DEVELOPMENT OF AN IOT-BASED REMOTE WATER QUALITY MONITORING SYSTEM

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Annotation: The article provides examples of IOT-based monitoring systems used in various fields of human activity, which are built using foggy and edge computing and distributed ledger (blockchain). The relevance and expediency of conducting further research on the joint use of fog and edge computing technologies and a distributed registry in the construction of environmental monitoring systems based on IOS networks are shown, and the tasks of further research are formulated.

Keywords: Development of environmental monitoring systems, IOT, fog and edge computing, distributed registry

Use the IOT Water Quality Monitoring application template and the guide from this article to develop a comprehensive solution for monitoring water quality In recent decades, the deployment of environmental monitoring networks has been using a large number of heterogeneous equipment. Since its maintenance and work with it requires extensive technical and human resources, the issue of creating distributed monitoring systems affects the scope of application in these systems of methods for studying the condition of the studied distributed objects (territories of industrial facilities, recreational urban areas, territories of cities themselves, nature protection zones, agricultural lands, forests, etc.) based on wireless sensor networks (including IOT networks) [1-6]. Based on the latest achievements in the field of IOT technologies, we can say that they provide a number of tools that allow for large-scale and widespread monitoring of surveillance objects (in production, for medical purposes, during transportation and sale of goods, during environmental monitoring). Among the goals of using IOT technologies are to increase the efficiency and accuracy of monitoring systems, increase economic benefits and improve the quality of life in general [2, 7, 8]. Since as a result of the operation of any distributed large-scale monitoring system, large volumes of heterogeneous data are generated that come from a distributed network of sensors, they require timely collection and primary processing of data, safe and holistic storage, further correct extraction and transmission for processing, and ultimately, transmission of processed data to users. It is known that currently the cloud computing paradigm is widely used for organizing distributed monitoring of various surveillance objects and allows solving issues related to big data analysis due to its scalable and distributed data management scheme. Examples of environmental monitoring systems using cloud technologies can be found in the articles [2, 4, 9, 10].В решениях для управления водоснабжением используются интеллектуальные устройства, такие как расходомеры, устройства контроля качества воды, интеллектуальные вентили, детекторы утечек.

Devices used in intelligent water monitoring solutions can be connected using energy-efficient long-range networks (LPWAN) or through a third-party network operator. To send data from this type of device to an IOT Internet of Things application, use the IOT Central Device Bridge. In addition, you can use device gateways that support IP addresses and can connect directly to IOT CENTRAL.

IOT is an IOT application platform that helps you quickly create and deploy IOT solutions. You can create a brand name for your solution, configure it and integrate it with third-party services. After connecting intelligent water monitoring devices to the IOT, the application provides capabilities for controlling devices using commands, as well as monitoring, alerts, a user interface with built-in RBAC roles, customizable analytics dashboards and the possibility of further expanding the functions of the solution.

Conclusion.

Summing up the work carried out , we can conclude that, when developing monitoring systems using cloud computing and sensor networks (including IOT networks) used in various fields of human activity (including environmental monitoring systems), foggy and edge computing technologies and distributed registry technologies (most often blockchain) are increasingly used. Research in the field of development of environmental monitoring systems using these technologies has overcome the initial stage and is relevant and promising. The use of fog computing allows parallelizing the processes of data transmission and processing, thereby ensuring high computing performance and reducing the load on data transmission channels. The use of blockchain technology brings advantages to environmental monitoring systems associated with a distributed and dynamic form of data storage, which has properties and capabilities that allow you to go beyond the usual classic centralized databases and get a reduction in load on the cloud by placing copies of the database closer both to the lower level of the system and to users, as well as to ensure data security and integrity. In the future, it is advisable to explore the possibilities of joint application of fog and edge computing technologies and a distributed registry in the construction of environmental monitoring systems based on IOT networks. In order to achieve an increase in the efficiency of assessing the current situation in such monitoring systems, it is necessary to solve the problem of distributing the computational load within the framework of the fog and edge layers available in the system. Therefore, it is necessary to investigate the types of distributed registries from the point of view of limiting their use when creating such monitoring systems and describe possible options for choosing the type of distributed registry. It is also necessary to study the types of consensus protocols used in the work of the distributed registry, which will be used in conjunction with fog and edge computing technologies, and the limitations of their use to solve the problem of environmental monitoring.

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