Internet of Things

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Abstract— Nowadays Internet of Things (IoT) gained a great attention from researchers, since it becomes an important technology that promises a smart human being life, by allowing a communications between objects, machines and every things together with peoples. The Internet of Things (IoT) is an extension of the Internet in which large numbers of "things", including sensors, actuators and processors, in addition to human users, are networked and able to provide high resolution data on their environment and exercise a degree of control over it. It is still at an early stage of development, and many problems/research challenges must be solved before it is widely adopted. Many of these are technical, including interoperability and scalability, as billions of heterogeneous devices will be connected, but deciding on how to invest in the IoT is a challenge for business, and there are also major social, legal and ethical challenges, including security and privacy of data collection, which must be resolved. As the future IoT will be a multi-national, multi-industry, multi-technology infrastructure, the paper reviews the global standardization efforts that are underway to facilitate its worldwide creation and adoption.

Key words: Internet of Things (IoT)

I. INTRODUCTION

The Internet of Things is the interconnection of endpoints (devices and things) which can be uniquely addressed and identified with an IP (Internet Protocol) address. With the Internet of Things, devices can be connected to the Internet, sense, gather, receive and send data and communicate with each other and applications via IP technologies, platforms and connectivity solutions. Figure 1 reviews that with the internet of things, anything's will able to communicate to the internet at any time from any place to provide any services by any network to anyone. In the 21st century, we want to be connected with anything anytime and anywhere, which is already happening in various places around the world. The core component of this hyper connected society is IoT, which is also referred to as Machine to Machine (M2M) communication or Internet of Everything (IoE). It is an extension and expansion of Internet-based network, which expands the communication between human to human (H2H), human to things (H2T) or things to things (T2T) [6] as presented in Figure 2.

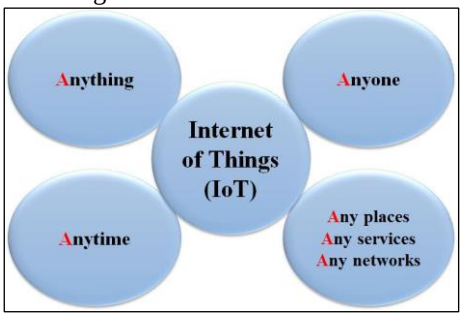

Fig. 1: Internet of Things

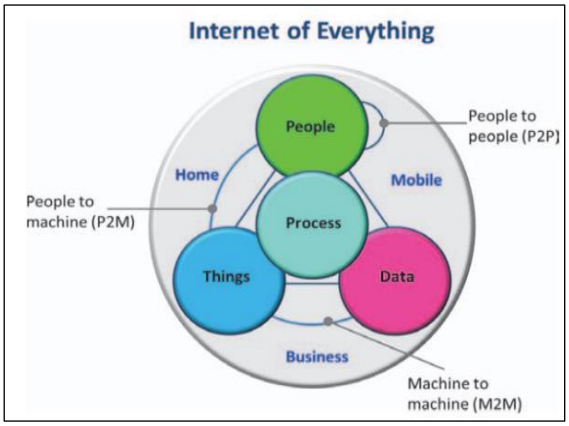

Fig. 2: Internet of Everything

II. ARCHITECTURE OF INTERNET OF THINGS

Implementation of IoT is based on an architecture consisting of several layers: from the field data acquisition layer at the bottom to the application layer at the top. The layered architecture is to be designed in a way that can meet the requirements of various industries, enterprises, societies, institutes, governments etc. Fig. 3 presents a generic layered architecture for IoT. The layered architecture has two distinct divisions with an Internet layer in between to serve the purpose of a common media for communication. The two lower layers contribute to data capturing while the two layers at the top is responsible for data utilization in applications. The functionalities of the various layers are discussed briefly in the following:

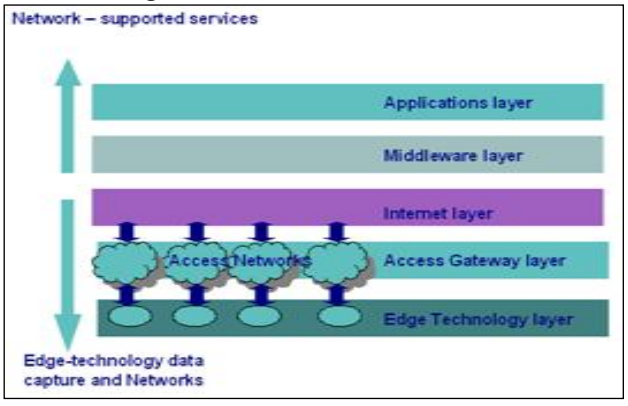

Fig. 3: Layered Architecture of Internet of Things

A. *Edge layer*

This hardware layer consists of sensor networks, embedded systems, RFID tags and readers or other soft sensors in different forms. These entities are the primary data sensors deployed in the field. Many of these hardware elements provide identification and information storage (e. g. RFID tags), information collection (e. g. sensor networks), information processing (e. g. embedded edge processors), communication, control and actuation.

B. Access gateway layer

The first stage of data handling happens at this layer. It takes care of message routing, publishing and subscribing and also performs cross platform communication, if required.

C. Middleware layer

This is one of the most critical layers that operate in bidirectional mode. It acts as an interface between the hardware layer at the bottom and the application layer at the top. It is responsible for critical functions such as device management and information management and also takes care of issues like data filtering, data aggregation, semantic analysis, access control, information discovery such as EPC (Electronic Product Code) information service and ONS (Object Naming Service).

D. Application layer

This layer at the top of the stack is responsible for delivery of various applications to different users in IoT. The applications can be from different industry verticals such as: manufacturing, logistics, retail, environment, public safety, healthcare, food and drug etc. With the increasing maturity of RFID technology, numerous applications are evolving which will be under the umbrella of IoT.

III. Application of Internet of Things

Internet of things promises many applications in human life, making life easier, safe and smart. There are many applications such as smart cities, homes, transportation, energy, smart environment, smarter hospitals, and smarter enterprises and factories. In the following subsections, some of the important applications of IoT are briefly discussed.

A. Medical and healthcare industry:

IoT will have many applications in the healthcare sector, with the possibility of using the cell phone with RFID-sensor capabilities as a platform for monitoring of medical parameters and drug delivery. The advantage gained is in prevention and easy monitoring of diseases, ad hoc diagnosis and providing prompt medical attention in cases of accidents. Implantable and addressable wireless devices can be used to store health records that can save a patient's life in emergency situations, especially for people with diabetes, cancer, coronary heart disease, stroke, chronic obstructive pulmonary disease, cognitive impairments, seizure disorders and Alzheimer's disease. Edible, biodegradable chips can be introduced into human body for guided actions. Paraplegic persons can have muscular stimuli delivered via an implanted smart thing-controlled electrical simulation system in order to restore movement functions.

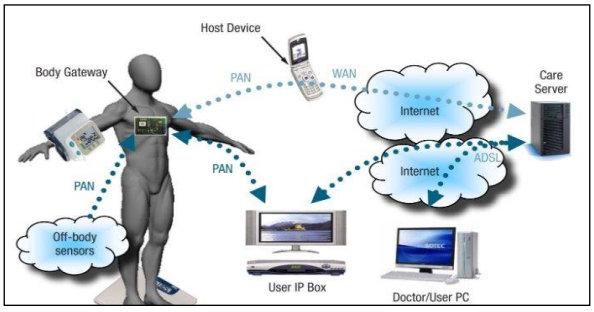

Fig. 4: Smart Healthcare Concept

B. Transportation industry

IoT offers solutions for fare collection and toll systems, screening of passengers and bags boarding commercial carriers and the goods moved by the international cargo system that support the security policies of the governments' and the transportation industry, to meet the increasing demand for security in the globe. Monitoring traffic jams through cell phones of the users and deployment of intelligent transport systems (ITS) will make the transportation of goods and people more efficient. Transportation companies would become more efficient in packing containers since the containers can self- scan and weigh themselves. Use of IoT technologies for managing passenger luggage in airports and airline operations will enable automated tracking and sorting, increased per-bag read rates, and increased security.

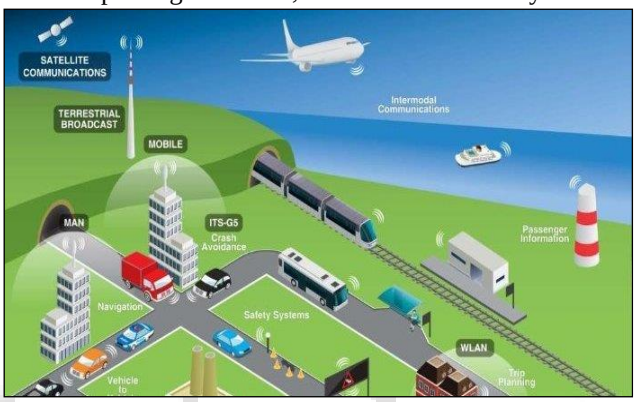

Fig. 5: Transportation

C. Smart Home and Buildings

Wi-Fi's technology in home automation has been used primarily due to the networked nature of deployed electronics where electronic devices such as TVs, mobile devices, etc are usually supported by Wi-Fi. Wi-Fi have started becoming part of the home IP network and due the increasing rate of adoption of mobile computing devices like smart phones, tablets, etc. For example a networking to provide online streaming services or network at homes, may provide a mean to control of the device functionality over the network. At the same time mobile devices ensure that consumers have access to a portable 'controller' for the electronics connected to the network. Both types of devices can be used as gateways for IoT applications.

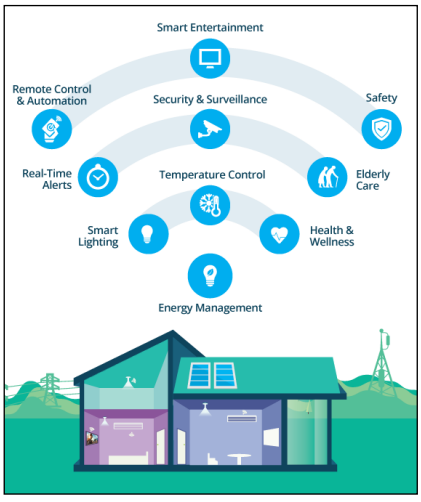

Fig. 6: Smart Home

REFERENCES

[1] G. Santucci. From Internet to Data to Internet Of Things. Proceedings of the International Conference on Future Trends of the Internet. (2009).
[2] V. Bradshaw. The Building Environment: Active and Passive Control Systems. John Wiley & Sons, Inc., River Street, NJ, USA, 2006
[3] Jukka Suhonen. Experiences and Future Plans for WSN-enabled Service Development in Home Environment. Realin white paper 2013
[4] Tiago D. P. Mendes et al. , Smart Home Communication Technologies and Applications: Wireless Protocol Assessment for Home Area Network Resources. Energies 2015.
[5] Suwimon Vongsingthong and Sucha Smanchat. A Review of Data Management in Internet of Things. KKU Res. J. 2015
[6] Brumitt, B. Meyers, J. Krumm, A. Kern, and S. A. Shafer. Easyliving: Technologies for Intelligent Environments. HUC, 2000.

