Development of a Distributed Semantic Platform for Internet of Things and Internet of Devices

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Abstract

The development of platforms and services to create the Internet of things and Internet of devices is now one of the main trends in so-called Web 3.0 environment. Such systems allow users to run a variety of monitoring and controlling services in the cloud of smart devices. By connecting all devices to the cloud it is possible to realize interaction between agents of smart environment on a completely new level. The main goal of our work to build such a system as simple as possible in terms of a high-level architecture. Each device has only two functions: to transfer of its status and to execute some command. In the simplest case, the work of a device does not depend of the importance of a particular command and of its state. For example, the switcher of the light is not restricted, it is believed that it is absolutely safe. But there is a complex system, such as washing machines, they already have some requirements in order to ensure safety. For example, you can not run a machine while the door is not locked. In this case, the controller must reject the server command to start the engine of this device.

The high-level architecture of our platform supposes a permanent connection to the server. The use of central servers provide many advantages, such as an update the devices' firmware, more flexibility, statistics, and lowest system cost. Regardless of the location of servers, there are two main problems of work of such a system. A connection of any new equipment from the kettle to the life support systems in real time and without updating a server software. This flexibility can provide Semantic Web technologies, including RDF data storages. However, they do not address the second problem of collecting and store of streaming data. Streaming data can be generated every second. Therefore, a separate database to store a set of values are often similar, and track the ability to remove outdated statistics from the stories flow.

Selected issues related to security and ensure the impossibility of failover or to determine a set of connected devices. There are also problems with security and access rights in existing RDF databases.

Now we are working on an implementation of the core components of our system, including executive and transmitting data smart controllers. Further research is related to using RDF-store providing the ability to implement third-party services, for example:

- Processing of data transferred from electricity meters and transmission received power generating statistics organizations for more effective use of resources.
- Service accounts for the automatic granting of resource consumption.
- Protection and monitoring systems.
- Prediction of user actions based on an analysis of data from connected devices in order to optimize the interaction between users and devices.
- Service that provides effective interaction of external systems. An example is the automatic robot cleaners that will work only when the person is not at home, or air conditioning system, taking into account the crowdness of the room and so on.

At the market there is an analogue of our platform: http://cosm.com/. It provides the ability to send data and view graphs of their values. But this service does not support the creation of custom portlets and doesn't use semantic formats (just XML).

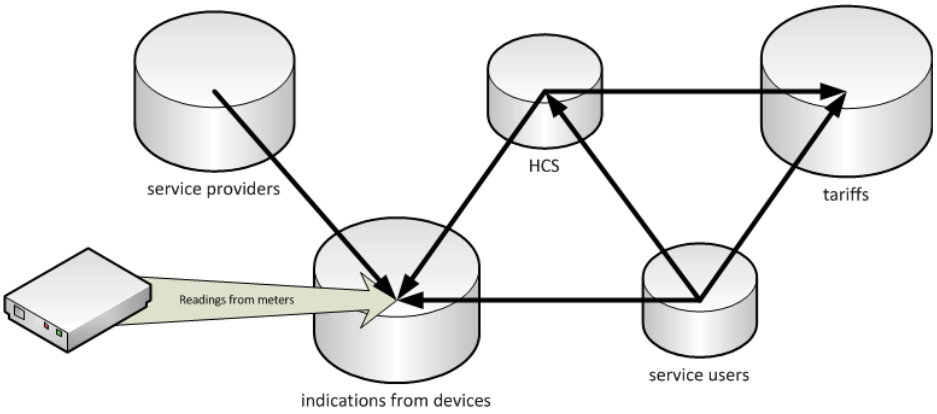

Fig.1. An example of the system architecture for resource accounting system

The current version of our system is based on the following hardware components:

- Controllers Arduino.
- Electricity meters, water, heat and gas.
- Electrical components. Circuit breakers, residual current devices, sockets, lamps, relays, etc.
- Unique adapters providing communication via RS-485.

Small electric stand (Fig. 2) is designed to test and demonstrate the capabilities of the system, implemented in a portable package, the access point is equipped with Wi-Fi. It allows to control up to four sockets and readings from the meter. The meter read date and time, reading rates, the current power load.

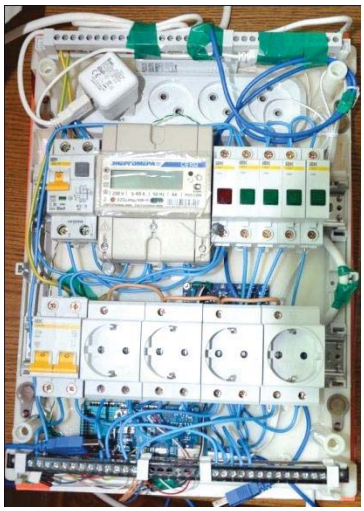

Fig.2. The test and demo stand

Index Terms: Internet of things, Internet of devices, Semantic network, Smart Space.