GIS SYSTEM OF OPPORTUNITIES ANALYSIS

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Many developers of automated systems (in fact, GIS) can not quite confidently answer the question of whether these systems are GIS or not. This is due to the variety of technologies and even the terminology of numerous previously existing (and existing now) systems for the collection and processing of space-time data.

The GIS themselves can also differ significantly from each other in terms of capabilities, basic data processing technologies (and their number), the required technical configuration, computing resources, etc. For example, in some GIS tool packages, the term “arc” is borrowed from graph theory and serves to designate a polyline, in other packages, a polyline is called a “polyline”, and an arc is called an “arc”.

Because of this, the generalized assessment of typical attributes of the information system belonging to the GIS class and its distinctive properties, carried out on the basis of systems analysis methods, is of particular relevance.

It is necessary to emphasize that GIS belongs to the class of integrated systems. Current trends in the creation of integrated automated systems (including GIS) include various aspects of integration - the integration of data, technology and hardware.

The integration of data consists in the application of a system approach to the design of data models, the creation of some kind of universal information model and the corresponding data exchange protocols.

The integration of technical means is now expressed in the creation of distributed processing systems, the application of the concepts of "open systems" and modern methods of designing systems based on CASE-technologies (Computer Aided System Engineering).

The integration of technologies in information systems implies not a simple summation of known technological processes and solutions, but the obtaining of optimal technological solutions for processing information based on well-known methods and the development of new, more or less unmatched technologies. The development of automated information technology based on the existing human-aided technology in the vast majority of cases is unprofitable and inefficient. The element of novelty, as a rule, determines the efficiency of a new automated technology.

To analyze the generalized GIS, we give the basic concepts of the hierarchy of an information integrated system (Fig. 1.1).

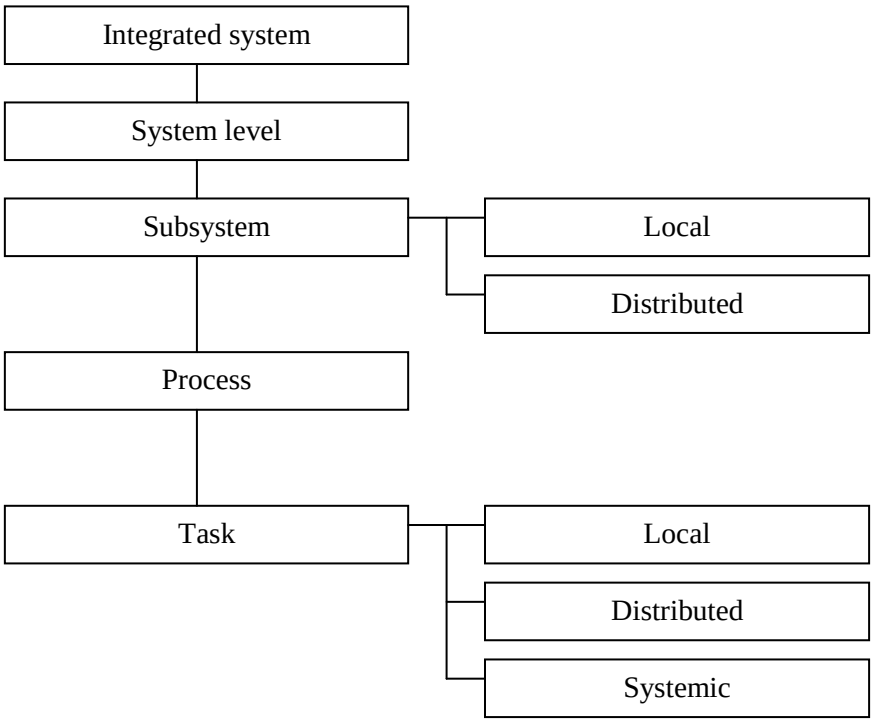

Fig. 1.1. The structure of the integrated system.

The top level of concepts is an integrated system - an independent complex in which all the processes of processing, exchanging and presenting information are carried out. The system diagram includes system levels, subsystems, processes, tasks. The system may be complete and incomplete.

We will call complete a system that, in the course of its work, implements a technological cycle including the following processes:

• input (or the ability to enter) all types of information in this subject area to solve the tasks assigned to the system;

• processing information using a set of existing tools used to solve this class of problems;

• output or presentation of data in output forms according to the task without using other systems.

Incomplete, we will call a system that performs partial data processing, partial data entry, or uses other systems during processing.

The lower level in relation to the system is the system level. With this term we define the part of the system that unites subsystems and processing processes according to functional and technological features. The system level can include from one to several subsystems.

We define a subsystem as a part of a system, united by functional data processing methods, including different algorithms and modeling methods. Subsystem can be local or distributed.

A distributed subsystem will be considered a subsystem consisting of fragments that are located on different nodes of a computer network, possibly managed by different systems and allow several users from different network nodes to participate in the work.

In contrast to the distributed, the local subsystem is grouped at one point of the network and, hak rule, is served by one user.

The subsystem includes a data processing process - a set of methods that provide an implementation of a processing algorithm or a single modeling method that solves one or several data processing tasks. It is divided into local, system, distributed.

The meaning of the terms local and distributed is similar to their meaning for subsystems. The system process is designed to maintain the system; as a rule, it is "transparent" (i.e. invisible) to the user.

The task as an element of the system is determined by the simplest cycle of processing typed data. In this context, a task can be associated with processing algorithms (with calculations) or technological processes not related to calculations such as data entry, data generation, visual data control, functioning of automated sensors or devices, etc.

The concepts discussed relate to the elements of the system (GIS). The systems approach allows equally to analyze both systems and processes. Therefore, for integrated data processing processes (in GIS), the hierarchy of concepts similar to that discussed above for systems will look like this:

• integrated process;
• system level processing;
• process block;
• process;
• class of tasks;

The difference between the system level and the subsystem should be emphasized. The subsystem always has a technological purpose, a logical description of the physical implementation. Thus, the subsystem of semantic modeling can be implemented as an integral part of the technology for collecting information or as an independent technology, for example, in the formation of graphical models.

The system level is a descriptive concept, i.e. It has a technological purpose and may (or may not) have a logical description.

Physical implementation is usually carried out at the subsystem level. The definition of the fundamental principles of functioning of any automated system (including GIS), the achievement of its integrity, optimization of the structure are carried out on the basis of the methods of system analysis.

Analysis performed using the formalization methods of general systems theory will meet the requirements of the integrity and unity of the problems and tasks under consideration, will allow to determine the structure of the generalized GIS and the minimum requirements that such a system must meet.