

OSE/RM model specification on a basis the reference models of the Internet of things

A.V. Boichenko

PhD, Plekhanov Russian Academy of Economics, tel +7 916 624 267,
boichenko46@mail.ru, boytchenko.av@rea.ru

V.A. Kazakov

PhD, Plekhanov Russian Academy of Economics, tel. 8-903-148-10-44
kazakov.va@rea.ru

O.V. Lukinova,

Doctor of Engineering, Trapeznikov Institute of control sciences
of Russian Academy of Sciences, tel. 916-707-13-90
lobars@mail.ru

Abstract. In work the specification in projects the Internet of Things standardized reference model of the environment of the open systems OSE/RM (Open System Environment/Reference Model) on a basis the reference models of the Internet of things is considered.

Also use of the OSE/RM model in integration projects of the Internet of things on the basis of the European interoperability framework EIF (European Interoperability Framework) is considered.

Keywords: Internet of things, reference models of the Internet of things, reference model of the environment of the open OSE/RM systems, integration Internet of things, European interoperability framework of EIF.

Within the last several decades in world practice of system and program engineering at design of information systems the referency model of the environment of open systems was widely used (in the Russian practice, unfortunately, significantly more rare) OSE/RM (Open System Environment / Reference Model). This model describes basic functionality of any information system. The main maintenance of this model is described in the document ISO/IEC TR 14252:1996 Information technology – Guide to the POSIX Open System Environment (OSE) [1]. In this document the three-dimensional model of an information system is described and for everyone components of model are given the standards existing for that time. Now these standards, of course, have become outdated, however the described model keeps the practical value. To this model there were other models anyway describing basic functionality of an information system, but in flat representation and the OSE/RM model was widely adopted. Unfortunately, in the document stated above the model has only been de-

scribed, wasn't its integral graphic to representation. Because of this circumstance have been presented by various authors a little differing in graphic representations. Nevertheless authors of the this work adhere to representation (fig. 1) offered by E.N. Filinov in 1995 in the publication [2] in three-dimensional option (one year prior to a release of the document IEEE).

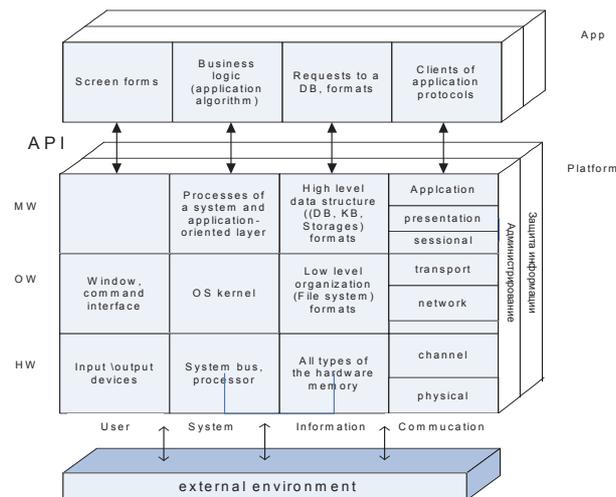


Fig. 1. Reference model OSE/RM

This model assumes a specification at application her in the specific project or as standard model for some subject domain.

According to authors of this work, the OSE/RM model can be used in projects of realization of new information technologies, such as cloud computing, the Internet of things, etc. and also for integration of the information services Internet of things, etc.

Specification of the OSE/RM it is expedient to do, in turn, on base the reference models of concrete technologies, for example, the Internet of things. For architectural representation of the Internet of things there is a number of documents, the developed both the international organizations, and major companies, such as Cisco, IBM, Microsoft, etc.

A number of such models is given in [3-11]. Nevertheless, today there is no standard model of the architectural description of Internet of things standardized by the international organization. The international standard on architecture the Internet of things developed in IEEE which is expected to release at the end of 2017 can become such document. Presumably this standard is based on the ISO/IEC/IEEE 42010-211 Systems and software engineering – Architecture description, the Russian version – GOST P 57100-2016 System and program engineering. Description of architecture. The first versions of the ISO/IEC/IEEE 42010-2011 standard belonged to the direction which was called Software Intensive Systems, SIS. On one of the last schedules of a cycle of a maturity of the new information technologies of Gartner representing

expectations of potential users, Software-Define Anything (actually SIS) it is presented on rise of the user interest.

For integration aspects, also taking into account the reference models of the Internet of things, the levels of a stack of EIF (European Interoperability Framework) [12] relating to information systems can be used. In a general view the stack of interoperability includes (from top to down) the following levels:

- political context;
- legislative;
- organizational (level of business processes);
- semantic;
- syntactic (level of the organization of interaction);
- technical (the VOS level – interconnection of open systems).

From these levels only three lower levels belong to information systems. Use of the OSE/RM model gives the chance to concretize these levels at interaction the Internet of things. At the syntactic level the place on the OSE/RM model program a component, responsible for the organization (rules) of interaction between the Internet things is defined (these functions aren't performed by VOS model components). The technology of web services (WSDL) is the cornerstone of functions of the organization of interaction (without UDDI). This technology now only which allows to provide interaction both a component in one program, and program complexes and information systems. At the level of the OSI model which as the communication component is a part of the OSE/RM for the Internet of things the stack of protocols is used the CoAP – Constrained Application Protocol, UDP – User Datagram Protocol, 6LoWPAN – IPv6 over Low power Wireless Personal Area Networks, IEEE 802.15.4e.

Except architectural models for an OSE/RM model specification (but with their account) other components of technology the Internet of things presented on a cycle of a maturity of this technology of Gartner for 2016 (fig. 2) can be used.

Besides Gartner marks out ten technologies of the Internet of things which will allow to realize the potential of the Internet of things significantly more stoutly:

- safety of the Internet of things;
- analytics of the Internet of things;
- device management (things);
- networks of the Internet of things low power and small range;
- wide area networks of the Internet of things low power;
- processors of the Internet of things;
- operating systems for the Internet of things;
- processing of an event stream;
- platforms of the Internet of things;
- standardization and ecosystem of the Internet of things.

At realization of these technologies it is also expedient to use the OSE/RM model.

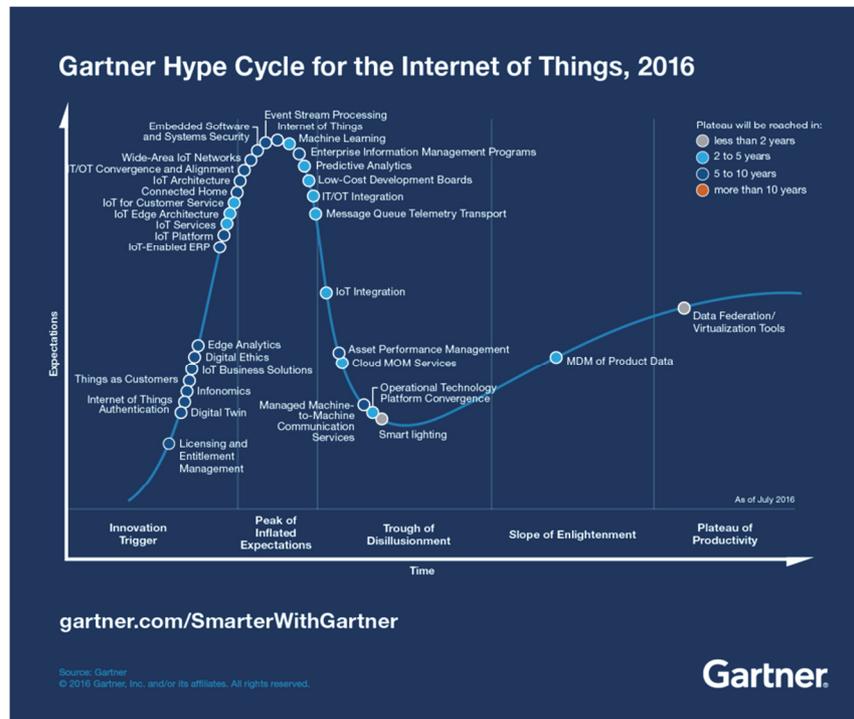


Fig. 2. Maturity cycle Internet of things, Gartner 2016

Conclusion

The Internet of things is one of basic technological bases of the information society which is formed now, his digital economy. The Internet of things represents a big range of technologies, aspects, platforms for which successful implementation and also it is expedient to their integration to use various models (it is desirable standardized), development of a complex of standards is necessary.

For the partial solution of these questions in this work joint complex use at implementation of specific projects of the Internet of the prophetic known standardized referensny model of the environment of the information systems OSE/RM, architectural models of subject domain of the Internet of things, the European stack of interoperability of EIF, various standards of information technologies, including things, specific to the Internet, is offered.

Reference

1. ISO/IEC TR 14252:1996 Information technology – Guide to the POSIX Open System Environment (OSE). <https://www.iso.org/standard/23985.html>

2. Filinov E.N. Choice and development of conceptual model of an open system environment. Open systems. DBMS. № 6, 1995 г.
3. IEEE P2413. Standard for an Architectural Framework for the Internet of Things (IoT) <http://grouper.ieee.org/groups/2413/>
4. IEEE P2413. Standard for an Architectural Framework for the Internet of Things (IoT) <http://grouper.ieee.org/groups/2413/>
5. ITU-T STUDY GROUP 20 : Internet of things (IoT) and smart cities and communities (SC&C) http://www.itu.int/ITU-T/recommendations/index_sg.aspx?sg=20
6. Special Publication (NIST SP) – 800-183 (July 28, 2016) <https://www.nist.gov/publications/networks-things>
7. FP7. Internet of Things Architecture (IoT-A) <http://iotforum.org/wp-content/uploads/2014/09/D1.5-20130715-VERYFINAL.pdf>
8. Industrial Internet Consortium (Industrial Internet Reference Architecture) <http://www.iiconsortium.org/>
9. The Intel IoT Platform (Architecture Specification White Paper Internet of Things) <http://www.intel.ru/content/www/ru/ru/internet-of-things/iot-platform-solution-brief.html>
10. Microsoft Azure IoT Reference Architecture <https://azure.microsoft.com/en-us/updates/microsoft-azure-iot-reference-architecture-available/>
11. IoT Reference Model Whitepaper (CISCO) <https://www.iotwf.com/resources/71>
12. European Interoperability Framework for European Public Services (EIF) Version 2.0.
13. <http://www.bigwobber.nl/wp-content/uploads/2009/11/European-Interoperability-Framework-for-European-Public-Services-draft.pdf>
14. Boichenko A.V., Kazakov V. A., Korneev of D.G. Reference models of the Internet of things. Collection of scientific works of the XX anniversary Russian scientific conference "Engineering of the Enterprises and Management of Knowledge". Moscow. 2017.
15. Boichenko A.V. Basic features of the Internet of things. Scientific notes of Institute of social and humanitarian knowledge. Release No. 1 (15). Materials XI of the International scientific and practical conference "Electronic Kazan 2017". Kazan. Yuniversum. 2017.