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Research Article

USING DATABASES IN GEOGRAPHICAL OBJECTS

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ABSTRACT

The article describes modern methods for presenting and analyzing socio-economic data using spatial OLAP, BI, GIS systems. State-of-the-art innovative class-based solutions based on widely used and proven software have been explored by major software developers for end-to-end "real-time" comprehensive analysis of socio-economic data associated with geographic features.

KEYWORDS

Patial system OLAP, socio-economic data analysis, BI technology, GIS technology, SOLAP technology.

INTRODUCTION

Currently, major government agencies and commercial companies make decisions modern support are actively using their systems (goal setting, planning and support) management decisions acceptance support, as a rule, user perception and different from the initial set in a form that is easy to analyze provide data collected for space-time samples have the means. The basis of such systems are the following modern technologies consists of OLAP, BI, GIS.

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OLAP technology performance

OLAP technology (On-Line Analytical Processing) is multidimensional is a complex data analysis technology. OLAP database is a key component of the organization. The OLAP concept was introduced in 1993 a well-known database researcher and a relational data model described by author Edgar Codd. Installed by Codd in 1995 applications that run for multidimensional analysis based on requirements made the following demands, and he, in turn, said, "Together is multidimensional developed the Rapid Data Analysis (FASMI) test, which includes:

- ✓ User analysis results within a reasonable time (usually within 5 seconds short-term);
- ✓ Any logical and statistical analysis that is typical for this program the ability to transfer and store it in a user-friendly format;
- ✓ Using appropriate protection mechanisms and permitted access means access to multiple data users;
- ✓ Multidimensional conceptual representation of data, including hierarchy and full support for multiple hierarchies (this is OLAP is a basic requirement);
- ✓ Access any required information, regardless of size or storage location opportunity.
- ✓ OLAP functionality can be implemented in different ways: office from the simplest tools of data analysis in software, to distributed analytics systems based on server products.

Typically, the aggregate functions in OLAP systems are multidimensional data (called a hypercube or metacube) on its axes parameters, and the information is contained in the aggregate data associated with them will be each axis can have different levels of data organized as a hierarchy representing details. This data model due to which users form complex queries, reports can compile and retrieve data sets.

The cells of the OLAP cube are SQL, such as SUMM, MIN, MAX, AVG, COUNT may include the results of performing other general functions, some others (variance, standard deviation, etc.). Summary term used to describe the data values of information (in general) one cube can have several of them). They are calculated raw is a measure of time in order to access data. Size is used to refer to query parameters. About measurements in other words, the administrations have different levels of detail should be mentioned when necessary. Aggregate data acquisition capabilities with different levels of aggregated data will be available in different sections for different data to compare and analyze the use of database requirements. Modern OLAP systems support the "historicity" of any measurement, with the exception of the calendar, which combines the functions of OLAP and Data Warehouse. Microsoft's newest OLAP program is: MS SQL Server Analysis Services.

BI technology performance

BI technologies (Business Intelligence, business analytics) are often given to the manager help in analyzing information about your company and its environment

information technology designed to provide. Business The term intelligence was first coined in 1958 by IBM researcher Hans Peter Appeared in Lun's article. He defined the term as follows: "The ability to understand the connections between presented facts." Howard Dresner (Gartner analyst) "Business intelligence" is based on "business data." the concept of improving business decision making using systems and technique "as a general term.

There are currently several options for understanding this term:

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- Business analytics (in the narrow sense) is the study of the current situation methods and tools for generating reports (e.g., general management consolidated report arising from its responsibilities). BI current management It is very important to make decisions.
- Business intelligence (in the broadest sense) makes evidence-based decisions modify, store, analyze data while working on tasks, is a tool for modeling, delivery and search. Using these tools decision makers need to get the information they need at the right time.

Thus, BI in the narrow sense is one of the areas of business intelligence in the broad sense. In addition to reporting, it is a means of consolidating and cleaning up data (ETL), DWH or OLAP and DataMining tools. This according to the second variant of understanding the term, BI technologies focusing users' attention only on key performance factors the simulation of the results of the options of different actions, specific on a large scale by monitoring the results of decision-making allows you to analyze data. [2]

Data analysis such as BIG Data based on Hadoop technology in 2011 there are ways to do this, which can be broadly incorporated into BI, and so on the first stable release of the system (Apache Software Foundation Hadoop) appeared at the end. BIG Data is one of the most widely used methods of Data Mining is used and the data model is not clearly defined.

The operation of GIS technology

GIS technologies (GIS or geoinformation systems) are often used to identify objects and computer encoding of events storage, modification, analysis, and display technologies. Today, GIS technology is traditional for databases visualization and mapping of operations, such as surveys and statistical analysis combines the advantages of geographical (spatial) analysis. GIS is concerned with the analysis and prediction of events and happenings in the environment in a wide range of tasks, the main factors and causes, as well as in understanding and highlighting their potential consequences; used in planning strategic decisions and current outcomes.

Modern GIS has five main components:

- Hardware;
- Software;
- Information;
- Data processing methods;
- Performers.

GIS software for storage and analysis of geographical (spatial) data and features and tools needed to visualize. The main components of software products are:

- Geographic data entry and management tools;
- Data Base Management System (DBMS);
- Space query support tools, analysis and visualization (demonstration);

Location information (geographic information) and relevant (geo-coded) table data is collected and prepared or delivered by the user may be purchased from suppliers on a commercial or other basis. Spatial in the process of data management, GIS spatial data is different combines data types and sources, as well as the ones at their disposal by many organizations to organize and store data can use the DBMSs used. GIS geographic information as a set of thematic layers grouped by location.

Modern GIS can handle two types of data - vector and rasterli. Dots, lines, and polygons in a vector model of data is encoded and as a set of X, Y coordinates The location of a point (point object) with even coordinates (X, Y) described. Linear features such as roads, rivers, or pipes X stored as a set of coordinates.

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Polygonal objects, such as patios etc. are stored as a set of closed coordinates. Vector model, especially useful for describing discrete objects and is constantly changing properties, such as soil types or the presence of objects, are less suitable. In a raster data model, the image is unique is a cell of a set of values for elementary components and looks like a scanned card or picture. Raster model with permanent features optimal for performance. Both models have their advantages and disadvantages has Modern GIS is divided into general-purpose GIS and specialized GIS. General-purpose GIS typically includes five procedures (tasks) with data. performs: input, manipulation, control, query and analysis, and visualization. The latest in OLAP and BI technologies discussed above Let's talk about two tasks in more detail. [3]

Survey and analysis. Using the available GIS and geographic data, you can either simple or you can get answers to complex questions. Examples of simple questions: “This Who owns the land? "," How far apart are these objects? ", "Where is this industrial zone located? It requires further analysis more difficult questions are “Where is the space to build a new house?”, “Spruce forests What is the main type of soil under it? ”,“ Construction of a new road to traffic how does it affect? ”The answers to the questions posed highlight some of the objects can be presented both by demonstration and by means of modern analytical tools queries. Using GIS for you to search you can define and install patterns, such as "what if ..." you can play. Modern GIS has many powerful analytics tools, two of which are the most important: proximity analysis and additional analysis. From a process called GIS buffering to analyze the proximity of objects uses. This will help answer the following questions: How many houses are there within 100 meters of this pool. How many do customers live there 1 km from this store? The coating process uses information located in different thematic layers includes merging. Normally, this is a display operation, but one in a number of analytical operations, data from different layers are physically obtained are combined.

Visualization. The end result for many types of space operations is the presentation of data in the form of maps or graphs. This is a map storage, presentation and transmission of geographical information effective and informative method. GIS is closely related to a number of other types of information systems. Although there is no single generally accepted classification of information, systems, GIS is desktop mapping systems. As an example of the most common GIS that has become a global industry standard ESRI SDE (Spatial Database Engine) relational based on MS SQL Server An example is ESRI ArcGIS, which uses database management technologies.

Use of SOLAP technologies

OLAP, BI and GIS for top-down analysis and planning The natural development of technology spatial OLAP data engine technology, in which geodesy has several hierarchical dimensions combined into hypercubes, organizational division, time intervals hierarchy, classifiers, and so on. These technologies have been around for the last decade is actively developing within. Leading software such as ESRI, Microsoft, IBM, Oracle such solutions are only being developed among supply manufacturers, although, for example, GeoMondrian already creates SOLAP cubes technology. He said what tasks can be solved using SOLAP technologies can we answer the question?

Task 1: Matrices or rotation tables of the analytical cube and with it visualize pieces of data in the form of a synchronized GeoMap fragment creating an interactive presentation is one of these dimensions.

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Each other in GeoMap layers can be displayed inside the shapes. "From above interactive hierarchical level across the GeoMap section on a "down" basis make a selection and select the desired map layers and shapes, that is

install a filter for the matrix with. Interactive work with the matrix component

change the location and display scale of GeoMaps while navigating, the selected layers corresponding to the currently active elements of the matrix and highlight shapes. This function is currently SAS Enterprise BI Server product, as well as SpotOn Vantage Maps. In addition, this function is supported by Microsoft SQL Server SSAS and ESRI ArcMaps platforms and technologies.

Task 2: Pre-user of a complex visual analysis system of geodes system creation, which is a whole-known and back-to-back functions (drilling and turn-down) and multidimensional (MDX) query results in GeoMap Try GeoHypercube or Pivot Table. Current

time to solve this problem based on the non-profit SOLAP system it is possible for this group of enthusiasts to work with Geodata This will be the first attempt to create an OLAP system. Geomondrian SOLAP Server focused on a comprehensive analysis of Geodata in real time. Geodata as a set of measurements of the GeoMondrian system GeoHypercube (Geometry and Geography). PostGIS systems and MDX used to display query results. Similar solutions are available in Microsoft SQL Server ESRI can also be created in ArcMaps.

Task 3: Basic data from an array of data entered into analytic cubes

extraction, some measurements are often made according to the method of using the analytical cubes classifiers are considered as basic data, based on the "business regulations" of the geodesy and the rigorous process of approving changes. This the problem has not yet been resolved for SOLAP systems, but it appeared in 2012 as a free component for Microsoft SQL Server Microsoft SQL server can solve it using MDS technology. [4]

Software tools for solving SOLAP problems

Microsoft SQL Server Analysis Services provides you with multidimensional structures design, creation and management. The only integrated support supported by built-in computing from multiple data sources, such as a logical model database analysis and statistics. In this case, the analysis services are available to users in several national languages, and in different languages delivered with a national date formatting, visually translated based on this possible combined data model provides fast, convenient, and top-down data analysis. They analyze historical data and real-time data supported dataWarehouse, data routes (DataMart), OLTP databases and operational data with databases used to work.

They also allow you to analyze large amounts of data. With their help, you can get detailed and statistical information from several sources design multidimensional structures that contain data, you can create and manage. SQL Server Management Studio OLAP used to manage and work with cubes. New OLAP cubes and SQL Server Analysis Services to create data collection models It uses Business Intelligence Development Studio (BIDS), which is Microsoft Visual Studio has extensions for business intelligence solutions. This Working with Engine Analysis Services projects and Reporting Services and Ability to combine Integration Services and Analysis Services projects offers a number of unique features and the most important elements includes various constructors. [4.5]

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Master Data or NSI - business processes continuously and conditionally as required in an automation information system (IS) is a permanent data set. This information the defined business process is a spatially distributed socio-economic

any process of data processing can be the same whether or not there is a reference, depending on the content of the information used possible. For other processes in the data creation process data that are normative and reference are, in fact, normative and reference is The NSI system is permanent and conditionally permanent to system users provides storage, processing and presentation of information and data keep arrays up to date, ensure completeness, eliminate errors,

provides integrity control and data consistency. Only the system can modify the data stored in the data system and their structure experts allow. All data modification actions strictly regulated. Information users are predefined are other corporate ISs that receive data through interfaces. Historical data systems according to data corporate information dataWarehouse, which is information for OLAP systems sources, while maintaining the accuracy of corporate catalogs and classifiers to stay.

Assign objects, assign logical primary columns, between tables relationship identification, queries named tables, or other tables and existing tables in the form of data sources adding named accounts.

- Cube Designer creates an environment for customizing a cube and the objects it contains. For applications in other languages, you use Analysis Services objects you can add translations for when processing cubes you can see their structure and data.
- Dimension Designer Measurement and adjustment of its contents creates an environment for. Measurement for localized applications you can add translations for metadata. Re-measure you can see their structure and data while working possible.

SQL Server is a traditional OLAP and data mining solution a flexible but powerful, self-service analysis that complements provides new BI capabilities that Self-governing Business Intelligence (BI) includes the following products:

- PowerPoint for Sharepoint. Can be stored on a SharePoint farm new version of existing analytics services. Stored in Sharepoint an example is uploading data on demand and out of the box a new one that allows you to use resources and manage consumption in-depth analysis services that implement the memory storage method modification. Update data in saved example, to data has a mid-level web service that manages access and monitoring.
- f - PowerPivot for Excel. Excel, which can be installed with Excel client application for. This plugin provides multidimensional data in Excel provides tools for creating collections. Extra compressed memory copy and pivot of database analysis services visualize existing Excel data such as spreadsheets and pivot tables combines with making.
- f DAX. PowerPivot for Excel is a new reporting language (Data Analysis Expressions, DAX) to create complex calculations, use time intelligence and perform searches facilitates.

SQL Server Master Data Services is the source of basic data of an organization. Master Data Services (MDS) of various operating and analytical systems integration with data for all applications in the organization provides a centralized, clear source. MDS basic information creates a single source and changes

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data over time keeps track of MDS is flexible, flexible supports hierarchies that allow you to access basic information can be used for grouping and generalization. [6]

Because your business needs to change, you need to break these hierarchies update accordingly, change the structure of the generated reports, and you can introduce new aspects of the business. These changes does not result in data loss or duplication if the data occurs when controlled by multiple systems that do not communicate with each other it can. Business rules ensure the accuracy of your information and to warn users of non-compliance with the rules allows.

DBS includes the following components and tools:

- DBS Configuration Manager - DBS databases and web applications a tool used to create and customize.
- The key data manager is always the key to the company organizational framework to maintain a clear view of data used to manage data and other administrative tasks web application.

Any changes can be clearly reflected in several hierarchies, each of which is easily updated. Also the latest to users data versions that allow you to work with data and their structure can be preserved. Dispatcher to the user 's company provides a single, accurate source for managing key data, Active Includes basic information through integration with directory, secure access, with a clear reflection of the structure of the organization and changes in business needs which allows you to define a flexibly modified model flexible data modeling, high quality data business rules to ensure that the data complies with the business rules about selected users or groups when not found email notifications, data versions for creation support

- Developer-specific DBS solutions for a specific environment DBS web service that allows you to expand or create.
- Contains all the information needed for the DBM system database.

This is the basis for the DBS distribution, which is required for the DBS System

stores settings, database objects, and data, and spreadsheets used to organize data from source systems and a schema for storing basic data from source systems and provides database objects. DBS database versions, including business rules approval and email supports messages. Data from the DBS system database provides views for the subscriber systems they need to receive. [8.9]

High-level DBS has the following features:

- ❖ "Single user responsible for one directory or classifier" style subject management. Responsible user references may add, edit, or delete data records.
- ❖ References and using the "Private" DBS visual interface create complex models of classifier data.
- ❖ Manage three possible hierarchies: multiple entities balanced hierarchies based on a single entity with final hierarchies, recursive hierarchies - upload hierarchies or they can be created in the user interface.
- ❖ Data model level versions. Enterprises, hierarchies and collections will be combined into "models". A variety of models versions operate independently of each other.
- ❖ Business rules and if DBS is connected to SharePoint Server there are "basic workflows for data extensions".

Specific "process of reconciliation" when the conditions are met starts automatically. “Reference

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data The working version of the "model" by "responsible users" will be updated only after approval.

CONCLUSION

Thus, in this paper using spatial OLAP systems (SOLAP) modern methods of presenting and analyzing socio-economic data described. As shown in recent years, this is the case with information technology While the direction is actively evolving, SOLAP analysis is currently underway There are few technological solutions that can solve their problems. Geographical Socio-economic data linked to objects in real time develop modern software for comprehensive analysis based on popular, proven software products from manufacturers The classy solution offers modern innovation and low prices, and current at the time, the academic and business community had not yet recorded such decisions.

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