INTERNET DEVICES FOR SMART HOUSES DEVELOPMENT CONDITION AND PERSPECTIVES

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Abstract. *The development of smart technologies in the Republic of Moldova is in constant growth, "Smart Houses" technologies have a special place. The latter being at a relatively early stage in our country, it has a lot of opportunities for development and diversification. The most famous companies that provide services and sell products in this field are: SMART HOUSE LLC, SMARTTRONIC ENVIRONMENT LLC, TOP LIGHT LLC, IDOMUS COMPANY LLC, and the equipment is spread across most top distributors of household and electronic products.*

In the paper are presented some summary information on the importance, the condition and some perspectives for the development of smart houses systems. Although relatively new, the scientific subject of Smart House (or Smart House) benefits of particular interest from researchers and industry. It falls within the general domain of the Internet of Things (IoT). The most significant reported results and also future and immediate research directions are highlighted.

Key words: Smart house, IoT, energy efficiency, home robot, smart device

Introduction

People have begun to deal with smart house systems for decades, but those smart house systems were very simple. Recently, they are used to provide security, control, energy efficiency, comfort, quality of life, etc. Smart House includes centralized control for lighting, heating, ventilation and air conditioning, device management and other. Now, the smartest houses are used to provide ease to people with disabilities and elderly people.

One of the biggest advantages of smart houses is easy control and management from multiple devices such as a tablet, desktop, laptop and smart phone. Thanks of the range of applications for the Wireless Sensor Networks (WSNs) derived from distributed monitoring of embedded smart management systems, WSN can be used for smart house. Terminal nodes WSNs are included to monitor the statistics of things or events in their coverage areas. Information received through these nodes is transmitted by wire to the Base Station (BS) or a wireless network. Tolerance to defects and WSN precision are improved through scattered processing and, as a result, they find a wide demand in industries, army, gardening and everyday life.

The Internet of Things (IoT) covers multiple networks of physical objects with action and detection of embedded units. IoT uses multiple network protocols to communicate between devices. For example, the different components in physical locations transmit information or act on the information received through network communications. One of the fields that benefited from IoT is the smart house that uses different types of network protocols such as Wi-Fi and Bluetooth. The growth of mobile technology and the rapid development of integrated systems have made it possible to integrate mobile technology into the design of smart house systems.

The smart house incorporates several classes of devices to be monitored and controlled by a single system and provides home-based customers with better compatibility, greater security and greater energy efficiency. Integration of smart systems gives customers the ability to control their home system and save energy more efficiently in the future. Recently, internal energy management has become an active subject of research. The involvement of smart networks in building and home automation has led to the improvement of various standards for interoperable products for device control, lighting, security and energy management.

The smart network allows users to control power consumption according to demand and price. The efficiency of management at home is based on a number of different factors, such as the type

of home system (such as management at home on the Internet, by GSM, etc.) and the consumer's personal needs. Smart Home system can be defined as a system that enables devices to make the most of their potential. In this system, managing the process at home will be automatically based on conditions that the designer will determine or according to the frequent tasks. This system has many advantages: it saves time for the owner of the house, good house management, lowers the need for owner intervention for many processes, offers more free time and saves energy resources.

Some statistics

In order to identify and argue the importance of this field, some statistical data have been studied.

One of the most persuasive can be considered as the spending forecast in the IoT field for the next year presented in Figure 1 [1].

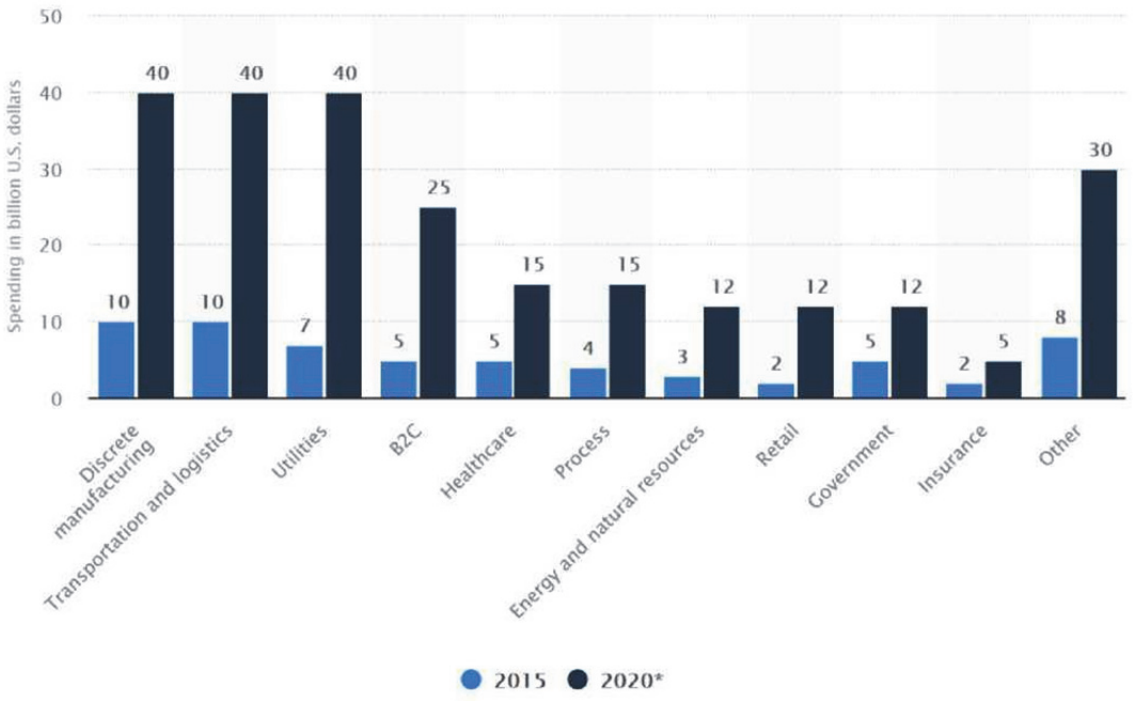

Fig.1. Spending on Internet of Things worldwide by vertical in 2015 and 2020

From Figure 1, it can be easily noticed that much of the IoT expenditure relates to the development of smart house systems. Such directions, such as discrete manufacturing, transportation and logistics, utilities, healthcare, energy and natural resources, have a direct impact on the development of home automation. Almost each of them plans to spend four times higher than four years ago.

Such expenditures are due both to the quantitative and qualitative increase of the smart systems. From a quantitative point of view, the evolution of smart systems (within IoT) during 2015-20125 is presented in Figure 2 [1].

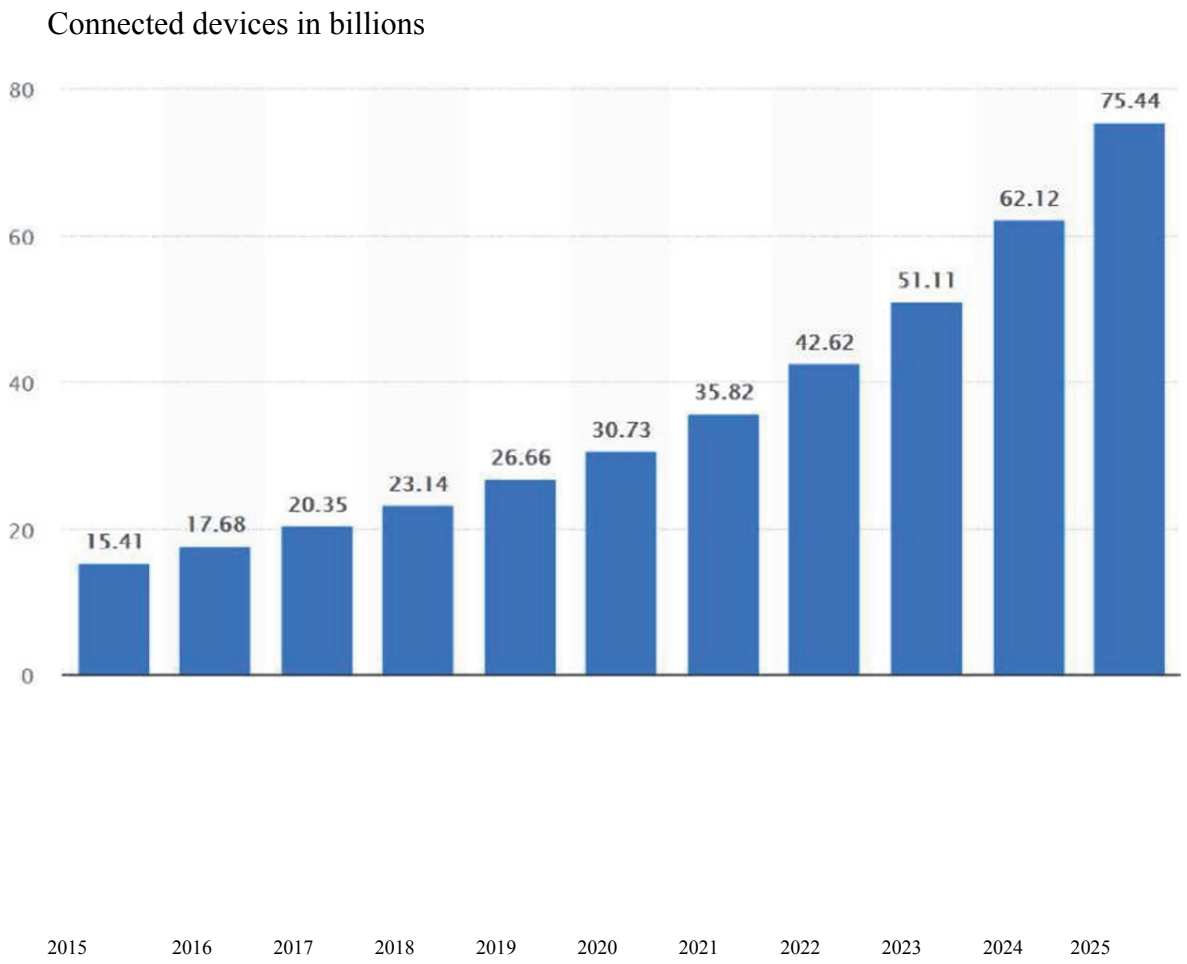

Fig. 2. Internet of Things (IoT) connected devices installed base worldwide from 2015 to 2025

Increasing the number of devices will also increase the complexity of the development of software. Figure 2 shows that this trend can be approximated by an exponential growth. A similar trend can be said about the number of devices for smart homes. With the increase in the number of devices, the complexity of the software needed to control and meet the increasingly complex requirements is increasing.

Impact of smart homes

Although not as revolutionary as the radio, the TV, the phone (the cell), the emergence of smart houses in the modern world becomes inevitable anyway. Familiarizing the population with new realities is slower (or better said more attentive) because of the various components that this product may contain. The phenomenon in question can be explained, especially for the post-Soviet region, with the lower exposure of the user from that period to an election. But the impact of the technology house promises to be more sensible in the long run.

It has become not only a household item, but rather a new member, with almost equal control over all devices. The smart house will create sensation of presence through the ability to communicate verbally, to understand gestures and even to identify the emotional state of the people. It can be assumed that the culmination of the exteriorization of the smart house control element will be a humanoid, which will penetrate the user's lifestyle thus adjusting to the smallest detail the habitat. The information processed by such a smart system can be even obtained from a coffee.

Returning to reality, the impact of this technology on everyday life can already be analyzed. Such a tool replaces a lot of routines, which we continue to execute because we have become accustomed to this. It would seem trivial to pay attention to such utilities as, for example, connecting and disconnecting lighting sources; but the smallest detail must be taken into account when talking about smart houses.

The intelligent house could save lives. Providing the system with devices such as fire prevention (gas and water sensors) and the fight against them (automated extinguishers, ventilation system) could save human lives. The importance of such a system increases considerably when fires occur during the night, when people sleep.

Another way of saving lives by a smart house is to endow it with *machine learning* technology that could detect the unusual behavior of family members, especially when only one of them is at home. The smart house, through specialized software, can detect such cases as accident and intervene by questioning the resident about the situation. If he does not receive a response, he will automatically call the rescue services.

Looking from the economic perspective, it does not mean every time that these technologies are a burden to a family's savings. On the contrary, besides the energy saving that promises to provide us with a smart house, its presence can also save us some payments for goods insurance. That is, the endowment of the house with smart fire prevention and flood prevention can significantly reduce the cost of property insurance against these types of accidents.

Another impact of the smart house is security. Until now, security features such as video cameras, alarm systems, lockers, automated gates were perceived as a special system, a service we call for, now we see their integration in a whole.

Problems of smart houses

The most important problem of a smart home, on merit, can be considered vulnerability. The main danger to such a home is the attack of cybercriminals. They can remotely control smart devices as well as capture video. Such a vulnerability can be considered a webcam, which besides the property of recording video and sound, it is also endowed with a series of sensors: movement, temperature, humidity. If it is also equipped with speakers, it can be used both as a surveillance device and for the care of a child. The temptation to have a multifunctional device exposes to a greater risk the security of the data that can be obtained through it.

A common mistake, often encountered, is to connect devices to an open hotspot that does not require username and password.

As mentioned above, the number of devices that ensure the functionality of a smart house is steadily increasing, so the amount of information provided by it continues to grow. To meet the requirements of such information flow, an efficient router is needed, the price of which may increase exponentially in relation to performance.

Another problem that comes from the previous one is the ability to interconnect more devices. It goes without saying that the smart devices proposed on the market can not belong to a single producer. And their diversity results in a discontinuity in their operation together. Such situations could cause a minor discomfort, such as the refusal to disconnect light from a smart bulb, to the loss of video data from a surveillance camera.

While the smart control system becomes more complex, and the demands on it are growing, it is becoming increasingly difficult to adapt its functionality to the actual situations that may come from. Hence the next issue is to activate smart home devices at the wrong time. For example,

activating the alarm system and the arrival of messages on the phone every time the branches hit the window or a pet pass through the room [2].

With the increase in the number of devices in a smart house, it is easy to assume that the operation of such a system can sometimes be interrupted because some of them will fail. The solution would be a diagnostic system that would detect damage or loss of connection with any device. A particular timeliness has this problem when using wireless devices. Even more, some smart home appliances may have an autonomous power source that should be periodically renewed.

Conclusions

When analyzing the statistics about smart houses, it is remarkable that the development trend of this field is constantly increasing. It is forecast that turnover in this area in 2022 will exceed USD 50 billion [xxxxx].

The smart house becomes more and more indispensable to the everyday life of a contemporary person. This inclusion has been favored by the promising facilities such a technology brings, but also by the human property to get used to things that make it simpler.

A smart house can have a direct positive economic effect (e.g. energy savings) and indirectly (reducing the price to the property insurance bill, but also house goods if it has a smart management).

At the present stage, the smart house also has a fire protection and prevention system. It is equipped with video cameras, sensors and an Internet connection. Under these circumstances, we can always check the status of homework, and in case of a breakdown, the protection organs (guard, police, etc.) will be automatically notified.

The smart house can save lives. By continuously monitoring the data from sensors and cameras, the system can take concrete action to warn people about the danger they are exposed to or take automatically protective measures.

Such a performance can be achieved with the help of a technologically simple system. It is known that as the system becomes more complicated, it becomes more unstable, thus causing risks of inappropriate operation, including disconnection.

Besides all the benefits that can be gained from a smart house, there will be a lot of problems, difficulties. The most important is the security of the information that is in the system management. It is of major importance that when a smart house is used to make sure it is protected against cybercrime.

References

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