

INTERNET OF THINGS: DIMENSIONS, EVOLUTION, CHALLENGES AND ITS IMPACT

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Abstract— (IoT) is the interconnection between the day to day computing devices via the internet and enabling them to send and receive data with each other. A device which is connected to the network in the IoT can be controlled by its user from any part of the world. IoT is the part of Industry 4.0 and it is the next level of automation for smart homes and smart factories. There is innumerable number of ways that IoT can help in making routine work simple is to be discussed. The opportunity to improve the privacy and security systems are also discussed. This article defines the evolution of IoT and the various dimensions, impact and challenges of the IoT.

Keywords— Interconnectivity, Computing Devices, Network, Industry 4.0, Automation, Privacy, Security Systems

I. INTRODUCTION

The Internet of Things (IoT) came into reality in the recent times. Nevertheless, we have been hearing several talks related to machines communicating with each another since early 1800's.

Internet of Things means "Sensors and actuators inserted in physical objects are having a linkage through wireless and wired networks, frequently using the same Internet Protocol (IP) that links the Internet".

The Internet Connection is the notable aspect of the Internet of Things starting from DARPA in 1962 till the evolution of

APPANET in 1969. However in 1980s, increasing assistance from commercial service facilitators in the use of ARPANET, led to the evolution of modern internet. In the early 1993, Global Positioning Satellites (GPS) has come into a reality with a reliable and viable system of 24 satellites, which was instantly followed by private satellites placed in landlines and also orbit providing essential [2].

Another way to improve a Characteristic of IoT was IPV6's significant idea to expand the space of the address. To phrase it in another way, we are not lacking behind in the internet address any time soon. [14]

II. LITERATURE REVIEW

[8] By introducing reference architecture, IoT -based smart Industrial plants can be defined with a focus on the sustainability views. And then based on the IoT paradigm, managing the energy in smart industrial plants was proposed.

[10] Described IoT as a shift in the paradigm in manufacturing technology. Having observed the transformation in the production process to the product in terms of awareness and Responsibility of an IoT, Every product element in the manufacturing process has recognition and guides the production devices on what has to be done and where the shipment does is needed. This shift enables the operations to allow mass customization, service and its feedback, in response from products in the market (e.g., stats of people's usage, failures, required

maintenance, repairs etc.). In order to enable the total potential of industry 4.0 new methods and tools need to be developed, allowing innovative production processes. In general, present procedures either aiming at scale effects using highly planned processes (i.e. lot of inexpensive similar products) or scope effects (i.e. cheaper individual products). Joining these effects is a vital dilemma in Manufacturing.

[12] Identified Internet of Things in the three greater measuring criteria's like orientation things, schematic and Internet. Internet is also called as middle ware of this Network. These are the prime motives behind the Internet of Things which facilitates ubiquitous interconnections to provide accessibility anywhere, any time and in all possible means. Middle ware is getting affected with greater challenges to offer a clear pathway for analytics in big data and its challenges, high cognition, etc.

IoT is a way of interconnecting many physical devices to the Internet so as to collect and share information. There is a step by step method to inspect IoT technology in terms of standards and its patents. Complete analysis includes all the vital standard landscape along with patents landscape based on the regulatory governing standards of the organizations.

[13] IoT is a new evolution which results from the combination of sensors in industries, Speed computing, and pervasive communication Networks. This is a transformation where many industrial devices, starting from old to new, have started to use communication technologies with IP. The Internet of Things is basically a philosophical idea that tracks the movement when we begin combining, computing and communicating technology into large number of "devices" which we regularly use at home and work. That pattern has transitioned, as the market started to supply low-cost communication technologies which is Internet based and its computing devices. This perfect storm of vast broadband networking and low computing cost has allowed the Internet of Things to emerge. Now, the IoT includes everything ranging from home appliances, watches, light bulbs, systems with automation, to even our cars and truck vehicles. In technical terms, the IoT is a accumulation of physical artefacts that includes embedded systems of computing, Communication Mechanisms, mechanical and electrical Systems thereby facilitating Internet-based communication and data exchange. Operational technology (OT) also known as the traditional software and hardware system is found within the environments of Industries. Some examples comprise of distributed control systems

(DCS), programmable logic controllers (PLC), human-machine interface (HMI) etc. They "govern" the various procedures happening within an industrial environment; therefore, they are also called as Industrial Control Systems (ICS). These traditional control systems have instantly began to use Internet-based communication technologies so that they can be integrated into manufacturing organizations' information technology (IT) systems and infrastructures. This OT/IT integration movement is presently happening in large scale across various industries, and it facilitates a technological alignment with the needs of future smart manufacturing systems and Industry 4.0.

III.NEED FOR STUDY

IoT, as a theory, was officially named in 1999. In early 1990's, By using Internet Local programmers it could connect to the refrigerated appliance and they could check whether a drink is available and also they can check if it is cold. As a result, they can save some time in travelling to the refrigerator for the drink [5]

By 2013, the IoT developed using multiple technologies into a Network which includes the Internet, micro-electromechanical systems (MEMS), wireless communication and embedded systems etc. The traditional fields of robotics (which consists of the automation of homes and bigger buildings), sensor networks (wireless), control systems, GPS etc. supports the IoT [11].

In Laymen's Language, the IoT can connect in any device with a on/off switch having an Internet Connection. It would be able of anything starting from cell phones, building maintenance and till the Airplane's Jet Engine. Health care medical devices, like a bio chip transponder or a heart monitor implant in a farm animal, can share data via network. Ring, a doorbell that connects to your smart mobile, illustrates a fabulous example of a latest change to the IoT. When the doorbell is pressed the ring signals you and then you will get the image of the person before you speak with them.

In addition to that, an astonishing fact is that the idea of IoT by Ashton emphasizes on making use in technology of radio frequency identification (RFID) so as to connect many computing devices together. Another way to say but remarkably varied from today's Internet of Things, which depends predominantly on IP network to make devices swap a wide range of data.

Wireless networking which was started in 1999 is still in its starting stages, and cellular networks have still not switched to a completely IP-based configuration. By having such conditions, would make it much difficult to think of an IoT where in all connecting devices distinct IP addresses have.

Kevin Ashton, (MIT)'S Executive Director, was the first person to mark out the IoT during the Seminar in 1999 for Procter and Gamble. During his oration, Mr. Ashton mentioned that: "Dependence on human beings for information was taken care of by today's computers. About 50 pet bytes (a peta byte =1,024 terabytes) of information available on the Internet. That data was created and captured by humans by downloading a video, taking a digitalized picture or bar code scanning. The problem is, people are not having sufficient time, attention, and accuracy.

In the real world, Computing Devices are not great at capturing data about things. If we had computer systems that knew everything, using data they collected without taking any support from humans, we can track and measure every possible data and greatly minimize the waste. One would know when things need to be replenished, serviced or repaired and whether they were fresh or old Items are better."

Kevin Ashton had explained that Radio Frequency Identification (RFID) was the precondition for the Iot and he has came up with a conclusion that if tagging happens for all computers, computers can track, manage and maintain a record. To some extent, the tagging things is done by the kind of technologies like QR codes, barcodes and digital water marking. Inventory control is one of the more notable uses of the IoT. [1]

IV. NEW WAYS OF CONNECTING DEVICES

When talking about IoT, Contemplate about this notion, "any computing device is capable and can be interconnected with other computing devices". Internet of things is prepared for innovative ideas to be added to the activities already in existence. Consider an alarm waking you up at 5AM, and at the same time giving signal to the coffee maker to automatically switch on and start brewing coffee. Also think about your printer getting aware on when your paper's are getting over, and instantly ordering more. Think about the watch on your wrist keeps telling you when the real productivity does happened in your work. This shows how an IoT can be used in a systematic manner of organizing for things in the form of transportation networks. And also

"Smart cities" could use them to reducing current waste and optimizing the energy usage.

In real world scenario, the IoT facilitates an almost extensive supply of possibilities to interconnect our devices (Things). Speaking about Innovation and creativity, it is a broader field, with an unlimited number of paths to "connect the things." That will give an exhilarating time for creative members, in part, because we cannot completely unlock the capacity of these interconnections. As a result, IoT offers both opportunities and possible security problems. However; there is position of defensiveness for the purposes of privacy and security [2].

V. CHALLENGES FACED BY IOT

Even though we are having a wide range of applications in the IoT, but it has its own issues to overcome. Since large amount of data is collected and transferred through the internet the privacy and security may be compromised in some cases.

a) Privacy of the Customers.

As video cameras and sensors become more prevalent, mainly in public places, consumers are unaware of the data about that is being accumulated without their knowledge, and there is no means to deny it.

There are lot many individuals who are not comfortable with the notion of firms gathering their data, and even more worrisome is selling that data to everyone. To be honest, aged people abhor having data gathered by firms more than millennial, but as per one survey, around 45% of "all" participants have not believed in firms to use their private information for their privacy protection.

Rightly, choices regarding privacy are like an on/off switch. The customer is enforced to give up all his/her privacy (or else the no access for the customer in terms of customer service). That has made continuous talks regarding privacy of the consumers and how best to educate them about data access.

In the first part of IoT series, we initialized the trade of interconnected networks and its possibility to get bigger and faster. Organizations are silently gathering consumer's private data to take the optimized decisive actions in business. However, latest reports spotlighted consumer discomfort with the globally interconnected devices.

As per the survey conducted by Accenture in 2015 for more than 28,000 consumers in 28 countries, opinions of 47% says that they have no thought to purchase a device of IoT because of the challenges over data authenticity and security issues. Federal Trade Commission's of U.S in 2015 report documented that security and privacy IoT device shortfalls, and made manufacturers to take a more proactive approach to accumulated informed agreement and stringent security audits in their products.

Customers concerned with the agreement, use and clarity associated with the data that is being stored by IoT devices. Whereas the PIPEDA facilitates basic guide lines for how firms can gather, use or reveal personal information for business purposes, and also interconnected devices need further traditional methods in providing consent.

Interconnected devices make standards of privacy principles by PIPEDA complicate. As mentioned in the recent reports of Canada's Privacy Commissioner, IoT devices are made to operate slowly in the live background. Data collection unawareness by interconnected devices, making consumers not able to offer meaningful consent.

In the Recent times, Privacy Commissioner of Canada's office stated that it is integrating a privacy implications of IoT health devices by doing a global study. That paved a way to the "privacy sweep," which is controlled and coordinated by the Global Privacy Enforcement Network, is many firms collaboration which are privacy across the world with the aim of enhancing privacy rights awareness and responsibilities for stakeholders and business Firms. Issues figured out because of the "sweep" could result in engagement and an outreach with firms in the business of interconnected devices and an authority of enforcement action.

b) Security

Providing security after emergence of IoT is a major issue. It is possible for anyone to hack in to your coffee maker and then accessing your network is possible because the devices are interconnected. More security threats are faced by business across the world by the emergence of IoT. Regarding data sharing, privacy become an issue when using internet of things. Issues are more when billions of devices are interconnected. Business organization dealing with huge amount of data face issues with sorting data they, they need to find a secure method to sort data along with that they should still be able to get access and analyze abundance of data these devices being produced.

There is greater raise in the interconnected devices which continues to increase, industry, government, and consumers will reap the uses of improved convenience and productivity. The potential pros of Internet of Things for healthcare, in smart homes, and on roadways are humongous. But the improvement of IoT also poses new threats to safeguarding these devices, applications, and networks, and to privacy and security.

VI.CONCLUSION

Internet of things is another level of automation where all the devices are interconnected, everything in our life including objects; this is a new technology. It is an ecosystem with increasing complicity. IoT makes application of things much faster and accurate, which in turn will enhances greater aspects of our life at home, work and also in between. Everything starting from our refrigerators to smart kitchen, from parking space to smart houses, everything is digitalized. IOT is bringing everything device into digital means each day, that will more likely make IOT a multi-trillion-dollar industry in the foreseeable future. Introduction of "IOT as a Service" technology is one possible result in the foreseeable future. If digital intervention in devices and object keep on increase like this we can say that we are using flavors of technology as service now days. However, we have to come across lot many obstacles before we reap the advantages of IoT. Scholars and researchers around the world are talking about IoT to seek understanding and to identify the IoT in our life.. As of now the best thing that we can do is educate and stimulate ourselves about what the IoT is and the potential impacts and benefits that can be seen on how we work and live [6].

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