

Literature Survey on Real World Applications using Internet of Things

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ABSTRACT

The IoT is an innovative idea and it will transform any real world object into intelligent virtual objects in the future. It enables user to identify everything in this world uniquely, take control over identified the things (e. g. Door Locks, Microwave, Lights, TV, Coffee Maker etc.) and keep informed about state of the things. The IoT sensors can use various types of connections such as RFID, Wi-Fi, Bluetooth, and ZigBee, in addition to allowing wide area connectivity using many technologies such as GSM, GPRS, 3G, and LTE. By the technology of the IoT, the world will become smart in every aspects, since the IoT will provide a means of smart cities, smart healthcare, smart homes and building, in addition to many important applications such as smart energy, grid, transportation, waste management and monitoring. The internet of things promises future new technologies when related to cloud, fog and distributed computing, big data, and security issues. By integrating all these issues with the internet of things, smarter applications will be developed as soon. This paper surveyed some of the most important applications of IoT with particular focus on what is being actually done in addition to the challenges that facing the implementation the internet of things concept, and the other future technologies make the concept of IoT feasible. IoT has been gradually bringing a sea of technological changes in our daily lives, which in turn helps to make our life simpler and more comfortable, though various technologies and applications.

Index Term : Bluetooth, GSM, GPRS IoT, RFID, Wi-Fi, ZigBee,

I. INTRODUCTION

Now a days, the Internet is now omnipresent and ever-present. The smart phones and smart gadgets have a greater contribution to internet. In the form of smart phones, now everyone is having a portable and internet connected computer in their pocket. With thousands of apps in use, internet has become a day to day incidents and a must have in the present generation. With the rise of 'Internet of Things' every possible thing that we use is going to get IT enabled.

The Internet of Things may be a hot topic in the industry but it is not a new concept. In the early 2000's, Kevin Ashton was laying the groundwork for what would become the Internet of Things (IoT) at MIT's AutoID lab. Ashton was one of the initiators who formed this notion as he searched for different ways that Proctor & Gamble could improve its business by connecting Radio frequency identification information to the Internet. The concept was simple but effective. If all objects in daily life were equipped with identifiers and wireless connectivity, these objects could be interacted with each other and be controlled by computers.

Internet of Things is quickly becoming a reality. From day to day our devices are getting smarter from smartphones to smart TV to smart car to Smart kitchen. Everything is now getting connected to Internet.

The purpose of IOT is solved not only by connecting things with internet but also communicate things with the physical world. The Internet of things refers to integration of IT infrastructure with the physical world where maximum of all devices and the home appliances could be managed and operated by a smart phone, the security cameras and locks can be accessed from anywhere in the Physical world, an umbrella can sense the environmental conditions and alert before going outside, the medicine caps start blinking indicating that it is the time to take dosage etc.

Internet of Thing is an architecture that consists of specialized hardware boards, Software systems, web APIs, protocols which together creates a smooth environment which allows smart embedded devices to be interacted to internet such that sensory data can be accessed and control system can be triggered over internet. Also devices could be connected to the cloud/network through a different technologies like Wi-Fi, Bluetooth, Zigbee, GPRS or Ethernet. The sensors collect data from their environments like a temperature sensor senses the temperature of the surrounding environment. Similarly, GPS location receiver and accelerometer in a smart phone are also sensors. A washing machine has water level sensor and a refrigerator has a thermostat to sense the temperature of its freezer. The actuators are devices that are responsible

for moving or controlling a mechanism of a system like the temperature controller in an air conditioner is an actuator.

The infrastructure of an IoT comprised of sensors, network interfaces, cloud servers and actuators all together form the core infrastructure of an IoT framework. These are the building blocks of IoT to make the most common objects of human use IT enabled.

Government, academia, and industry are involved in different features of research, implementation, and business with IoT. IoT opens across different application fields varying from civilian to defence sectors. These fields include agriculture, space, healthcare, manufacturing, construction, water, and mining, they are currently transitioning their legacy infrastructure to support IoT.

The Internet of Things will rapidly transform every aspect of how we work and do business. By interacting applications with their integrated systems, businesses are able to transform their industry significantly. Today almost 90% of all data generated by tablets, smartphones or connected appliances is never acted upon. Imagine you could change that. Imagine that image could be changed and use those data to create intelligent tools and interconnected systems or services allowing to optimize and accelerate business processes.

A number of crucial elements are very rapidly creating a perfect soil for the Internet of Things to thrive in. Smartphone penetration is increasing rapidly and the cost to connect internet has reduced as broadband internet is highly available. More and more devices are being equipped with Wi-Fi capabilities. So that everything that has an on and off switch can and will be connected in the future.

Internet of things affects every business. Mobile and the IoT will change the types of devices that connect into a company's systems. These newly connected devices will produce new types of data. The Internet of Things will help a business gain efficiencies, harness intelligence from a large range of equipment, improve operations and increase customer satisfaction. IoT will also have a more impact on people's lives. It will improve public safety, transportation and healthcare with better information and faster communications of this information. There are various ways that the Internet of Things could affect society and business. There are at least three major benefits of IoT that will affect every business. They are communication, control and cost savings.

II. LITERATURE REVIEW

The first internet connected appliance was a Coke machine at Carnegie Melon University in the early 1980s. The programmers could connect to the machine over the Internet, check the status of the machine and determine whether or not there would be a cold drink

awaiting them, should they decide to make the trip down to the machine. The phrase "Internet of Things" was first coined by technologist Kevin Ashton way back in 1999, when he discussed how data captured by humans would lead to a revolution once computers started generating and collecting data by themselves without any human input. Since then, the vision of the Internet of Things has evolved as a convergence of multiple technologies, varying from wireless communication to the Internet and from embedded systems to micro-electromechanical systems (MEMS).

Now this time Mobile networks already deliver connectivity to a wide range of devices and allow the development of new services and applications. This new trend of connectivity is going beyond tablets and laptops; to connected cars and buildings; smart meters and traffic control; with the prospect of intelligently connecting almost anything and anyone. This is what the GSMA refers to as the "Connected Life". The concept of sensor networks are described as which has been made viable by the convergence of micro electro-mechanical systems technology, wireless communications. The authors in Memon et al [1] developed an Electronic Information Desk System. Here they are using SMS based approach but different approach. The system is designed to work independently without any human intervention and when a student or employee needs any information, they will need to send an SMS to this system which will respond with the information required by user.

Many technical communities are vigorously pursuing research topics that contribute to the IoT. I.F. Akyildiz et al. [2] purpose of research is to understand the feasibility of IoT in bus transportation system in Singapore. The Singapore, which is technically very advanced but still has scope of advancement in their transportation system. By the using the IoT, system is developed for the consumer to understand and evaluate different bus options in an efficient manner. Secondary research was used to predict arrival timings of buses as well as the crowd inside each bus. A. Menon¹, et al. [3] presented a three layered network construction of Internet of Things communication method for high-voltage transmission line which involves the wireless self-organized sensor network, optical fibre composite overhead ground wire, general packet radio service and the compass navigation satellite system. The function of each layer of network, application deployment and management of energy consumption are studied. The method can meet the needs of interconnection between the monitoring centre and terminals, reduce the terminals and OPGW optical access points, and ensure the on line monitoring data transmission real time and reliable under the situation of remote region, extreme weather and other environmental conditions.

Now a days the IoT may be used in various research fields in this literature and are classified as massive scaling, creating knowledge and big data, architecture and dependencies, robustness, openness, security,



privacy, and human-in-the-loop.

N. Jagan et al. [4] dealt with an innovative rather an interesting manner of intimating the message to the people using a wireless electronic display board and is synchronized using the GSM technology. This will help us in passing any message immediately without any delay and is better and more reliable than the old traditional way of pasting the message on notice board. This proposed technology can be used in almost all public places, malls or big buildings to improve the security system and also make awareness of the emergency situations and avoid many dangers. Messages are displayed onto the display board by using various AT commands. GSM technology is used to control the display board and for passing the information through a message sent from authenticated user.

The term Internet of Things was first coined by Kevin Ashton in 1999 in the context of supply chain management. The main goal of IoT is to make a computer sense information without the aid of human effort remains the same.

III. APPLICATIONS

The applications for internet connected devices are enhanced. The applications are classified as consumer, enterprise (business), and infrastructure applications [6-7]. George Osborne, the former British Chancellor of the Exchequer, posited that the Internet of things is the next stage of the information revolution and referenced the inter-connectivity of everything from urban transport to medical devices to household appliances[8].

A. Smart Agriculture

It will monitor Soil nutrition, Light, Humidity etc and enhance the green housing experience by automatic adjustment of temperature to improve the production. Accurate watering and fertilization helps to improve the water quality and saving the fertilizers respectively.

B. Smart Home

IoT devices are a part of the larger concept of domestics. Large smart home systems utilize a controller to provide users with a central control for their devices. These devices can include lighting, heating and air conditioning, media and security systems [9]. The main benefit to connect these functionalities is the ease of usability. There are so many benefits of home automation such as ensuring lights and electronics are turned off. One of the major drawback of smart home technology is highly expensive [10].

C. Commercial Transportation

Transportation extends to business and manufacturing by optimizing the transport arm of organizations. It



reduces and eliminates problems related to poor fleet management through better analytics and control such as monitoring idling, fuel consumption, travel conditions, and travel time between points. This leads to product transportation operating more like an aligned service and less like a collection of contracted services.

D. Medical and healthcare

IoT devices allow to monitor health and emergency notification systems from remote location. These health monitoring devices can range from blood pressure and heart rate monitors to advanced devices capable of monitoring specialized implants, such as pacemakers, Fit bit electronic wristbands, or advanced hearing aids. Some hospitals have started to implement "smart beds" that can identify when they are occupied and when a patient wants to get up. It can also adjust itself to ensure appropriate pressure and support is applied to the patient without the interaction of nurses [11]. According to the latest research, US Department of Health plans to save up to USD 300 billion from the national budget due to medical innovations [12].

Specialized sensors can also be supported within living spaces to monitor the health and general well-being of senior citizens, while also ensuring that proper treatment is being provided and helping people regain lost mobility through therapy as well[13]. Some other consumer devices to encourage healthy living, such as, connected scales or wearable heart monitors, are also a possibility with the IoT [14]. More and more end-to-end health monitoring IoT platforms are introduced for antenatal and chronic patients, helping one manage health vitals and recurring medication requirements. The Research & Development Corporation a company that creates prosthetic limbs has created a battery-powered arm that uses electricity, a device that converts muscle group sensations into motor control. The arm is nicknamed Luke Arm after Luke Skywalker. This allows us to prevent substantial contamination and related disasters.

E. Extreme Weather

Though advanced systems in use allow deep monitoring, they suffer from using broad instruments, such as radar and satellites, rather than more granular solutions. New IoT promises more fine-grained data, better accuracy, and flexibility. Effective forecasting requires high detail and flexibility in range, instrument type, and deployment. This enables early detection and early responses to prevent loss of life and property.

IV. TECHNOLOGICAL CHALLENGES

The development of a successful IOT application is not an easy task due to multiple challenges. This section

discusses some of the major challenges that need to be addressed in order to build the IoT.

A. Society

Understanding IoT from the customers and regulators prospective is not an easy task for the following reasons:

- 1) Customer demands and requirements change constantly.
- 2) New uses for devices as well as new devices sprout and grows at breakneck speeds.
- 3) Inventing and reintegrating must have features and capabilities are expensive and take time and resources.
- 4) The uses for Internet of Things technology are expanding and changing often in uncharted waters.
- 5) Consumer Confidence: Each of these problems could put a dent in consumers' desire to purchase connected products, which would prevent the IoT from fulfilling its true potential.

B. Regulatory Standards

Regulatory standards for data markets are missing especially for data brokers; they are companies that sell data collected from various sources. Even though data appear to be the currency of the IoT, there is a lack of transparency about who gets access to data and how those data are used to develop products or services and sold to advertisers and third parties. There is a need for clear guidelines on the retention, use, and security of the data including metadata

C. Security

IoT has already turned into a serious security concern that has drawn the attention of prominent tech firms and government agencies across the world. The hacking of baby monitors, smart fridges, Barbie dolls, drug infusion pumps, cameras and even assault rifles are portending a security nightmare being caused by the future of IoT. So many new nodes being added to networks and the internet will provide malicious actors with innumerable attack vectors and possibilities to carry out their evil deeds, especially since a considerable number of them suffer from security holes. There are many reasons behind the state of insecurity in IoT. Some of it has to do with the industry being in its "gold rush" state, where every vendor is hastily seeking to dish out the next innovative connected gadget before competitors do. Under such circumstances, functionality becomes the main focus and security takes a back seat.

D. Privacy

The IoT creates unique challenges to privacy, many that go beyond the data privacy issues that currently exist. In terms of the latter, voice recognition or vision features are being integrated that can continuously listen

to conversations or watch for activity and selectively transmit that data to a cloud service for processing, sometimes which includes a third party. The collection of this information exposes legal and regulatory challenges facing data protection and privacy law. In order to realize the opportunities of the IoT, strategies will need to be developed to respect individual privacy choices across a broad spectrum of expectations, while still fostering innovation in new technologies and services.

E. Device Management

Gartner estimates that besides smart phones, tablets & PC, more than 25 billion "things" will be connected to the Internet by 2020. The number of sensors, devices and gateways will be very large and they will be spread over wide geographical dispersed locations. Make sure that the devices are completely automated and remotely manageable is a challenge. Managing all the devices and keeping an eye on failures, configurations and monitoring the performance and security of such large number of devices is definitely a challenge of IOT. The service providers will need to manage fault, configurations, performance and security of their inter-connected devices, and accountability for each aspect will be their ma-jor responsibility.

F. Compatibility and Longevity

IoT is growing in many different directions, with many different technologies competing to become the standard. This will occur problems and require the extra usage of hardware and software when connecting devices. Other compatibility issues are lack of standardized M2M protocols and diversities in firmware and operating systems among IoT devices. Some of these technologies will eventually become obsolete in the next few years, effectively rendering the devices implementing them useless. This is especially important, since in contrast to generic computing devices which have a lifespan of a few years, IoT appliances (such as smart fridges or TVs) tend to remain in service for much longer, and should be able to function even if their manufacturer goes out of service.

H. Intelligent Analysis

The last stage in IoT implementation is extracting insights from data for analysis, where analysis is driven by cognitive technologies and the accompanying models that facilitate the use of cognitive technologies.

1) Challenges facing the adoptions of intelligent analytics within IoT.

1) Inaccurate analysis due to flaws in the data and/or model: A lack of data or presence of outliers may lead to false positives or false negatives, thus exposing various algorithmic limitations.

2) Legacy systems' ability to analyze unstructured data: Legacy systems are well suited to handle structured



data; unfortunately, most IoT/business interactions generate unstructured data.

3) Legacy systems' ability to manage real-time data: Traditional analytics software generally works on batch-oriented processing, wherein all the data are loaded in a batch and then analysed.

V. TECHNOLOGIES

IoT has been gradually bringing a sea of technological changes in our daily lives and in making our life simpler and more comfortable, though various technologies and applications. The factors such as range, data requirements, security and power demands and battery life will dictate the choice of one or some form of combination of technologies. Depending on the application, the technologies play a vital role in the success of IoT since they are responsible for the connection between the objects. So we need a fast and powerful network to manage a large number of potential devices. Some of the major technologies on offer to developers

A. Near Field Communication

Near Field Communication (NFC) is a technology that enables simple and safe two-way interactions between electronic devices, and especially applicable for smartphones, allowing consumers to perform contactless payment transactions, access digital content and connect electronic devices. Essentially it extends the capability of contactless card technology and enables devices to share information at a distance that is less than 4cm. NFC technology makes life easier and more convenient for consumers around the world. Allows intuitive initialization of wireless networks and NFC is complementary to Bluetooth and 802.11 with their long distance capabilities at a distance up to 10 cm. now a days data exchange rate is approximately 424 kbps. During data reading, Power consumption in NFC is under 15ma.

B. Radio Frequency Identification

Frequency Identification (RFID) is a system that transmits the identity of an object or person wirelessly using radio waves in the form of a serial number. First use of RFID device was happened in 2nd world war in Britain and it is used for Identify of Friend or Foe in 1948. Later RFID technology is founded at Auto-ID center in MIT in the year 1999. RFID technology plays an important role in IoT for solving identification issues of objects around us and lead Radio to cost effective. The technology is classified into three categories based on the method of power supply provision in Tags: Active RFID, Passive RFID and Semi Passive RFID. The main components of RFID are tag, reader, antenna, access



controller, software and server. It is more reliable, efficient, secured, inexpensive and accurate. RFID has wide range of wireless applications such as distribution, tracing, patient monitoring, military apps etc.

C. Bluetooth

An important short range communications technology is of course Bluetooth, which has become very important in computing and many consumer product markets. It is expected to be key for wearable products in particular, again connecting to the IoT albeit probably via a smartphone in many cases. The new Bluetooth Low-Energy (BLE) or Bluetooth Smart, as it is now branded is a significant protocol for IoT applications. Importantly, while it offers similar range to Bluetooth it has been designed to offer significantly reduced power consumption. However, Smart/BLE is not really designed for file transfer and is more suitable for small chunks of data. It has a major advantage certainly in a more personal device context over many competing technologies given its widespread integration in smartphones and many other mobile devices.

Devices that employ Bluetooth Smart features incorporate the Bluetooth Core Specification Version 4. with a combined basic-data-rate and low-energy core configuration for a RF transceiver, baseband and protocol stack. Importantly, version 4.2 via its Internet Protocol Support Profile will allow Bluetooth Smart sensors to access the Internet directly via 6LoWPAN connectivity. This IP connectivity makes it possible to use existing IP infrastructure to manage Bluetooth Smart 'edge' devices. Standard: Bluetooth 4.2 core specification.

D. Zigbee

ZigBee, like Bluetooth, has a large installed base of operation, although perhaps traditionally more in industrial settings. ZigBee PRO and ZigBee Remote Control (RF4CE), among other available ZigBee profiles, are based on the IEEE802.15.4 protocol, which is an industry-standard wireless networking technology operating at 2.4GHz targeting applications that require relatively infrequent data exchanges at low data-rates over a restricted area and within a 100m range such as in a home or building. ZigBee/RF4CE has some significant advantages in complex systems offering low-power operation, high security, robustness and high scalability with high node counts and is well positioned to take advantage of wireless control and sensor networks in M2M and IoT applications. The latest version of ZigBee is the recently launched 3.0, which is essentially the unification of the various ZigBee wireless standards into a single standard.

E. WiFi

WiFi connectivity is often an obvious choice for many developers, especially given the pervasiveness of WiFi within the home environment within LANs. It requires little further explanation except to state the obvious that clearly there is a wide existing infrastructure as well as offering fast data transfer and the ability to handle high quantities of data. Currently, the most common WiFi standard used in homes and many businesses is 802.11n, which offers serious throughput in the range of hundreds of megabit per second, which is fine for file transfers, but may be too power-consuming for many IoT applications. A series of RF development kits designed for building WiFi based applications are available from RS.

F. Artificial Intelligence (AI)

Artificial Intelligence refers to electronic environments that are sensitive and responsive to the presence of people. In an ambient intelligence world, devices work in concert to support people in carrying out their everyday life activities in easy, natural way using Information and Intelligence that is hidden in the network connected devices.

VI. CONCLUSION

The growth potential for the embedded industry is enormous. Internet of things is a new technology which provides many applications to connect the things to things and human to things through the internet. This paper surveyed some of the most important applications of IoT with particular focus on what is being actually done in addition to the challenges that facing the implementation the internet of things concept, and the other future technologies make the concept of IoT feasible. Finally we discussed a number of applications resulting from the IoT that are expected to facilitate us in our daily lives. The goal is to achieve better levels of comfort while cutting overall expenditure. This kind of system useful because Human can make mistakes and forgot to switch off the machine at specific condition. The monitoring and controlling of machines in industry has become a major problem.

REFERENCES

1. Memon, Azam Rafique "An Electronic Information Desk System For Information Dissemination In

Educational Institutions."

2. I.F. Akyildiz, W. Su, Y. Sankarasubramaniam, E. Cayirci, Wireless sensor networks: a survey, Computer Networks (2002)

3. A. Menon¹, et al. " Implementation of internet of things in bus transport system of Singapore "Asian Journal of Engineering Research(2013).

4. N. Jagan Mohan Reddy, G.Venkareshwarlu, et al. "Wireless Electronic Display Board Using GSM Technology", International Journal of Electrical, Electronics and Data Communication, ISSN: 2320-2084 Volume-1, Issue-10, Dec-2013.

5. Gubbi, Jayavardhana, et al. "Internet of Things (IoT): A vision, architectural elements, and future directions." Future Generation Computer Systems (2013).

6. "The Enterprise Internet of Things Market". Business Insider. 25 February 2015.

7. Perera, C., Liu, C.H., JayaVardana, S. "The Emerging Internet of Things Marketplace from an Industrial Perspective: A Survey". IEEE Transactions on Emerging Topics in Computing.

8. "Budget 2015: some of the things we've announced".

9. Porup, J.M. "Internet of Things" security is hilariously broken and getting worse". June 2016.

10. Kang, Won Min; Moon, Seo Yeon; Park, Jong Hyuk (5 March 2017). "An enhanced security framework for home appliances in smart home". Human-centric Computing and Information Sciences. 3 November 2017.

11. "IoT In Healthcare Industry: See Why It Has A Promising Future".

12. Istepanian, R.; Hu, S.; Philip, N.; Sungoor, A. (2011). "The potential of Internet of m-health Things "m-IoT" for non-invasive glucose level sensing". Annual International Conference of the IEEE Engineering in Medicine and Biology Society.

13. Swan, Melanie (8 November 2012). "Sensor Mania! The Internet of Things, Wearable Computing, Objective Metrics, and the Quantified Self 2.0". Sensor and Actuator Networks.

14. Hruska, Joel (12 May 2014). "FDA approves the Deka arm, the first commercial mind-controlled prosthetic arm ExtremeTech". ExtremeTech.