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AN APPROACH TO INFRASTRUCTURE FOR ENVIRONMENT SENSOR NETWORK

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Abstract:
The paper focuses on a systematic architectural approach for modular implementation of Infrastructure for environment sensor network. The requirements for devices to realization of infrastructure for the environment sensor network are defined. A model of sensor network is proposed. A model of computer system is synthesized on the basis of modern modules and devices for building a local infrastructure for the sensor network based on LoRaWAN technology. The end-node for sensor network is synthesized. Proposed are variants of information services to the computer system on the basis of existing modern cloud technologies.

INTRODUCTION:
In recent years, sensor networks has evolved at a rapid pace, creating a separate direction of Internet of Things (IoT). Because the environment has separate objects with specific requirements, it is possible to define a separate connectivity based on their specific features. For this purpose is currently looking for different solutions to build sensor networks. This new direction in computer systems and technologies will significantly change the way we can make data acquisition, transfer, store and process information about an ecosystem. As a basis for building sensor networks for the environment, the experience gained from the development of Internet of Things (IoT) technology can be used, taking into account the features of the distance of the observed objects from the existing network infrastructures.

MATERIAL AND METHODS:
The end hosts of the environmental sensor networks consist of many sensor nodes located close to the observation object located in different territorial locations. These sensor nodes should be more functional, such as: - to have wireless network capability greater than 1 km; - to have the possibility of low consumption for the purpose of battery power; -to "capture" and discretize relevant technological signals; - to have the ability to locally buffer and store the received data in cloud structures; - be able to measure the parameters for the environment of the sites and ecosystems; - to have a low price; - to have small dimensions for integration into typical environments and ecosystems.
These basic requirements automatically exclude wireless sensor nodes that support Bluetooth and Wi-Fi, due to the limited range of network connectivity, and wireless network nodes based on mobile 3G/4G, due to the high cost of hardware, monthly network support plan and high-energy efficiency. Alternatively, modules that support the LoRaWAN Low Consumption Network (LPWAN) standard may be used. One possible variant of a functional structure for building separate branches of an environmental sensor network infrastructure based on existing Internet of Things systems is shown in Fig. 1.

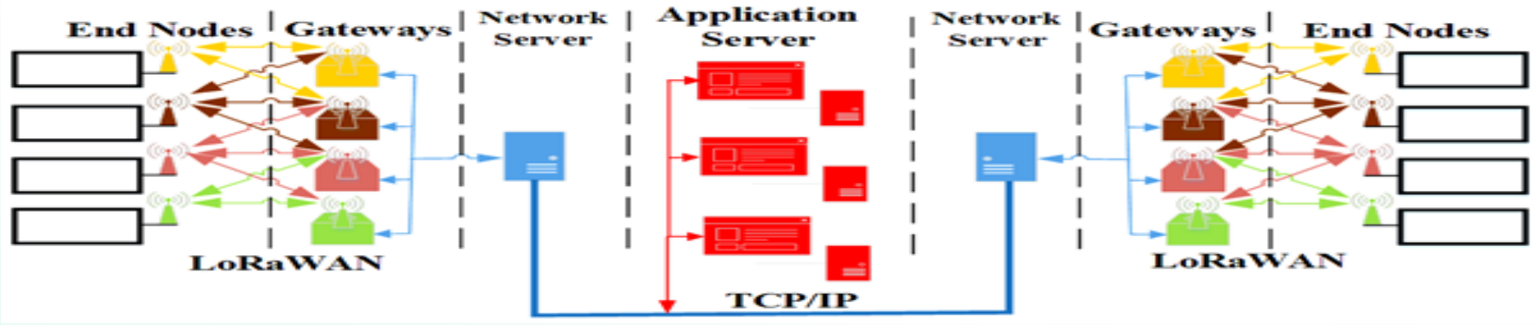

Figure 1. Functional diagram of the infrastructure for environment sensor network

RESULTS AND DISCUSSION: Based on the proposed network infrastructure for sensors, by integrating LoRa embedded microprocessor modules, a model of a computer system was developed to build infrastructure for traceability, identification, monitoring and remote environmental control (Fig. 2). We offer our own version of the end sensor node. On Fig. 3 is shown the schematic diagram of the realized end-to-end environmental traceability node. The end node firmware was developed based on the adaptation of the IBM LoRaWAN C-Libraries (LMiC) to control access to the transmission medium (MAC). The ResIOT remote monitoring platform was used to develop the application software (Fig. 6).

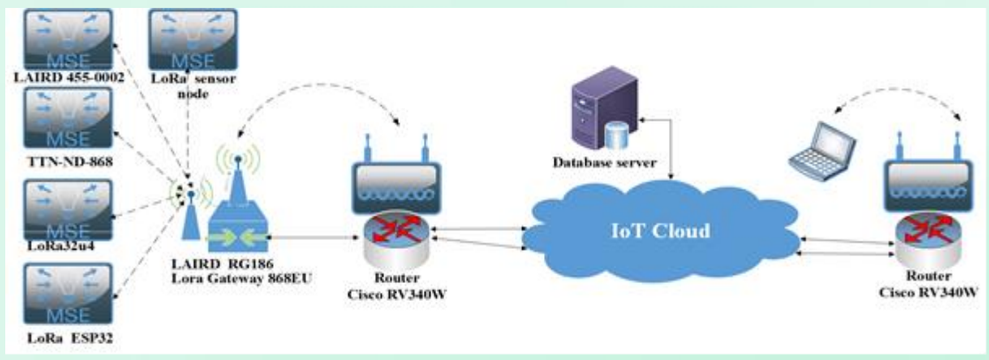

Figure 2. Model of computer monitoring system

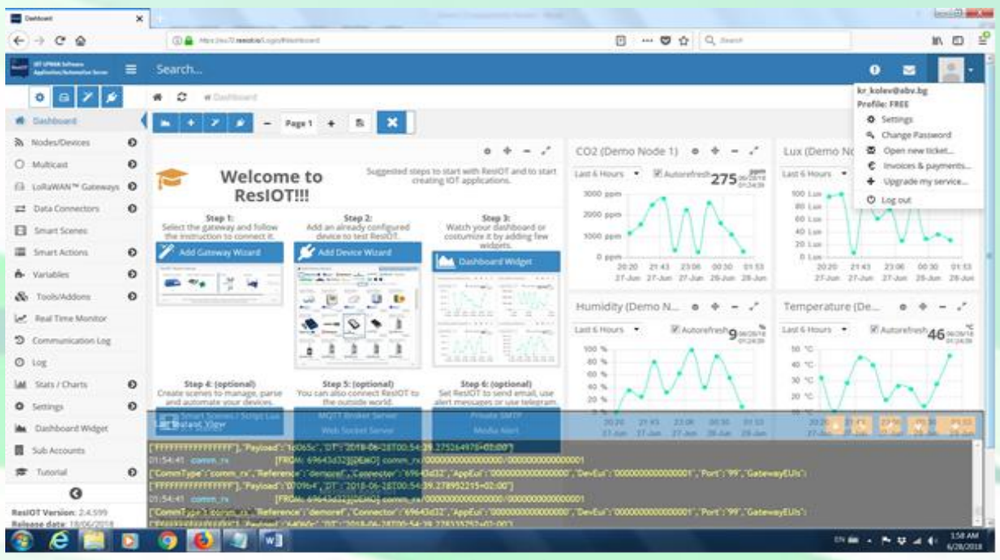

Figure 4. Remote monitoring platform for environment sensor network

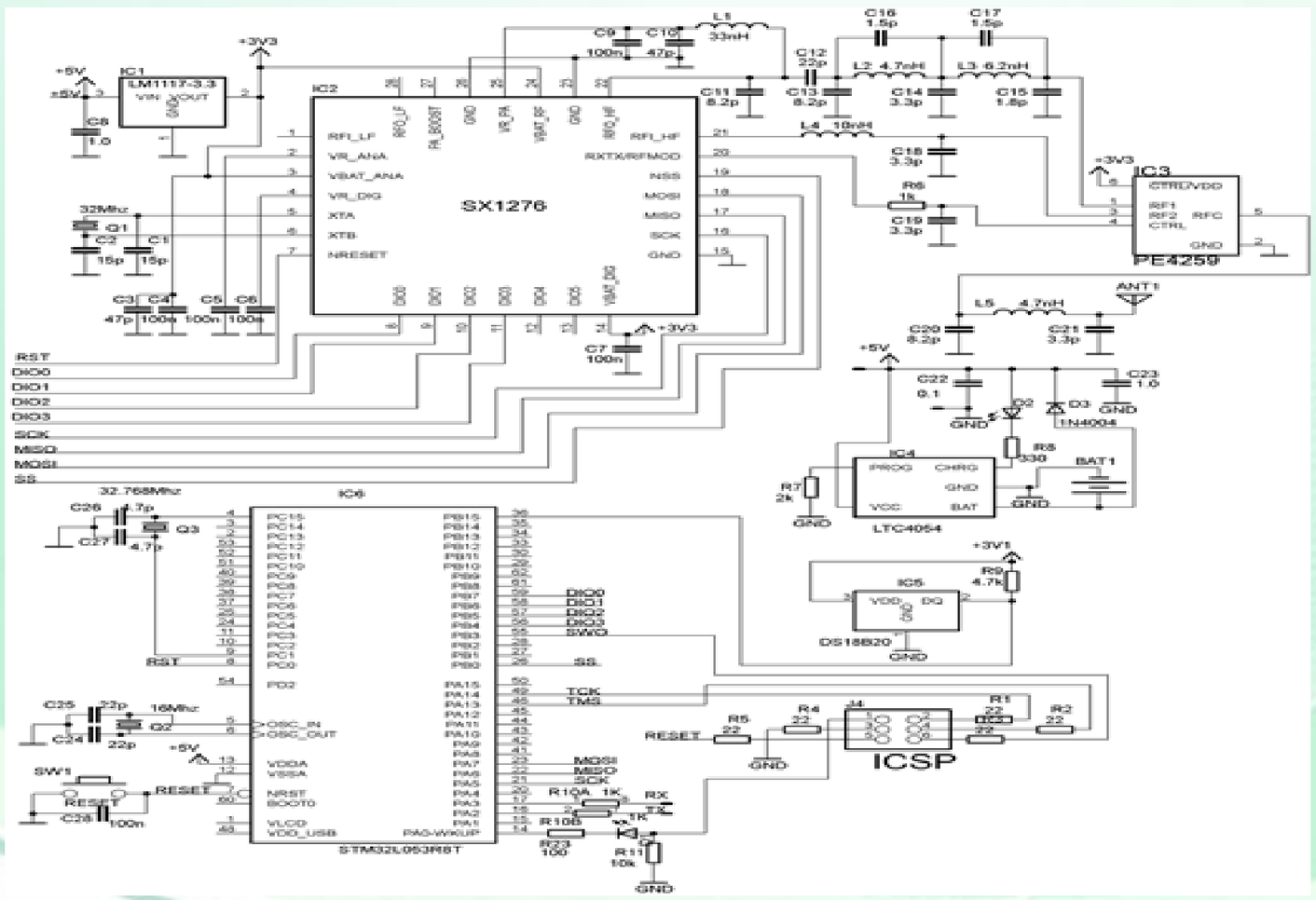

Figure 3. Schematic diagram of the end node

CONCLUSION: The construction of the Infrastructure for environment sensor network requires special attention to the selection and design of the sensor end node. These devices work with different objects with different characteristics at different environmental parameters. The presented structure for the implementation of a system based on the microcontroller STM32L053R8 and the SX1276 transceiver allows basic environmental parameters to be controlled. The proposed system is hardware open and allows to expand with different types of sensors. The proposed end node is reusable and as low cost as possible for mass battery powered use. Main application of developed system is to be used for monitoring and data acquisition with environmental sensors