County Spatial Database of Split-Dalmatia Institute of spatial planning

Marjan Sikora, M.Sc.E.E.
ENTER d.o.o.
Matošića 5, Split
email: marjan.sikora@enter-st.hr

Miće Gamulin, M.Sc.
Institute of spatial planning, County of Split-Dalmatia
Vukovarska 1, Split
email: mice.gamulin@splitsko-dalmatinska-zupanija.tel.hr

Abstract: **In order to fulfill the need for quality IT foundation, the County Spatial Database was developed as a GIS solution for Spatial planning institute of County of Split-Dalmatia. The CSD has a complex structure, in order to accommodate all needs of spatial planning. To ensure up-to-date status of data and possibility of rollback to important stages in past special procedures are developed. To give the public an insight into documents of physical planning the MapGuide Internet GIS maps are created and published. Preparations are being made for transformation of CSD into an Information System of Physical Planning where all plans for the County would be incorporated.**

1. INTRODUCTION

In last few years Split-dalmatia County is making significant efforts to control and plan its future by using advanced technologies. Particular place in this process has Institute of spatial planning which is developing several tools and instruments to facility work on planning processes. In this complex task GIS has central position, because it gives the opportunity of controlling the whole sets of spatial data, and makes planning process more transparent and efficient. GIS developed in Institute of spatial planning is base on guidelines and suggestions made by Ministry of planning.
Institute of spatial planning (ISP) of Split-Dalmatia County has from its constitution begun development of its County Spatial Database (CSD). Primary goals of this system are to deliver quality information to its employees, and to serve the process of designing the maps as a formal document in urban and regional plans. Secondary goal is to serve the information to other Departments of the CSD and to general public.
In order to fulfill these tasks the DOD has hired the ENTER d.o.o., a Split based IT company.
CSD is a complex structure, build of huge amounts of raster and feature spatial data (table 1), a big attribute database, and software tools for accessing and manipulating this data. As an integral part of the CSD the MapGuide Internet based GIS system was made. Due to complexity of the system detailed procedures for update, archive and backup of data were developed.

Type of data	**Size (GB)**
Raster	4,5
Feature	1
TOTAL	*5,5*

Table 1 – Size of County spatial database

2. STRUCTURE

The structure of the CSD is displayed in the figure 1. It consists two main segments: the social data and the natural data. These parts are thematically further divided into segments. This structure was defined in order to facilitate the process of making thematic maps, which is usually composed of the base map (either raster or feature map) and thematic layers above.

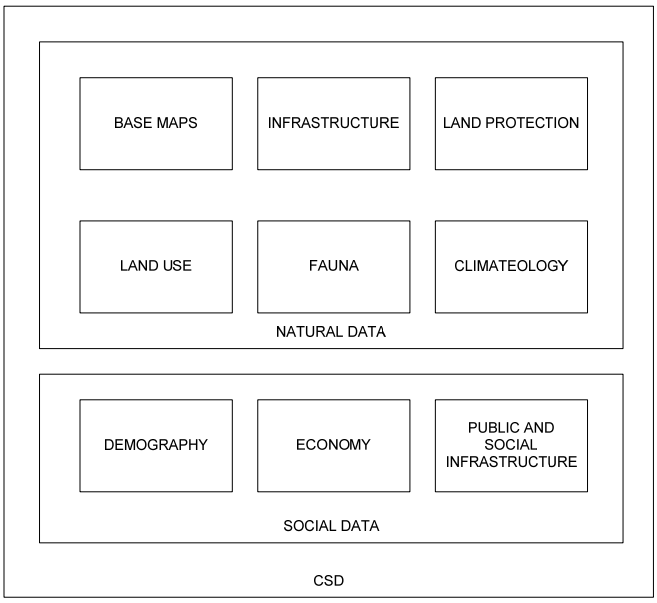

Figure 1 – The structure of the CSD

The format of the thematic data is standardized. The standard formats are not always the most recent ones, but were chosen for their compatibility with other state and private planning bureaus and departments.
The raster data is saved in GeoTIFF format, projected in the VI. zone of the Gauss-Kruger projection. The raster files are in the scale 1 : 25 000 and 1 : 100 000.
The feature data is saved in the ESRI shapefile format. The data is projected in the IV zone of the Gauss-Krueger projection. With some exceptions the feature data in the CSD is prepared and digitize with precision according to scale 1 : 25 000. Accordingly, the attribute data of SHP files is saved in DBF format. The data is prepared using WIN1250 code page.
In some cases, the data is saved in other formats such as DWG, JPEG etc. This is done in cases where data is provided from other sources, and due to some reasons is not converted into standard GeoTIFF-SHP-DBF format of the CSD.
The metadata was prepared in ASCI TXT format, according to predefined specifications. The metadata was prepared for all themes in the CSD.
The DEM (digital elevation model) data is saved in the DWG format for contour line data, and DWG and ESRI TIN formats for TIN data. The DEM models are prepared in scale 1 : 25 000 and 1 : 150 000.
For the purpose of the planning process, thematic data is organized into maps. These maps are prepared according to Regulations [1] for each Plan that is being developed. The maps are designed in the APR format for the older plans, and in the MXD format for the recent ones.
The software used in the CSD can be divided in two parts: Autodesk LandDevelopment, RasterDesign and 3D Studio VIZ are used during the process of acquiring and preparation of the spatial data; ESRI ArcGIS Desktop with extensions is used for the display and the analysis of the data, as well as for the process of design and printing the maps.

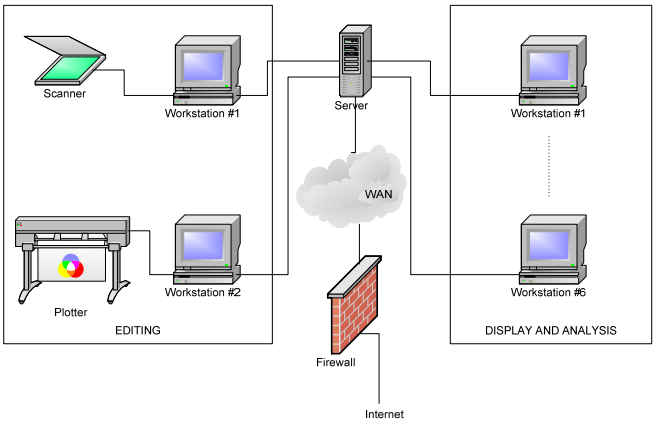

Figure 2 - The organization of the network.

The organization of the network in the ISP is shown in the figure 2. All data resides on the server, and clients across the network can access the data with read permissions for the purpose of the displaying and the analysis of the data.
The speed of the network is 100 mbits. This is not enough for some employees that use the CSD more intensely. Since the average map with feature and raster data has about 100 MB, even with optimized, caching software the work with these datasets is slow and cumbersome. Therefore, such users have the *mirror-image* of the CSD on their client computers, and access the data locally with full speed that desktop computer hardware permits. The process of refreshing the *mirror-images* is described in the next chapter.

3. THE UPDATE, BACKUP AND ARCHIVE PROCESSES

Due to complexity of this database procedures for updating, archiving and backup were developed.
In order to avoid collisions and inconsistencies in the updating of the database, only CSD two working places in CSD are authorized to make changes to database. The procedure for the updating the base is shown in fig 3. First,

the changes are made locally. Second, two editing working places are synchronized using Folder Synchronize software made by Funduc Software, Inc. This synchronization is done in two steps: fist the databases are compared, and if audit of changes shows no errors the synchronization is completed. After local synchronization, the synchronization with server is done, in order to give the other users ability to view changes.

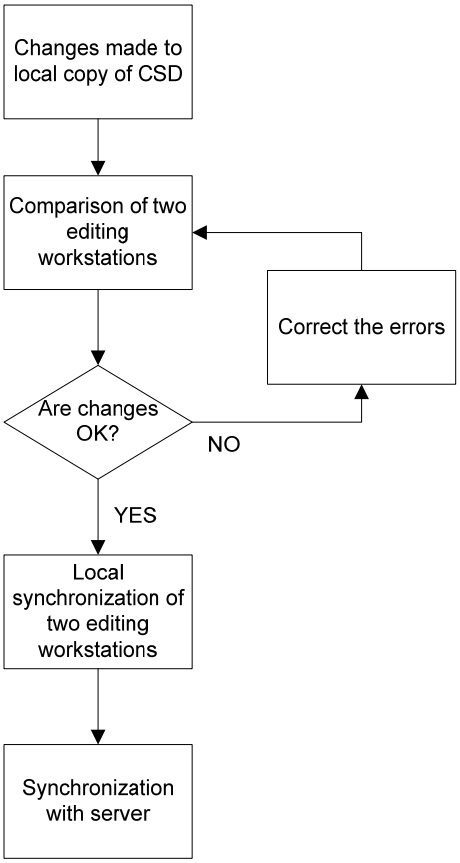

Figure 3 - Procedure for the updating the CSD

The backup process of the CSD is done periodically-every 15 days. The backup is of differential type, and the backup media is CD-ROM.
The CSD is a dynamical database. The phases in the development of database are determined by the completition of separate Plans. After one plan (for example Spatial plan of County of Split-Dalmatia) is completed, the complete CSD with maps of that particular plan is archived. This is done in order to be able to make a rollback of the CSD to the point in time when the plan was completed and authorized. With this mechanism, the CSD is always up-to-date and if the need arises to check the state of the CSD when particular plan was being authorized, one has only to use the archive.

4. INTERNET MAPGUIDE SUBSYSTEM

The law [2] defines obligation to give the public the access for the documents, which are the result of the urban and regional planning. In order to fulfill this obligation, the DOD decided to publish the maps of the Regional plan of County of Split-Dalmatia on Internet.
The maps were published using the Autodesk MapGuide technology. MapGuide is a client-server [3] system used for distribution of spatial data over the network either intranet, or Internet. With MapGuide (figure 4.)one can create proprietary web applications, which enables the user to display, create or modify spatial and attribute data. MapGuide system consists of three major parts – Server, which serves the data over the net either in raster or vector form; Author, used to design the maps; and Viewer, a plug-in for Internet browser, that enables the display and manipulation of maps in Internet browser. Maps can also bi distributed in LiteView form, which does not require the installation of the plug-in, but can be directly viewed in Internet browser.

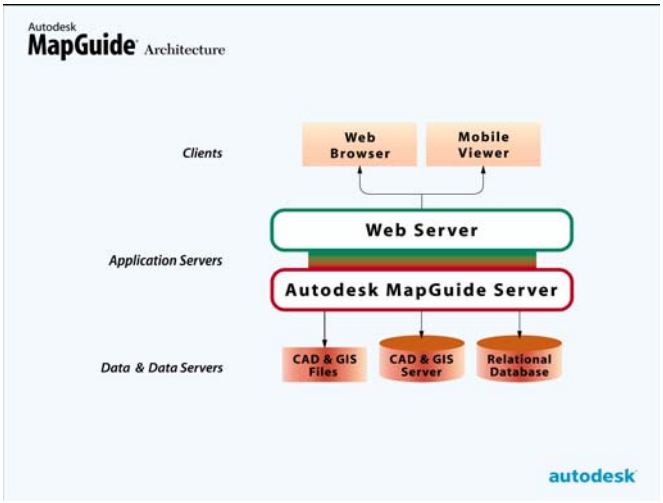

Figure 4 – The MapGuide system

Nine maps of Regional plan of County of Split-Dalmatian were published on the Internet using the MapGuide system

[4]. The maps are optimized for distribution over the Internet by both the generalization and conversion into native SDF format, and by selective display of the themes depending on the current scale. Where possible the data remained in the basic SHP and TIFF format of the CSD.
The maps were also enriched by the reports and queries. Using reports one can examine the attribute dataset for the particular theme. The reports were created using ASP technology.
MapGuide Viewer has tools for graphical selection of spatial data. In order to be able to make selection based on the attribute data, the queries were added to selected maps. With queries, one can select several features, display them graphically and examine the attribute data attached to selected features. The queries were developed using JavaScript and VBScript technology.

5. CONCLUSION

CSD is a complex spatial database, which is the foundation for physical planning of Institute of spatial planning of County of Split-Dalmatia. Due to its complexity the procedures for update, backup and archive were developed. This was done in order to conserve the integrity of the database, and to be able to make a «rollback» to a significant stages in the development of the database.
In order to give the public access to documents of regional and urban planning, the MapGuide Internet GIS system was used. Users can via Internet access the maps of the Regional plan of County of Split-Dalmatia.
The CSD is constantly being updated and filled with additional data, as new plans are developed. In addition, the level of detail in the database will increase, because the planning is being done in the bigger scale.
In this phase the primarily user of the CSD is the ISP, but the goal is that other County departments start using the database, and contribute to its development. Also due to changes that would be made in the law, the efforts are being made to transform the CSD into Information System of Physical Planning, which would incorporate all plans, and not only ones made by ISP of County of Split-Dalmatia.

[1] Pravilnik o sadržaju, mjerilima, kartografskih prikaza, obveznim prostornim pokazateljima i standardu elaborate prostornih planova, Narodne Novine 98/106, Zagreb
[2] Zakon o prostornom uređenju, Narodne Novine 30/94, 68/98, Zagreb
[3] MapGuide 6 Users Guide, Autodesk Inc., 2002.
[4] http://mapguide.recro.hr/plan