and the text search on an advanced level based on the name of map and several other attributes. It also provides searching based on spatial analysis. Inputs could be a position entered in GPS coordinates or village name and a distance. Results from searching could be viewed in map, table or could even be downloaded in supported formats. In other modules application could obtain detailed information about authors, maps and clubs. It is effortlessly possible to switch between map and these modules.

Web content management system of map archive application is realized in a secure mode. Authorization to administrator console uses your Google Account and OAuth2 protocol. In this section it is possible to insert and edit records of maps and their authors. Inserting of geometry is developed by using Google Drawing Library.

Application is completely translated into English, therefore; it is perfectly useable for English speaking users.

## **SUMMARY**

This work presents the result of the final part of the Master Study Program in Geoinformatics at the Faculty of Science, Palacky University in Olomouc.

Since 1997 the actual administrator of the Czech Orienteering Federation Map Archive Zdenek Lenhart started to collect, sort and manage maps for orienteering and information about them. He started to fill the information to the Microsoft Database (MDB) format through Microsoft Access application. Year by year he had more and more maps to fill in, many times he changed database scheme a fairly easier to put records in. The geographic part of the data, meaning the outline of each mapped area was drawn in OCAD application which is the best one for making maps for orienteering.

There were many successful and the unsuccessful attempts to built an application allowing searching and visualization of the data from Archive. Most of them were just tabular. A fundamental improvement was done by Lukas Svoboda in 2004 with his bachelor thesis Mapserver for orienteering. He made some changes in the database structure to simplify migration of data from Microsoft Access to the mapserver. The web map application he made as the main result of his work brings an easy way to access the data from Map Archive. It was the first application with the full access to the geographical data of map outlines. This application is still available from URL address: <http://csob.tmapserver.cz>. From 2006 to 2008 the administrator of Map archive scanned all maps to the raster files and author of this thesis added them to the application mentioned above. It was another big step for viewing Map archive information.

The first idea of making a new web application is dated in 2008. The possibility to add data about maps easily through internet browsers and give users availability to see added records immediately were main goals in thoughts of new application. Increasing amount of new maps and therefore growing amount of work needed for adding records to the database was also one of the main reasons for developing the new web application. Good idea is to spread this work among more volunteers. Nowadays the whole work is done by Zdenek Lenhart.

Year by year the needs to have new application were growing. Finally in 2010 a cooperation was set between T-MAPY company (part of T-KARTOR group) and a supervisor of the present thesis. Main goals of this thesis are to create application for on-line editing, managing and publication information of Czech Orienteering Federation Map Archive. Application will provide tools for inserting and updating tabular and geographical part of the database (descriptive information about map for orienteering sports including the outlines of those maps and their raster images). Next aims are modification of database design, data migration do the new data model and visualization

and publication thematic information over available basemaps using map server technologies.

There will be possibility to insert, edit and delete records and also to export into required data formats. Available functionality will be scaled into different roles. Final application will be filled by final version of original data and GUI will be multi-lingual. In the theoretical part the author will mention terms such as Google Maps API, Google Fusion Tables, Microformats, OpenLayers and Geo(JSON).

The first difficult choice was in the beginning when it was necessary to choose the technology for storing the data and engine for viewing the geographic data. The challenge was set up between these technologies: OpenLayers, PostgreSQL, PostGIS, ArcGIS API for FLEX, ArcGIS API for Silverlight, ArcGIS API for JavaScript, ArcSDE, Google Maps API a Google Fusion Tables. All these technologies are shortly mention in the theoretical part. At the end Google technologies were chosen, it means Google Fusion Tables as a database and Google Maps Javascript API v3 as map engine. These technologies were chosen because they are maintenance-free (you do not have to buy server, install the database or even map engine and manage it), easy to use, innovative and free for non-commercial use. There is limited number of accesses per day, which is really safe for this type of application.

Before programming (main part of this work) was necessary to make few steps, which were really important for successful creation of this application. These steps included questionnaire, meetings, data model changes, creation of catalogue of requirements, creation of a case study and also migration of data.

The questionnaire was set using Google Docs – Form, which provides one of the easiest ways to use questionnaire through web. The answering time was during December 2010 and there were 426 respondents mainly from orienteering. The questions were really simple to make as quick as possible. Every respondent could also write notes to tell us their own opinion. Feedback from this small research gave us many inspirational ideas.

There were also some meetings between Map Archive administrator Zdenek Lenhart and author of this thesis, and also many of them between the head of Czech Orienteering Federation Map Council Jan Langr. The main goal of those meetings was to create a new data model to write down all requirements to the catalogue and create case study document. In the catalogue of requirements there are about seventy records. For every record is set a priority from one to three. During the analysis there a complete system was also invented including the whole mapping agency under the Czech Orienteering Federation. The details will be mentioned in the discussion. Making an application with a complete system of the whole agency would be time consuming. Instead of this much

simpler solution providing the most important functionality was chosen. In the catalogue of requirements there were chosen all records with priority one and some of them with priority two.

The migration of the data was divided into three parts regarding the type of data. The Map Archive data includes almost 6000 maps, that means around 20MB for tabular and geographical data, and around 120GB stored in raster images. Firstly map outlines were migrated as a geographical part of the data. Original data were exported from OCAD data format to Shapefile and then using ArcGIS with Export to KML 2.5.5 extension to the KML file, which was resaved in Google Earth for smaller size. The last step was to import data into Fusion Tables using their own GUI directly to the database. Tabular data were exported from Microsoft Access to the DBASE V and then using Microsoft Excel to the CSV file, which is possible to import into the Fusion Tables database. Raster images were migrated in two steps. Firstly watermark was added and TIFF files were saved as JPEG files using Jasc Image Robot. Every image has different resolution, which is stored in EXIF header. Application Picture Resizer 6.0 was used, because it is able to read EXIF header and decides if it is necessary to resample image or not.

Programming was in the beginning just about to try all main functions. The author of the present thesis wanted to be totally sure that the chosen technology is good enough to provide all functions which are necessary for all parts of this application. A demo application was created. Then a document was created, which included specifications of graphic user interface for web designers. The graphic template was made by CobraDesign Company ([www.cobradesign.cz](http://www.cobradesign.cz)). During the period of time they were designing the application more functionality was developed in demo application. In early 2012 both parts were put together, the functionality from demo and graphics from the template.

Afterwards more functions were developed. Most of the programming code was written in PSPad application. It is mostly JavaScript for client side and PHP for server side operations. In this part the Internet was really helpful as a main source of information, especially reference guide, documentation, samples and different user blog with other samples, etc.

During development a second language was added. Nowadays the application is in both Czech and English language. All strings are saved in two different files and each request to the page chooses the string from one of them regarding your browser settings or your choice. That means that all of the pages have to be PHP files.

The application could be divided into two parts. One is for public, which really does not require any authentication and the second part is available just for administrator (people who have their own login and password).

As a public use you can search maps in three different ways, which are typing the name of the map with autocomplete function, using the click on the map as spatial request or using the form for advanced search. The result can be visualized on the map, in table or download to the CSV, XLS or KML file. You can display all maps of the author or the club which you choose. There is also an option in advanced search to type the GPS coordinates or city and the distance you want to search maps around. City will be geocoded by using Google Geocode Service. There is also a possibility to display URL link to whole map composition or to each map. The URL link will be shortened by Google URL Shortener API.

The administrator console offers only a few features more than the public part. Administrator had to use your own Google Account to sign to this application using OAuth2 protocol. Application is registered in the Google Apis console. Afterwards it is controlled if the user has the right to edit both Fusion Tables in which all Map Archive tabular data are stored. After administrators are logged in, four more features appear. These features allow them to insert or edit maps or authors. At this early time of service there will be no availability to delete records, which is also possible from Fusion Tables graphic interface. Inserting and editing of maps also provides the function for drawings the outlines of maps. This functionality is built on Google Maps Drawing Library.

The final release of the application is available from URL address: <http://csos.tmapsserver.cz>, as you can see all main objectives were met. There were also around ten testers of this application. All of them were fully satisfied. The author of this thesis really hopes that this application will provide easy accessible information for orienteering runners as main users.

During the whole process of analysis and application developing involved people invented many ideas where this application could go. The greatest idea will be to create the whole system of orienteering maps evidence including all region cartographers and also all clubs. The main thought and also process models are mentioned in case study document, catalogue of requirements and in process models, which are part of this thesis as appendices. A more realistic idea is to add layers for embargoed areas and event centres. It will be necessary to create features for inserting and editing them. Utopian idea is the creation of the whole Czech Orienteering Federation system including all clubs runners, competitions, race enrolments, race schedules, start lists, results, maps, etc. The other idea could be to gather all source files, which are mainly in OCAD format and securely save it to web server and create e-shop. Using this e-shop, users could

immediately download the map they paid for. For fulfilling any of this idea you need many highly interested volunteers. The work for orienteering in Czech Republic is mainly voluntary.

The research part mentions also different applications providing users view on orienteering maps from different countries as Czech Republic, Israel, Finland, Latvia, Lithuania, Slovakia, Slovenia, Sweden and Switzerland. To the final ranking worldwide orienteering application WorldOfO.com was added. The final ranking is shown in chapter 3.3.11.