TECHNOLOGIES OF SOFTWARE DEVELOPMENT BASED ON NON-RELATIVE DATABASES

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Introduction. In the modern information society, the need to use the latest technologies in various organizations to improve methods and technologies of internal management and document management is becoming increasingly important. After all, nowadays there is an increase not only in the volume and speed of data, but also in the number of their sources. In addition, the data are often unstructured and poorly structured. Traditional relational databases lose performance when storing such data. The need for their storage and processing forces us to pay more attention to databases based on NoSQL technologies. Their advantages include the ability to store and process fast and poorly structured data, flexible data structure, high scalability as well as distributed architecture. However, these benefits are achieved through weaker data consistency. The introduction of NoSQL allows companies to reduce costs and time to enter the market.

Data in NoSQL database are stored in different ways. They can be column-oriented, graph-oriented documents based on graphs, or organized as a KeyValue repository. This flexibility means that:

– you can create documents without preliminary defining their structure;

– each document can have its own unique structure;

– syntax can vary from database to database;

– you can add fields as events unfold.

The main material. The object of this study is to review some software development technologies based on non-relational databases.

NoSQL is a class of database management systems (DBMS) that do not follow all the rules of relational DBMS and do not use traditional SQL to generate data queries. The interpretation of NoSQL as "No SQL" is somewhat erroneous, but the interpretation of "Not Only SQL" is correct because this type of database is not a replacement at all but rather a supplementary addition to relational databases and

SQL. NoSQL has become a general term for various databases and repositories, but it does not refer to any specific technology or product.

There is a number of publications devoted to the review, analysis, and comparison of relational and non-relational databases. Some of them are outlined in this paper.

The traditional approach to creating web applications for companies in different industries based on databases involves the use of a combination of different development tools such as PHP, MySQL, JavaScript, HTML, CSS etc. At the same time, there is a NoSQL solution based on Wakanda client-server platform with a built-in object-oriented WakandaDB database which offers to use only JavaScript on both the client side and the server side. The peculiarities of such a solution are considered in [1].

One of the branches of NoSQL technology is graph databases (graph stores) which allow you to store data not in the form of a table, but in the form of a graph using vertices and links. This makes it possible to organize data in a flexible way as they are presented in the real world. Graph databases have an advantage when working with data for which connections between objects play an important role, especially if there is a need to track connections at several levels in depth. Works [2-5] are devoted to the use of such databases. A good example is the use of a graph database to implement a semantic network in an expert system [6].

Popular implementations of NoSQL are also document-oriented databases such as MongoDB. It is the most common NoSQL database according to the DB-Engines Ranking [7]. MongoDB is an open source document-oriented database. One document corresponds to a row of a table from a relational database, documents are stored in collections. Collections, unlike relational tables, can store documents of different structures. The popularity of this data model led to the emergence of works where relational (MySQL) and non-relational (MongoDB) databases are analysed [8-10]. The comparison of POSTGRESQL / POSTGIS and MONGODB is presented in [11].

Conclusions. The amount of information stored and processed by computer devices is large and increases every day. Various tasks require specialized technologies that can improve a certain parameter when performing operations.

Such tasks can be accomplished through the use of non-relational databases that implement different views on certain types of data warehouses that were previously unpopular for a variety of reasons.

References

1. Liashenko O.A., Konashkov O.O. Tekhnologiya razrabotki informaczionnogo obespecheniya na osnove nerelyaczionnoj bazy` danny`kh [Technology for the development of information support based on a non-relational database], Materials of the All-Ukrainian Science and Methodology Conference "Problems of Mathematical Model", 23-25 May, 2018, Kam'yanske: DDTU, 2018. pp.89-91, available at: Google Scholar.

2. Srinath Srinivasa Data, Storage and Index Models for Graph Databases. Graph Data Management: Techniques and Applications, IGI Global, Chapter 3, 2012. P. 47-71. doi: 10.4018/978-1-61350-053-8.ch003

3. Jaiswal G., Agrawal A.P. Comparative analysis of Relational and Graph databases, IOSR Journal of Engineering (IOSRJEN), vol. 3, no. 8, pp. 25–27, Aug. 2013, doi: 10.9790/3021-03822527.

4. Malinina V.O., Liashenko O.A. Osoblivosti vikoristannja nereljacijnoï bazi danih na osnovi grafovoï modeli danih [Features of using non-relational database based on graph model of data]. Tezi dopovidej IX Mizhnarodnoï naukovo-tehnichnoï konferenciï studentiv, aspirantiv ta molodih vchenih "Himija ta suchasni tehnologiï". [Abstracts of 9th Int. Sci.-Techn. Conf of students, graduate students and young scientists "Chemistry and modern technologies"]. Dnipro, 2019, vol. IV, pp. 28-29, available at: Google Scholar.

5. Miroshnik E.V., Dorosh N.L. Dosli`dzhennya mozhlivostej grafovikh ta relyaczi`jnikh modelej danikh v zadachakh i`ntelektual`noyi obrobki i`nformaczi`yi [Advancement of the possibilities of graph and relational data models in the problems of intellectual processing of information], 4th Int. Sci.-Techn. Conf. proceedings "Computer modeling and optimization of complex systems", Materiali IV Mizhnarodnoï naukovo-tehnichnoï konferenciï (Dnipro, November 1-2, 2018), Dnipro: Balans-Klub, 2018, pp. 262-263. doi: 10.32434/CMOCS-2018

6. Solodka N.O., Polishhuk Eu.O., Liashenko O.A. Vikoristannja grafovoï ta reljacijnoï modelej danih pri rozrobci ekspertnih sistem [Using the Graph Database Model and the Relational Model while Developing Expert Systems], Visnuk of Kherson National Technical University, vol. 4, no. 67, pp. 246–251, October 2018, available at: Google Scholar.

7. DB-Engines Ranking. DB-Engines: web-site. URL: https://db-engines.com/en/ranking (date of the application: 10.02.2021).

8. Dipina Damodaran B, Shirin Salim, Surekha Marium Vargese MongoDB vs MySQL: a comparative study of performance in super market management system. International

Journal of Computational Science and Information Technology (IJCSITY). Vol.4. No.2. May 2016. P. 31–38.

9. Cornelia Gyorodi, Robert Gyorodi, George Pecherle, Andrada Olah A Comparative Study: MongoDB vs. MySQL. 13th International Conference on Engineering of Modern Electric Systems (EMES). 2015. P. 189–194.

10. Liashenko O.A., Konashkov O.O., Solodka N.O. Sravnitel`ny`j analiz vy`polneniya zaprosov k serveram baz danny`kh MYSQL i MONGODB [Comparative analysis of queries execution for MYSQL and MONODB database servers], Visnuk of Kherson National Technical University, vol. 4, no. 71, pp. 114–124, Dec. 2019, doi: 10.35546/kntu2078-4481.2019.4.13

11. Liashenko O.A., Litvinov S.N., Solodka N.O. Analiz proizvoditel`nosti baz danny`kh POSTGRESQL/POSTGIS i MONGODB dlya geoprostranstvenny`kh zaprosov [POSTGRESQL / POSTGIS and MONGODB database performance analysis for geospatial queries], Visnuk of Kremenchuk National University named after Mikhail Ostrogradsky, vol. 6, no. 119, pp. 60–67, 2019, doi: 10.30929/1995-0519.2019.6.60-67

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Annotation. The paper presents an overview of some technologies of software development based on non-relational databases. It is emphasized that nowadays more and more data are generated to be stored and processed in real time. In addition, the nature of these data is often increasingly unstructured or poorly structured. This causes a niche of problems when applying traditional approaches to building databases that are integrated into software systems. At the same time, NoSQL databases provide a mechanism for storing and retrieving data that are organized in a different way than the usual relational approach. The motivation for this approach is the simplicity of architecture, horizontal scaling, and accessibility control. The growing interest to non-relational databases is represented by a review of some publications.

Keywords: NoSQL, Wakanda, Graph Databases, Document Databases, MongoDB.