

eSIM: НОВЫЙ ТЕХНОЛОГИЧЕСКИЙ ВЫЗОВ ДЛЯ ОПЕРАТОРОВ МОБИЛЬНОЙ СВЯЗИ

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В данной статье исследуется потенциал технологии eSIM. Рассматриваются основные особенности технологии, связанные с вопросами хранения нескольких операторских профилей на одном электронном устройстве (чипе) и способами подключения устройств к сети мобильной связи без физических SIM-карт, преимущества и недостатки технологии. Отмечается, что внедрение eSIM ведет к повышению конкуренции на рынке мобильной связи.

Ключевые слова: электронная SIM карта (eSIM), мобильные операторы, сеть, смартфоны, IoT.

eSIM: A NEW CHALLENGE FOR MOBILE OPERATORS

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This article investigates the potential of promising eSIM technology. The essential features of eSIM technology including its benefits and drawbacks on the issues of storage multiple carrier profiles on one integrated electronic device (chip) and the way of devices connection to cellular communications without physical SIM cards are revealed. It is noted that the implementation of the eSIM standard leads to the increased competition in mobile communications.

Key words: eSIM, mobile operators, network, smartphones, IoT.

Currently the main increase in the subscriber base of the operator companies is due to the IoT segment (Internet of Things – Internet of Things) [3]. It has led to an increase in the interest of mobile operators in eSIM technology, which is necessary for users of smart devices and has become popular with gadget users.

To authenticate subscribers in the mobile network, a SIM card is used (Subscriber Identification Module – subscriber identification module). However, using a familiar physical SIM card implemented in the form of a separate module is not always convenient, so the transition to eSIM (embedded SIM – embedded SIM) is currently underway. eSIM is a programmable module integrated into the chip of the device. While not all devices support this technology, it presents many opportunities to both end users and vendors [2].

The purpose of this paper is to review recent research in the field of study, to highlight a problem and controversy of introduction of eSIM by mobile operators and to establish the importance of the topic for telecommunication specialists.

One of the main advantages that many mobile operators have already implemented is the ability to get an eSIM without visiting the office. Currently, especially in the context of a pandemic that has not yet ended, this advantage is very relevant. In addition, it makes more accessible the use of mobile

communication services by persons with disabilities. eSIM is also convenient for end users, as it cannot be lost or broken.

The introduction of eSIM contributes to the development of competition in the mobile communications market, as a result improving the quality of service in general [1]. The use of eSIM contributes to the emergence of MVNO (Mobile Virtual Network Operator – virtual mobile operators), as it reduces the cost of entering the market due to the absence of costs for the manufacture of a physical SIM card and logistics. Subsequently, it is planned to implement the connection of one eSIM module to different telecom operators through the use of MEP (Multiple Enabled Profiles) technology [5].

In addition, using eSIM is an opportunity to reduce costs while roaming as the eSIM profile is much easier to replace than replacing a physical SIM card. This opens up many opportunities not only for users of smartphones, tablets, laptops, etc., but also for the development of IoT (Internet of Things).

IoT implementation is a necessary and natural process. Physical M2M (Machine-to-machine interaction) SIM cards are usually made of more expensive materials than conventional SIM cards due to the requirements for thermal and vibration loads. Installing SIM cards in a large number of devices is a time-consuming and expensive process. This problem is also solved by using eSIM. In addition, the eSIM module is more compact than the slot for a physical SIM card, so the use of eSIM makes it possible to produce more compact models. In addition, it simplifies the task of producing a sealed case.

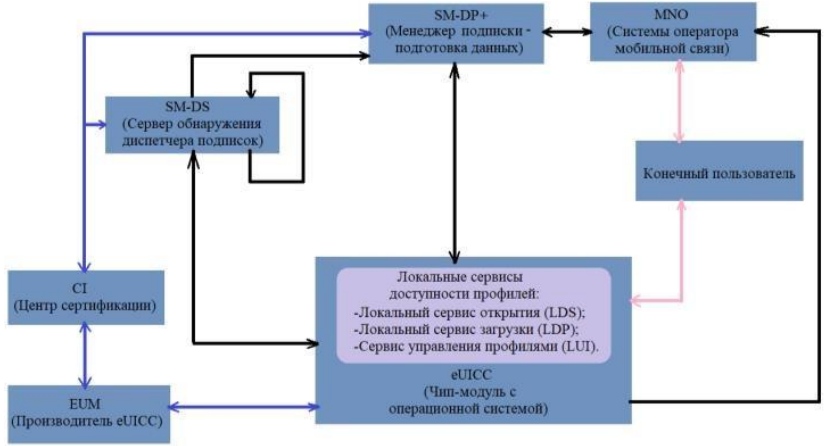


Fig. 1. Architecture of the PULL model

When using eSIM in gadgets, a PULL model is used (loading the eSIM profile on the initiative of the client, as a rule, after scanning the QR code). When configuring M2M eSIM, a PUSH model is used. Figure 1 shows the architecture of interaction between the server and the device when adding an eSIM profile [4].

Despite the eSIM is already available to customers of many telecom operators, this technology still has disadvantages. For example, at the time of downloading the eSIM profile, the device must be connected to the Internet. When using technology in a gadget, this does not seem to be a significant problem. When connecting a large number of IoT devices, moving the device into the Wi-Fi network coverage area (or deploying a Wi-Fi network to the location of IoT devices) can be difficult or even impossible. Currently, to eliminate this difficulty, as a rule, the first connection of the device to the mobile network is made at the factory, at the time of manufacture, then, after the configuration is completed, the device switches to bootstrap mode (i.e. boot mode in which the device is ready to receive eSIM M2M service commands). Connecting even before the device is sold has a positive effect on the quality of the final product it minimizes the number of defective devices on the market, but limits competition among mobile operators the user will have to conclude an agreement with the operator company with which the vendor signed the contract.

Thus, eSIM technology is a technology lead to the evolution of mobile communications in general. Originally developed for use in smart devices, the technology is not only successfully used in the M2M segment simplifying operation and maintenance, allowing for more compact devices, solving the problem of using devices in roaming, but has also found application in gadgets. Besides, eSIM technology makes it possible to make both economic and social spheres more comfortable by making it more comfortable to conclude a contactless contract with a telecom operator.

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