



Application Intelligence and Vision in Internet of Things (IoT)

Mohsen Hallaj Asghar

School of Computer and Information Sciences, University of Hyderabad, Hyderabad, India

E-mail: mohsenhallaj62@gmail.com

ABSTRACT

Internet of Things (IoT) is envisioned as billions of sensors connected to the internet through wireless and other communication technologies. Recently IoT received much attention from scientists, industries and governments all over the world for purpose of succeeding and achieving ubiquitous sensing wireless sensor network technology for changing the era of our modern day living. This offers the capability to measure and understand environmental indicators. Building or home automation, social smart communication for enhancement of quality of life that could be considered as one of the application of IoT where the sensors, actuators and controllers can be connected to internet. IoT can be represented as a main enabling factor of promising paradigm for integration and comprehension of several technologies for communication solution, Identification and integration for tracking of technologies as wireless sensor and actuators. The target of this paper introduces the concept of several applications for internet of things and with the discussion of IP for smart device that will arise as the future vision of internet of things.

Keywords: Internet of Things (IoT), Radio Frequency Identification (RFID), Electronic Product Code (EPC), IP for Smart Device.

1 INTRODUCTION

The internet of things (IoT) is the novel paradigm which has rapidly spread in the scenario of the emerging modern wireless communication. IoT represents a target and vision to extend the internet into the real world by embracing the everywhere, everyday objects [1]. Physical devices are not longer disconnected from the virtual world but it can be controlled remotely from anywhere and the capability of device and physical item can act as physical access point to the internet service provider. Unquestionably the main consistency of the IoT idea is the collaboration in high impact for several aspects of everyday life and manner of potential user. The most signally effectiveness of IoT is introduction of the high impact that will have a several aspect of daily and behavior of users. From the view of private users, the obvious effect of IoT will be in both scenarios, commercial and domestic fields. IoT can assist the improve the quality of life, e-health, industrial, social internet of Things, agriculture, transportation, etc. Enhanced learning of a few instances of possible application

scenarios in which the new paradigm will be useful for role of the IoT in near future. Similarly, from another perspective for business users the most obvious consequences will be bright future in industrial automation, logistic, and quality of business management for smart transportation of assets and goods. McKinsey Global Institute announced by 2025 internet endpoint will touch every physical things around, furniture, cars, personal device and more. It's highlight future will be arise as a combination of technology with the interaction of human environment and extension diffusion of the internet of things. "Smart" objects play the main roles in the IoT vision [2]. Whereas the information technology and embedded technology would have potential to revolutionize the usage of objects. By using the sensor, they are capable to understand the context and would be able to communicate with each other "Digitally upgrading" ordinary nature of object, this would enhance their physical function by adding ability to digital object[3]. Precursor development are more and more obvious today such as washing machines, exercise bike, electric toothbrushes also smart

metric are occupied with the network interface. Another application domain in IoT, will estimated the internet connectivity of everyday objects which can be used and tracked remotely from anywhere. The data will collect-up by readers from physical object from anytime to analyze the data and will send in to the cloud smart device. This enables many aspects of real world which can be observed as unattained level of details at trivial cost. The use of word internet in term of internet of things, which stands for vision above can be seen either simply as a metaphor- in the direction of people used in the web, objects will soon communicate with each other, use service, purvey information and generate value or explanation in several technical sense, IP protocol stack will be used by smart objects. The term IoT was published by work of Auto-ID center at Massachusetts institute technology (MIT), which in 1999 started the prototype of RFID infrastructure in 2002, the co-founder and former head Kevin Ashton stated “we need an internet of things to standardization of computer to realize the real world” [4]. Nowadays the epithet of IoT is rapidly increasing and academic, industrial and people know that this is the emerging phenomenon of new IT technology.

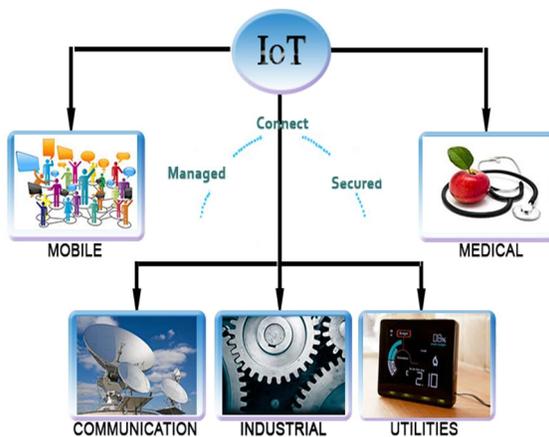


Fig. 1. Application in IoT

European Union and politicians initially used the term in the context of RFID technology that they tried to link the RFID with the internet of things as key component of IoT. Finally in 2009 the EU commission alluded to action plan ultimately saw Internet of Things as general evaluation forum for network of interconnected computers to the physical cyber world as interconnected object[5]. Following the paper will define the II part

introducing the critical application in IoT which play an important role in our life, III part presents a significant vision in IoT, part IV presents the IP for smart things that will be attach as new corporation of IP as authentication and addressability for smart device, part V presents the conclusion of this article and finally VI shows presents the source and references for contacts with the more information about several aspect of this paper.

2 APPLICATION

There are several application domains which will be compact by the emergence of internet of things. The application can be classified into various network availability, scale, coverage (Figur1.Application of Internet of Things) and repeatability of use involved. In figure.1 [6].We categorize the application relevant into five kind of domain, Personal communication and home automation, mobile communication, Enterprise and industrial, medical, utilities.

Personal and home communication, IoT products power usage data and make it available to the house electricity. It's for communication of smart object through the ubiquitous power supply for each node. Node is attached in things and it should act as energy saver for home utilities. Utility companies and enterprises can save the energy and optimize in the industries, Mobile customer can interact with smart device by using communication with the intelligence cloud and data center.

There wide range of applications in the field of IoT, but we represent the important application that have loop with our life and society. Here we define these applications.

2.1 Home and personal communication

The sensor data collected is utilized only by individual user and who directly own the network connection. Usually Wi-Fi is access as backbone for higher bandwidth data (video) also transfer as well as higher sampling rate (sound). Control of home appliances such as air conditioners, washing machines, refrigerators, etc, will allowed for better energy consumption and for the cost savings. User appliance also can be benefited and optimize energy reducing cost of living and create peace of mind[7].The main purpose of home automation is to control all smart device in the location of home. Control of device will bring the satisfaction for customer and owner. One of the greatest advantage in home automation is that the user can prevent disasters like fire, etc,. User can control

light and temperature by using the phone, tablet or computer. Future of home automation can be visualized as more security, comfortable, energy efficient and convenient. Nowadays home automation has become more and more affordable by usage of operating systems which are less complex, so owner can master the control of all smart devices to order of security and safety [8].

2.2 Healthcare

Many benefits is provided by IoT technologies to the e-health care domain. This scenario was envisioned two decades ago. Recent activities and scientists trying to give a perfect platform for IoT, to realizing the sensor body and transfer data to the server for analyzing information[9].

1) *Tracking of objects and people (staff and patients)*: is the target at the identification of person or anybody with motion sensors, like case patient monitoring improve workflow in the hospital. Tracking in the motion is the vital point in smart healthcare such as connecting to the ambulance. Availability and maintenance of material/equipment is another important aspect, like during surgery such as blood packets, etc.,[10].

2) *Identification of patients with smart authentication*:

It's introducing the point identification for prevent and protect of the patient from harmful Accident such as (wrong drug , does and time). For patient especially in case of aged citizens, monitoring by comprehensive electronic medical record is for analyzing the maintenance and monitoring of the patients. Both case of identification and authentication are to improve the frequently used for accessibility address of patient in urgent moment and it useful for security process to avoid of missing of the important data of patients and surgical equipments.

3) *Data collection from sensors*:

Automatic data collection is one of the issues in healthcare system. Data should be transfer to the domain and analyzing data helps us to reduce the processing time. This function is relevant to the RFID technology. RFID must collected data from RFID reader to the domain

of healthcare. Clinical application technologies is with the purpose of the network and provide the location of RFID for identification of the patients location.

2.3 Industrial

Internet of Things (or) Network of Things within the environment as an enterprise. Application, information must be collected from different actuator or sensors, used by the manager for authorizing the person for release of the data. Social internet of things keeps to track of the assets and goods, sensors always been an important part of the industrial in setting-up the security, climate, control, etc[11]. By using sensors there are several test beds implemented and it's plane to get the control of network enterprise and eavesdropping, by using the secure channel can tke action against of hackers between enterprise in different location. Nowadays some important part of enterprise and governments are facing with the hacking, such as military, nuclear power plant, by using the specific categories of smart sensors and actuators can be protect their assets form attackers.

2.4 Utilities

The information from the network in this application domain is almost for service operation and optimization of consumer for customer. Already being used by utilities organization such as (smart metric) for calculate of the optimize cost. This utility has several extra expenses about the reading and analyzing the consumer and management because the monitoring is the strength of efficient resource of management. Measuring, monitoring by control remotely can save time, cost and optimize efforts of employees. Recent applications like smart Grid and smart metric are one of the potential IoT applications. Efficient energy consumption by smart metric can be achieved by monitoring in-house electricity points and optimizing the utilities consumption by the owner.[12]This data is useful for power plant and utilities organization with load balance of energy in the city for ensuring the high quality of customer service. One of the important point in the IoT is monitoring of drinking water. Sensors measuring the external parameter are installed at necessary location to order ensure quality water supply. The same network can be using in agriculture for cost and time saving by monitoring grading or grass remotely. By monitoring solid and humidity can prevent contamination and avoid on-watering with the help of IoT [13].

2.5 Mobile

IoT is enable by using the huge WSNs for online monitoring at the travel times. IoT can choice route, traffic, air pollution and noise emissions. The IoT is likely to update the traffic information and providing by sensor network in existing traffic control systems. IoT can change the algorithm of the urban traffic by using the mobile communication and tracking the road as online service for the quality of the service in the urban. Bluetooth technology (BT) refers the IoT number of digital products such as (mobile, parking and navigation system) Bluetooth technology is a signal with the unique media access identification number which can be by BT in crowded area [14]. Reader can be installed at the different location in the city and can be capturing the signal of cars in motion, for the purpose of speed in time of vehicle to understand and pick-up the time in traffic. This scenario also can be used in bus and other public transport systems. Another important issue in mobile IoT domain is efficient management by using of monitoring the item transport as well as efficient transportation planning. Monitoring items is carrying out move location. This will be using the large scale of social internet of things.

3 SIGNIFICANCE VISION

The IoT is not a single novel technologies, for instance there are several inter-corporation technological development which collaborated together to help and take the bridge between the virtual world to the physical world, such as:

- 1) Communication: object has the ability to network Resource to make use of data,service and upgrading that states, wireless sensor technologies, such as actuators, Wi-Fi, GSM, Zigbee, all these technology recently are under the development and standard for a particular purpose of IoT.
- 2) Addressability: IoT object can be addresses by discovery object-name-service (ONS)and have remotely integrated together.
- 3) Identification of things: objects have unique identification, such as RFID, EPC, NFC, which automatically read the labels or bar codes, which technology even the passive and active actuators. Identification can be linked to information that achieved by sensors and can send data to the server or capture the data by sensors or controllers.

- 4) Sensing: Sensors should collect the data from the objects and forward it to the readers.
- 5) Embedded processing: Smart objects processing or micro controllers, this device can be used to process sensor information or producing a “memory” of how they should be.
- 6) Localization objects: smart things location is the physical location, Mobile or any satellite (GPS) is more suitable to achieve this (ultra, wide band), radio frequency (WSN, RFID reader).
- 7) User interface: The target of smart object is to communicate with the people in an appropriate way (voice display, image).

Most applications need a subset of the capacity because the implementation of all is expensive and often required significant technological and technical effort.

4 IP FOR OBJECT

Suppose in future of IoT every day things(objects) should be addressed and controlled through the internet, then we could not ideally ensuring to the special communication protocol which currently used with RFID, instead objects must behave like normal nodes otherwise they should be the internet protocol for communication with another smart things and communicated with network nodes.

In addition to the huge number of address, we required the newly IPV6 version with 128bit address. One of the benefits of having IP address is obvious, even if the objects are not globally accessible but still used in a controlled network environment. This scenario enable us to make directly functionality like global interoperability, network management, data transmission across different physical media and naming service(URL,DNS).By usage of IP smart object enables to use the existing internet service and application, also smart object can be address and control from anywhere since object are proper internet participation. However it will be easy to use essential application layer protocol like HTTP. Recently IPV6 also has interestingly capability of automatic address configuration, smart object and assign its own address. There are 16-bit microcontrollers which are sufficient for storage and require less than 400 μ w/MIPS, and TCP/IPV6

stacks flash memory [15]. In importantly wireless communication standard like IEEE 802.15.4 can cover layers of IP with consume little power by using ZigBee, required approximately 20 to 60MW. The wireless unit can be used only for short periods of time to order save energy.

Nowadays, some companies and standardization committees team adopting various technique and scenario. In 2008 some companies like Cisco, Intel, SAP founded the 'IP' for smart object (IPSO), with corporate of alliance for purpose of compliment of IP for low-power device such as RFID, EPC and other smart object. Lately IPV6 low power wireless area network (6LowPAN) is still under setup by the internet engineering task force (IETF). It will address and support IPV6 by using the 802.15.4 wireless standard [16].

In 2009 the ZigBee announced that would be incorporating native IP address into future of ZigBee specifications which enabling integration on internet community for each products.

5 CONCLUSION

Internet has changed forcefully in the way we live, and interaction between people at virtual level in several context of professional life to social relationships. IoT has potential to new dimension by enabling and processing communication by the smart objects, to achieve the vision of “, anywhere, anything, anytime, any-media ” communication. In this paper we trying to show a survey of the IoT should be as important part of future. In this paper we effort to show the comprehensive vision of application domain that is in IoT as well as Ring in our daily lives. We show the important vision as capability, the gap between the virtual and physical world. Finally we show two scenario of EPC, RFID as key component of IoT which can be bring the sensors or any actuators from device and reader in environment.

6 REFERENCES

- [1] Mohsen Hallaj Asghar ,”RFID and EPC as key technology on Internet of Things (IoT)”,IJCST Vol. 6, Issue 1, Jan - March 2015
- [2] McKinsey Global Institute “Disruptive technologies: Advances that will transform life, business, and the global economy”. Report by May 2013.
- [3] Fleisch, E.: What is the Internet of Things? When Things Add Value. Auto-ID Labs White Paper WP-BIZAPP-053, Auto-ID Lab St. Gallen, Switzerland (2010).
- [4] Schoenberger, C.R.: The internet of things. Forbes Magazine, March 18 (2002).
- [5] European Commission: Internet of Things – An action plan for Europe. COM(2009) 278,http://eur-lex.europa.eu/LexUriServ/site/en/com/2009/com2009_0278en01.pdf (2009).
- [6] A. Gluhak, S. Krco, M. Nati, D. Pfisterer, N. Mitton, T. Razafindralambo, A survey on facilities for experimental Internet of Things research, IEEE Communications Magazine 49 (2011) 58–67.
- [7] H.S. Ning, Z.O. Wang, Future Internet of Things architecture: like mankind neural system or social organization framework? IEEE Communications Letters 15 (2011) 461–463.
- [8] L. Atzori, A. Iera, G. Morabito, SIoT: giving a social structure to the Internet of Things, IEEE Communications Letters 15 (2011) 1193–1195.
- [9] L. Atzori, A. Iera, G. Morabito, The Internet of Things: a survey, Computer Networks 54 (2010) 2787–2805.
- [10] A.M.Vilamovska,E.Hattziandreu,R.Schindler, C.Van Oranje,H.De Vries,J. Krapelse,RFID Application in Healthcare-Scoping and Identifying areas for RFID Deployment in Healthcare Delivery,RAND Europe,February 2009.
- [11] X,Li,R.X,LU, X.H,Liang,X.M.Shen, J.M.Chen.X.D,Lin,smart community:an internet of things application,IEEE Communication Magazine 49(2011)
- [12] M, Yun,B Yunix,Research on the architecture and key technology of internet of things(IoT) applied on smart grid, in:Advance in Energy Engineering, ICAEE,2010
- [13] H, Jun-Wei, Y,Shouyi, L. Lebio,Z zhen, W .Shaojum, A crop monitoring system based on wireless sensor network,Procedia Environmental Science 11(2011)
- [14] P.Kumar, S .Ranganath, W.Huang ,K.Sengupta, framework for real-time behavior interpretation from traffic video,IEEE transaction on intelligent Transportation system (2005)
- [15] Hui, J., Culler, D.: IP is Dead, Long Live IP for Wireless Sensor Networks. Proc. 6th Int.Conf. on Embedded Networked Sensor Systems (SenSys), pp. 15–28 (2008)
- [16] Hui, J., Culler, D., Chakrabarti, S.: 6LoWPAN – Incorporating IEEE 802.15.4 into the IP architecture. Internet Protocol for Smart Objects Alliance, white paper # 3 (2009).