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PROPERTY RELATIONS AND INFRASTRUCTURE MAPPING IN THE CASE OF PROJECT "SLAVONIAN NETWORK"

IMOVINSKOPRAVNI ODNOSI I KARTIRANJE INFRASTRUKTURE NA PRIMJERU PROJEKTA "SLAVONSKA MREŽA"

ABSTRACT

Directive 2014/61/EU of the European Parliament and of the Council of the EU (15th May 2014) on measures to reduce the cost of setting up electronic communications broadband networks – requires establishment of a national information contact point for Member States for utilities infrastructure. By implementing Directive – inventory of all utilities shall be made, which will be used for planning construction works in the field and installing utilities for internet broadband access. In that way, a stocktaking in the area before making key decisions about the planning of construction work, which could also serve to set up the infrastructure for broadband access. In the areas where it will be necessary to thoroughly renew electronic communications infrastructure by laying pipes or fiber-optic cables directly into the ground, it won't be possible without proper project documentation. Property relations could represent unexpected difficulties in this process if they aren't noticed ahead. By mapping existing infrastructure and its electronic integration with public records from cadaster and land registry, it is possible to achieve a new quality in the design and planning of infrastructure for broadband access.

Key words: broadband, Directive 2014/61/EU, infrastructure, mapping, property relations

SAŽETAK

Direktiva 2014/61/EU Europskog parlamenta i Vijeća Europske unije od 15. svibnja 2014 o mjerama za smanjenje troškova postavljanja elektroničkih komunikacijskih mreža velikih brzina nalaže članicama EU uspostavu nacionalne kontakt točke za podatke o infrastrukturi. Na taj bi se način uspostavila inventura u prostoru prije donošenja ključnih odluka o planiranju građevinskih zahvata, a koji bi mogli poslužiti i za postavljanje infrastrukture za širokopojasni pristup. Na području gdje će biti potrebno elektroničku komunikacijsku infrastrukturu temeljito obnoviti polaganjem cijevi ili svjetlovodnih kabela direktno u zemlju, to se neće moći obaviti bez valjane projektne dokumentacije. Imovinskopravni odnosi mogli bi biti nenadana prepreka ako se na njih pravovremeno ne ukaže. Kartiranjem postojeće infrastrukture i njeno informatičko povezivanje s javnim evidencijama Katastrom i Zemljišnom knjigom moguće je postići novu kvalitetu u osmišljavanju i planiranju infrastrukture za širokopojasni pristup.

Ključne riječi: Direktiva 2014/61/EU, imovinskopravni odnosi, infrastruktura, kartiranje, širokopojasni pristup

1. Introduction

European Union documents – the Digital Agenda 2020 and the accompanying directives, from which the most important is the Directive 2014/61/EU from European Parliament and Council of 15 May 2014 on measures to reduce the cost of setting up electronic communication broadband networks, requires establishment of inventory of the existing electronic from national economies and to, by method of good management come up with models of investment in the reconstruction. Technologically speaking, big problems aren't expected. Commitment to a minimum transfer speed of 30 Mbit/s for all households, and 100 Mbit/s for 50% of households does not leave doubts on which technology should be used. Certainly, it is a technology that uses optical fiber as a medium. Exceptions exist, and they are conditioned by large investments to individual lone subscribers. To cover commercially problematic (isolated) areas with broadband Internet connection, Europe is ready to invest up to 80% percent of the total investment in infrastructure. National economies are obliged to perform the necessary steps to ensure the continuous flow in investment cycle from getting building permit to the certificate of occupancy. Discontinuity in the developing process causes a significant delay in realization of the investment which Europe punishes by withholding funding from the budget.

Fundamental analysis starts from the review of the current electronic communications infrastructure. All the critical infrastructure needs to be mapped. We could say that Croatia has advantage over some state members of the European Union, because infrastructure mapping has been controlled since 1973 through the utility cadaster. Condition of infrastructure records in northeast Croatia is significantly better than records in a large part of the Croatia, with the exception of Zagreb, which utility cadaster was organized even before the legal regulation, because of the needs of a large city. This register is important because existing route can be used for laying fiber-optic cable or, in the case of the distributive telephone network used for copper conductors, optical fibers replacement can be done at no additional construction work. Without this utility cadaster register, significant damage to the existing infrastructure is expected in the area excavation.

Another important factor that affects the realization are property relations on the path of infrastructure route of future construction. Various obstacles are expected because of unregulated property relations on the real estates.

These two threats in the realization of broadband access are theme of this paper. Without utility cadaster there is no economical use of space, the probability of damaging existing infrastructure is big. Utility cadaster (of utilities embedded in the ground) defines on whose property is the existing route and whether the property relations are already settled, or whether they will be a threat to obtaining a building permit. Because this is a multidisciplinary professional matter in which surveyors and lawyers take part, there is a need for connecting existing databases: land cadaster, utility cadaster and Land register through information technologies. Databases are connected in the form of Web GIS solution to visualize problems.

2. Collection and analysis of attribute data

When we talk about data (and their storage in a database) from any domain of real life, we need to be aware of their spatial component. In fact, about 80% of all data contains spatial component by default – the address or location to which this information is linked (Cetl et al. 2008). Sometimes data without their spatial component have no significance to us, e.g. if we find out that the

earthquake happened yesterday, but we do not know where it happened, that information will not be relevant for us, but if we find out that the earthquake happened near the place where we live, then that information will have certain weight of importance. In addition to spatial component, time component is very important, i.e. connection of actual situation with older data. Development of systems for spatial data management (and their accompanying attributes), so called GIS's (geographic information systems) began in the late 60s of the last century. Geographic Information Systems include technologies for input, processing, analysis and display of spatial information (geoinformation) (Frančula 2004). Today, GIS systems are realized as computer software that allows you to communicate with the database in which data is logically structured and perform operations on data in database. Application of GIS systems is very broad, and some of the purposes of use are:

- maintenance and monitoring of municipal infrastructure (roads, power lines...)
- monitoring and guiding the vehicle fleet (e.g. Fire trucks, taxis...)
- environment protection
- management of the agricultural industry...

A modern approach to visualize geographic data, as well as all other information is through the Internet. This approach has significant advantages over the classic presentation of data:

- easy accessible from any location (requires Internet access)
- simultaneous access from large number of users
- data is stored on a centralized place which makes updating easier
- to view the data, user requires just an internet browser (no need to buy commercial software)
- usually does not require special training to use it's the same platform that we use every day for consuming various content over the Internet (web browser)
- data is always available in the latest version...

For the purpose of developing GIS aimed to facilitate and speed up regulation of property relations in the real estate registry, data was collected from public records of Land registry and Cadaster. The task required a high level of data reliability, and since there is a large amount of data (City of Osijek as the local government, i.e. Cadastral municipalities: Osijek, Tenja, Tvrđavica-Podravlje, Briješće, Josipovac and Klisa) it was necessary to carry out informatization of data collecting process. The goal of informatization was to automate the process of data collection, but also avoiding human error factor which could cause data loss or even wrong data collected. With spatial analysis of the data using GIS, corridors through which infrastructure passes are defined. For marked cadastral parcels is then downloaded data from public records.

Land registry and Cadaster data together give the full picture of the smallest official spatial units in Croatia – cadastral parcels. Throughout history, these two records are maintained with different interests:

- Land registry includes data about property rights proprietorship, easement rights
- Cadaster includes data about position and size of the parcels, land usage info and some other real estate information

The result of many years of keeping those two records as separate entities are the unadjusted records for same parcels, therefore the collected data should firstly be thoroughly analyzed and matched with the actual, current state of cadastral parcels so that we can perform operations on that data. After data adjustment, unique data set for every cadastral parcel is prepared, which is the basis for the analysis of property relations. However, such aggregated data also contains different entries for the same owner, for the purposes of visualization it was necessary to perform the categorization by the owners of real property (Table 1).

In addition to data from Land registry and Cadaster, it was necessary to collect additional data on the already regulated property relations – copies of contracts concluded between Croatian Telecom

(Hrvatski Telekom – HT) and the title holder on real property – in order to check whether the contracts are implemented in Land registry records, and if not, so that they can be particularly emphasized.

By unification of all the necessary information in one place – in the database – development of Web GIS solution could start in order to visualize the attribute data.

Record about owner in the Land register	Associated category
UDIO 1/1 GRAD OSIJEK	City of Osijek
UDIO 1/1 GRAD OSIJEK OSIJEK, F. KUHAČA 9	City of Osijek
GRAD OSIJEK OSIJEK, FRANJE KUHAČA 9 OIB: 30050049642	City of Osijek
UDIO 1/1 GRAD OSIJEK OSIJEK, KUHAČEVA 9	City of Osijek
UDIO 1/1 GRAD OSIJEK OSIJEK, FRANJE KUHAČA 9	City of Osijek

 Table 1 Example of different entries of the same owner in the Land register

Data source: Public records of the Land register (http://e-izvadak.pravosudje.hr; 05.04.2015.)

3. Technology and tools used in the Web GIS creation

Computer programs used for project like this include a series of software for different purposes, which are necessary for the formation of the final product. The process of preparing data included: the separate preparation of graphic data, collection and processing of attribute data, their shared storage and finally visualization and serving Web GIS solution over the Internet. Earlier in the paper was mentioned that own software tools were developed collect certain data sets in order to prevent data loss and the factor of human error due to large amounts of data. For processing the graphic part, software used is Autodesk AutoCAD with additional official MAP 3D enhancement, which is de facto standard in Croatia when it comes to cadastral spatial data. As the central database for storing and manipulating data is a free version of Microsoft SQL Server – SQL Server Express Edition.

There are many GIS tools which are distributed under so-called FLOSS license (Free/Libre Open Source Software). In this project is used MapGuide, free and open source tool for visualizing and servicing Web GIS over the Internet.

4. The implementation and use of Web GIS

Developed web application for viewing and analyzing adjustment of property relations on the real estates was placed on cloud server through which it is distributed to users (Figure 1).



Figure 1 The initial screen display of application

Source: Web GIS application

After zooming in, cadastral parcels are displayed in different colors – fill color is appropriate to the category of the owner. Such thematic overview of ownership allows easy visual recognition of property rights on the parcels (Figure 2).



Figure 2 Thematic view of cadastral parcels ownership

Source: Web GIS application

Each parcel in the application is possible to be individually selected and found via built-in search tool. By selecting cadastral parcel in the application, it displays additional attribute information about the parcel. Shown data is not immediately visible from the thematic presentation of ownership, data in table contains (Figure 3):

- cadastral municipality in which the parcel is located,
- unique number of cadastral parcel,
- the owner (record from Land registry records),
- the holder (entry from the records of the Cadaster),
- land usage (entry from the records of the Cadaster),
- total length of ECI (electronic communication infrastructure) on the parcel,
- the contract between HT and owner (if any),
- recorded easement right in the Land register for the parcel.



Figure 3 Tabular presentation of attributes for selected cadastral parcel

Source: Web GIS application

By activating additional thematic layers, other relevant information about implementation of existing contracts in the Land registry is shown. On Figure 4 dark blue marked parcels are the ones with existing contract between the City of Osijek and HT, while the dark green marked are those parcels for which the contract was fully implemented in the Land register (have registered easement right).

Figure 4 Highlighting of parcels for which the contract was concluded but aren't implemented in the Land register (blue), and parcels on which easement right is implemented (green)



Source: Web GIS application

By zooming in we can easily see which parcels (owned by the City of Osijek) are not included in existing contracts between the City and HT, and we see clearly that there is a built electronic communication infrastructure (purple line) (Figure 5) on parcels. Besides the visual elements and their associated attribute data, application also contains scanned contracts and scanned copies of Land registry entries which can be used for in depth study of the actual state (Figure 5 – link within tooltip).



Source: Web GIS application

The data that the application offers changes over time, so it is necessary to perform periodic updating. One of the most important advantages of this GIS, based on digital technology is the possibility of "painless" data refresh, according to a pre-defined schedule or on demand (in this case by HT or City) after the intervention on the infrastructure or the Cadastral and Land registry data. Internet application is primarily intended for the City of Osijek and the HT to ease resolving property relations on parcels as soon as possible, which ultimately brings regulated condition that favors the development of the economy. Apart from the office – for the preparation of documentation for settlement of property relations, studying, analyzing and planning the changes to the infrastructure etc., the application can be used live in the field when setting up new routes or maintaining existing ones. Thanks to the development of information technology, today we have laptops and tablets that have wireless Internet access and can be used effectively in the field. The application allows you to check the status of lines in the area around the City of Osijek at any time, and the only limiting factor is access to the Internet.

5. Conclusion

Modern GIS solutions are an excellent tool for analysis and visualization of spatial data. Considerably facilitate the resolving of spatial-related problems from practice. Developed Web GIS solution is an example of tool to solve specific practical problems which complicates and delays obtaining and use of financial resources of the European Union. It is characterized by ease of use, ease of access and the availability of 0-24 from any location where Internet access is available. No need for expensive software applications for end users, which are generally used only for viewing data. As a software foundation for Web GIS, used free tools have proved to be adequate and fully functional replacement for expensive commercial GIS solutions available on the market.

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