

The aim of the solution we developed is to serve an integrated ecosystem based on the NB IoT standard.

The solution fully and turnkey includes the delivery of NB IoT sensors, communication unit, the provision of the associated central data receiving solution, the central data processing, data analysis system and web portal and mobile user applications, as well as interface connections, and also the necessary infrastructure elements, servers and network connections.

The solution includes the server infrastructure necessary for the full operation of the application elements. The data center consists of database and application servers, as well as data storage connected to the database servers, in a scalable design that can be scaled arbitrarily according to the given business needs. The background of the implemented system is provided by a solution based on VSAN technology, instead of classic central storage, it is based on a high-availability, distributed configuration called Software Defined Storage (SDS).

The complete solution will be assembled at Albacomp's headquarters in Székesfehérvár. The complete installed and configured solution is delivered to the customer as a unit, together with the associated sensors and the infrastructure management solution necessary for the operation.

Albacomp has sold the above-mentioned sensors and components to several customers in its own or on-premises server center, but there has been a need to put together a complete wall-to-wall package solution specifically for international projects. Therefore Albacomp has typically assembled the solution package in this form for foreign sales, Our first customer is Kazakhstan, but we will market it in the region too.

The solution:

The NB IoT GSM communication technology is the standard of 3GPP created in 2016, which aims to create the possibility of M2M communication. The technology enables cheap and low-energy sensor units to be operated, which makes the operation of 'smart' services economical.

The Application Environment (data receiving interface, central system and mobile application) receives and processes data from sensors – after receiving the encoded raw data, it is stored primarily in a high-reliability No-SQL database, and after extracting and interpreting the data, it is saved to a MySQL database. The server portal user interface allows users to remotely access data through a personal computer or mobile device. The central data storage solution and server portal includes connection architecture, BigData and query database, user interfaces and functions, application interfaces. The user interface is thin-client technology due to the cloud solution (and the need for platform independence). Depending on the nature of the sensors, the data collected by the sensors can be displayed on a tabular or map form, where it is possible to monitor the condition of the given sensor, for example, to monitor the trend of the measured value.

Mobile apps were developed on Android and iOS operating systems.

The system is suitable for transferring data to the SCADA system, and if required, it is also possible to install and operate the database and web interface locally.

The sensor and intervention units associated with the solution are low-energy units communicating on NB IoT technology, which communicate through standard interfaces developed by ourselves, so the solution can be easily integrated with later sensors and meters.

We currently have the following NBloT sensors in the solution:

NBloT smart parking

Built-in sensors allow you to indicate when a parking space is free. The detection is based on magnetic and radar technology, does not require local power supply, with the built-in battery it provides several years of operation. The equipment has ip67 standard water, dust, shock resistance, operating range from -40 to +60 °C, lightning protection. The device sends a Busy/Free signal to the central system if there is a change in its condition.

NBloT smart device tracking

The NBloT based terminal equipment performs adjustable position transmission for tracking or localization purposes. The purpose of the solution is to answer the problem of areas where it is necessary to track parts outside the site, and there is no possibility to place large, expensive devices.

NBloT watermeter transmitter

One of the key aspects of optimizing their business operations for water utility operators is measuring the water use of distribution networks and the ability to monitor consumption. With the technology we have developed, service providers can get a more accurate picture of the state of their network, consumption on metering stations without personal control, thereby reducing not only their losses on the water network, but also discovering anomalies in consumers.

The physical design of our smart water meter is designed to work as long as the water meter authentication lasts, and withstand water and dust, even in industrial conditions. The device we developed can be easily adapted to the wide range of industrial, sectional and residential water meters on the market, thanks to its design it is easy to install. Pulse output water meters with standard cable outlet can be connected to the data collection device.

NBloT garbage container sensor

It is in the interest of waste collection service providers to rationalise the running performance of waste transport vehicles, one of the important factors of which is the knowledge of the saturation status of waste collection containers. Smart garbage sensors provide real-time data on the saturation of garbage bins. With the solution, it will be possible to optimize the process of waste collection, schedule the emptying of containers on the basis of saturation, improve the efficiency of the transport task.

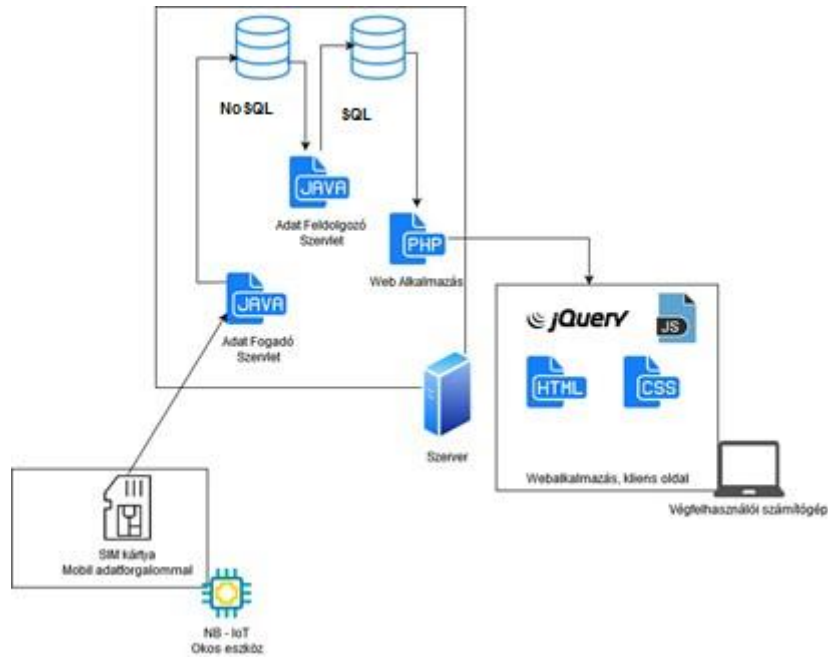
Our smart garbage sensor features a sensor based on 60GHz radar technology.

Components of solution hardware and basic software

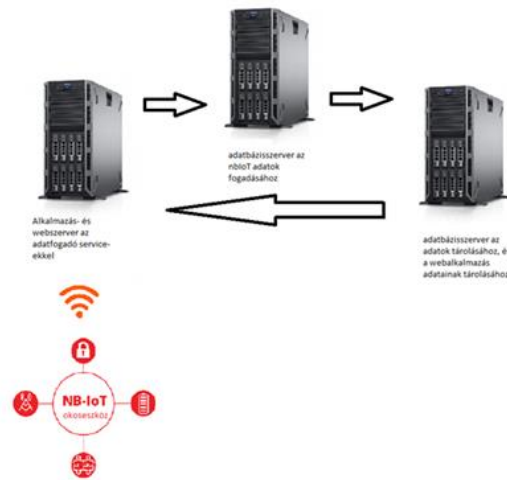
The data center consists of database and application servers, as well as data storage connected to the database servers, in a scalable design that can be scaled arbitrarily according to the given business needs.

During assembly and installation, we use VMWare VSAN technology on the servers to develop a high-availability, distributed configuration Software Defined Storage (SDS) solution. The classic SAN network is logically separated as a back-end data transmission medium, and the LAN data route separation used exclusively for data traffic is preserved.

In optimal provisioning, each provider (NoSQL database, SQL database, application server, data receiving server) is placed on a separate server, but with the virtualization solution it is possible to flexibly consolidate or multiply it as needed.



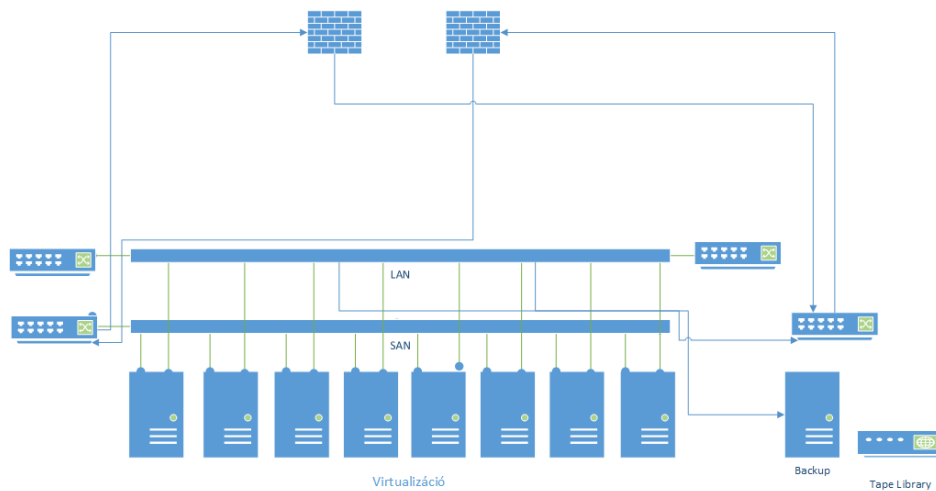
1NBIOT system structure



2Server Diagram

Applied extensible configuration per server

Component	Value
Operating system	Linux
CPU	2 vcpu
Mem	4GB
HDD	80GB



Logical Network Configuration

The management system is a client-server structure. With the monitoring system, the monitored equipment communicates on an IP basis. The monitoring of server devices can be active or passive control:

Passive:

- Passive checks are initiated and implemented by external applications/processes
- The results of the passive inspection will be sent to Nagios for processing

Active:

- Active audits are started by the Nagios process
- Active checks are scheduled regularly

For passive checks, so-called agents must be installed on the entity for the purpose of the audit.

The administration system is available through the Nagios Web Interface. Thus, platform can be achieved independently.