CHALLENGES OF IOT PAYMENTS IN SMART SERVICES

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Abstract

Many applications including Industry 4.0, Smart City, Building Management, Car of the Future, Smart Home and Connected Health use IoT (Internet of Things). IoT is changing the way businesses and consumers, even whole cities interact through connected devices. In the future, with Internet of Everything (IoE), every entity (people, machines, animals, cars, buildings, etc.) will have possibilities for direct interconnections. Forecasts show that over 20 billion connected devices will reach the market by 2020. Ninety percent of cars are expected to be connected, too. These wide range of industry and consumer applications have growing needs for IoT and many common elements such as decentralization, real-time requirements, sensory or measurement capabilities, a communications layer and Big Dataanalytics/intelligence. Besides these well know common elements, also in many applications exit the need for payment. This additional requirement is known as the idea of IoT payments. In this paper is present some of challenges in implementation of IoT payments.

Keywords: IoT; smart services; human-robot; smart city; Internet payment

1. Introduction

The Internet Society determines Internet of Things (IoT) as one of milestone in implementation of the identification technology [1]. The basic concept of IoT was introduced at the end of XX and beginning of XXI century [2]. The main goal of this paper is to present possibilities for use of IoT in process of service automatization and creating smart process in execution of these services. There are many definitions of IoT, but following can be common: IoT is the network of physical objects (things) embedded with hardware, software, usually with sensors, and network connectivity, which enables data collection and exchange data [3][4][5]. These objects usually call 'smart objects' because they require minimal human intervention to generate and exchange data, and they have capabilities for feature data collection, analysis and management capabilities [6].

IoT devices include other capabilities like:

- Identification
- Sensing
- Actuation
- Embedded processing
- Communication
- Ubiquitous
- Intelligence
- Interoperability, etc.

All these capabilities enable wide range of different applications, including Industry 4.0, Smart Agriculture, Smart City, Building Management, Car of the Future, Smart Home and Connected Health [7][8][9][10][11][12][13]. An illustration of the IoT devices networking is shown in Fig. 1.

Fig.1. Illustration of the IoT with IoT devices networking of different devices (Image source: <https://comarkcorp.com/iot-devices-internet-things-devices/>)

Data collection is one of primary function of IoT, so security and privacy issues are connected with this function. In the case of the IoT, traditional methods of control are mostly absent. In fact, there are common cases where people are no longer users of an IoT service but rather subjects of the service. For examples, smart city sound monitor's or public Wi-Fi connectivity. These examples just show how a fraction of people in the nearness might discover and use the service, but not being the ones who installed the actual access points. Unfortunately, most people would be unaware of the service's privacy properties [14].

It is well known, that one of the IoT major privacy problems is that users aren't always aware when a device is collecting personal data. Of course, these privacy problems can't exist when we have any kind of payment transaction based on the IoT. Actually, because one of capabilities of IoT devices is ubiquitous, sometimes we have situation that a person can easily not know when a data exchange is present. Have in mind that one of basic privacy principle is that personal data collection should happen only with appropriate notice and with approve of a person which data are collecting. One of framework called the privacy stack for user communication issues and needs regarding IoT privacy is shown in Fig. 2.

Fig. 2. The privacy stack framework bridges from today's Internet of Things (IoT) systems to users [14]

Connecting various types of IoT devices together is great challenge and it is stated to be the mayor objective of IoT. Today, on the market we can find may different hardware and software platforms. Also, developers of new products and services need to do analysis of information available in patent databases, if they want to define future research and development plans and good market strategies [15], especially in the field of disruptive innovation like IoT.

2. Payment System

A payment system consists of a set of instruments, banking procedures and, typically, interbank funds transfer systems that ensure the circulation of money [16]. This system includes different institutions, customers, standards, rules, procedures and technologies that make money exchange possible as shown in Fig. 3.

Fig. 3. How faster payments works (Image source: <http://www.fasterpayments.org.uk/how-faster-payments-works/>)

Traditional payment systems may be physical and electronic. Modern payment systems are electronic and mostly oriented to be cashless as compared to traditional payment systems which mostly oriented to be cash. Each of these systems has its own procedures and protocols. Business development through the automation and digitization is the primary goal of many businesses. This approach leads to a strengthening of the market position and creating sustainable growth and development [17]. The payments market is changing according to new developments in ICT (Information

Communication Technology)). Institutions are investing in new ICT as they adjust to market conditions and customers' expectations. These investments are necessary to respond to short-term and long-term changes plans.

The need to support changing customer preferences to transact via digital channels remains a major driver of change, particularly because of the increasing expectation that payment services will become a deeply embedded and largely invisible part of the digital customer experiences of tomorrow. The way of execution of financial and payment services, today necessarily includes personalization and automation of the services [18]. Businesses across all sectors will continue to invest in their payment capabilities. In the Global Payments Insight Survey [19], is given that at a global level, 51% of all merchants, billing organizations, and retail banks will increase their IT budgets for payments-related projects in 2018, with over a fifth increasing spending by 5% or more on 2017 levels. From a regional perspective, America and Asia will lead increasing payments ICT investment. Forecast for the investment in payment systems is shown in Fig. 4.

Fig. 4. Forecast for the investment in payment systems [19]

In last ten years, another “player” is appeared in payment systems. This “player” is cryptocurrency or crypto currency [20]. The first cryptocurrency was Bitcoin in 2009. Nowadays, on the market exists over hundred cryptocurrencies [21]. It means that modern payment system must include, besides traditional currency like Dollars, Euro, Yen, etc., the most popular cryptocurrencies. It is obviously than modern payment system is very complex, and includes interdisciplinary knowledge for its implementation.

3. Payments and the Internet of Things

As it is mentioned before, the IoT extends the connectivity between things with minimal need for human intervention. This characteristic is the desirable for merchants whom seek to ease the shopping experience for the consumers. IoT payment is a process of money transfer based on use device which is connected to a money account. The usage view sets up the technical solution by describing the user's journey through all the steps of the use case being implemented. This view would include the key actors, that may be users and/or machines, and the activities involved. The usage view also describes the use case from the point of view of user needs and system capabilities. Fig. 5 illustrates a typical IoT use in a store [21]. Applying of this scenario, every new user has much more chance to have good satisfaction using IoT payment. More users, more experience (this means more data), enable the opportunity of using data analytics process of IoT payment to be a smart process.

Fig. 5. The IoT usage view [22]

It is interesting that the proposed scenario in Fig. 5 can be applied to small shops, such as those located in kiosks. Fig. 6 shows a realized new type of kiosk that can be easily transformed from a standard vendor kiosk to a vendor-less kiosk [23]. The software that is installed in the vending machines makes it possible to follow the habits of each customer and, on that basis, to suggest products with a greater chance of being firstly selected by the customer. Each customer is personalized, which means that all menus on the vending machine are automatically configured according to the customer. In this way, the customer gets the impression that he/she is buying from a seller, who knows his typical habits.

Fig. 6. Smart-shop kiosk [23]

The authors of this paper are part of the team that developed this smart store. In the first time, on Serbian territory this smart shop will work in conjunction with a sales man to allow the sale of products that would require specific vending machines.

4. Conclusion

In recent years we can see growing trend of IoT based applications, and what is much more important, this trend will continue in the future. IoT can vary from simple network of devices, to integration of hundreds or millions IoT devices with integration of many different disciplines like computer sciences, telecommunication, data analytics, security, etc. Applying of IoT devices will remain a challenge for an extended period of time. This paper describes some of the existing payment methods that are implemented in different applications as well as advantages and disadvantages of payment systems and IoT. Also, this research described the vendor-less kiosk as an example of successful implementation of payment systems based on IoT technology. This research shows that the use of IoT is already widespread. In the future, applications of IoT will rapidly grow in the area of payment services, and adaptation to new concepts will be of the utmost importance. It is very important for further research to take into account dynamic of changes in IoT area and new forms of use.

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