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Koval V.S., graduate student of specialty 122 Computer science
Scientific supervisor: Laktionov I.S., Dr. of Engin. Sc., associate professor, professor of the computer systems software department
(Dnipro University of Technology, Ukraine, Dnipro)

THE IoT ARCHITECTURE JUSTIFICATION OF THE AGGREGATION AND ANALYSIS TECHNOLOGY OF ENVIRONMENTAL MONITORING DATA

Introduction. Internet of things systems and networks based on weather sensors have gained widespread adoption and scaling around the world. Such systems provide important information for understanding climatic conditions and natural phenomena. The relevance of this study is due to the need for further development of research into architectural solutions of the system for collecting, aggregating and analyzing data coming from intellectualized wireless weather sensors. The purpose of this study is to provide a detailed consideration of the architectural structure of the system, which will be developed to ensure effective collection, aggregation and analysis of information coming from globally located weather sensors. One of the main research tasks is the study of the internal processes and interaction of the components of this system with the aim of improving the use of meteorological data for scientific research, climate forecasts and optimizing the response to weather phenomena and natural disasters.

There is also a need to optimize tools for processing large volumes of environmental data aggregated online. The development of an effective architecture is aimed at increasing the speed of processing, ensuring the accuracy and reliability of measurement data analysis, as well as the implementation of scalable data collection and integration systems. The need for highly efficient methods of processing and storing information, including for environmental purposes, forces the search for new technologies to optimize the operation of applied information systems and monitoring technologies, contributing to improving the quality and availability of valuable data analysis for research and management of the current and projected integral state of the environment [1].

Research results. The proposed and developed meteorological data collection and analysis system integrates globally located meteorological sensors for comprehensive monitoring of temperature, humidity, atmospheric pressure and wind direction. A distinctive feature of the system is the use of not only direct sensor measurements, but also the integration of third-party APIs and other sources of meteorological data from third-party organizations, which increases the objectivity and accuracy of information [2].

Various advanced technologies are used to transmit the received data, such as satellite communication, mobile and wireless networks, as well as the Internet, ensuring fast and reliable delivery of information to the central server.

The central server functions in real time, performing verification and storing data in a specialized database. Note that historical data is stored for further scientific research and comparisons, providing an opportunity to study the dynamics of changes in weather conditions.

In the process of analysis, various methodologies are used, including statistical analysis, application of machine learning models and mathematical modeling of climatic phenomena [3].

Analysis results are stored separately from raw data in a specialized database for having analyzed data which will be used for statistics and other processes further related to that data. Databases are regularly backed up and replicated to ensure information security and reliability.

The findings and analysis results can be used to develop statistical models, digital doppelgangers, accurate weather forecasts, scientific research and presentation on websites and mobile applications for a wide audience of users depending on specific access rights. Such an information and analytical system becomes a key tool for understanding and monitoring

changes in climate conditions. The developed architecture of the Internet of Things system intended for environmental monitoring tasks is shown in Figure 1 [2].

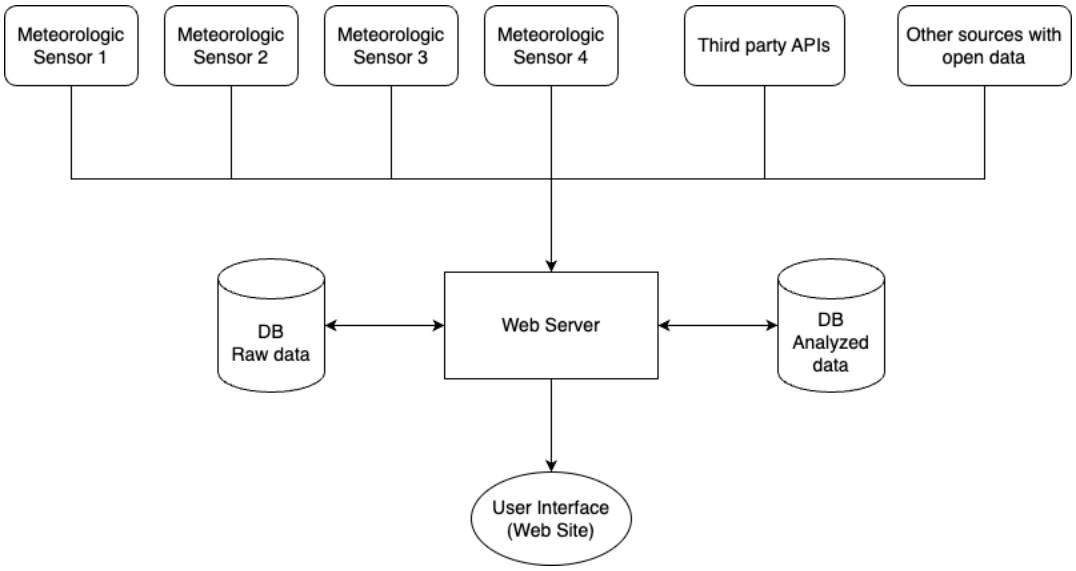

Figure 1 – Composite architecture of the Internet of Things environmental monitoring system

The following designations are entered in the figure: Meteorological Sensor 1 – temperature, Meteorological Sensor 2 – humidity, Meteorological Sensor 3 – atmospheric pressure, Meteorological Sensor 4 – wind direction, DB – database.

Accordingly, the architecture of the IoT system developed in this article represents a structural and functional basis for conducting further research on the development of methods and means of increasing the efficiency of applied information technologies for intelligent ecosystem monitoring [4].

Conclusion. Based on the research of this article, it was established that further development in the direction of IoT environmental monitoring allows synthesizing an effective detailed architecture of the meteorological data collection system, emphasizing the importance of optimizing the processing of large environmental data. The obtained results indicate the need for the integration of global networks of wireless sensors and the use of advanced transmission and analysis technologies, which strengthens the relevance of the system in the context of scientific research and climate change monitoring.

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