

DATA PROCESSING AND STORAGE IN THE INTERNET OF THINGS SYSTEMS

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ОБРОБКА І ЗБЕРІГАННЯ ДАНИХ В СИСТЕМАХ ІНТЕРНЕТУ РЕЧЕЙ

У статті був проведений аналіз існуючих технологій до появи IoT Hub. Було підтверджено підвищення ефективності та безпеки обробки даних в системах Internet of Things за рахунок нової IoT архітектури з використанням IoT Hub.

In the paper, an analysis of existing technologies before the emergence of IoT Hub is presented. The increase of efficiency and security of data processing in the Internet of Things systems through a new IoT architecture using IoT Hub was confirmed.

The Internet of Things (IoT) in future will bring together billion devices called “smart things”. These devices can be extremely heterogeneous in terms of hardware (e.g. processing power and available memory), software (e.g. operating systems, application software (middleware)) and communication interfaces. The purpose of our work is to improve the efficiency and security of data processing in the Internet of Things systems through a new IoT architecture using IoT Hub.

IoT Hub has advantages compared with earlier IoT services such as Eventhub and service bus. It is able to receive messages from device to cloud service (Telemetry messages, feedback), as well as sending messages and commands from devices to cloud services. It allows us to manage, monitor and connect the huge number of devices supporting HTTP, AMQP and MQTT protocols. SDK available for multiple platforms such as Windows, Linux and some RTOS and support multiple languages such as C, .NET, Java and Node.js. In view of the above considerations, it is proposed to use the node named as “IoT Hub”, which enhances the network by implementing as follows: a router, Cross-proxy, cache and a directory of resources. In design work the method of processing and data storage IoT systems. IoT Hub is designed to connect devices easily to the cloud service and provide two-way communication (device - cloud services, cloud services - the device). This bidirectional message will be securely stored and authenticated, thereby ensuring security and privacy. In addition, IoT Hub provides access to libraries for the most popular languages and platforms that provide tools in order to safely and securely

connection. Figure 1 shows the architecture of our proposed solutions for data processing and storage in the IoT systems. The proposed architecture with additional node IoT Hub provides the ability to handle millions of requests per second per processor events, and IoT Hub stores data about events for up to seven days to ensure reliable processing. IoT Hub provides authentication for each device and a secure connection. We can provide our own security for each device key used to connect to the center of the IoT.

Register of certificates IoT center stores device IDs and keys in the decision. The server part of the application solutions can add individual devices to the whitelist or blacklist, thereby completely controlling access devices.

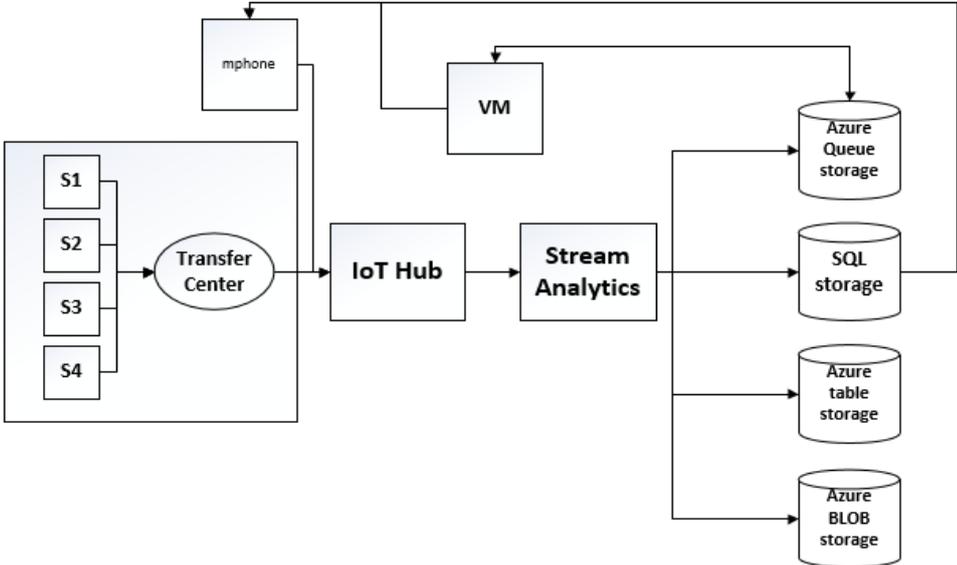


Fig. 1 System IoT architecture using IoT Hub.

Fig. 1 shows the architecture of the following elements:

1. S1, S2, S3, S4 - a set of sensors.
2. Transfer Center - serves as a device that sends data from all sensors simultaneously to IoT Hub.
3. IoT Hub - provides opportunities messaging between devices and cloud services, and acts as a gateway to the cloud and other key services IoT Suite.
4. Module event processing Azure Stream Analytics provides rapid data analysis. This is a service for handling incoming data telemetry, aggregation and detection of events.
5. To store data and their preparation for analysis of preconfigured storage solution using BLOB-objects, Queue-, SQL-, table-storage.
6. Data visualization capabilities available web applications Azure and Microsoft Power BI, which are designed and configured by virtual machine.

To store text and audio of any type of storage used by BLOB-objects such as documents or media files. Repository tables – a key store and attributes. There are fast and economical access to data provided by the applications of all kinds. Telemetry data scanned from the sensors are transmitted using Raspberry Pi microcomputer input service IoT Hub. Then the incoming data is analyzed, broken down into flows analyzed for the presence of abnormal data and recorded in various repositories. Analysis of business requirements led to the conclusion that the data telemetry health indicators recorded as a current day. Information is better seen in graphs that are generated using Power BI. Formation of graphs is a cloud service Azure, so to save the data, we can use table-storage. Due to the large processing power Azure offset disadvantages of slow reading and processing.

In this paper we have presented the analysis of existing technologies before the emergence of IoT Hub and the advantages of using cloud services for data processing and storage in IoT systems using such a technology as IoT Hub. The IoT Hub can be used by external clients to discover and access smart objects without requiring any a-priori knowledge of their details (e.g. communication protocol and IP address). It is also able to manage a number of heterogeneous physical networks, each with several devices, with limited use of resources, in terms of processing and memory, thus making it possible to deploy the IoT Hub even on low-end devices.

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