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INTERNET OF THINGS FUTURISTIC VISION AND CHALLENGES

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ABSTRACT

IoT is defined by ITU and IERC. Internet of Things is the network of physical objects-devices, vehicles, software, buildings and other items embedded with electronics, sensors, and network connectivity that enables these objects to collect data and exchange data. The internet of things allows objects to be sensed and controlled remotely across existing network infrastructure [1].Major ICT players like GOOGLE, Apple, and CISCO takes the major significant decisions to position themselves in IoT landscape. The IoT is expected to connect more than 28 billion —things to the internet by 2020, ranging from wearable devices such as smart watches to automobiles, appliances, and industrial equipment [2]. In this paper, we will take a look at different IOT solutions developed so far; their functionalities as well as technology used and thus conclude the various challenges to be focused on to give way to better solutions that will help the community.

INTRODUCTION

The term of Internet of Things (IoT) was invented in 1998 which is a network of networks where typically, a large number of objects or sensors are connected through communications and information infrastructure to provide value-added services. It assured in creating a world where all the objects around us are connected to the internet and therefore the communication to each other with minimal human intervention. The ultimate aim of IoT is to create a better world for human beings, where the objects around us understand our desire and hence act accordingly without any explicit instructions. [3]

According to another definition, The Internet of Things (IOT) has been defined in a variety of ways. Generally Speaking, it refers to a global, distributed network (or networks) of physical objects that are capability of sensing or acting on their environment, and able to communicate with each other, other machines or computers. Such 'smart' objects or devices come in a various range of sizes and capacities, including simple

objects with embedded sensors, trains, household Appliances, industrial robots, cars, and wearable objects such as Bracelets or shirts, watches. [4].

All these things have certainly changed the entire look of the word _connectivity‘. Internet of Things is highly on the rise and it can be observed from the areas that are completely under its effect. From smart cities, environment, health, energy, vehicle, transport, public safety to our daily essentials, Internet of Things has completely revitalized these areas.

IoT FUNCTIONALITY

IoT is sometimes understood as being synonymous with ―smart‖ systems: smart wearable, smart homes, smart city, smart environment, smart enterprises and so on. \This Section discusses the functionality review of IoT solution available in different sectors:

1. ***Smart Wearable:*** Smart wearable are networked devices that can collect data, track activities, and customize experiences to users‘needs and desires. Wearable solutions are designed for a variety of functions and where on a different of part of body such as the head, fingers, legs, eyes, wrist, hands, or embedded into different element of attire. [3].Wearable devices can be classified according to two standards. One standard is based on product forms, including head-mounted (such as glass and helmet), body-dressed (such as coat, trousers, and underwear’s), hand-worn (such as gloves, bracelet, and watch), and foot-worn (such as shoes and socks). Another standard is based on product functions, including healthy living (such bracelet and smart as sport wristband), information consulting (such as smart glass and smart watch), and somatosensory control (such as somatosensory controller). [5]

2. ***Smart Homes:*** Smart Homes is the integration of technology as well as accommodations through home networking for a better quality of living. A Iot technologies cognate to Astute Home are emerging.[6]. Some perspicacious home solutions additionally fixate on people in their circadian activities and on health care monitoring. Due to the immensely colossal market value in concrete time, more and more keenly intellective home solutions are making their way into the market. From the academic perspective, keenly intellective energy and resource management, human–system interaction, and activity management have been some of the major focus.[7]

3. **Smart City:** A 'perspicacious city' is an urban region that is highly advanced in terms of overall infrastructure, sustainable authentic estate, communications and market viability. It is a city where information technology is the principal infrastructure and the substratum for providing essential accommodations to denizens. There are many technological platforms involved, including but not constrained to automated sensor networks and data centers. Though this may sound futuristic, it is now liable to become an authenticity as the _smart cities‘ kineticism unfolds. Urban IoTs, in fact, are designed to fortify the Astute City vision, which aims at exploiting the most advanced communication technologies to fortify integrated-value accommodations for the administration of the city and for the denizens. The application of the IoT paradigm to an urban context is of particular interest, as it responds to the vigorous push of many national regimes to adopt ICT solutions in the management of public affairs, thus realizing the soi-disant Keenly smart City concept [8].

4. ***Smart Environment:*** The Keenly smart Environment in a city comprises of Perspicacious Governance, Astute Mobility, Perspicacious Utilities, Keenly smart Buildings.[9].Services enabled by the IoT paradigm in astute city environment might ranges from Monitoring health building, Management of waste, Monitoring air quality, Monitoring noise, Traffic congestion ,keenly smart parking , keenly smart lightning, dehydrogenate monoxide quality monitoring, natural disaster monitoring ,astute farming and many more. For instance, Airqualityegg [10] is a community led sensor system that avails the community to have better air quality. AmritaWNA[11] is a wireless landslide detection system that is capable of relinquishing alerts about possible landslides caused by torrential rain in the season. There are many more solutions available providing diverse solutions in different areas mentioned above.

5. ***Smart Enterprise:*** Enterprise IoT solutions are designed to support infrastructure and more general purpose functionalities in industrial place. Current enterprise strategies already acknowledge a few interfaces to smart items, but with increased communication and computational capabilities of these items, the power shifts towards the edges of the network. Intelligent mechanisms for data aggregation, filtering, fusion and conversion can be deployed to and executed at the network edge, or within the network, as appropriate.

   Software is already the key innovation driver in many industries and many new business models of the future will heavily rely on the use of such items. We see with the expanded definition of the Internet of Things many other interesting application domains. Some of the most promising ones are Manufacturing, supply chain

integrity, energy and production, health, transportation and logistics. For Instance, Wattics [9] is a smart metering solution that manages energy consumption at the individual appliance and machine level. Canatalouspesys [10] allows the user to keep track of stocks in vending machine remotely. Timely and optimal replenishment strategies are determined from context info related to usage patterns. Engaugeinc [11] is a remote fire extinguisher monitoring system.

6. ***Smart Agriculture:*** IoT sensors capable of providing farmers with information about crop yields, rainfall, pest infestation, and soil nutrition are invaluable to production and offer precise data which can be used to improve farming techniques over time. Of the many advantages IoT brings to the table, its ability to innovate the landscape of current farming methods is absolutely groundbreaking. IoT sensors capable of providing farmers with information about crop yields, rainfall, pest infestation, and soil nutrition are invaluable to production and offer precise data which can be used to improve farming techniques over time. New hardware, like the corn-tending Rowbot, is making strides by pairing data-collecting software with robotics to fertilize the corn, apply seed cover-crops, and collect information in order to both maximize yields and minimize waste.

IOT TECHNIQUES

There are three IoT components which enables seamless pervasive computing: a) Hardware - made up of sensors, actuators and embedded communication hardware b) Middleware - on demand storage and computing tools for data analytics and c) Presentation - novel easy to understand visualization and interpretation tools which can be widely accessed on different platforms and which can be designed for different applications.[.The IoT covers a huge scope of industries and applications. This Section focuses on some of the technologies that are driving the IoT, from popular communication options to the different software and data brokerage platforms managing the data exhaust from these systems.

1. Radio Frequency Identification (RFID)

A radio-frequency identification system uses tags, or labels attached to the objects to be identified. Two-way radio transmitter-receivers called interrogators or readers send a signal to the tag and read its response. The readers generally transmit their observations to a computer system running RFID software or RFID middleware. RFID tags can be either passive, active or battery assisted passive. An active tag has an on-board battery and

periodically transmits its ID signal. A battery assisted passive (BAP) has a small battery on board and is activated when in the presence of a RFID reader.[12] It is more reliable, efficient, secured, inexpensive and accurate. RFID has an extensive range of wireless applications such as Road tolls, Building Access, Inventory, tracing, patient monitoring, military apps etc.

2. Wireless Sensor Networks (WSN)

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. [13]. the components that make up the WSN monitoring network include:

WSN nodes are low cost devices, so they can be deployed in high volume. They also operate at low power so that they can run on battery, or even use energy harvesting. A WSN node is an embedded system that typically performs a single function (such as measuring temperature or pressure, or turning on a light or a motor).[13] A WSN edge node is a WSN node that includes Internet Protocol connectivity. It acts as a gateway between the WSN and the IP network. It can also perform local processing, provide local storage, and can have a user interface. WSN Technologies: There are multiple candidates that can be selected as WSN technologies .Few of them are discussed here a single function (such as measuring temperature or pressure, or turning on a light or a motor). [13]

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 Wi Fi - The first obvious networking technology candidate for an IoT device is Wi-Fi, because it is so ubiquitous. Certainly, Wi-Fi can be a good solution for many applications. Almost every house that has an Internet connection has a Wi-Fi router. However, Wi-Fi needs a fair amount of power. There are myriad devices that can‘t afford that level of power: battery operated devices, for example, or sensors positioned in locations that are difficult to power from the grid.

 IEEE 802.15.4: One of the major IoT enablers is the IEEE 802.15.4 radio standard, released in 2003. Commercial radios meeting this standard provide the basis for low-power systems. This IEEE standard was extended and improved in 2006 and 2011 with the 15.4e and 15.4g amendments. Power consumption of commercial RF devices is now cut in half compared to only a few years ago, and we are expecting another 50% reduction with the next generation of devices.[13]

3. Addressing schemes

[The ability to uniquely identify Things_ is critical for the success of IoT. This will not only allow us to uniquely identify billions of devices but also to control remote devices through the Internet. The few most critical features of creating a unique address are: uniqueness, reliability, persistence and scalability. Every element that is already connected and those that are going to be connected must be identified by their unique identification, location and functionalities. The current IPv4 may support to an extent where a group of cohabiting sensor devices can be identified geographically, but not individually. The Internet Mobility attributes in the IPV6 may alleviate some of the device identification problems; however, the heterogeneous nature of wireless nodes, variable data types, concurrent operations and confluence of data from devices exacerbates the problem further IPv6‘s addressing scheme provides more addresses than there are grains of sand on earth — some have calculated that it could be as high as 1030 addresses per person (compare that number to the fact that there are 1028 atoms in a human body!). With IPv6, it is much simpler for an IoT device to obtain a global IP address, which enables efficient peer-to-peer communication.[13]

4. Data storage and analytics

One challenge is that this highly measured world will create data at an astonishing rate, even if not all the data is or ever will be interesting or valuable. Storage, ownership and expiry of the data become critical issues. Hence data centers which run on harvested energy and which are centralized will ensure energy efficiency as well as reliability. The data have to be stored and used intelligently for smart monitoring and actuation [14]. The primary value in an IoT system is in the ability to perform analytics on the acquired data and extract useful insights.

CHALLENGES IN IOT

This section discusses some of the major challenges that need to be addressed in order to build the IoT. The solutions for these issues need to be come from technological, social, legal, financial, and business backgrounds in order to receive wide acceptance by the IoT community:

1. *Standards and interoperability*

Standards are important in creating markets for new technologies. If devices from different manufacturers do not use the same standards, interoperability will be more difficult, requiring extra gateways to translate from one standard to another. In addition, a company that controls different parts of a vertical market (e.g. the acquisition of data, its integration with other data streams, and the use of those data streams to come up with innovative solutions or to provide services) may dominate a market, stifling competition and creating barriers for smaller players and entrepreneurs. Differing data standards can also tend to lock consumers into one family of products: if consumers cannot easily transfer their data when they replace one device with another from a different manufacturer, they will in effect lose any benefit from the data they have been accumulating over time.

2. *Security*

As the IoT connects more devices together, it provides more decentralized entry points for malware. Less expensive devices that are in physically compromised locales are more subject to tampering. More layers of software, integration middleware, APIs, machine-to-machine communication, etc. create more complexity and new security risks. Expect to see many different techniques and vendors addressing these issues with policy-driven approaches to security and provisioning.

3. *Trust and Privacy*

With remote sensors and monitoring a core use case for the IoT, there will be heightened sensitivity to controlling access and ownership of data. (Note that two recent high-profile security breaches at Target and Home Depot were both achieved by going through third-party vendors‘stolen credentials to gain access to payment systems. Partner vetting will become ever more critical.) Compliance will continue to be a major issue in medical and assisted-living applications, which could have life and death ramifications. New compliance frameworks to address the IoT‘s unique issues will evolve. Social and political concerns in this area may also hinder IoT adoption.

4. *Complexity, confusion and integration issues*

With multiple platforms, numerous protocols and large numbers of APIs, IoT systems integration and testing will be a challenge to say the least. The confusion around evolving standards is almost sure to slow adoption. The

rapid evolution of APIs will likely consume unanticipated development resources that will diminish project teams‘abilities to add core new functionality. Slower adoption and unanticipated development resource requirements will likely slip schedules and slow time to revenues, which will require additional funding for IoT projects and longer runways‖ for startups. [15]

5. ***Evolving architectures, protocol wars and competing standards***

With so many players involved with the IoT, there are bound to be ongoing turf wars as legacy companies seek to protect their proprietary systems advantages and open systems proponents try to set new standards. There may be multiple standards that evolve based on different requirements determined by device class, power requirements, capabilities and uses. This presents opportunities for platform vendors and open source advocates to contribute and influence future standards. [15]

6. Concrete use cases and compelling value propositions

Lack of clear use cases or strong ROI examples will slow down adoption of the IoT. Although technical specifications, theoretical uses and future concepts may suffice for some early adopters, mainstream adoption of IoT will require well-grounded, customer-oriented communications and messaging around ―what‘s in it for me.‖ Detailed explanations of a specific device or technical details of a component won‘t cut it when buyers are looking for a ―whole solution‖ or complete value-added service. IoT providers will have to explain the key benefits of their services or face the proverbial ―so what.‖ [15]

CONCLUSION

The potential of the IoT appears to be great, despite the range of issues that need to be addressed. This paper has sought to highlight the IoT concept in general through the four sections.

REFERENCES

1. https://en.wikipedia.org/wiki/Internet_of_Things, Jun 25 (2016).
2. S. Jankowski, ―The Sectors where the Internet of Things really Matters ― Retrieved from https://hbr.org/2014/10/

3. H. Harun and A. Mohd Zin—A Study using Internet of Things Concept toward Engineering Education‖ , Volume 4 No.6, June 2015, Available Online at http://www.warse.org/ijacst/static/pdf/file/ijacst03462015.pdf
4. R. Davies —The Internet of things Opportunities and Challenges (May 2015)‖ , European Parliamentary Research Service . Retrieved from www.europarl. europa.eu /RegData/. ../EPRS_BRI(2015)557012_EN.pdf
5. H. Jiang, X. Chen, S. Zhang, X. Zhang, W. Kong And T. Zhang —Software for Wearable Devices: Challenges and Opportunities‖ Available Online at http://arxiv.org/ftp/arxiv/papers/1504/1504.00747.pdf
6. R. John Robles and T. hoon Kim —Applications, Systems and Methods in Smart Home Technology: A Review‖ Vol. 15, February, 2010 Available Online at www.sersc.org/journals/IJAST/vol15/4.pdf
7. C. Perera, Member, C.Harold Liu & S.Jayawardena —The Emerging Internet of Things Marketplace From an Industrial Perspective: A Survey‖ Available Online at http://arxiv.org/pdf/1502.00134.pdf
8. A. Zanella,N. Bui, A. Castellani & L. Vangelista, M.e Zorzi,‖ Internet of Things for Smart Cities‖ IEEE INTERNET OF THINGS JOURNAL, VOL. 1, NO. 1, FEBRUARY 2014
9. Wattics, —Smart metering,‖ 2011, http://www.wattics.com/
10. Cantaloupe Systems, —Seed Platform,‖ 2012, http://www.cantaloupesys.com/
11. [14] ENGAUGE, —Remote Fire Extinguisher Monitoring System,‖. Retrieved from http://engaugeinc.net/fire-extinguisher-monitoring
12. Internet of Things Technologies. Retrieved from www.postscapes.com/iot
13. IoT for Embedded systems: The new Industrial Revolution. Retrieved from http://www.micrium.com/iot/overview/
14. J.Gubbi,R. Buyya, S. Marusic, M.Palaniswami —Internet of Things (IoT): A Vision, Architectural Elements, and Future Directions‖ Future Generation Computer Systems Volume 29, Issue 7, September 2013, Pages 1645–1660
15. The internet of things challenges and opportunities. Retrieved from http://sandhill.com/article/the-internet-of-things-challenges-and-opportunities/
16. Internet of Things (IoT) : Challenges and Future Directions Ms. Yogita Pundir1, Ms. Nancy Sharma2, Dr. Yaduvir Singh3 International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 3, March 2016

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