ANALYSIS OF QUALITY SUPPORT METHODS FOR IOT 4G SERVICES

Kadatskaja O.I., Saburova S.A., Emeziem Uchenna Daniel

V.V. Popovsky Departanent Infocommunication
Engineering, HNURE, Ukraine

E-mail: olha kadatska@nure.ua

Abstract

NB-IoT or NB-LTE is a new 3GPP radio-access technology. It is not fully backward compatible with existing 3GPP devices however as designed to achieve excellent co-existence performance with legacy GSM, GPRS and LTE (4G) technologies. Methods of quality support of NB-IoT (LTE) services presented. Internet of Things (IoT). One way to improve the performance and quality of IoT services is the NB-IoT protocol, which uses the potential of modern mobile networks. Methods of testing the quality of NB-IoT deployment considered the method of calculation and estimation of parameters of quality of access to NB IoT LTE services presented.

The Internet of Things essentially enables clients to connect ‘things’ to the Internet (and to networks that use Internet technology). These things or items can exchange information between them and transmit data to other devices and systems. They can usually also received data. The information they share can be about objects to which they attached and the environment they are in (through sensors that come in many shapes for different parameters). Smart devices and machines can also share information about their internal state.

The Internet of Things (IoT) is an important part of the digital transformation of the global economy. However, the spread of IoT may slow down due to insufficient network bandwidth, which contributes to reduced service quality.

One way to improve the performance and quality of IoT services can be the NB-IoT (Narrow Band Internet of Things) protocol, which uses the potential of modern mobile networks – 4G (LTE-Advanced).

By 2021, the global amount of data generated by IoT and NB-IoT could reach 50 trillion gigabytes, and the number of connected users of world- 4 billion. This will require new approaches to data transmission and monitoring the efficiency of network systems.

At the same time, in most cases, the Narrow Band Internet of Things transmits small portions of data at known intervals, such as information about the patient's heartbeat, gas pressure in the pipe, soil moisture, etc.

Such network devices do not require high-bandwidth communication channels, but a widely available wireless network. The best candidate for this role is mobile networks, but their modern protocols are too cumbersome for simple NB-IoT devices [1].

The principle of NB-IoT service support is one of the following:

- Reading information for additional sensors;
- Transfer of data from sensors to cloud;
- Processing of date with help sensors;
- Transfer of information to the interface of the client.

Reading information for additional sensors in the collection of data from the analysis. It can be a simple process, such as reading the temperature, or folding, like recording video on a video camera.

Transmission of data from sensors to dark skins can used for additional advanced methods, including: stylistic netting, satellite netting, Wi-Fi, Bluetooth, low-flow wide-netting netting (LPWAN), or it can accessed via Ethernet [2].

The processing of the date for the help of the sensors is the check for the help of the software for the protection of the date.

The transfer of information to the interface of a client can found in the form of assistance. It is also possible to actively change the system and inject it into the country.

Also, to work with NB-IoT on the terminal does not require a SIM card and a fairly small receiver capacity. IoT devices can run for many years on a single battery.

Deployment of NB-IoT has begun in the EU. In Ukraine, mobile operators are also launching NB-IoT LTE networks.

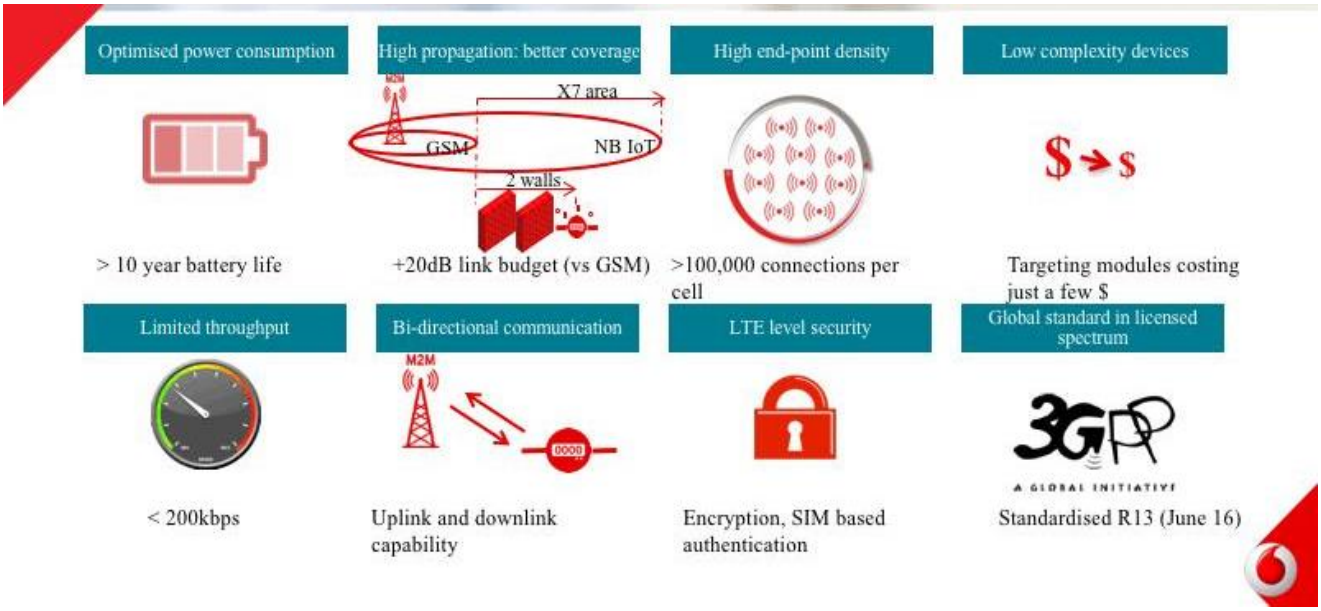

Fig. 1. Model of improving the quality of support of NB-IoT LTE services

Also, to work with NB-IoT on the terminal does not require a SIM card and a fairly small receiver capacity, ie IoT devices can run for many years on a single battery.

Deployment of NB-IoT has begun in the EU. In Ukraine, mobile operators are also launching NB-IoT LTE networks.

The NB-IoTLTE standard can e deployed in three versions (fig. 2):

- standalone;
- on the guard-band;
- in-band.

Different types of NB-IoT LTE deployment

The most common is intraband. It is widely used in Europe, where NB-IoT in-band networks deployed by telecommunications companies: Kyivstar, Vodafone, Lifecell, Deutsche Telekom, Telecom Italia Mobile and others.

The in-band deployment method allows the use of NB-IoT within existing LTE networks, which have the highest coverage and provide the required quality of service of the Internet of Things. This is the best way to connect to IoT, as it allows operators to use modern equipment without significant hardware changes. Thus, in-band NB-IoT makes it possible to meet the current demand for smart devices.

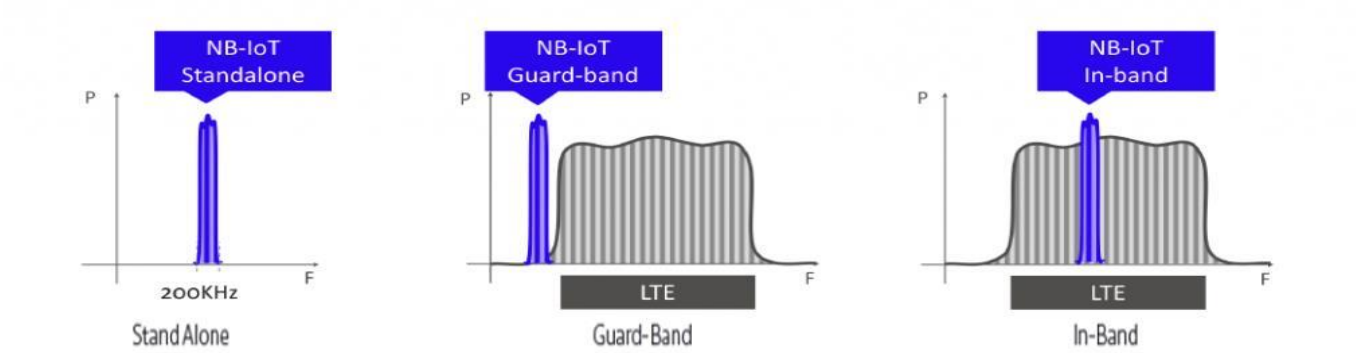

Fig. 2. Deployment options for NB-IoT LTE networks

Despite the prevalence of in-band method of using NB-IoT, it has disadvantages. Thus, the narrowband in-band signal NB-IoT occupies a frequency of 180 kHz and in LTE networks can create interference for physical resource units (PRB). In this mode, NB-IoT takes away the functional resources of mobile networks.

When used in-band, the NB-IoT PRBs separated from other PRBs by dynamic power characteristics. In particular, the usual PRB for LTE is 6 dB more powerful than the PRB for NB-IoT in in-band and guard-band. Also, the specifications of the NB-IoT standard suggest other differences in signal structure, such as supported signal modulation types, frequency error, error vector amplitude (EVM, Error Vector Magnitude), and channel synchronization and control parameters.

EVM is an important criterion for the quality of modulation and channel performance of data reception and transmission in complex wireless networks, including LTE and NB-IoT[2].
In fact, EVM is the difference between the "reference" transmitted signal and the received (measured) signal. EVM is a useful indicator of the parameters of the quality of the transmitted wireless signal, which helps to assess the performance of NB-IoT.

Conclusion

Support for NB-IoT technology in domestic communication networks appeared in this time. All the necessary conditions and tools for the deployment of this standard are already available to mobile operators. Thus, it already makes sense to implement Internet of Things devices with already established support for NB-IoT protocols (and / or LoRaWAN), so that in a few years do not need to upgrade the existing LTE infrastructure according to the requirements QoS for objects and services.

References:

1. 3GPP LTE-Advanced. Available from: http://www.3gpp.org/technologies/keywords-acronyms/97-lte-advanced_links.html. Accessed 28 May 2015.
2. Huawei, “NarrowBand IoT Wide Range of Opportunities,” 2016. [Online]. Available: http://carrier.huawei.com/en/technical- topics/wireless-network/NB-IoT/NB-IoT-White-Paper.