A Survey on Internet of Things

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ABSTRACT

The creativity of IoT (Internet of Things) is boundless, with an amazing potential to improve billions of lives and make them feel comfortable. Imagine utilities and telecoms that can predict and prevent service outages, airlines that can remotely monitor and optimize plane performance, and healthcare organizations that can base treatment on real-time genome (identification of genes and inherited disorders) analysis. The business possibilities are endless. This actually makes an interaction between the device and humans more meaningful with the help of IoT. The paper may have endless possibilities regardless the condition that live in and discusses the applications of IoT in various sectors. The integration of AI (Artificial Intelligence) and IoT will have various opportunities to explore and create a better world for all the living beings in this planet.

Keywords : IoT, Artificial Intelligence, applications, Bluetooth, wi-fi

I. INTRODUCTION

The IoT is already in effect, currently there are around 9.5 billion of devices connected to the Internet of Things. The vast network of devices connected to the Internet, including smart phones and tablets and almost anything with a sensor on it – cars, machines in production plants, car engines, oil drills, wearable devices, and more. These "things" collect and exchange data. The machine-to-machine (M2M) concept has brought IoT even closer to the limelight and most of the industry has already started using this. With the help of AI integrated to the IoT, it will be able to understand the behaviors and act/function accordingly. All the information is stored in an invincible world of data that is created by product, sensors, mobile devices, websites and more.

This paper is organized as follows the Section II discuss the overview of Internet of Things (IoT), Section III provides the technologies of IoT, Section IV describes the development of IoT and Section V discussed the applications of IoT in various field and finally conclusion presented in the Section VI.

II. OVERVIEW OF IOT

Worldwide spending on the IoT will reach $772.5 billion next year, marking a 14.6% jump over 2017 revenues, according to a new forecast from IDC and manufacturing companies will lead the way. The market research firm said the IoT will enjoy a compound annual growth rate (CAGR) of 14.4% over five years, becoming a $1.1 trillion market in 2021. Hardware will be "the largest technology category" in 2018, IDC said, with $239 billion going primarily toward modules and sensors and some lesser investments in infrastructure and security. The Internet of Things (IoT) basically means any-thing connected to the internet and that could be operated remotely without the human's involvement. Bluetooth operates at 2.4 GHz with a range of less than 33 feet while WiFi works at 2.4 GHz and has a range of around 60 feet depending on obstructions. Audio signals work at much lower frequencies around 20 to 20,000 Hz. Audio signals can traverse over 500 feet using simple speakers and microphones that require very little power. The amount of data

that can be transmitted with audio signals, however, is much less than with Bluetooth and WiFi therefore the consumers are left with no option but to connect to the internet. Few basic things for IoT can be viewed as an advanced technology as mentioned below:

1. Anything is identifiable Anytime and Anywhere
2. Anything can communicate at Anytime and Anywhere
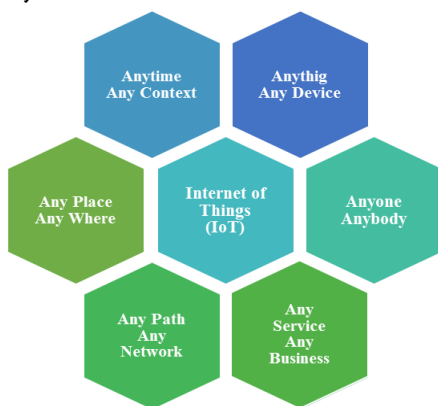3. Anything interacts Anywhere and at Anytime

Fig -1: Scenario of IoT

III. IOT TECHNOLOGIES

The main objective of the IoT is exchange any information without manual input between two devices automatically. It is qualified users to bring physical objects into the scope of cyber world. The element of technologies that includes RFID, nano technology, embedded technology and sensor technology. IoT is combined with all these technologies. It is the global network based on the hardware resources of internet contents objects together. The possible by different tagging technologies like NFC, RFID and 2D barcode. It involves sophisticated technologies of computer and communication network outside, still including new supporting technologies of IoT, such as Controlling Technology, Information Technology, Remote Information Transmission Technology, Remote Communication Technology and Sea Measures Information Intelligence Analyzes etc., The

automated data takes place using particular technologies, which are explained in below section.
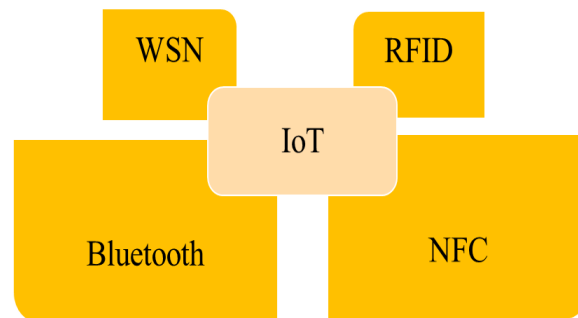

Fig -2: Components of IoT

3.1 RFID (Radio Identification)

RFID is the basic and core networking of the build of IoT [8]. The RFID referred to system transmits, using radio waves to automatically identify a person or an object wirelessly in the form of a serial number, tracking tags or electronic barcode. Information about a tagged object of by searching database entry and an internet address that relates to technologies [9]. Two types of RFID tags are available, Active and passive tags.

3.2 WSN (Wireless Sensor Networks)

A wireless sensor network (WSN) is a collection of distributed sensors that monitor physical or environmental conditions, such as temperature, sound, and pressure. Data from each sensor passes through the network node-to-node [10]. WSN Technologies: There are multiple candidates that can be selected as WSN technologies. Example: Wi-Fi [11].

3.3 NFC (Near Field Communication)

Near Field Communication (NFC) is a set of short-range wireless technology at 13.56 MHz, typically requiring a distance of 4 cm. NFC technology makes life easier and more convenient for consumers around the world by making it simpler to make transactions, exchange digital content, and connect

electronic devices with a touch. Allows intuitive initialization of wireless networks and NFC is complementary to Bluetooth and 802.11 with their long distance capabilities at a distance circa up to 10 cm [12].

3.4 Bluetooth

Bluetooth wireless technology is an inexpensive, short-range radio technology that eliminates the need for proprietary cabling between devices such as notebook PCs, handheld PCs, PDAs, cameras, and printers and effective range of 10 - 100 meters. At first in 1994 Ericson Mobile Communication company started project named "Bluetooth". It is used for creation of Personal Area Networks (PAN). A set of Bluetooth devices sharing a common channel for communication is called Piconet. This Piconet is capable of 2 - 8 devices at a time for data sharing, and that data may be text, picture, video and sound. The Bluetooth Special Interest Group comprises more than 1000 companies with Intel, Cisco, HP, Aruba, Intel, Ericson, IBM, Motorola and Toshiba.

IV. DEVELOPMENT OF IOT

The internet of things is growing steadily at a fast pace and will be soon coming to revolutionize virtually every aspect of modern life. IoT development projects can be found anywhere and affordable, the advanced technology is the driving force behind this fast-growing phenomenon. Simpler and smaller, this is makes it more easily to access hardware and the flexibility to use common programming languages make it easier than ever before to develop these embedded IoT systems. Mainly, the IoT has attracted the attention of numerous companies all across the globe, with many creating internal business units dedicated to IoT development. IoT has become a top business initiative for many companies. IoT is still taking shape, as making incredible strides as a new frontier for the connected world in which people, devices, environment and virtual objects are connected all together for better interaction.

4.1 Developing an IoT Device

From a development standpoint, creating IoT devices hinges on embedded programming. As there are both kinds of software and hardware perspective to be considered as an account while creating an IoT prototype. A small computer is embedded in the object or a device and the installed software that makes it run. The software used in systems and software development kits (SDKs) are now using programming languages and operating systems that engineers already used for mobile and web development, which enables the accessibility to many more developers.

4.2 IoT Development Platforms

For a starter, one need a platform to produce a development team to develop and launch the product itself. The most popular hardware/software platform for creating interactive IoT devices and objects is the Arduino platform, which includes a physical board processor, shields with individual libraries of a C code and an integrated development environment (IDE) for writing, compiling, and uploading code.

4.3 IoT Hardware and Operating System

IoT hardware components include low-power boards, single-board processors (like the Arduino Uno), field-programmable gate arrays (FPGA) and smaller boards like shields are plugged into the main boards to extend the functionality by abstracting specific functions like GPS, light and heat sensors, or interactive displays. Another well-known IoT platform is Raspberry Pi. A "tiny affordable computer" that can house a web server that fits in the palm of hand, shortly termed as "RasPi". It has enough processing power and memory to run Windows 10 IoT Core. RasPi is great for more heavy-

duty processing, especially when using the Python programming language.

4.4 IoT Software and Programming Languages

At earlier stages of IoT device development embedded systems had a certain set of limitations consider low processing power and smaller amounts of RAM and storage. The most commonly used operating systems for these embedded computers are Linux or UNIX-like OS like Ubuntu Core or Android. The programming languages usually used in IoT devices and objects are C & C++, Java, Nod.js and Javascript, Python, B# and languages designed for I/O Programming. The common open source tools for internet of things are Oracle, Ayla Networks, Arkessa, Open Sense, Jasper and Swarm and etc.

V. IOT APPLICATIONS

An application of IoT is wide and versatile over the world in every nook 'n' corner. From Building automation and smart factories to wearable, the IoT has inspected to every aspect of daily life and future needs. As IoT develops easier hardware and software with accessibility to interconnect anything to internet networks. IoT applications is mostly based on smart up things and usage like building & home automation, smart cities, smart manufacturing, automotive, wearable, health care, precision agriculture, circuit design, GPS programming and 3D design. The internet of things devices developed known commonly are Amazon Echo, Smart home, Fitbit One, Wearables, Barcelone, Smart cities, AT&T - Connected Car. For concern as hardware they include things like wearables, connected home devices, and many more.

Some of the open source developer tools are Arduino, Home Assistant, ThingSpeak, Device Hive and Zetta. While taking consideration over the professional developer tools they stand upright in an excellent tools for developing IoT applications, TESSEL 2, LOSANT, IFTTT, IBM WATSON, PLATFORMIO and DRONESMITH.

At the University of Tokyo researchers have created an electricity conducting ink that can be printed on to clothing and can be used to measure heart-rate and muscle contractions so that people could easily monitor their vital signs. IoT technology can also help in emergency situations if someone has a heart-attack or a stroke relevant data from the patient's medical history can be sent to the doctor before the ambulance reaches the hospital giving physicians few more crucial minutes to figure out the best treatment possible. Figure 3 shows the applications of IoT.
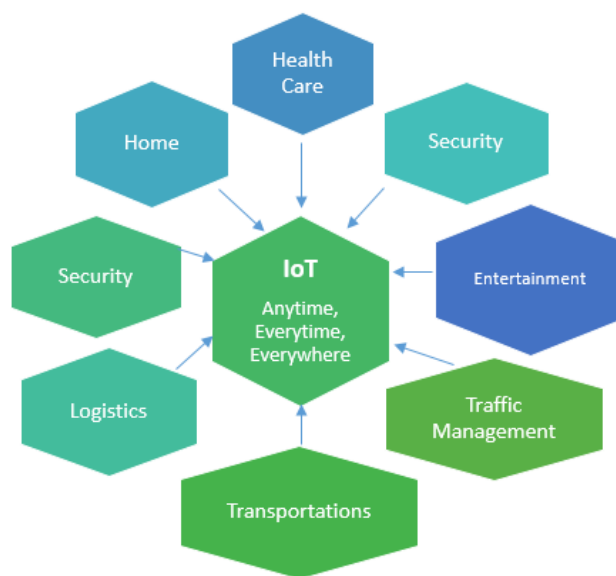

Fig -3: Applications of IoT

VI. CONCLUSION

In overall this has always been a human's greatest vision and is now in reality. It can be beneficial to each and every one out there as it plays a crucial role around all the major segments such as Smart-City, Energy, Agriculture, Industries, Connected Cars, Smart retail and also supply chains. The IoT is in act mostly in America and Europe globally. The Internet and enterprise IT has always focused on secure the data. IoT must focus on securing all of the "things" use in lives and businesses—from smart thermostats to connected vehicles, to military drones. Traditional closed operational systems in factories or buildings are now open and connected, and consumer device vendors need to learn the importance of comprehensive risk management.

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