

# GIS as a Basic Integrating Component of city Public Safety Information-Analytical Systems

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## Abstract<sup>1</sup>

The article describes general considerations about using GIS in municipal public safety information-analytical systems building process. Structure of the system and structure of the GIS spatial data are provided.

## 1. Introduction

The main purpose of city public safety information-analytical systems is strengthening of safety, namely, the establishment of political, economic and social stability, situation monitoring and maintaining of law and order, creation of normal living conditions for residents and the functioning of city infrastructure. All of these issues faces to the authorities, law enforcement bodies of any territorial entity (council / district / city / region).

The resolvement of variety of problems from various fields of the people's activity is required for achievement of this goal. So for public safety sphere this problem is a prevention and suppression of terrorism and other criminal activity, maintenance of the law and order enforcement system. In the field of the emergency management it's a creation of city monitoring and forecasting system, emergency prevention and recovery activity improving. In the industrial sphere it's technological structures safety support, city life-support systems reliability increasing, maintenance of secure functioning of the city infrastructure and industry in the conditions of dangers and threats. In social and business sphere it's maintenance of personal security, life quality improvement, fight against economic crimes and corruption.

Due to large amount of data processing for the mentioned tasks, modern information technologies can be useful by

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implementation of the intellectual distributed geoinformation systems.

Also important aspect is a necessity of the general informational basis for decision making in public safety on the various territorial levels.

Use of geoinformation system (GIS) as a basic integrating component of city public safety information-analytical systems will allow:

- to monitor city territory;
- to react fast on various emergency situations (caller location identification; nearest patrol vehicle identification in case of incidents; explosions, fires and other accidents modelling; objects in the dangerous area identification; etc.);
- to solve optimization problems (to optimize an objects arrangement, to define optimum routes of movement and so forth.);
- to make various kinds of the spatial analysis (analysis of condition promoting criminality growth, engineering networks analysis, etc.).

## 2. Structure of city public safety information-analytical systems

The general logic structure of the city information-analytical system is shown on picture 1. There is GIS on the central place. All data arriving from different information sources are transported into Central datastore through the data exchange interface. The Central datastore contains spatial, attributive, video, audio and the graphic information e.g.:

- the images from video monitoring systems;
- the results from person identification module;
- the results from motorways monitoring module;
- the data from communications centre (calls record);

- the user activity log data;
- the system objects spatial information;
- the information from other municipal systems.

Superstructures on GIS are three program complexes, resolving three main groups of problems. Management software should provide:

1. creation and support of a common information environment for data search tasks;
2. administration, management and audit of system's program environment;
3. consistency, integrity and relevancy of the data;
4. data protection.

Data search software provides:

1. friendly user interface;
2. information query construction and processing;
3. possibility of spatial, attributive, audio, video and graphic information joint processing.

Business task software should provide automation of problems solution in maintenance of a public safety management sphere.

### 3. Tasks and functions of the GIS as a basic integrating components

The main tasks which should be solved by GIS are:

1. input, ordering, storage, relevancy maintenance of the cartographical, attributive, graphic and text

information about management objects having a spatial binding;

2. providing ability for users to query, search, extract of the information from databases (attributive, cartographical, text, graphic), representation and analysis of the results;
3. creation of information base for decision of information-analytical problems (video cameras, rapid response units etc. location planning; objects in dangerous zone identification; location of observation cameras nearest to accident place).

To solve mentioned tasks the GIS must provide functions:

1. map layers management depending on the scale;
2. general map manipulations (zoom in, zoom out, pan etc.);
3. attributive object search, complex query building;
4. object data display;
5. multi-user database access;
6. map design and printing;
7. road network analysis;
8. 3D-analysis;
9. miscellaneous data integration;
10. GIS-services providing for system scalability and remote availability;
11. remote sensing images storage, processing and presentation.

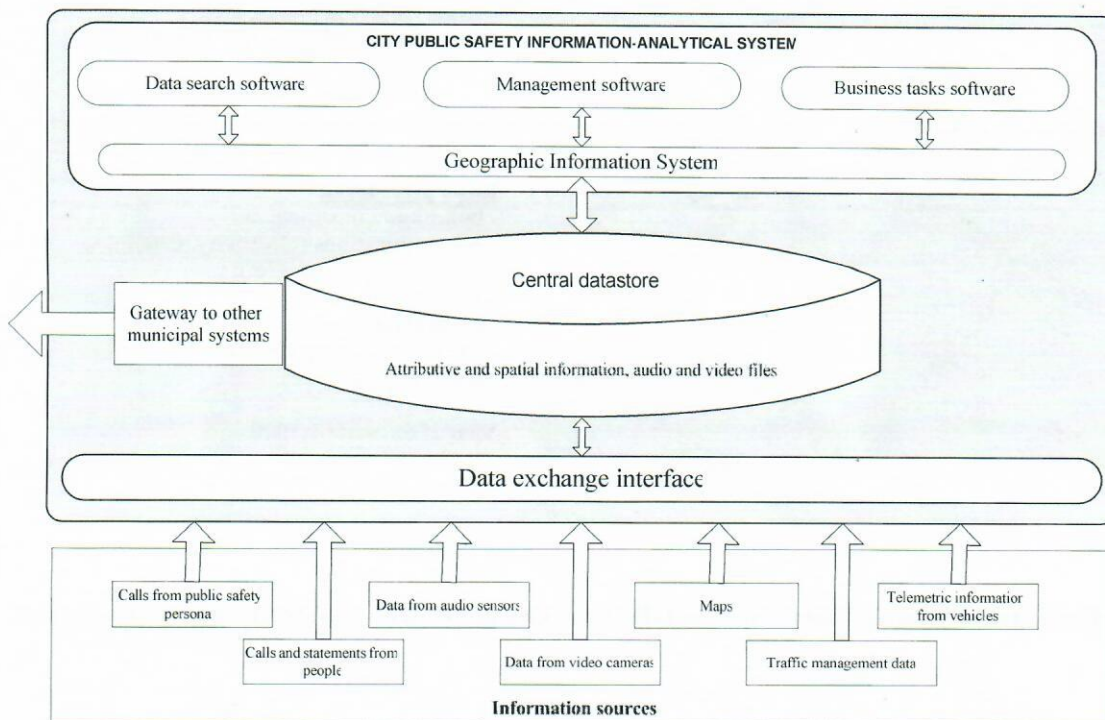
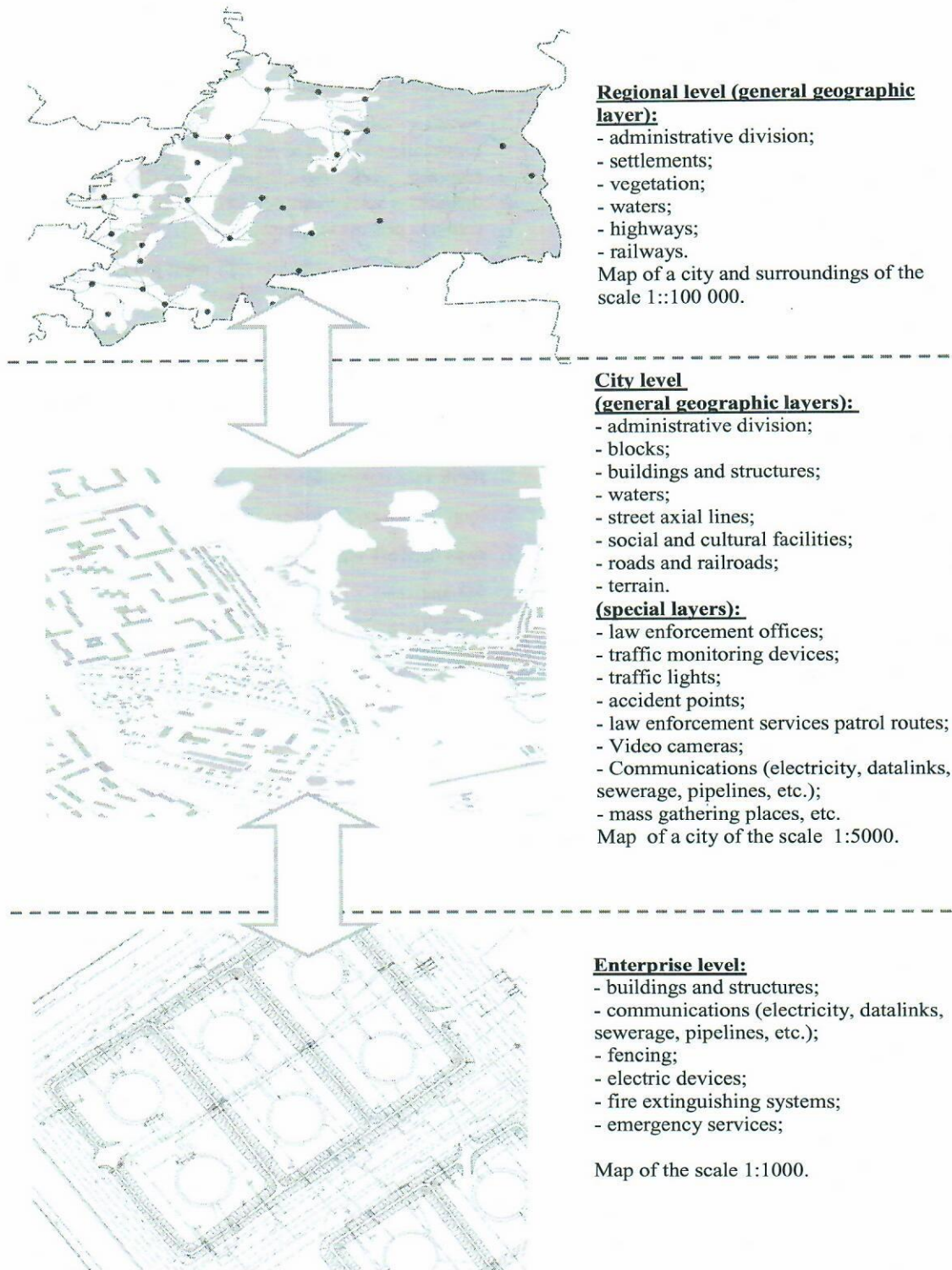


Fig. 1. Structure of city public safety information-analytical system



**Fig. 2. The structure of spatial data of GIS in the City public safety information-analytical system**

#### 4. Requirements for spatial information in the GIS

To solve the mentioned tasks spatial information should contain vector maps and plans of various scales, including: general geographic layers of the city and its environs, specialized layers:

1. vector map of the city scale 1:5000, which includes all general geographic layers and specialized layers;
2. vector map scale of 1:1000 or less, for specialized facilities located in the city (drawing of objects).
3. vector map of the region and the city surrounding of scale 1:100000 for analysis and display of processes affecting the situation in the city (such as tracking of hazardous materials transported through the city).

The structure of cartographic information (fig.2) should contain general geographic layers of spatial data (administrative division, topography, vegetation, water bodies, roads), as well as special layers of public safety services facilities.

#### 5. Conclusion

Development of the GIS in the City public safety information-analytical system will serve not only to display information, but will also be an effective tool for reporting and analysis, aimed at maintaining public safety and order in the city.

GIS will aid to react timely on various emergency situations, identify caller location, find nearest patrol vehicle.

GIS can be integrated with call recording system to display the caller location and analyze and identify trends. Also GIS can be integrated with data from other public authorities for a full analysis of all available information on emergencies.

Thus, the development of GIS in the municipal system will improve the efficiency of decision-making by monitoring the current operating environment, management of forces and resources and coordination of rapid response services, based on the analysis of spatial information about the city and public safety facilities.

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