

## **Municipal (G)IS in Czech Republic** **(complex desktop and web solution based on ESRI technologies )**



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### **Abstract**

Solution for Municipal GIS – realised by T-MAPY company - introduces a complex system of applications which has the ambition to cover all GIS tasks identified in municipal environment for all groups of users with different levels of requirements and knowledge of GIS technology. Being based on ESRI ArcGIS technology, the system is widely open, extendible and fully supports the integration with other parts of Municipal information systems.

Classic desktop is extended by perspective web solution with usual web browser (MSIE, Mozilla) as an user environment. Selected technology provides the integration of information system into a user's Intranet, distant accesses from Internet and also a direct editing of selected information on external web pages of a user.

Current and future development is based on regular requirements of more than 60 municipalities in Czech Republic

### **Introduction**

The system design and development is lead by the endeavour to solve – among others – these problems:

- a) quality data base for GIS
- b) system of GIS applications which support the widest area of tasks on multiple user levels
- c) integration of GIS with other applications of Municipal Information System

This text is focused especially at a software part of whole solution, but we think that it is appropriate to briefly mention our approach to a data basis of Municipal GIS.

### **Data**

In a long term period we are interested in data creation, maintenance and administration for many Municipal GISes. For particular subsystems we dispose of :

- methodologies
- data models
- SW tools for required geoprocessing (for necessary controls and conversions etc. )

#### **Basic aspects of data creation and maintenance in Municipal GIS**

All the data used in our Municipal GIS projects are generally created by two basic methods:

- internally (i.e. via our delivery or by internal capacities of the office, but according to our methodology and into our data model)

- externally (data are primarily created by the third side and therefore it is necessary to offer respective tools for data control and conversion before their implementation to Municipal GIS)

It is our greatest interest to harmonize our methodologies and data models for **internally** created data with existing or emergent rules, standards etc. It is a case especially of cadastral maps (here we have many interesting projects, where the data of digital cadastral map have been created for many years in cooperation with respective Cadastral Office and so called digital technical maps (which are created according to internal methodologies and data models of respective owners of technical infrastructure)).

We implement **external** data on the basis of successfully finished controls and conversions. It is important to mention here that our systems can work (read) with many other "ESRI non-native" formats, but in many cases we also convert such data because of the aspiration to enhance "internal" quality of data (for instance creation of polygon topology).

## Supported data subsystems

For instance we introduce here data subsystems which we support in Municipal GIS, i.e. we are able to create or implement these datasets:

- basic reference data
  - digital cadastral map
  - digital technical map
  - spatial identification (i.e. address points, map of house numbers etc.)
- other reference digital maps
  - orthophotomaps (typically conversion to suitable data format – MrSID or image catalog)
  - other maps of so called medium scale
  - topographic maps 1:10 000 – data structure modification, image catalogs etc.
  - DMU 25 – 1:25 000 (map of Czech Army)
  - digital terrain model, hypsography
- specialized geographic databases
  - urban planning documentation
  - so called "pasports" of technical equipment of the city – i.e. of buildings, roads etc.
- cartographic tasks
  - digital block map
  - various city plans (different versions according to users' requirements)
- other tasks
  - parcels prices map
  - living environment
  - etc

## Software solution

### General description

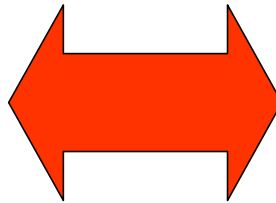
**Technological part of SW** solution can be characterised by these items:

- a) Usage of ESRI technologies as a foundation for users' applications development and applications for batch geoprocessing
- b) Independence and security
  - independence on operational systems (Linux, Solaris, Windows), databases and other technologies
  - use of free (but proved, stable and secure) technologies
  - use of web technologies, remote access
- c) Standards

- data formats
  - communication methods and services
  - software standards (common, OpenGIS, ...)
  - standards coming with European projects (GINIE, ESDI, ..., INSPIRE)
- d) Open and scalable architecture applications and technologies adjustable according to needs of users and different user levels
- e) Open and published interface for all applications
- f) Extensibility
- g) Basic applications can be extended by
- additional modules (plug-ins) (for desktop solution)
  - applications (for inter/intranet solution)
- h) Communication and integration with other part of Municipal ISData is the most important part of the system

Basic **architecture of the system** is designed with respect to these conditions:

- a) introduction of new ESRI ArcGIS concept
- b) support of formats of larger number of “greater” producers (not only of ESRI, but also of Bentley (MicroStation dgn) etc.
- c) well-balanced support of two basic directions in applications development, i.e.
- **desktop** – by quality desktop clients and extendible modules
  - **web (inter/intranet)** – by html/Java clients to respective MapServers and extendible application services... and not at least also technical, personal and financial situation of our customers
- d) ... and not at least also technical, personal and financial situation of our customers

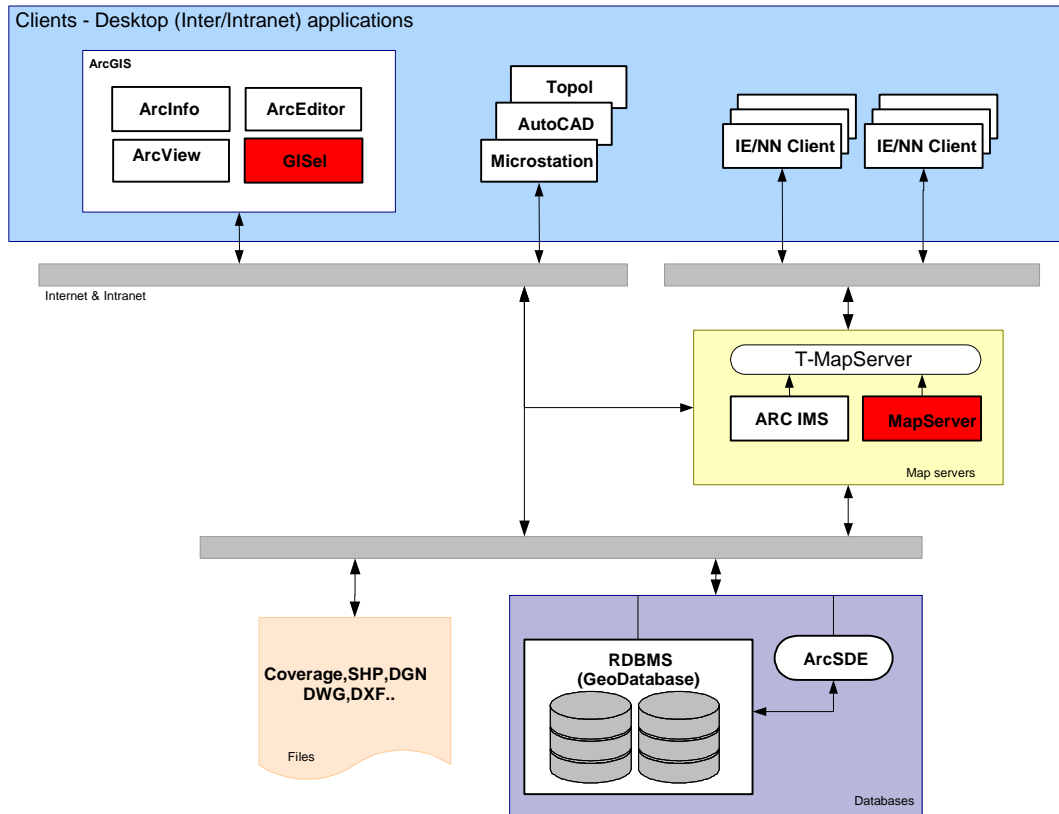


- **quality and actual data**
- **communication interface**
- **user friendly interface**
- **database application or current operational information system**
- **desktop or web technologies**

- **quality and actual geodata**
- **communication interface**
- **user friendly interface**
- **common GIS software or specialized map application**
- **desktop or web technologies**

*Picture above describes philosophy of task dividing between database and map applications*

In our system architecture we really try to use well-known ESRI ArcGIS scheme (GISel: MapObjects application):



This scheme we have mapped on common requirements of our customers' information systems (their architecture). It must be said that in conditions of Czech republic many municipalities still use for instance file architecture (i.e. not SDE), but the conditions have been rapidly changed after so called "regions" were established (2-3 regions = NUTS 2); all new ideas (distributed GIS, ..., ArcGlobe) started to spread much more quickly in our public sector (and its GIS community) and a great potential to realize ambitious concepts have really grown.

Basic structure of user applications is developed in a narrow connection with data subsystems which are described above:

- sophisticated support of work with digital cadastral map
- support of work with digital technical map
- spatial identification
- urban planning documentation
- so called "passports"
- etc. ...

The applications are developed for both desktop and web environment. It is obvious that current possibilities of desktop are still higher than those of web solution. According to our tendency to offer various subversions of one application the web part is - of course - used as a base for the widest part of users, rising needs are supported by such (sub)versions, which are developed on the desktop platform.

## Integration with the systems of the third parties

Integration with other parts of Municipal information system is one of the most important goals in our software development. It is especially important in case of integration with large SW packages, which are offered by many SW producers in Czech Republic.

Applications based on desktop clients ArcGIS/GISel provide an object interface which is based on COM (Component Object Model). This interface enables to use for instance functionality of GISel application from other software environment. Software developer or advanced user can use GISel functions or elements of user interface from other environments and are able to create additional modules to GISel. Additional modules can contain either full implementation of respective application area or only support communication with other system. Such a module is integrated in GISel and can communicate via many technologies, for instance:

- COM/DCOM
- DDE
- Database access
- communication interface (by HTTP which communicates with IMS via Web server)

Additional module (plug-in) always extends or modifies user interface of GISel. It is not necessary in many cases, especially when the third side application has not demanding needs, as is a localisation of a spatial element or spatial relationship.

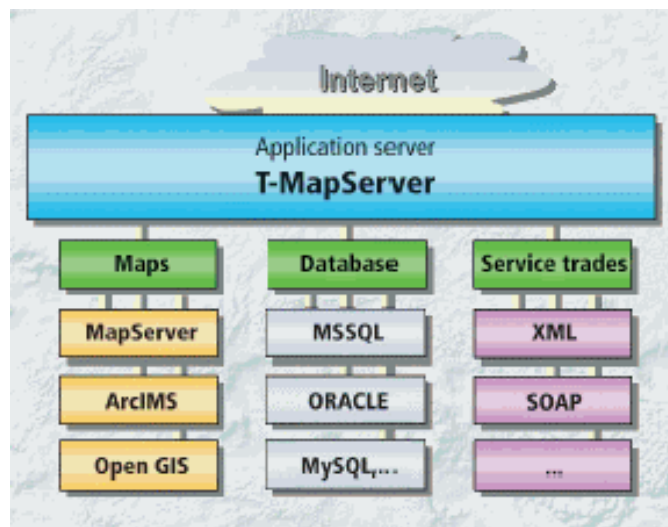
GISel application is at once available as an ActiveX element. This means that "map part" can be fully integrated into other applications with full potential of standard GISel.

**The possibilities described above cover all the variations, which can be identified in municipalities in the area of software integration.**

## Software for inter/intranet

Our company develops complex web solution called **T-WIST** (Team Web Information System of T-Mapy). Map part of T-WIST is delivered as **T-MapServer**.

T-MapServer is an application server/middleware for MapServers (ArcIMS, MapServer etc) . T-MapServer links a user's Web browser and an IMS application server and allows users to access geographic information on the Web and also gives them the opportunity to establish communication between map part and external applications. This technology can be used in many tasks from the simple map representation to complex work with (geo)graphics or database-oriented applications and their interconnections. The user environment is based on standard Web browsers. Unlike other map server solutions, T-MapServer complements IMS with the possibility of communication between the map and external applications and operating environments in Windows and UNIX (Solaris, Linux, etc.).



*T-MapServer schema*

## Additional Web applications – T-WIST

Map server cannot solve application logic for many user tasks. According to this fact we develop special web applications on base of **T-WIST** technology. The most important are two of them:

T-WIST KN  
T-WIST UIR

Application T-WIST KN is internet application for the work with cadastral map, which offers following services:

- basic info about parcel, building and the flat
- detailed information from the sheet of ownership
- owners relationship
- many other functions .

Application T-WIST UIR is an internet application for the qualified work with information from so called Spatial identification registry. It enables a searching of addresses and offers an access to many other information.

### ANNEX

The solution described above is (in Czech Republic) used in different subtypes at cca 60 town halls (Praha, Ostrava, Hradec Kralove, Mlada Boleslav, Cesky Krumlov, Jablonec, Most etc) and plenty of other users from public and private sector.

### About T-MAPY company

T-MAPY was established in 1992 and has been fully focused on comprehensive services provision in the sphere of information and geoinformation technologies. It has been a reliable partner for its customers who can expect comprehensive projects implementation from offer or project elaboration through data and software supply and "plug-and-go" assembly to a long-term service and consultation support. Final information systems solutions can help the end users to make their activities in their decision-making process easier and more effective and to orientate more easily in the existing information "chaos". You can find more information on the company's web pages - [www.tmapy.cz](http://www.tmapy.cz).. Live presentations of implemented projects can be seen on [www.tmapserver.cz](http://www.tmapserver.cz).

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